W4C SF 5.4.4.4
W4C AR 2.6

# Remedial Investigation Report
## Pacific Sound Resources
## Marine Sediments Unit
## Seattle, Washington

## Volume I

**EPA REGION X**

Contract No. 68-W9-0046
Work Assignment No. 46-37-0M2L
Work Order No. 4000-031-001-5000
Document Control No. 4000-031-001-AABR

**April 1998**

1031

WESTON MANAGERS DESIGNERS/CONSULTANTS

USEPA SF
*1072129*
105645

# REMEDIAL INVESTIGATION REPORT
**Pacific Sound Resources**
**Marine Sediments Unit**
**Seattle, Washington**

*Prepared for*
**U.S. Environmental Protection Agency**
**Region X**
**1200 Sixth Avenue**
**Seattle, Washington 98101**

Contract No. 68-W9-0046
Work Assignment No. 46-37-0M2L
Work Order No. 4000-031-001-5000
Document Control No. 4000-031-001-AABR

April 1998

*Prepared by*
**Roy F. Weston, Inc.**
**700 Fifth Avenue**
**Suite 5700**
**Seattle, WA 98104-5057**

## ARCS QUALITY ASSURANCE CONCURRENCE

### Remedial Investigation Report

| | |
|---|---|
| Project Name: | Pacific Sound Resources<br>Marine Sediments Unit<br>Seattle, Washington |
| Contract Number: | 68-W9-0046 |
| Work Assignment Number: | 46-37-0M2L |
| Responsible Organization: | Roy F. Weston, Inc.<br>700 Fifth Avenue, Suite 5700<br>Seattle, Washington 98104 |

Concurrences:

Name: Nancy Musgrove
Title: FOR Project Manager, Roy F. Weston, Inc.
Signature: _____ Date 4/17/98

Name: Steve R. Fuller, RG
Title: Deputy QA Manager, Roy F. Weston, Inc.
Signature: _____ Date: 4/17/98

Name: Frank C. Monahan, PE
Title: ARCS Program Manager, Roy F. Weston, Inc.
Signature: _____ Date 4/17/98

## TABLE OF CONTENTS


| Section | Page |
|---|---|
| **EXECUTIVE SUMMARY** | **ES-1** |
| **1. INTRODUCTION** | **1-1** |
| 1.1 REPORT ORGANIZATION | 1-1 |
| 1.2 OBJECTIVES AND APPROACH | 1-2 |
| 1.2.1 Project Objectives | 1-2 |
| 1.2.2 Approach | 1-3 |
| 1.3 SITE BACKGROUND | 1-3 |
| 1.3.1 Site Location and Upland Use History | 1-4 |
| 1.3.2 Current and Planned Future Use | 1-4 |
| 1.3.3 Upland Cleanup Actions | 1-5 |
| 1.4 PREVIOUS INVESTIGATIONS | 1-6 |
| 1.5 REMEDIAL INVESTIGATION SAMPLING DESIGN | 1-7 |
| 1.5.1 Surface Sediment Sampling | 1-7 |
| 1.5.2 Subsurface Sediment Sampling | 1-8 |
| 1.5.3 Sediment Bioassays and Benthic Community Evaluation | 1-10 |
| 1.5.4 Clam Bioaccumulation Study and Bioassay | 1-10 |
| 1.5.5 Fish Tissue Investigation | 1-11 |
| **2. PHYSICAL AND ECOLOGICAL SETTINGS AND SOURCES OF CONTAMINATION** | **2-1** |
| 2.1 PHYSICAL SETTING | 2-1 |
| 2.1.1 Upland and Shoreline Features | 2-1 |
| 2.1.2 Geology | 2-2 |
| 2.1.3 Hydrogeology | 2-2 |
| 2.1.4 Regional Meteorology | 2-3 |
| 2.1.5 Upland Surface Water Features | 2-3 |
| 2.1.6 Elliott Bay and Duwamish River Estuary | 2-4 |
| 2.2 ECOLOGICAL SETTING | 2-10 |
| 2.2.1 Intertidal and Subtidal Habitats | 2-11 |
| 2.2.2 Biota | 2-11 |
| 2.3 SOURCES OF CONTAMINATION | 2-12 |
| 2.3.1 Historical Sources | 2-12 |
| 2.3.2 Ongoing Sources | 2-13 |
| **3. CONTAMINANT FATE AND TRANSPORT** | **3-1** |
| 3.1 INTRODUCTION | 3-1 |
| 3.2 POTENTIAL SOURCES OF CONTAMINANTS IN SEDIMENT | 3-1 |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## TABLE OF CONTENTS *(Continued)*

Section Page

3.2.1 Source Linkages ..... 3-2
3.3 FATE, TRANSPORT, AND PARTITIONING OF CONTAMINANTS ..... 3-3
3.3.1 Contaminant Properties ..... 3-3
3.3.2 Fate and Transport ..... 3-3
3.4 CONCEPTUAL SITE MODEL ..... 3-15

**4. DATA QUALITY, ANALYSIS, AND PRESENTATION ..... 4-1**
4.1 INTRODUCTION ..... 4-1
4.2 DATA QUALITY ..... 4-1
4.2.1 Chemical Data ..... 4-1
4.2.2 Sediment Bioassays and Benthic Community Data ..... 4-2
4.3 DATA ANALYSIS ..... 4-3
4.3.1 Nature and Extent of Sediment Chemical Contamination ..... 4-3
4.3.2 Human Health and Ecological Risk Evaluations ..... 4-3
4.4 GIS DATA PRESENTATION ..... 4-5
4.4.1 Display of Concentration Information ..... 4-5
4.4.2 Display of Spatial Extent of Chemicals Exceeding Criteria ..... 4-6

**5. NATURE AND EXTENT OF CONTAMINATION ..... 5-1**
5.1 INTRODUCTION ..... 5-1
5.2 MSU SURFACE SEDIMENT CHEMICAL RESULTS ..... 5-1
5.2.1 Semivolatile Organic Compounds (SVOCs) ..... 5-2
5.2.2 Polychlorinated Biphenyls (PCBs) ..... 5-3
5.2.3 Dioxins and Furans ..... 5-3
5.2.4 Inorganic Substances ..... 5-3
5.3 BACKGROUND SURFACE SEDIMENT CHEMICAL RESULTS ..... 5-4
5.3.1 SVOCs ..... 5-4
5.3.2 PCBs ..... 5-5
5.3.3 Dioxins and Furans ..... 5-5
5.3.4 Inorganic Substances ..... 5-5
5.4 AREAS OF MSU SURFACE SEDIMENT EXCEEDING CHEMICAL CRITERIA ..... 5-5
5.5 MSU SHALLOW SUBSURFACE SEDIMENT CHEMICAL RESULTS ..... 5-6
5.5.1 SVOCs ..... 5-6
5.5.2 PCBs ..... 5-7
5.5.3 Inorganic Substances ..... 5-7
5.6 AREAS AND VOLUMES OF MSU SUBSURFACE SEDIMENT EXCEEDING CHEMICAL CRITERIA ..... 5-8
5.7 DEEP SUBSURFACE SEDIMENT RESULTS ..... 5-8

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## TABLE OF CONTENTS *(Continued)*

Section Page

**6. HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT ..... 6-1**
6.1 INTRODUCTION ..... 6-1
6.2 CONCEPTUAL SITE MODEL AND SELECTED RECEPTORS ..... 6-1
6.2.1 Conceptual Site Model ..... 6-1
6.2.2 Selected Receptors ..... 6-1
6.3 CONTAMINANT SELECTION ..... 6-2
6.4 EXPOSURE ASSESSMENT ..... 6-2
6.4.1 Human Health ..... 6-2
6.4.2 Ecological Risk ..... 6-3
6.5 TOXICITY ASSESSMENT ..... 6-3
6.5.1 Human Health ..... 6-3
6.5.2 Ecological Risk ..... 6-5
6.6 HUMAN HEALTH RISK CHARACTERIZATION AND UNCERTAINTIES ..... 6-6
6.7 ECOLOGICAL RISK CHARACTERIZATION AND UNCERTAINTIES ..... 6-6

**7. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS ..... 7-1**

**8. SUMMARY OF FINDINGS ..... 8-1**
8.1 INTRODUCTION ..... 8-1
8.2 CHARACTERIZATION OF NATURE AND EXTENT OF CHEMICAL CONTAMINATION ..... 8-1
8.3 CHARACTERIZATION OF POTENTIAL CONTAMINANT SOURCES, FATE, AND TRANSPORT ..... 8-2
8.4 CHARACTERIZATION OF HUMAN HEALTH RISKS ..... 8-3
8.5 CHARACTERIZATION OF ECOLOGICAL RISKS ..... 8-3

**9. SOURCES OF UNCERTAINTY ..... 9-1**
9.1 INTRODUCTION ..... 9-1
9.2 FATE AND TRANSPORT ..... 9-1
9.3 NATURE AND EXTENT OF CONTAMINATION AND DELINEATION OF CHEMICAL EXCEEDANCE AREAS ..... 9-2
9.4 HUMAN HEALTH RISK ASSESSMENT ..... 9-3
9.5 ECOLOGICAL RISK ASSESSMENT ..... 9-3

**10. REFERENCES ..... 10-1**

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## LIST OF APPENDICES


| Appendix | Title |
|---|---|
| A | Immunoassay Test Kit Analysis |
| B | Surface Sediment Field Sample Records |
| C | Subsurface Sediment Coring Logs |
| D | Sediment Analytical and Chemical Screening Results |
| E | Chemical and Biological Data Validation Summaries |
| F | Sediment Chemical Data Screening Procedures |
| G | Phase 2 Archived Sample and Phase 3 Laboratory Results |
| H | Individual PAH Contaminant Distribution Figures |
| I | Groundwater Transport of Dissolved Creosote Constituents |
| J | Response to Comments Received on Interim Deliverables |
| K | Ecological and Human Health Risk Assessment Technical Memorandum (see Volume II) |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## LIST OF FIGURES


| Figure | Title |
|---|---|
| 1-1 | PSR Upland and Marine Sediments Unit Location Map |
| 1-2 | Locations of Process Residual Sludge Excavation and Shoreline Features |
| 1-3 | PSR Upland and Marine Sediments Unit Site Features |
| 1-4 | PSR Marine Sediments Unit Phase 1, 2 and 3 Surface Sediment Chemical and Biological Sampling Locations |
| 1-5 | PSR Marine Sediments Site Unit Site and Background Fish Sampling Transects |
| 1-6 | PSR Marine Sediments Unit Surface Sediment Background Chemical and Triad Sampling Locations |
| 1-7 | PSR Marine Sediments Unit Subsurface Sediment Sampling Locations |
| 2-1 | PSR Superfund Site Fill Sequence |
| 2-2 | Site Plan with Selected Historical Features |
| 2-3 | PSR Superfund Site Future Site Layout |
| 2-4 | PSR Marine Sediments Unit Backscatter Intensity Interpretation of Sidescan Sonar Data |
| 2-5 | PSR Marine Sediments Unit Total Percent Sand in Surface Sediment |
| 2-6 | PSR Marine Sediments Unit Percentages of Total Organic Carbon in Surface Sediment |
| 3-1 | PSR Upland DNAPL PAH Composition |
| 3-2 | Station EB-27 PAH Composition |
| 3-3 | Station EB-98 PAH Composition |
| 3-4 | Relationship Between Shoreline Wells and Discharge Zones |
| 3-5 | PSR Marine Sediments Unit Conceptual Site Model of Potential Receptors and Exposure Pathways |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## LIST OF FIGURES *(Continued)*


| Figure | Title |
|---|---|
| 3-6 | PSR Conceptual Site Model of Receptors and Exposure Pathways in the Offshore Unit Post-Upland Cleanup |
| 5-1 | PSR Marine Sediments Unit Exceedance of Total LPAH in Surface Sediment |
| 5-2 | PSR Marine Sediments Unit Exceedance of Total HPAH in Surface Sediment |
| 5-3 | PSR Marine Sediments Unit Exceedance of 2,4-Dimethylphenol in Surface Sediment |
| 5-4 | PSR Marine Sediments Unit Exceedance of 2-Methylphenol in Surface Sediment |
| 5-5 | PSR Marine Sediments Unit Exceedance of 4-Methylphenol in Surface Sediment |
| 5-6 | PSR Marine Sediments Unit Exceedance of Pentachlorophenol in Surface Sediment |
| 5-7 | PSR Marine Sediments Unit Exceedance of Phenol in Surface Sediment |
| 5-8 | PSR Marine Sediments Unit Exceedance of Dibenzofuran in Surface Sediment |
| 5-9 | PSR Marine Sediments Unit Exceedance of Total PCB in Surface Sediment |
| 5-10 | PSR Marine Sediments Unit Comparison of Surface Sediment 2,3,7,8-TCDD (Equivalent) to Elliott Bay Background |
| 5-11 | PSR Marine Sediments Unit Exceedance of Total Copper in Surface Sediment |
| 5-12 | PSR Marine Sediments Unit Exceedance of Total Mercury in Surface Sediment |
| 5-13 | PSR Marine Sediments Unit Exceedance of Total Zinc in Surface Sediment |
| 5-14 | PSR Marine Sediments Unit Surface Sediment PAH Exceedance Areas |
| 5-15 | PSR Marine Sediments Unit Maximum Depth of SQS/LAET PAH Exceedances |
| 5-16 | PSR Marine Sediments Unit Maximum Depth of CSL/2LAET PAH Exceedances |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## LIST OF TABLES


| Table | Title |
|---|---|
| 1-1 | Summary of Surface Sediment Chemical and Biological Analyses |
| 1-2 | Summary of Shallow Subsurface Sediment Compositing Scheme and Chemical Analyses |
| 1-3 | Summary of Deep Subsurface Sediment Field and Laboratory Analyses |
| 1-4 | Summary of Clam and Fish Tissue Chemical Analyses |
| 3-1 | Chemical Composition of Coal Tar Creosote |
| 3-2 | Physical-Chemical Properties of Contaminants of Concern |
| 3-3 | Calculated Sediment-Water Partition Coefficients for Selected Contaminants |
| 3-4 | Raoult's Law Calculation of Contaminant Effective Solubility |
| 3-5 | Sediment Cap Loading Factors |
| 4-1 | SMS and AET Chemical Screening Criteria for Sediment COCs |
| 4-2 | Surface Sediment Background Concentrations of 2,3,7,8-TCDD (Equiv.) |
| 5-1 | Summary Statistics for Surface Sediment COCs |
| 5-2 | Summary Statistics for Shallow Subsurface (0 to 20 feet bgs) Sediment COCs |
| 5-3 | Summary Statistics for Shallow Subsurface (0 to 4 feet bgs) Sediment COCs |
| 5-4 | Summary Statistics for Shallow Subsurface (4 to 8 feet bgs) Sediment COCs |
| 5-5 | Summary Statistics for Shallow Subsurface (8 to 12 feet bgs) Sediment COCs |
| 5-6 | Summary Statistics for Shallow Subsurface (12 to 16 feet bgs) Sediment COCs |
| 5-7 | Summary Statistics for Shallow Subsurface (16 to 20 feet bgs) Sediment COCs |
| 7-1 | Potential Chemical-Specific ARARs for PSR |
| 7-2 | Preliminary Action-Specific ARARs for PSR |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## LIST OF TABLES (*Continued*)


| Table | Title |
|---|---|
| 7-3 | Potential Location-Specific ARARs for PSR |
| 7-4 | Potential Items to Be Considered for PSR |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# EXECUTIVE SUMMARY

## INTRODUCTION

This Remedial Investigation (RI) report is a contract deliverable under Work Assignment No. 46-37-0M2L through the U.S. Environmental Protection agency's (EPA's) Alternative Remedial Contracting Strategy (ARCS) Contract No. 68-W9-0046 with Roy F. Weston, Inc. (WESTON). Findings described in this report are the result of an investigation of hazardous substances in the sediment offshore of the Pacific Sound Resources (PSR) former pole-treating facility that is part of the PSR Superfund site (identified herein as the Marine Sediments Unit [MSU]). An RI/FS for the upland property (Upland Unit), addressing groundwater and non-aqueous phase liquid (NAPL), was released in June 1997.

## SITE BACKGROUND AND USE

The PSR Upland Unit is a former wood-treating facility located on the southern shore of Elliott Bay. The PSR MSU encompasses approximately 200 acres of Elliott Bay, adjacent to and offshore of the Upland Unit. The area surrounding the site is heavily industrialized with many facilities linked to water-dependent industries.

The Upland Unit was used exclusively for wood preserving operations between 1909 and 1994. The wood treating preservatives most commonly used during operations include creosote, creosote/fuel oil mixtures, pentachlorophenol (PCP) and Chemonite (ammonical zinc, copper and arsenic). Zinc meta-arsenate, chromated zinc chloride, Wolman salts, and Pyresote were also used on the site. Wood treatment, transport, and storage activities were primarily responsible for contaminating groundwater and soil in the Upland Unit, particularly in the northern half of the site. Sediment contamination in the MSU is most likely a result of surface water runoff and direct discharge of process wastes.

Current upland site use includes redevelopment by the Port of Seattle as an intermodal railyard and container shipping terminal. Adjacent property west of the site will continue operation as a large transport facility for various bulk materials. Included in the redevelopment will be a public access corridor and elevated walkway along the northernmost portion of the site. In addition, the main pier at the site will be retained as a public viewpoint, but fencing will be installed to prevent access to the shoreline and Elliott Bay. Water-dependent recreational activities in the vicinity of the site will be limited to boat access only.

### Upland Cleanup Actions

Various cleanup actions at the PSR Upland Site have been completed. All structures at the site, with the exception of one foundation, have been demolished. Additional completed cleanup

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

actions have included removal of woodwaste fill in the southern portion of the site, installation of a subsurface containment wall and light nonaqueous phase liquid (LNAPL) recovery trench, installation of a deep stormwater sewer system, addition of fill to elevate the site grade, and placement of a surface cap over the site. These early cleanup actions have significantly reduced potential health and environmental risks related to site contaminants. A study to evaluate the extent of groundwater contamination and identify possible cleanup options has also been completed and included passive NAPL recovery testing, groundwater treatability studies, tidal fluctuation studies, flow estimates, and slurry wall performance measures. The effectiveness of these actions in minimizing releases of site-related contaminants to Elliott Bay will continue to be monitored at the completion of all cleanup activities.

## MSU SAMPLING DESIGN

### Previous Investigations

Previous investigations have been performed in the MSU, but the data were generally not used in this RI to evaluate the extent of sediment contamination because they were 1) not considered comparable based on advancements in analytical techniques, and 2) did not fill any data gaps based on the widespread distribution of the more recently collected RI samples.

### Remedial Investigation Sampling

The RI sampling activities in the MSU were collected in three phases that extended from April to November 1996, and included the collection of surface (0 to 10 cm) sediment, shallow subsurface (0 to 20 feet below mudline) sediment, deep subsurface (0 to 96 feet below mudline) sediment, and fish (English sole) tissue samples for physical and chemical analyses. Surface sediment samples were also collected for laboratory toxicity testing, benthic enumeration and identification, and a clam (*Macoma nasuta*) laboratory bioaccumulation study.

The surface sediment sampling activities were designed to delineate the nature and extent of contaminated surface sediment, and encompassed sampling of 161 stations within an area of approximately 120 acres. The subsurface sediment sampling activities were designed primarily to support the FS calculations of sediment volumes potentially requiring cleanup (based on 17 shallow cores) and to evaluate potential DNAPL transport pathways from the Upland Unit to the MSU (based on 3 deep cores). The laboratory toxicity tests and benthic community evaluations were conducted to support the evaluations of ecological risk and refinement of potential cleanup areas, and the fish tissue sampling and clam bioaccumulation tests were conducted to support the assessments of human health risks from ingestion of seafood. To provide information on bioaccumulative chemicals in a setting similar to the MSU, background surface sediment and fish tissue samples were also collected within Elliott Bay. A subset of the Elliott Bay samples, in addition to sediment collected from Carr Inlet, also served as reference for the laboratory toxicity tests and/or benthic evaluations.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## PHYSICAL SETTING

### Upland Unit

The entire PSR Upland Unit is built atop fill material (placed between 1927 and 1974) that is up to 45 feet thick. Buried wood and concrete are also present in upland portions of the site. Although the nature of the fill material is largely unknown, some known materials included dredge spoils from the Duwamish River, soil from Beacon Hill, sawdust, peat, and concrete riprap. Structures present on the Upland Unit prior to redevelopment included buildings, retorts, railways and storage tanks. The shoreline of the PSR Upland Unit consists primarily of rock and concrete riprap, with three wooden piers extending into the central and western portions of the MSU.

The Upland Unit is located on former mudflats and sloughs associated with the original Duwamish River delta. Waters from Elliott Bay, the Duwamish River, surface runoff, and precipitation influence the hydrogeology of the site, which is characterized by an unconfined shallow aquifer located within the fill and alluvium. The overall movement of groundwater in the vicinity of the site is northerly toward Elliott Bay, although tidal fluctuations may periodically reverse flow directions. No surface water bodies presently exist on the Upland Unit, with the exception of localized flooding during heavy rainfall. Construction of the site cap and the installation of the slurry wall at the PSR Upland Unit have reduced freshwater infiltration and infiltration of estuarine waters from Elliott Bay.

### Elliott Bay and Duwamish River Estuary

The MSU encompasses approximately 1,600 feet of shoreline along Elliott Bay. The West Waterway of the Duwamish River, which channels the downstream river flow to Elliott Bay, lies east of the PSR site. The lower 6 miles of the river form the Duwamish River estuary. Urban, commercial and industrial development covers much of the shoreline of Elliott Bay and the Duwamish River estuary.

Bottom depths within the MSU vary from intertidal to over 200 feet deep with a generally steeply sloped configuration. Tides at the site are influenced by the mixed semidiurnal tides of Elliott Bay. Surface currents are generally weak and variable and most commonly travel counter-clockwise due to prevailing weather patterns, while deeper bottom currents generally travel in a clockwise direction. Higher current speeds attributable to boat traffic have been measured in waterways surrounding Harbor Island and may influence sediment resuspension. Sediment transport to Elliott Bay is seasonal and primarily from the Duwamish River, with minor contributions from beach and bluff erosion. The majority of suspended sediment initially settles out in the lower Duwamish River and near the mouth of the West Waterway; however, suspended sediment does enter Elliott Bay during peak river flows.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

The results of the RI field investigations and laboratory analyses indicate that surface substrates in the MSU consist primarily of fine and very fine sand, with localized areas dominated by coarse silts and gravelly sands and silts. Shallow subsurface sediment was generally composed of a silt layer over sand and silty sand. Deep subsurface sediments consisted primarily of medium to very fine sand.

Total organic carbon (TOC) concentrations in surface sediment within the MSU typically ranged from 0.5 to 2 percent, with higher concentrations observed west of the West Slip, north-northeast of the site and in the nearshore area north of the upland Unit. TOC content tended to decrease with depth below surface, with the deeper subsurface intervals (greater than 16 feet below mudline) characterized by an average TOC content of less than 1 percent.

The presence of anthropogenic materials in surface and subsurface sediment was also documented during field activities. Over half of the surface sediment sampling locations exhibited petroleum sheens, and samples from approximately 25 percent of the locations also contained wood debris. Shallow subsurface sediment samples exhibited a lower frequency of sheening, but staining and the presence of free product were noted in some samples. Both free and residual petroleum/creosote product were observed at depths below surface in the deep coring program (up to 78 feet below mudline). The results of a side-scan sonar survey conducted by the U.S. Geological Survey (USGS) further suggested the presence of non-native materials (i.e., probable or potential fill) offshore of the Upland Unit.

## ECOLOGICAL SETTING

Nearly all intertidal wetlands and shallow subtidal aquatic habitats in the vicinity of the MSU have been eliminated as a result of urban and industrial development. Limited intertidal habitat exists within the MSU in the form of two pocket beaches at the head of the West and Main Slips and as thin bands of mud- and sandflats along the toe of the riprapped banks. Because the MSU is located in a transition zone between the estuarine environment of the Duwamish River and the marine environment of Elliott Bay, the substrates and waters adjacent to the site contain habitat characteristics common to both environments. Biota utilizing the habitat within the MSU include a variety of marine invertebrates, fishes (including salmonids), birds, and marine mammals, including some state and federally classified species of concern.

## SOURCES AND PATHWAYS OF CONTAMINATION

### Historical

The PSR Upland Unit was included on the National Priorities List in May 1994 based on the presence of wood preservatives in soil, groundwater, surface water, and sediments at or adjacent to the site. Historical sources of upland soil and groundwater contamination included leaks from

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

chemical storage and transport vessels and dripping of preservatives from treated wood during handling and storage. Sediment contamination in the MSU is most likely the result of direct discharge or disposal of wood treating preservatives during the treatment and storage process or direct release of process wastewater to the bay. Other potential historical sources and transport pathways from the Upland Unit to the MSU include downward and lateral migration of free-phase creosote, transport of contaminated groundwater, and erosion of contaminated soils by stormwater runoff.

### Ongoing

As a result of cleanup actions at the former upland facility, the only likely remaining contaminant migration pathways are transport of deeper contaminated groundwater or free-phase creosote outside the slurry wall from the facility to Elliott Bay via preferential flow pathways (e.g., sand stringers), with subsequent partitioning to sediment and longshore or downslope migration of contaminated surface sediment in the MSU. The transport of shallow LNAPL and dissolved-phase NAPL in shallow groundwater to Elliott Bay has been inhibited by the slurry wall and LNAPL recovery trench that were constructed as part of the upland source control activities. However, some DNAPL is present seaward of and deeper than the slurry wall, potentially constituting an ongoing source to the bay. In addition, the capping and paving of the Upland Unit and wall construction does not prevent the transport of dissolved contaminants from deeper groundwater to the bay.

## CONTAMINANT FATE AND TRANSPORT

### Source Linkages

PAHs present in the MSU are associated with creosote and the fuel oil carrier used in wood preservation at the upland facility. Creosote is a complex mixture of hundreds of individual compounds, consisting primarily of PAHs (approximately 90 percent). When released to the environment, creosote forms an immiscible liquid that may occur in a free-phase (capable of flowing) or residual (bound in interstitial spaces) form. This liquid is referred to as a non-aqueous phase liquid, or NAPL. Creosote NAPLs are found in both dense (DNAPL) and light (LNAPL) phases at the PSR site. An examination of the relative ratios of PAHs in MSU sediment with the average upland DNAPL PAH composition indicated similar patterns, suggesting that releases of contaminants from the upland facility are the primary source of PAHs in the MSU.

Polychlorinated dibenzodioxins (dioxins) and dibenzofurans (furans) are produced by incomplete combustion of chlorinated organic compounds, and, historically, as by-products in the manufacture of PCP wood preservative. Although these compounds were not analyzed as part of the investigations of the Upland Unit, their presence in MSU sediment was qualitatively linked to the upland site based on comparisons between MSU concentrations and Elliott Bay background

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

values. The highest concentrations of dioxins and furans (relative to background) were observed in sediment adjacent to the upland facility, with decreasing concentrations with distance offshore, suggesting the source is the upland facility.

**Fate, Transport, and Partitioning of Contaminants**

Physical-chemical properties that influence fate and migration of contaminants in the MSU are primarily a function of a given compound's molecular weight and chemical structure and include solubility, vapor pressure, affinity for adsorbing to organic matter, and partitioning between air and water. In general, the contaminants of concern for the MSU have a strong affinity for binding with organic material associated with sediment.

Once released to the environment, contaminant interactions with various environmental media are complex. At the MSU, a number of chemical, physical, and biological processes are of concern because they affect the dispersal of site-related contaminants and the degree to which living organisms can be exposed and potentially harmed. These processes include adsorption to sediment, dissolution into groundwater or the water column, bioaccumulation, degradation, free-phase DNAPL migration, sediment transport, and sediment deposition. However, the dominant ongoing processes driving fate and environmental effects in the MSU are adsorption to sediment, selective dissolution of LPAHs from NAPL to groundwater or from sediment to the water column, and accumulation in biota.

**Potential Groundwater Contribution to Sediment Contamination**

Contaminant loading from groundwater underlying the Upland Unit was identified as a potentially significant pathway for contamination of MSU sediments. Therefore, an analysis was conducted using the BIOSCREEN model to evaluate the potential of existing upland groundwater quality conditions to impact sediment concentrations in the MSU. Specifically, the model was used to predict maximum groundwater concentrations in the centerline of the contaminant plume under steady-state conditions. Groundwater quality data, chemical properties, and hydrogeologic and aquifer characteristics were consistent with those presented for the fate and transport analysis that was conducted as part of the Upland Unit RI.

PAH data from shoreline wells, four of which contained DNAPL, were used as input to the model. PAHs were determined to be the only significant chemicals of concern present in groundwater that have the potential to contaminate sediment. Three discharge zones associated with the shoreline wells were identified (i.e., the shallow, intermediate, and deep zones), representing portions of the sediment/bay interface from the shoreline to elevations deeper than -50 feet MLLW. The modeled dissolved groundwater quality concentrations were based on theoretical dissolved phase concentrations, which were typically higher than the actual chemical concentrations measured in the wells. Sorption, dispersion, and tidal dilution were used as the primary attenuation mechanisms for dissolved groundwater constituents.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

A multistep screening approach was used for the fate and transport modeling, which included varying specific model input parameters to evaluate changes in the sediment loading factors (i.e., the sediment concentrations added to a sediment layer one meter thick per year) and resulting sediment layer concentrations. The predicted sediment layer concentrations were also compared to LAET and 2LAET values as a reference to determine the significance of the sediment loading factors. The results of the modeling effort indicated that the intermediate zone (between -25 and -50 feet MLLW) represents the area most likely to be affected by groundwater contaminant transport over time, and that naphthalene and fluorene are the two main creosote constituents that would contribute to sediment loading (i.e., the predicted concentrations of these contaminants in the intermediate zone exceed sediment chemical screening values after 20 years). However, groundwater contribution to sediment contamination under current conditions is minor compared to the existing mass in sediments from historical disposal or direct discharge of creosote wastes from the facility.

## DATA QUALITY, ANALYSIS AND PRESENTATION

### Data Quality

The sediment and tissue data collected during the RI sampling program were evaluated for various chemicals of concern using analytical methods defined by the EPA and Puget Sound Estuary Program. The data validation reviews determined that none of the sediment data were rejected and that only the results for three PAHs in one tissue sample required rejection based on unacceptable surrogate recoveries. In addition, the percentage of qualified data was minimal and did not adversely impact data usability. Therefore, the chemical data were considered overall to be of high quality and usable to support the RI evaluations.

The toxicity tests and benthic infaunal enumeration and identification were also conducted in accordance with PSEP protocols. Detailed reviews of the results were conducted by WESTON and indicated that the data were valid and generally of high quality. Performance standard failures were observed for the toxicity test reference sediments, but, in accordance with Ecology guidance, control sediment results were substituted for these failures for purposes of data evaluation.

### Data Analysis and Presentation

In this RI, surface and subsurface chemical data were compared with available sediments effects-based screening values [i.e. Washington State Sediment Management Standards (SMS) and Puget Sound Apparent Effects Thresholds (AETs)] to evaluate the nature and extent of sediment contamination within the MSU. Dioxins and furans, for which promulgated sediment regulatory screening values do not currently exist, were compared to Elliott Bay background concentrations established during the RI sampling program.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Several additional data evaluation techniques were employed as part of the ecological and human health risk assessments. These included the calculation and use of various statistical endpoints (e.g., frequency of detection, average concentrations and 90th percentile), comparisons with EPA risk-based screening concentrations (RBSCs), calculations of cancer risks and noncancer hazard indices, maternal-egg transfer modeling, comparisons with SMS biological criteria, and calculation and use of various benthic community metrics. These evaluations are not discussed in detail in this RI but are presented in the risk assessment technical memorandum (**Appendix K** of the RI).

For the RI, a geographic information system (GIS) was used to prepare analyte concentration and spatial distribution figures for surface sediments sampled in the MSU. Data were presented on a station-by-station basis, and areas associated with each sampling point were depicted using Thiessen polygons.

## NATURE AND EXTENT OF CONTAMINATION

PAHs were determined to be the primary contaminant of concern in surface and subsurface sediments in the MSU based on their widespread distribution at concentrations in excess of effects-based chemical screening criteria. The concentrations of these chemicals tended to decrease with distance offshore of the Upland Unit and depth below mudline. Overall, approximately 100 acres and one million cubic yards of sediment are contaminated with PAHs at concentrations in excess of the lower sediment screening values. When compared with the upper sediment screening criteria, this area is reduced to approximately 50 acres with a concurrent reduction in volume to an estimated 500,000 cubic yards.

## HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

Human health and ecological risk assessments were conducted to evaluate the potential impact of site-related contaminants on receptors inhabiting or visiting the MSU. The overall approach focused on risks associated with site-related chemicals where the effects are not addressed by the SMS. The estimated risks represent "residual risks," or the risk remaining after a given area of the MSU is remediated. The evaluation of human risks focused on cancer and non-cancer risks to fishers who may consume above-average amounts of fish and shellfish from the site. The analysis of ecological risks focused on impacts to benthic invertebrates, fish and shellfish exposed to site-related contaminants. Contaminants evaluated in the risk assessment generally included those that exceeded SMS criteria, were known to bioaccumulate, were widespread throughout the site, exceeded Elliott Bay background concentrations, and, for human health, exceeded risk-based screening values. Overall, several individual PAHs, as well as dioxins and furans, were retained for both risk assessments.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## Exposure Assessment

The exposure assessment for human health focused on exposure of tribal fishers to site contaminants through consumption of fish and shellfish from the MSU site. English sole collected from the MSU were used as surrogate species to represent bottom fish because of their abundance at the site, extensive contact with sediment, and limited home range. Clams were used as a surrogate species for all shellfish because of their close association with sediment and potential for human consumption. The human health risk assessment used consumption rates and patterns determined from a fish consumption survey of the Tulalip and Squaxin Island tribes. Modifications were made to reflect reasonable expected consumption of fish and shellfish from the MSU. Exposure point concentrations for fish and shellfish under current conditions and various cleanup scenarios were determined using a linear bioaccumulation model.

The ecological exposure assessment focused on deriving exposure point concentrations for sediment, benthic infauna, clams, fish, and fish eggs. Contaminant-specific exposure point concentrations for surface sediment and benthic exposures were evaluated on a station-by-station basis. Contaminant exposure to clams and fish was estimated by directly measuring concentrations of contaminants of potential concern (COPCs) in tissues. A maternal-egg transfer approach was used to model exposures to fish eggs.

## Toxicity Assessment

The human health toxicity assessment focused on the relationship between exposure and potential for adverse health effects. Cancer risks due to site exposure were evaluated based on EPA toxicity factors; non-cancer risks were evaluated based on published reference doses. Of the site-related COPCs in fish and shellfish that were of concern for human health, only dioxins and some PAHs were considered to be carcinogenic. The cancer risks posed by these compounds were evaluated using EPA's toxicity equivalency factors approach. A non-cancer reference dose was identified for only one non-carcinogenic PAH.

In the ecological risk assessment, several different criteria were used to evaluate potential toxicity to a range of receptors at the site. Potential toxicity to benthic organisms was evaluated by comparing site-specific sediment chemical and biological data (including laboratory bioassays) to effects-based screening criteria (e.g., SMS), as well as benthic community-based data to Elliott Bay background data.

Chemical-specific toxicity evaluations were conducted for measured concentrations of COPCs in fish collected from the site and in clams exposed to site-collected sediment. Estimates of fish egg concentrations were made based on a simple maternal transfer model. Toxicity to fish and eggs was also evaluated using literature-based effects concentrations of chemicals in fish tissues and background concentrations of chemicals in clam tissue.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### Risk Assessment Conclusions

The results of the human health risk characterization indicated that cancer risks (4E-04) to subsistence fishers are the primary concern under current conditions, and that noncancer risks to human receptors based on exposure to PAHs do not appear to be significant (<1.0). Risks are reduced by an order of magnitude (7E-05) if sediments with PAHs above their respective CSL criteria are remediated, and cleanup to SQS results in a three-fold reduction (2E-05) in risk relative to a CSL-based cleanup.

The results of the ecological risk assessment indicated no risks to fish or fish eggs based on exposure to dioxins and furans in sediment. However, existing contamination has low to moderate impacts on benthic invertebrates residing in the MSU, and deleterious impacts to clams from exposure to site-related contaminants may be occurring based on the degree by which MSU sediment concentrations are elevated above background. Impacts to fish health from exposure to PAHs may also be occurring given the strong link between exposure to chlorinated hydrocarbons and such effects as development of lesions and tumors, reduced immune system response, or impairment of the cortisol stress response. However, the relationship between sediment concentrations and the body burden triggering these responses could not be quantified because PAHs are metabolized by higher order vertebrates (i.e., PAHs are not retained in their original form in tissues).

## UNCERTAINTIES

The major sources or uncertainty associated with the findings of the PSR MSU RI are those that are common to all remedial investigations, including work plan design and implementations and limitations of the sciences and analytical techniques used during the project.

In addition, the following uncertainties associated with fate and transport, nature and extent of contamination, the human health and ecological risk assessments, and groundwater contribution to sediment contamination are specific to this RI and will influence future decision for the MSU:

- Conclusions regarding cap effectiveness, impacts during dredging, potential for recontamination, and potential for natural recovery may be inaccurate based on the assumptions that the mobility and environmental persistence of contaminants of concern is accurately represented by laboratory studies of single chemicals, that volatilization, degradation, DNAPL flow or transport, and sediment deposition are not significant transport processes with regard to chemical behavior and migration of MSU sediments, and that sedimentation rates in the MSU are insufficient to support natural recovery.

- The conclusion that groundwater transport of PAHs may contribute to sediment contamination may be inaccurate based on the assumptions that the model used

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

accurately reflects actual shoreline conditions, that the groundwater quality in shoreline wells containing DNAPL is representative of groundwater quality throughout the upland shoreline, and the all dissolved contaminants would partition to the clean sediment cap.

- The areas and volumes of sediment identified as requiring cleanup may be inaccurate based on the assumption that sampling density as represented by the three phases of RI surface and subsurface sediment samples and the polygonal areas associated with each sampling location accurately represent surface and subsurface sediment contaminant distribution and extent.

- Risks to human health may be over- or underestimated based on the appropriateness of the assumptions regarding exposure, the availability and assumptions associated with the derivation of toxicity factors, and the use of a bioaccumulation model to represent exposure point concentrations.

- Risks to ecological receptors may be over- or underestimated based on the appropriateness of the background benthic area selected for comparison with MSU data, the accuracy of the laboratory bioassays in predicting impacts to *in situ* receptors, the assumptions regarding the site-specific bioavailability of contaminants, the accuracy of the predictions of exposure to clams and fish that were based on average tissue concentrations and chemical detection limits, the use of a model to predict chemical concentrations in fish eggs, and the assumptions associated with effects levels for fish.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 1

# INTRODUCTION

This Remedial Investigation (RI) report is a contract deliverable under Work Assignment No. 46-37-0M2L through the U.S. Environmental Protection Agency's (EPA's) Alternative Remedial Contracting Strategy (ARCS) Contract No. 68-W9-0046 with Roy F. Weston, Inc. (WESTON). Findings described in this report are the result of an investigation of hazardous substances in the sediment offshore of the Pacific Sound Resources (PSR) former pole-treating facility that is part of the PSR Superfund site (identified herein as the Marine Sediments Unit [MSU]; **Figure 1-1**), as implemented from the April 1996 Work Plan (**WESTON 1996a**) and companion Sampling and Analysis Plans (SAPs; **WESTON 1996b, 1996c, and 1996d**).

The purpose of this report is to provide EPA, other interested agencies, and the general public with findings from the sediment investigation. Interim documents have been previously released and reported the preliminary results of various phases of sampling and risk evaluation (**WESTON 1996e and 1997a,b**). Comments received as part of regulatory and trustee agency reviews of the documents are responded to in **Appendix J** and, where applicable to the RI and risk assessments, are addressed herein. The Feasibility Study (FS) for the MSU, addressing potential remedial alternatives for sediment cleanup, will be provided by WESTON mid-1998. An RI/FS for the upland property (Upland Unit) addressing groundwater and non-aqueous phase liquid (NAPL) was released in June 1997 (**RETEC 1997**).

## 1.1 REPORT ORGANIZATION

The sediment RI report is organized into 11 sections with accompanying appendices and maps. **Section 1** provides background information including the objectives and approach of the RI, as well as summaries of historical information and the RI sampling design. **Section 2** describes the physical and ecological setting of the MSU and vicinity, and provides a discussion of sources of contamination to the offshore sediments. **Section 3** provides a discussion of the fate and transport of contaminants of concern, as related to the conceptual site model (CSM) and the potential for groundwater to contribute to sediment contamination. **Section 4** describes the quality of the data collected during the RI and the methods used for data evaluation and presentation. The nature and extent of contamination and delineation of surface sediment chemical exceedance areas, as determined by the chemical analyses of sediment collected as part of this RI, are discussed in **Section 5**. The results of the human health and ecological risk assessments conducted for the MSU are summarized in **Section 6**. Potential applicable or relevant and appropriate requirements (ARARs) are summarized in **Section 7**. The summary of findings is provided in **Section 8**, and sources of uncertainty are presented in **Section 9**. **Section 10** provides complete citations for all referenced documents. **Appendices A through K**

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

contain supplemental information, including the Ecological and Human Health Risk Assessment Technical Memorandum, and are referenced throughout the text.

## 1.2 OBJECTIVES AND APPROACH

The overall objective of this investigation was to determine the magnitude and spatial distribution of hazardous chemicals in the MSU to support development of remedial alternatives for sediment management and cleanup. The remedial action objectives (RAOs) for the MSU are to reduce migration of contaminants into and within the marine environment, reduce adverse effects to aquatic biota and risks to human health, and to restore the aquatic habitat to quality comparable with less-impacted urban embayments in Puget Sound (**WESTON 1996a**).

### 1.2.1 Project Objectives

The specific objectives of the RI/FS were designed to address data gaps identified following evaluation of existing information (**WESTON 1995**) and were designated in the RI/FS Work Plan as follows (**WESTON 1996a**):

- Collect data of known and acceptable quality to evaluate the extent and magnitude of contamination in the surface and subsurface sediment in the PSR MSU.
- Determine residual risk to human health for contaminants of concern (COCs) in areas representing potential boundary conditions for the purpose of defining site-specific cleanup goals and a cleanup boundary that would be protective of human health.
- Determine risks to ecological receptors in boundary areas for bioaccumulative chemicals for the purpose of defining site-specific cleanup goals and a cleanup boundary that would protect aquatic biota from deleterious bioaccumulative effects.
- Develop and evaluate remedial alternatives for sediment requiring cleanup based on unacceptable impacts or risks to the environment or human health.
- Collect additional information to support selection of a feasible, cost-effective remedial action based on:
  - physical site characteristics,
  - future use information,
  - the potential for natural recovery, and
  - the potential for recontamination.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 1.2.2 Approach

The sampling and analysis approach was designed to collect data to meet the objectives of the RI/FS and fill data gaps affecting cleanup decisions. The procedures used for data collection were described in detail in a series of sampling plans (**WESTON 1996b, 1996c, and 1996d**), which can be found in the EPA administrative record file (#2.3) for the site. Deviations from the sampling plans are discussed in the Phase 1 and Phase 2 Technical memoranda (**WESTON 1995 and 1997a**).

A sequential data collection (i.e., phased) approach was implemented for the RI/FS sampling program. The first phase (Phase 1) of sampling focused on confirming and refining the boundaries of chemical contamination at levels above the Sediment Management Standards (SMS) chemical criteria. This phase of sampling included the collection of surface (0 to 10 cm) sediment samples for chemical and physical analyses.

Data gaps identified following completion of the Phase 1 assessment were used to guide the Phase 2 sampling effort, which was designed to further identify the extent of sediment contamination, support the evaluations of human health and ecological risks, and assess potential remedial alternatives. The task of refining areal extent was accomplished through the collection of additional surface sediment samples for chemical analyses. Data collection efforts designed to support the human health and ecological risk assessments included the collection of surface sediment for chemical analyses and toxicity testing, benthic infaunal analysis, and bioaccumulation testing, and the collection of fish tissues for chemical analyses. Additional sampling conducted to support preliminary evaluations of remedial alternatives included collection of subsurface sediment for stratigraphic interpretations, chemical analysis, engineering evaluations, and contaminant mobility testing.

Following completion of the Phase 2 assessment, it was determined that the outermost boundaries of surface sediment contamination in the MSU required further delineation. As a result, a third phase of sampling (Phase 3) was conducted to address this data gap through the collection and chemical analysis of additional surface sediments.

Details regarding each type of sampling, including total number of samples collected and sample analytical requirements, are provided in **Section 1.5**.

## 1.3 SITE BACKGROUND

Background information on the Upland and MSU was presented in detail in the Summary of Existing Information and RI/FS Approach Technical Memorandum (**WESTON 1995**) and the RI/FS Work Plan (**WESTON 1996a**). The following sections briefly summarize the information previously presented, with updates based on most recently available data for the Upland Unit.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 1.3.1 Site Location and Upland Use History

The PSR Upland Unit is a former wood-treating facility located on the southern shore of Elliott Bay. Elliott Bay is a deep, cold-water urban harbor in Puget Sound (**Figure 1-1**). The original facility was a pile-supported structure over intertidal and subtidal bottom lands that evolved into a 25-acre site. The upland property is bounded to the north by Elliott Bay, and on all other sides by the Port's newly constructed intermodal yard and container shipping facilities (of which PSR is part).

The PSR MSU encompasses approximately 200-acres of Elliott Bay adjacent to and offshore of the Upland Unit. Elliott Bay has been extensively developed for urban, port, and industrial land uses; the area surrounding the site is heavily industrialized with many facilities linked to water-dependent industries.

Historical operations at the Upland Unit consisted exclusively of wood preserving between 1909 and 1994 (**RETEC 1997**). Preservatives most commonly used in the wood-treating operation included creosote and creosote/fuel oil mixtures, pentachlorophenol (PCP), and Chemonite (also known as AZCA, a mixture of ammonical zinc, copper, and arsenic). Zinc meta-arsenate, chromated zinc chloride, Wolman salts (containing fluoride, chromium, arsenic, and phenol), and Pyresote (made of zinc chloride, boric acid, ammonium sulfate, and dichromate) have also been used on the site (**RETEC 1997**). The draining of retorts (wood/preservative cooking facilities), transfer of newly treated wood products to various areas of the site, and storage of these products were primarily responsible for the contamination of soil and groundwater in the Upland Unit. Indirect transport (surface water runoff, soil erosion), spills and direct discharge of process wastes most likely contributed to contamination of sediment in the MSU. Areas associated with the retorts, transfer tables, and preservative storage tanks in the northern half of the site represented the areas of greatest chemical contamination prior to initiation of upland cleanup activities. **Figure 1-2** shows the locations of excavated source areas at the site.

### 1.3.2 Current and Planned Future Use

The upland portion of the PSR site is currently being redeveloped by the Port of Seattle as an intermodal railyard and container shipping terminal. This facility will include railroad tracks, buildings and underground utilities. The installation of railroad tracks and terminal support facilities is scheduled for completion in late 1998 (**RETEC 1997**). The adjacent property west of the site (Crowley Marine) will continue operation as a barge transport facility for bulk materials such as sand.

As part of the Port's site redevelopment, a public access corridor, including an elevated walkway, will be constructed along the northernmost portion of the site. The main pier at PSR will be retained as a public viewpoint. However, both the shoreline and the pier will be fenced to prevent access to the shoreline and Elliott Bay, which is currently the site of many water-dependent recreational activities including sailing, boating, scuba-diving, parasailing, fishing,

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

shrimping, and crabbing. Such activities in the vicinity of the site would be limited to boat access only. The nearest public boat launch facility is at Don Armeni Park, approximately 0.5 mile northwest of the site.

Elliott Bay, including the area in the vicinity of the PSR site, is also part of the traditional fishing grounds of the Muckleshoot and Suquamish tribes. Tribal members engage in net fishing for salmon during seasonal runs. In addition, the Tribes have rights to gather shellfish in Elliott Bay.

### 1.3.3 Upland Cleanup Actions

#### *1.3.3.1 Facility*

In the Upland Unit, all structures, with the exception of one large foundation that was not a source of contamination, have been demolished. Several additional cleanup actions, including removal of the woodwaste fill in the southern portion of the site, installation of a subsurface containment (slurry) wall and light nonaqueous phase liquid (LNAPL) recovery trench, installation of a deep stormwater sewer system, addition of fill to elevate the site grade, and placement of a surface cap over the site are complete. Details regarding each of these early actions are provided in Implementation Plans (**RETEC 1994e** and **1995b**) and the Upland RI (**RETEC 1997**) and are briefly addressed below.

The physical containment barrier was installed in early 1996 to prevent migration of LNAPL to Elliott Bay and dampen tidal influence at the site. The wall is 1,600 feet in length; depth varies from 32 to 51 feet below ground surface (bgs) (**RETEC 1997**). The LNAPL recovery trench was installed in conjunction with the barrier to recover any product migrating towards the bay. To date, recovery equipment has not been installed because little to no LNAPL has collected in the trench (**RETEC 1997**).

A low-permeability asphalt cap was constructed over a layer of clean fill placed at the site to: (1) prevent direct exposure of site personnel to contaminants in the surficial soil, (2) prevent the off-site migration of surficial soils via surface runoff, (3) minimize impacts to groundwater by limiting infiltration of surface water and subsequent leaching of contaminants to the groundwater, and (4) support site development. Capping was completed in 1997 **[RETEC 1998 (pending)**; see **Figure 1-3]**.

An RI/FS to determine the extent of groundwater and NAPL contamination and formulate cleanup options has been completed. As part of this work, groundwater, surface and subsurface soils have been tested to determine the distribution of nonaqueous phase liquids (NAPLs; both light and dense) and dissolved contaminants in groundwater throughout the site. In addition, passive NAPL recovery testing has occurred and several treatability studies for groundwater have been conducted. Additional completed work includes tidal fluctuation studies and flow estimates in the vicinity of the slurry wall (**RETEC 1997**) to assess the performance of the wall.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

As part of the Upland Groundwater and NAPL Remedial Investigation, several dense nonaqueous phase liquid (DNAPL) recovery wells were installed to test the feasibility of passively recovering DNAPL. For wells yielding sufficient testing volumes, testing was conducted during the first six months of 1996. DNAPL was evaluated to determine physical and chemical characteristics (**RETEC 1997**).

The upland remedial investigation and design of the early cleanup actions, as described, have been completed. As a result of these early cleanup actions, potential health and environmental risks related to site contaminants have been significantly reduced (**RETEC 1997**). The effectiveness of the early actions in minimizing releases of site-related contaminants to Elliott Bay will continue to be monitored at the completion of all cleanup actions.

#### *1.3.3.2 Longfellow Creek and Overflow Channel*

The Longfellow overflow channel borders the western-most boundary of the current Port facility. Historically, Longfellow Creek flowed north along the southwestern edge of the site prior to discharging to Elliott Bay. The creek has since been diverted and currently flows into the West Waterway of the Duwamish river. The Longfellow overflow channel, which acts as a local stormwater drain, flows through a present-day closed culvert (the former creek channel) and discharges near the Crowley-Marine barge facility west of the PSR property. Because the overflow channel represents a potential receptor of groundwater from the site as well as stormwater and other runoff upgradient from the site, the Port chose to clean out the culvert prior to initiation of a groundwater monitoring program. All in-line sediment was removed from the pipeline, extending from the Birmingham Steel site to the pipe mouth. An additional 25 cubic yards of contaminated sediments were removed from the shoreline at the outfall. Birmingham Steel maintains a current NPDES permit to discharge to the Longfellow overflow channel (**Stetz 1998**).

## 1.4 PREVIOUS INVESTIGATIONS

Results of previous sediment investigations were described in detail in the Summary of Existing Information and RI/FS Approach Technical Memorandum (**WESTON 1995**). The historical data were not used in this RI to establish the nature or extent of sediment contamination, as the data were (1) not considered to be comparable to the RI data based on recent modifications to analytical methods and techniques, and (2) did not fill any data gaps associated with areal extent, based on the widespread distribution of the more recently collected RI samples. One exception is the data collected as part of the Southwest Harbor Project between the Lockheed shoreline and pierheads. These data formed the basis of the potential cleanup boundary proposed by the Washington State Department of Ecology (**Ecology 1996**) for remediation of contaminated sediments offshore of the Lockheed property. The proposed boundary is used in this RI to define the easternmost boundary of the MSU.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 1.5 REMEDIAL INVESTIGATION SAMPLING DESIGN

The RI sampling activities in the MSU were conducted from April to November 1996. To assess the areal extent of sediment contamination, surface (0 to 10 cm) sediment samples were collected from a total of 161 unique locations (**Figure 1-4**) for visual inspection, physical and chemical analysis (or archival), and/or field immunoassay testing. In support of the human health and ecological risk assessments, additional sediment volume was collected at nine of these locations for laboratory toxicity testing, benthic infaunal analysis, and clam bioaccumulation testing (**Figure 1-4**). English sole were also collected from two transects offshore of the site (**Figure 1-5**) for tissue chemical analyses. In total, four background locations in Elliott Bay were also sampled for sediment physical, chemical, and/or biological analyses to further support the risk assessments, as were two background fish transect locations (see **Figures 1-6 and 1-5,** respectively).

To support the development of potential remedial alternatives, the vertical extent of contamination was assessed through the collection of shallow subsurface cores (up to 20 feet below mudline) from a total of 17 locations (**Figure 1-7**) for physical and chemical analysis (or archival). In addition, deep subsurface coring (up to 96 feet below mudline) for stratigraphic interpretations and long wavelength ultraviolet (UV) field screening was conducted at three locations (**Figure 1-7**).

The procedures used for data collection were described in detail in a series of sampling plans (**WESTON 1996b, 1996c, and 1996d**) which can be found in the EPA Administrative Record File 2.3. In addition, actual station- and transect-specific sampling coordinates were summarized in the Phase 1 and Phase 2 Technical memoranda (**WESTON 1995 and 1997a**).

### 1.5.1 Surface Sediment Sampling

#### *1.5.1.1 MSU*

The surface sediment investigation was designed to delineate the nature and extent of contaminated sediment in the MSU. The selection of sampling locations was based on the availability of historical data and the need to define contaminant extent. This approach resulted in the collection of samples from 161 unique locations encompassing an area of over 150 acres and ranging in depth from approximately -0.5 to -81 meters mean lower low water (MLLW) (**Figure 1-4**).

Samples collected from 143 of the 161 stations were submitted for laboratory chemical and physical analyses (or archival) and/or field immunoassay testing (see **Appendix A**); samples collected from the remaining 18 stations were only visually assessed in the field for apparent gross contamination (presence of creosote, strong petroleum odor, sediment sheening). Of the 143 stations, laboratory data are available for 109 stations (see **Appendix D; Table D-1**); all samples collected from 9 additional stations were archived and not analyzed and sediments

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

collected from the remaining 25 stations are characterized by field immunoassay testing results (see **Appendix A**). The archived samples were not analyzed for the RI because the extent of contamination was established by samples collected inshore of those stations.

**Table 1-1** lists the analyses performed at each MSU surface sediment sampling location. Available data include total organic compound (TOC), grain size, percent moisture, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins and dibenzofurans (dioxins and furans), phenolic compounds, dibenzofuran, and select inorganics.

*1.5.1.2 Background Areas*

Background surface sediment sampling was conducted to support risk evaluations associated with bioaccumulative chemicals of concern, such as dioxins and furans and PCBs. The selection of sampling locations was based on the need to establish ambient surface sediment concentrations of bioaccumulative chemicals for a setting similar to the urban setting of the MSU. This approach resulted in the collection of samples from four unique locations in Elliott Bay: BK01 (and the field replicate BK01D), offshore of Magnolia Bluff; BK02, adjacent to Myrtle Edwards Park; BK03, west of the Duwamish Head offshore of Alki, and; BK04, east of the Duwamish Head offshore of Alki (see **Figure 1-6**). Stations BK01, BK02, and BK03 were initially sampled for sediment physical and chemical analyses during the Phase 1 investigation. One of these stations, BK01, was resampled for physical, chemical, and biological analyses during the Phase 2 investigations, at which time Station BK04 was also sampled for the same parameters.

**Table 1-1** lists the analyses performed at each of the background stations. TOC, grain size, PAH, PCB, dioxin and furan, and mercury data are available for each of the Elliott Bay background stations. Percent moisture and additional metals data are also available for three of the four stations (i.e., all but BK04).

### 1.5.2 Subsurface Sediment Sampling

*1.5.2.1 Shallow Coring*

The shallow (up to 20 feet below mudline) subsurface sediment investigation was primarily designed to support the FS calculations of sediment volumes potentially requiring cleanup in the MSU and to confirm the presence of potential fill materials indicated by U.S. Geological Survey (USGS) side-scan sonar data (see also **Section 2.1.6.5**). To meet these objectives, 17 shallow cores were advanced along transects radiating outward from nearshore areas at depths up to -52 meters MLLW (see **Figure 1-7**).

Of the 17 stations sampled, 20-foot cores were obtained at all but the following four locations: EB12, EB42, EB72, and EB113. Refusal at depth was encountered at these locations, resulting

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

in cores ranging from only 7 to 18.7 feet in length. Based on a 4-foot core interval compositing scheme (**WESTON 1996c and 1996d**), a total of 65 subsurface sediment intervals were collected for physical and chemical analysis and 12 intervals were archived. The archived samples were not analyzed for the RI because the vertical extent of contamination was established by shallower samples.

**Table 1-2** lists the compositing scheme for each core station and the analyses performed on each core interval. Available data include TOC, grain size, PAHs, phenolic compounds, dibenzofuran, PCBs, and selected metals. Select shallow core intervals were also composited and submitted for modified elutriate testing (MET) and dredge elutriate testing (DRET); the results of these tests will be discussed in the FS as part of the evaluation of the short-term impacts associated with dredging or disposal.

*1.5.2.2 Deep Coring*

The deep (up to 96 feet below mudline) subsurface sediment investigation was designed to evaluate potential DNAPL transport pathways to offshore sediments based on similarities between upland and offshore stratigraphy. The selection of sampling locations was therefore limited to areas located immediately offshore of upland areas that had exhibited DNAPL in deeper sand beds or laminae or in upland groundwater monitoring wells. The vertical intervals of the deep cores were located to maximize the likelihood of intercepting DNAPL zones identified onshore. As a result, deep cores were advanced at three stations located between 175 and 350 feet offshore of the Upland Unit (**Figure 1-7**) to depths of 85 and 96 feet below mudline.

Continuous sampling for stratigraphic interpretations was performed at each location at 2-foot intervals resulting in the collection of a total of 134 core intervals. Long-wavelength UV screening was conducted on a subset (32) of the core intervals representing a range of subsurface depths. Screening was conducted for those intervals with some evidence of NAPL (sheening, presence of residual product) and at intervals adjacent to potentially contaminated intervals to further refine the subsurface contaminant transport conceptual model. In addition, laboratory TOC and grain size data are available for nine of the 2-foot core intervals. Immunoassay data are also available for 34 of the 2-foot core intervals (see **Appendix A**). Other core intervals were archived for potential PAH, TOC, and grain-size analyses; however, these samples were not analyzed for the RI. **Table 1-3** lists the analyses performed on each deep subsurface sediment core interval.

Select deep-core intervals (representing the upper 6 feet of sediment) were also submitted for engineering parameter tests, which consisted of Atterburg Limits, engineering classification, specific gravity, grain size, percent moisture, triaxial sheer, consolidation tests, and unconfined compressive strength. These data will be used in the FS to evaluate the feasibility of various remedial technologies.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 1.5.3 Sediment Bioassays and Benthic Community Evaluation

The objective of conducting sediment bioassays and benthic community evaluations was to support the evaluations of ecological risk and refinement of potential cleanup areas through the characterization of the type and magnitude of acute and chronic biological effects, if any, associated with exposure to contaminated sediments in the MSU. To meet these objectives, those areas of the MSU that represented apparent geographical boundaries of sediment chemical exceedances as defined by Phase 1 data were primarily targeted for sampling, in addition to a limited number of locations within the Phase 1 defined chemical exceedance area to confirm or refute the inclusion of those sediments in a potential cleanup area. This approach resulted in the collection of surface sediments for bioassay testing and benthic infauna enumeration at nine stations co-located with surface sediment physical and chemical sampling (**Figure 1-4**). In addition, the interpretation of these data for the MSU required that similar data be collected from background locations. As described in **Section 1.5.1.2**, background stations were established at four locations in Elliott Bay. Based on similarities in physical habitat characteristics, two of these stations (BK01 and BK04) were selected as appropriate background locations for the biological testing program (see **Figure 1-6**). An additional location in Carr Inlet was also sampled for bioassay testing to provide a contaminant-free background sample comparison.

**Table 1-1** lists the analyses performed at each of the nine MSU stations, as well as the two Elliott Bay and one Carr Inlet background stations. Physical and chemical data available for each MSU site station and the two Elliott Bay background stations include grain size, TOC, PAHs, PCBs, mercury, and dioxins and furans. Grain size data, based on field screening, are available for the Carr Inlet background station. Bioassay testing consisted of the amphipod (*Ampelisca abdita*) 10-day mortality test and the echinoderm (*Dendraster excentricus*) embryo 72-hour mortality and abnormality test. *A. abdita* was selected because of its reported tolerance to a wide range of grain sizes (**Ecology 1995b**), as was represented by the selected sampling locations; *D. excentricus* was selected as the preferred brood stock for the larval test as the species was naturally spawning in Puget Sound at the time during which the toxicity tests were conducted (late September).

The bioassay and benthic community data were evaluated in detail as part of the ecological risk assessment and are presented in their entirety in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**).

### 1.5.4 Clam Bioaccumulation Study and Bioassay

The primary objective of conducting a clam bioaccumulation study was to support the assessment of human health risks resulting from ingestion of seafood through an evaluation of concentrations of contaminants of concern that may be bioaccumulating in tissues of clams residing in the vicinity of the MSU. However, following a field reconnaissance for risk assessment target species, it was determined that clams were not abundant enough or of adequate

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

size to support tissue analyses. As a result, a laboratory bioaccumulation and bioassay study was implemented and the objective of the study was modified to also support the ecological risk assessment through an evaluation of lethal and sublethal effects (e.g., reduced growth), if any, elicited in clams exposed to contaminated sediments collected from the MSU. The nine MSU and two Elliott Bay background stations selected for sampling for the bioaccumulation study were co-located with the stations sampled for sediment chemistry, bioassay testing, and benthic enumeration to further support the evaluations of ecological risk and refinement of potential cleanup areas (see **Figure 1-4**).

Whole body clam (*Macoma nasuta*) tissue samples from each MSU and background station were analyzed for lipid content, PAHs, PCBs, mercury, and dioxins and furans (**Table 1-4**). For each site and background station, clam mortality and growth were also measured and recorded. These data were evaluated in detail as part of the MSU risk assessments and are presented in their entirety in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**).

### 1.5.5 Fish Tissue Investigation

Similar to the clam bioaccumulation study, one of the objectives of the fish tissue investigation was to support the assessment of human health risks resulting from ingestion of seafood through an evaluation of concentrations of contaminants of concern that may be bioaccumulating in tissues of demersal fish residing in areas seaward of the originally anticipated active remediation areas. The fish tissue investigation was also designed to support the ecological risk assessment through an evaluation of tissue concentrations as part of a food web analysis. To accomplish these objectives, two fish sampling transects were established at locations seaward of the sediment chemical exceedance area defined by the Phase 1 data along approximate -60 meters MLLW bottom contours (see **Figure 1-5**). The interpretation of the fish tissue data for the area immediately offshore of the MSU required that similar data be collected from background locations. Two transects in the vicinity of surface sediment background stations BK01 (Magnolia) and BK03 (Alki, west of Duwamish Head) were subsequently sampled (see **Figure 1-5**).

English sole whole body and fillet tissue samples from each site and background transect were analyzed for lipid content, PCBs, mercury, and dioxins and furans (**Table 1-4**). PAHs were not analyzed in fish tissues as they are metabolized by these receptors and were thus not likely to be detected. The fish tissue data were evaluated in detail as part of the MSU risk assessments and are presented in their entirety in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 2

# PHYSICAL AND ECOLOGICAL SETTINGS AND SOURCES OF CONTAMINATION

## 2.1 PHYSICAL SETTING

### 2.1.1 Upland and Shoreline Features

The entire PSR Upland Unit is built atop fill material 20 to 45 feet thick. Buried wood and concrete bulkheads historically constructed to contain the fill material, as well as control erosion and protect equipment from marine tides, are present in upland portions of the site (**RETEC 1997**). The dates of specific filling events are fairly well documented. The first reported fill operation at the PSR site occurred in 1927. The facilities on the south side of the SW Florida Street were modified at that time by fill along the Nettleton Lumber Company's railroad spur. The fill extended approximately 200 feet into the PSR site and created the area called the tie yard. In 1947, the area under and around the west shed was filled. In 1964, the area under Tank Area 3 was filled, and the aboveground storage tank farm was constructed. In 1966, a trestle that provided east-west access from Harbor Avenue SW to Nettleton Lumber Company was regraded and replaced with SW Florida Street, which bisected PSR. The transfer table tram tracks were placed at the same grade as the roadway. Fill continued in the area east of the transfer table pit and Tank Area 3 to the Lockheed property in 1973. The last areas filled in 1974 were between Tank Area 1 and Tank Areas 2 and 3, and between the south shed and SW Florida Street in 1974. **Figure 2-1** depicts the areas and frequency of these fill activities.

No documentation exists pertaining to the fill of the west side of the PSR site, south of SW Florida Street. This area was filled with large quantities of sawdust, probably generated from the former sawmill located on the west side of the site near the present kiln building.

The origin and chemical characteristics of the fill material are largely unknown. Some known fill materials include dredge spoils from the Duwamish River, soil from Beacon Hill, sawdust, peat material, and concrete riprap. In general, the texture of the fill is sandy with varying mixtures of clay, silt, and gravel.

During the period of operation, structures in the Upland Unit included buildings, retorts, railways, and storage tanks; however, as discussed in **Section 1.3.3**, these structures have been demolished and removed to facilitate redevelopment of the site. **Figure 2-2** illustrates the site layout prior to demolition and **Figure 2-3** illustrates the current configuration of the site, as depicted in the Upland Unit RI Report (**RETEC 1997**).

The shoreline of the PSR Upland Unit consists primarily of rock and concrete riprap. Various fill materials, including bricks and steel cable, were observed along the bank during a 1994 shoreline

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

reconnaissance (**WESTON 1994a**). Three wooden piers, which form the Main and West slips, extend into the central and western portions of the offshore unit. Two small pocket beaches exist at the foot of the rip-rapped bank in the main and west slips; the approximate areas of these beaches are provided in sketches in the reconnaissance report (**WESTON 1994a**) and depicted in **Figure 1-2**.

### 2.1.2 Geology

The PSR Upland Unit is located at the north end of the Longfellow Channel physiographic division of the Puget Sound Basin (**RETEC 1994a**). The Upland Unit is situated on former mudflats and sloughs associated with the original Duwamish River delta. Site stratigraphy is generally characterized by fill overlying recently deposited (post-glacial) alluvial and estuarine soil. Borings conducted to date at the Upland Unit have not encountered bedrock, but rather have found low permeability estuarine deposits typically to the depth of the boring (up to 135 feet bgs) (**RETEC 1997**). Bedrock is estimated to occur 340 to 680 feet bgs (**RETEC 1997**).

### 2.1.3 Hydrogeology

The Upland Unit lies within an area influenced by the marine waters of Elliott Bay, estuarine waters of the Duwamish River, and freshwater from surface runoff and precipitation. The hydrogeology is influenced further by the material properties and spatial distribution of the various on-site soil units and bulkheads.

The hydrogeology of the Upland Unit is characterized by a single unconfined shallow aquifer that is located within the fill and alluvium. The water table is present at an average depth of approximately 6 feet bgs, but the depth to groundwater varies with the amount of rainfall and the tidal cycle. Tidal monitoring has indicated that fluctuations ranging from 3 to 10 feet may be observed near the shoreline (**RETEC 1997**). Investigations indicate that no continuous impermeable layer exists in the upper 150 feet beneath the site (**RETEC 1997**). However, the estuarine sediment unit and associated deltaic deposits below the fill has as a relatively lower permeability.

Groundwater recharge in the area occurs as a result of infiltration of precipitation and runoff into the soil, as well as from upland areas to the south. Groundwater below the Upland Unit is influenced by infiltration of estuarine waters from Elliott Bay; however, infiltration has been reduced by the installation of the slurry wall (**RETEC 1997**). Freshwater infiltration has been precluded by the construction of the surface cap covering the site. The interface between fresh and saline water is typically located between 25 and 30 feet bgs in the northern half of the upland site.

The overall movement of groundwater in the vicinity of the site is in a northerly direction toward Elliott Bay. Local groundwater flow directions in the northern portion of the site are north and northwest, while flow directions in the southern part of the site are mainly west toward the

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Longfellow Creek drainage. Historically, groundwater gradients were strongly affected by tidal fluctuations. Tidal influence was strongest in fill materials and decreased significantly in native soils. Tidal fluctuation has been significantly reduced in shallow upland wells following construction of the slurry wall (**RETEC 1997**). High tides may also periodically result in temporary reversal of groundwater flow directions. The heterogeneity of fill material and resulting hydraulic conductivity and the presence of buried bulkheads complicate on-site groundwater distribution patterns. Groundwater discharge to the bay likely occurs via shoreline diffuse flow through nearshore sediments (**RETEC 1994a**). Groundwater seeps (as evidenced by the presence of petroleum sheens) in the intertidal zone were observed during a 1994 shoreline reconnaissance (**WESTON 1994a**) prior to slurry wall construction; however, no seepage has been observed since wall placement.

### 2.1.4 Regional Meteorology

The climate in vicinity of the site is a mid-latitude, West Coast marine type. The majority of the air masses impacting the site originate in the Pacific Ocean. The maritime weather systems have a moderating effect on the weather throughout the year.

Winter daytime temperatures are typically between 40 and 50 degrees Fahrenheit, while nighttime temperatures range in the 30s. Summer daytime temperatures are typically between 70 and 80 degrees Fahrenheit with nighttime lows in the 50s. Extremes in temperature are associated with disturbances in the normal weather pattern and are usually brief, lasting only as long as the atypical weather pattern. Maximum temperatures reach 85 to 90° F for 5 to 15 days per year. Temperatures below freezing occur on 30 to 90 nights per year. Temperatures in the teens are recorded a few times during the winter.

Weather in the Puget Sound region is characteristic of a maritime climate. Prevailing onshore winds slow rapidly upon landfall. The resulting convergence leads to ascent of the air masses and enhanced precipitation. The surrounding mountains further enhance precipitation. The region where the site is located typically receives between 35 and 40 inches of rain per year, and is characterized by a rainy season (October to March) and a dry season (April to September). Because of moderate winter temperatures, snowfalls occur only a few times per winter, if at all, and are short-lived. Typically, less than 20 inches of snow falls in the lowlands along Puget Sound in a calendar year.

### 2.1.5 Upland Surface Water Features

There are presently no surface water bodies located on the PSR Upland Unit, although localized flooding has been documented during periods of heavy rainfall. As described in **Section 1.3.3.2**, the Longfellow overflow channel, which flows via conduits through the former stream channel and receives local runoff, discharges to Elliott Bay via the original Longfellow Creek outfall located directly west of the PSR property (**Figure 1-3; RETEC 1997**).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 2.1.6 Elliott Bay and Duwamish River Estuary

The MSU of the PSR site encompasses approximately 1,600 feet of constructed shoreline along Elliott Bay, which forms a deep water port within Puget Sound. Elliott Bay covers approximately 8 square miles, with extensive industrial and commercial development along much of its shoreline. Urban and industrial development along the bayside shores includes recreational beachfront and boat moorage facilities, heavy and light industrial operations, and numerous shipping terminals.

Located approximately 0.3 mile east of the PSR site is the mouth of the West Waterway of the Duwamish River. This waterway channels the majority of the downstream flow of the Duwamish River to Elliott Bay. The lower 6 miles of the river, including its confluence with the bay, form the Duwamish River estuary. Development throughout the estuary is similar to that along Elliott Bay, consisting primarily of light and heavy industrial operations, marinas, and commercial operations.

#### *2.1.6.1 Bathymetry*

Bottom depths in the PSR MSU range from intertidal to greater than 200 feet. Intertidal areas at the site are limited to two small pocket beaches at the head of the west and main slips (**WESTON 1994a; Figure 1-2**). Inner Elliott Bay depths reach 230 feet, while outer bays depths approach 600 feet (**NOAA 1981**). The configuration of the bay bottom in the offshore unit indicates slopes are generally steep, ranging from approximately 6 to 20 (or greater) percent slope. Bottom slopes in the nearshore area (less than 60 feet) are approximately 6 to 10 percent, with all other areas exceed 10 percent. Bathymetric contours are depicted in **Figure 1-3** and are based on 1970 and 1995 NOAA surveys.

#### *2.1.6.2 Currents and Tides*

Elliott Bay experiences mixed semidiurnal tides with a maximum recorded tidal range of +14.8 to -4.6 feet MLLW. Because the PSR site fronts Elliott Bay, this range likely reflects the range of conditions at the site. Additional information on tides and tidal influence at the site is found in several RETEC reports (**1994b, 1994c, 1995a, and 1997**).

Surface currents within Elliott Bay are influenced by Duwamish River flows, tides, and prevailing southwesterly winds. The surface water mass frequently travels counter-clockwise along the eastern shore, but exhibits a fair amount of variability. Bottom currents also vary, but tend to follow a clockwise gyre (**WESTON 1994b**). Both bottom and surface currents are typically weak with a mean speed less than 0.3 foot per second (fps) (**NOAA 1981**). However, peak currents greater than 5 to 10 fps of extremely short (one second) duration have been measured in both the East and West waterways (**EVS and Hart Crowser 1995**). These peaks may be associated with marine traffic, and represent velocities capable of resuspending sediment. However, the PSR offshore area receives less marine traffic than the Duwamish waterways. The

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

configuration of the shoreline containing the Main and West slips, as well as the area adjacent to the former storage tank area, likely causes localized eddies to form in the waters to the west and east of these features, and appear to represent depositional areas based on the presence of fine-grained sediments (see **Section 2.1.6.6.2**).

### *2.1.6.3 Water Quality*

Elliott Bay is designated as a Class A (excellent) waterbody (Chapter 173-201-130 WAC). Although this classification designates a water which is suitable for domestic, industrial and agricultural uses, the saline content effectively precludes this use in the absence of pretreatment. The Duwamish River is designated by the Washington Department of Ecology (Ecology) as a Class B (good) river (see Chapter 173-201A WAC for Class B definition).

### *2.1.6.4 Sediment Sources and Transport*

The main source of sediment to Elliott Bay is from loadings carried by the Duwamish River (**WESTON 1994b**). Erosion of beaches and bluffs serves as a minor source of sediment to the bay. The amount of sediment transported to the southern portions of Elliott Bay has been substantially reduced over time because of anthropogenic changes to the river (construction of dams and sediment retention basins) and extensive shoreline stabilization along the river and bay waterfronts.

Estuarine conditions in the lower river cause the majority of the suspended sediment in the river to initially settle out in the lower Duwamish River and in the nearshore areas of Elliott Bay at the mouth of the West Waterway (**WESTON 1994b**). However, suspended sediment will enter Elliott Bay during peak flows as part of the buoyant freshwater surface plume. This sediment can be transported towards the Seattle waterfront, in the presence of prevailing winds from the southwest. Once this material settles out, recent work by **GeoSea (1994)** suggests that this sediment may be entrained in the dominant clockwise gyre that forms near the bottom and is then transported back towards the Duwamish River and ultimately the Duwamish Head and the deep canyons near the entrance of the bay. Historical biological data collected by **Harmon and Serwold (1978)** tend to support the prevalence of this bottom clock-wise current, based on the distribution of typically nearshore estuarine fauna in deeper marine sediment to the west and north of the mouth of the Duwamish River.

Sediment transport in the MSU is likely to be seasonal because river flow and subsequent sediment loads vary seasonally. As with most Puget Sound beaches, sediment tends to build up in nearshore environments during the summer months and is removed during winter months because of the differences in direction and magnitude of prevailing winds, currents, and wave action. Ship traffic in nearshore areas serves to further modify these patterns, and may be a major source of sediment resuspension in localized areas.

*This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.*

### *2.1.6.5 USGS Bottom Surveys of Non-Native Materials*

A study of substrate characteristics in the MSU was conducted by the U.S. Geological Survey (**USGS 1996**), in which potential areas of non-native materials were mapped using side-scan sonar techniques. The results of the side-scan sonar survey are depicted in **Figure 2-4**. Comparisons of the acoustic backscatter intensity footprints with subsurface contaminant distribution show good correlation, suggesting that areas interpreted by the USGS as areas of probable or potential fill are correlated with areas of documented subsurface contamination at depth. According to the USGS data, fill materials range from about 6 to 7 meters in thickness near the shoreline to less than 1 meter thick at the most distal portions of the fill footprint. Subsurface data collected as part of the RI support this conceptual model of the non-native sediment area. However, depth of contamination is not well correlated with distance from source, reflecting possible separate dumping or discharge events associated with upland site activity. Historical bathymetry may have also played a role in where dumped or discharged material may have accumulated or slumped. Surface contamination does not correlate well with the footprint for accumulated non-native (i.e., fill) material because additional mechanisms of transport (down-slope sloughing, long-shore transport) are likely to have contributed to the redistribution of dumped or discharged material from the site.

### *2.1.6.6 Sediment Composition*

#### 2.1.6.6.1 Anthropogenic Materials

The presence of anthropogenic materials in surface and subsurface sediment was documented during field collection and core processing activities. Complete surface sediment sample descriptions, including presence of anthropogenic materials, are provided in the field sample records in **Appendix B**. Subsurface sediment characteristics were documented in field boring logs and are included as **Appendix C**. The following subsections briefly summarize these data.

Surface Sediment

Of the 161 locations investigated during the Phase 1, 2, and 3 sampling activities, slightly over half exhibited petroleum sheens (see **Appendix B**). The majority of these stations were characterized by small droplets or pockets of sheen evident on the sediment surface, in the water within the van Veen grab, or following homogenization of the sediment sample. At 11 stations, heavy sheening or globules of probable wood treating formulations were observed. These stations were located at relatively shallow depths (-6 to -14 meters MLLW) east of the former tank storage area and west of the Main Slip, as well as in deeper water (between -40 and -56 meters MLLW) offshore of the Main Slip.

Wood debris was also present at about 25 percent of the locations sampled, ranging from trace to substantial amounts of fragments, chips, or larger pieces (see **Appendix B**). Locations at which

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

highest wood fragment densities were observed were located east of the eastern boundary of the Upland Unit at depths less than -12 meters MLLW.

Subsurface Sediment

The presence and attributes of NAPLs were logged for both shallow and deep cores.

*Shallow Cores (0 to 20 feet)*

Of the 77 4-foot core intervals collected during the Phase 2 investigation, 27 samples showed no evidence of NAPL being present, 18 samples exhibited some degree of sheening (iridescence on the sediment surface potentially due to the presence of residual petroleum/creosote), 14 samples had staining (sediment darker than surrounding native material; interpreted to be residual petroleum/creosote contaminants bound to sediment surface or within fractures), and one sample was noted as having free product (interstitial spaces containing NAPL) present. These sample results are based on descriptions of sediment cores obtained from both field and laboratory logs. These sample results do not imply that the observation occurred throughout the entire 4-foot interval, but rather that anthropogenic material occurred in some layer(s) within the interval. Odor was noted for 27 samples, a number of which were also stained or exhibited sheening; however, odor may be due to either residual or dissolved phase wood treating formulation.

Core sampling locations characterized by trace to strong petroleum/creosote sheens or brown staining extending from the surface to depths up to 8 feet below mudline included nearshore stations (predominantly shoreward of the Outer Harbor Line) in the vicinity of the Main Slip and former tank storage facility. Residual petroleum/creosote was also present in various core intervals collected at depths up to 12 feet below mudline at a limited number of locations offshore of the Outer Harbor Line and northwest of Crowley Marine Services. Three nearshore coring locations (EB13, EB27, and EB66) were characterized by the presence of abundant petroleum/creosote staining or saturated product in the upper layers (0 to 8 feet below mudline) and sheening throughout the remaining lower layers (8 to 20 feet below mudline).

The two recovered core intervals (0 to 4 and 4 to 7 feet below mudline) at nearshore Station EB113 were composed primarily of wood debris. Wood debris was also present in the upper (0 to 4 feet below mudline) core intervals collected at the majority of the stations sampled north-northeast of the former tank storage facility.

*Deep Cores (0 to 96 feet)*

Both free and residual (noted as staining or sheen) petroleum/creosote product were observed at depths below surface during the deep coring program, as follows:

- At Station EB14, which is located at approximately -8 meters MLLW west of the West Pier, visible sheening and staining was observed in sediment collected between 6 and

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

10 feet below mudline, and a slight sheen was observed on the water in the core at 30 to 32 feet below mudline. No evidence of petroleum/creosote was observed at depths between 32 and 85 feet below mudline.

- At Station EB16, which is located at approximately -8 meters MLLW northeast of the former tank storage facility, sheen was noted for sediments sampled between 8 and 10 feet below mudline and 12 and 14 feet below mudline, while residual petroleum/creosote (as indicated by strong to moderate staining) was observed at depths between 58 and 70 feet below mudline. Odors that smelled like creosote were also present at depths between 70 and 85 feet below mudline and may be due to dissolved product.

- At Station EB114, which is located at approximately -13 meters MLLW directly north of the former tank storage facility, sheening was noted for sediment sampled between 12 and 14 feet below mudline, 34 to 42 feet below mudline, 62 to 64 feet below mudline, 66 to 70 feet below mudline, and 78 to 86 feet below mudline, while free petroleum/creosote was observed in thin lenses (several inches thick) between the depths of 74 and 78 feet below mudline. Moderate to mild odors that smelled like creosote were noted for many depth intervals between observations of sheening or staining.

2.1.6.6.2 Grain Size

Surface Sediment

Substrate composition in the MSU was interpreted relative to the Wentworth scale and was determined to be generally dominated by very fine [63 to 125 micrometers (μm)] and fine sand (125 to 250 μm), although two relatively distinct areas offshore of the former tank storage facility and west of the Main Slip were finer-grained (particle size less than 63 μm) (**Figure 2-5**), dominated by coarse silts (31 to 63 μm). Gravelly silty sand and sandy silt were also observed at nearshore stations directly east of the eastern Upland Unit property boundary (EB02, EB09, EB12, and EB16) and at one location offshore at a depth of approximately -56 meters MLLW (EB86).

Substrates at the background sampling locations in Elliott Bay were also composed primarily of sand, as follows:

- Gravelly and medium-fine sand was observed offshore of Magnolia Bluff (BK01 and BK01D);

- Silty sand was measured offshore of Myrtle Edwards Park (BK02);

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Very fine to coarse sand was sampled off Alki west of the Duwamish Head (BK03); and,

- Fine to very fine sand was observed off Alki east of the Duwamish Head (BK04).

Grain size data for all site and background samples are listed in **Appendix D (Tables D-1 and D-8)**.

Shallow Subsurface Sediment

Substrate composition generally varied with depth below surface, although some general trends were apparent. Over half (59 percent) of the shallow subsurface sampling locations were characterized by an upper layer (0 to 4 feet bgs) of silt, beneath which sand and silty sand were encountered in all intervals sampled (up to 20 feet bgs). At a few locations (EB12, EB27, EB87), the predominantly silty substrates extended up to approximately 8 to 12 feet bgs. Locations farthest offshore (EB66, EB72, EB78) were dominated by sand, with silty layers intermittently encountered at various depths below surface (from 4 to 16 feet). As discussed in **Section 2.1.6.6.1**, Station EB113 was unlike any other coring location in that the recovered materials (0 to 7 feet bgs) were composed primarily of wood debris. Grain size characteristics for all subsurface sampling intervals are described in the shallow core description logs in **Appendix C** and laboratory results for those intervals submitted for grain size analysis are provided in **Appendix D (Table D-9)**.

Deep Subsurface Sediment

Continuous sampling for geologic logging was performed at each of the deep coring stations (EB14, EB16, and EB114); details regarding grain size characteristics with depth are provided in the sediment deep boring logs in **Appendix C**. Nine of the samples collected from the deep cores were submitted for laboratory grain size analysis, representing two 2-foot depth horizons (32 to 34 and 70 to 72 feet bgs) at Station EB14, two depth horizons (32 to 34 and 72 to 74 feet bgs) at Station EB16, and five depth horizons (30 to 32, 38 to 40, 56 to 58, 64 to 66, and 92 to 94 feet bgs) at Station EB114. In general, the deep subsurface samples were dominated by medium, fine and very fine sands, with a few exceptions. The samples collected from 32 to 34 feet bgs at Station EB16 and 30 to 32 and 56 to 58 feet bgs at Station EB114 were dominated by very fine sands and coarse to medium silts. The laboratory grain size data for these samples are included in **Appendix D (Table D-14)**.

2.1.6.6.3 Total Organic Carbon Content

Surface Sediment

The TOC data for the surface sediment sampling events are presented in **Figure 2-6**. The results of these investigations indicated that the majority of the MSU stations were characterized by a

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

TOC content between 0.5 and 2 percent. Stations with TOC content between 2 and 4 percent were located primarily on the relatively flat shelf (**Figure 1-3**) west of the West Slip and north-northeast of the site. Stations characterized by a TOC content greater than 4 percent were predominantly located in the nearshore area north of the upland facility.

The TOC content of background samples was within the range of values observed for the MSU, but was most similar to the lower range of values observed. The background station offshore of Alki and west of the Duwamish Head (BK03) exhibited the lowest TOC of all MSU and background surface sediments sampled, at 0.29 percent. The TOC content of surface sediments sampled offshore of Magnolia during the first phase of sampling (BK01 and BK01D) and offshore of Alki (east of Duwamish Head) during the second phase of sampling (BK04) was slightly higher, ranging from 0.70 to 0.94 percent. In contrast, sediment collected offshore of Magnolia during the second phase of sampling were characterized by a higher TOC content of 2.4 percent, and the background sampling conducted offshore of Myrtle Edwards Park (BK02) yielded surface sediments with a TOC content of 1.1 percent. TOC data for all site and background samples are presented in **Appendix D (Tables D-1 and D-8)**.

Shallow Subsurface Sediment

TOC content tended to decrease with depth below surface. The average TOC content of sediments collected from 0 to 8 feet below mudline was 2.4 percent, slightly higher than the range of TOC generally observed in the surface (0 to 10 cm) sediment samples. Average TOC content decreased to between 0.6 and 1.0 percent in sediments collected from 8 to 16 feet below mudline, and further declined to approximately 0.5 percent in sediments collected from 16 to 20 feet below mudline. TOC data for all shallow subsurface core samples are summarized in **Appendix D (Table D-9)**.

Deep Subsurface Sediment

The nine samples submitted for laboratory grain size analyses were also analyzed for TOC. All samples were characterized by a TOC content less than 1 percent, ranging from 0.20 (EB114, 38 to 40 feet below mudline) to 0.98 (EB14, 70 to 72 feet below mudline) percent. The TOC data for these samples are included in **Appendix D (Table D-14)**.

## 2.2 ECOLOGICAL SETTING

A detailed description of the ecological setting of the MSU, including habitats and biota, is provided in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**). The following sections briefly summarize this information.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 2.2.1 Intertidal and Subtidal Habitats

Uplands surrounding Elliott Bay have been developed for urban, port, and industrial land uses, resulting in the elimination of nearly all intertidal wetlands and shallow subtidal aquatic habitats (**PTI and Tetra Tech 1988**). Although estimated to be limited in area (about 2.3 acres) based on the lowest spring tides, intertidal habitats present in the MSU include mud- and sandflats, in addition to bulkheads, pilings, and riprap. Presently, the mudflats and sandflats exist as two pocket beaches at the head of the west and main slips. The remaining intertidal mud or sand occur only as a thin strip at the toe of the rip-rapped banks and are only exposed at extreme low tides. Subtidal habitats in Elliott Bay primarily consist of sandy silts, and muddy and coarse sands, except at the mouth of the Duwamish River, where sandy substrates predominate (**Dexter et al. 1981; PTI and Tetra Tech 1988**). The MSU is located in a transition zone between the estuarine environment of the Duwamish River and the marine environment of Elliott Bay; as a result, the substrates and waters adjacent to the site contain habitat characteristics common to both environments.

### 2.2.2 Biota

Biota utilizing available habitat within the MSU include a variety of marine invertebrates, estuarine and marine fishes, salmonids, birds, and marine mammals. Some of these species have been classified by State of Washington and federal government as species of special concern (i.e., requiring protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance).

Common marine invertebrate inhabitants of the piling surfaces, riprap, and bulkheaded areas of the MSU include barnacles, tube-dwelling worms, sea anemones, sponges, tunicates, and mussels. Marine invertebrates documented or anticipated to utilize the offshore subtidal habitat of the MSU include a variety of polychaetes, clams, mussels, crab, and shrimp.

Habitats within the MSU provide nesting and adult forage areas on either a seasonal or year-round basis for numerous estuarine and marine species of fish that are found in Elliott Bay, including Pacific herring, shiner perch, snake prickleback, Pacific tomcod, pile perch, Pacific sand lance, copper rockfish, Pacific staghorn sculpin, and various flatfish species, most notably English sole (**Tetra Tech 1988; Dexter et al. 1981**). The most abundant fish species collected during the RI fish trawling activities included English and slender sole, Pacific hake, and Pacific tomcod.

Salmonids represent the most important anadromous fish present in the vicinity of the MSU. Chinook, pink, and chum salmon are common, while coho and sockeye salmon, steelhead trout, and cutthroat trout are less abundant. Multiple migratory runs of both native and hatchery reared salmonid stocks occur seasonally in Elliott Bay and the Duwamish River (**Warner and Fritz 1995**). Returning adult salmon congregate at the mouth of the Duwamish River in the vicinity of

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

the MSU prior to upstream migrations, and juvenile salmonids may use the nearshore reaches of the MSU for physiological transition to marine waters.

Shorelines of and waters overlying the MSU provide habitat to a number of terrestrial and water-dependent birds, including loons, grebes, cormorants, scaups, mergansers, scoters, coots, and gulls. The majority of these birds utilize the water-column habitat in the vicinity of the MSU during their respective overwintering periods. Two state monitor species, osprey and great blue heron, breed close to and possibly feed on fish within the MSU. However, the great blue heron utilizes primarily shallow water habitats that can be accessed by wading or perching on structures immediately next to or floating on the water surface. This type of habitat is extremely limited at the site and in some cases exists only under pier structures. Three other state monitor species (the western grebe, horned grebe, and red-necked grebe) and two state candidate species (the common loon and Brandt's cormorant) are also likely to forage or utilize surface waters associated with the MSU. Two state and federally listed endangered species, the bald eagle and peregrine falcon, have also been observed in the vicinity of the site. The bald eagle may feed on fish occurring in the water column. However, the peregrine falcon feeds primarily on other birds (usually song or shore birds). Occurrence of these prey species at the site is habitat-limited, thus exposure of the peregrine to site-related contaminants is unlikely.

Marine mammals known to frequently forage in Elliott Bay include Harbor seal, California sea lion, and harbor porpoise (**Calambokidas 1991**). Harbor porpoise and harbor seals are year-round residents, while California sea lions utilize the area for winter feeding (**Pfeifer 1991**). Both the harbor seal and the California sea lion are state monitor species and have been observed hauled out on floating structures near the site.

## 2.3 SOURCES OF CONTAMINATION

### 2.3.1 Historical Sources

The PSR Upland Unit was included on the National Priorities List in May 1994. Inclusion was based on chemicals associated with wood-preservation processes contaminating soil, groundwater, surface waters, and sediments at or adjacent to the site. Historical sources of upland soil and groundwater contamination include leaks from tanks and associated piping during chemical storage and transport and dripping of preservatives from treated wood during handling and storage. Upland soils and groundwater are contaminated with high concentrations of PAHs, PCP, and metals (**RETEC 1997**). LNAPL and DNAPL have also been documented in upland groundwater.

Direct discharge of wood-treating preservatives during processing, storage and handling of treated logs may have been a principal mechanism of release to sediment. Historical maps (**RETEC 1994a**) show old outfalls leading from process areas to the bay or nearby waterways that were subsequently filled as part of the historical site expansion (see **Section 2.1.1**). Test pits

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

excavated on-site show no evidence of burial of process waste sludges on the site (**RETEC 1994d**), suggesting that direct discharge to the bay may have also been used to dispose of site-generated wastes. Erosion of contaminated soil via surface water runoff and discharge of contaminated groundwater via shoreline seeps or diffuse flow through banks are also considered other historical pathways of chemical release and transport to offshore sediment.

### 2.3.2 Ongoing Sources

Discharge of groundwater potentially containing dissolved-phase NAPL and NAPL transport represent possible continuing sources of contamination to the MSU. As part of the upland source control activities, a slurry wall and an LNAPL recovery trench were constructed along the perimeter of the shoreline with upland extensions (wing walls) in 1996. The wall inhibits transport of shallow LNAPL and dissolved-phase NAPL in shallow groundwater to Elliott Bay. The site has also been capped and paved, thus limiting erosion of soils or infiltration and transport of contaminants to the offshore unit via shallow groundwater (**RETEC 1997**). DNAPL has been documented in wells associated with the former process areas at depths up to 100 feet bgs. Along the central shoreline, DNAPL has been noted in the MW-5 series wells, which are located near a buried riprap wall (**RETEC 1997**). This wall may have sufficient voids to act as a migration pathway from a former outfall terminus leading from retorts 3 through 7. The slurry wall will prevent lateral migration (if any) of shallow DNAPL to the bay; however some DNAPL is present seaward of and deeper than the slurry wall, which may constitute a source to the bay (**RETEC 1997**).

DNAPL was noted in RW-1 series well which is screened below the depth of the slurry wall, with the largest volume noted in well RW-1D (**RETEC 1997**). Additionally, DNAPL occurred in MW-15 wells along the eastern shoreline, east of Tank Area 1 (**RETEC 1997**). The majority of the DNAPL resides in the aquifer under the historical central processing area between 30 to 60 feet bgs. According to **RETEC (1997)**, these thin stringers of deeper DNAPL pose only a limited direct threat to Elliott Bay.

Transport of contaminants dissolved in groundwater from deeper strata may represent a continuing source to sediment from the upland site. The capping and paving of the upland unit and wall construction will not prevent the transport of dissolved contaminants from deeper groundwater. The potential for groundwater to contaminate clean sediment following remediation is presented in **Section 3**.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 3

# CONTAMINANT FATE AND TRANSPORT

## 3.1 INTRODUCTION

This section evaluates transport pathways and the physical-chemical properties of the principal contaminants of concern present in the MSU adjacent to the former PSR wood-treating facility (the Upland Unit of the PSR Superfund site). Historical operations in the Upland Unit consisted exclusively of wood preservation using creosote, creosote/fuel oil mixtures, PCP with associated fuel oil carrier, and various inorganic salts of arsenic, chromium, copper, and zinc.

The primary contaminants of concern found in the MSU sediment and identified in the risk assessment (**Appendix K**) included PAHs and dioxins and furans. PAHs are associated with creosote wood preservation and fuel oils. Dioxins and furans, while not used in wood preservation, have been historically identified as contaminants in both new and spent PCP-based wood preservatives.

## 3.2 POTENTIAL SOURCES OF CONTAMINANTS IN SEDIMENT

Potential historical and continuing sources of contamination to Elliott Bay sediment include:

- Historical, direct release or disposal of used or waste creosote and associated wood-preservative carrier oil from the facility to Elliott Bay. Because the facility was originally situated on pilings over the water and the area was subsequently filled, there is a high potential for both surface and subsurface sediment contamination.

- Historical, direct release of process wastewater from the facility to Elliott Bay with partitioning of dissolved contaminants to sediment.

- Historical and continuing downward and lateral migration of free-phase creosote via preferential flow pathways (e.g., sand stringers) to Elliott Bay, due to creosote density characteristics.

- Historical erosion of contaminated soil by stormwater runoff to Elliott Bay.

- Historical stormwater runoff from the facility to Elliott Bay, with subsequent partitioning of dissolved contaminants to sediment.

- Historical and continuing transport of contaminated groundwater from the upland to Elliott Bay with subsequent partitioning to sediment.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Potential bedload transport of contaminated sediments to deeper offshore areas.

The slurry wall that was installed during cleanup activities at the upland facility will minimize lateral migration of shallow free-phase creosote and groundwater but it will not impede the movement of contamination that is below or outside the wall.

### 3.2.1 Source Linkages

PAHs are associated with creosote and the fuel oil carrier used in wood preservation at the upland facility. Creosote is a dense, viscous material that is a semisolid at room temperature. When released to the environment, creosote forms a immiscible liquid that may occur in a free-phase (capable of flowing) or residual (bound in interstitial spaces by capillary action) form. This liquid is referred to as a non-aqueous phase liquid or NAPL. Creosote NAPLs are found in both dense (DNAPL) and light (LNAPL) phases at the PSR site.

Creosote is a complex mixture of hundreds of individual compounds, mainly PAHs (approximately 90 percent), phenolic compounds, and nitrogen, oxygen, and sulfur heterocyclic analogues of PAHs. While the exact chemical composition can be highly variable depending upon the source of raw materials and the manufacturing conditions, an average composition is presented in **Table 3-1** along with average results for the DNAPL found in monitoring wells during the upland investigation. The upland DNAPL contains higher relative percentages of LPAHs than the average creosote composition would indicate. This difference is consistent with the reported use of Number 2 fuel oil as a carrier for both creosote and PCP wood preservative at the PSR wood-treating facility during its operation.

#### *3.2.1.1 Polycyclic Aromatic Hydrocarbons*

Sediment PAH contamination can be qualitatively linked to the PSR Upland Unit by comparing relative ratios of PAHs in sediment with ratios from the facility. Comparison of average upland DNAPL composition as shown in **Figure 3-1** with sediment PAH concentrations at one of the more highly contaminated sampling stations (EB27) in **Figure 3-2** shows virtually identical patterns of PAH relative percent composition suggesting that both samples have a common source. This same PAH composition pattern was common at a number of nearshore stations sampled; however, the PAH pattern changes in samples collected from offshore locations. Typically, the percent of LPAHs decreases relative to HPAH, most likely due to preferential dissolution of the more soluble LPAHs. This suggests that releases of contaminants from the upland facility are the primary source of PAHs in the MSU.

#### *3.2.1.2 Polychlorinated Dibenzodioxins and Dibenzofurans*

Dioxins and furans are produced by incomplete combustion of chlorinated organic compounds and, historically, as by-products in the manufacture of PCP wood preservative. There are 75 possible dioxin compounds or congeners and 135 furan congeners, each with different chemical,

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

physical, and toxicological characteristics. To simplify the interpretation of large numbers of different congeners present in a sample, dioxin and furan concentrations are often expressed in terms of equivalent concentrations of 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity (the most toxic congener) using factors developed by **EPA (1989a)**.

Less toxic dioxin and furan cogeners are the most abundant compounds present as manufacturing contaminants in unused pentachlorophenol. Because similar processes create both dioxins and furans (incomplete combustion of chlorinated compounds) in the manufacture or use of organic compounds, the composition of these contaminants in PCP is not unique and thus cannot serve as a fingerprint for source identification.

Additionally, dioxins and furans were not analyzed as part of the PSR upland remedial investigation. However, these compounds can be linked to the site by comparison of results from the Elliott Bay urban background stations with results from MSU stations near the facility that contain elevated PAH concentrations. The highest TCDD equivalent concentrations relative to background (expressed as a ratio of site to background) were found in surface sediment samples collected from Stations EB05 (147 times background) and EB26 (252 times background), located adjacent to the upland facility. Ratios tended to decrease with distance from the shore, suggesting the source is the upland facility.

## 3.3 FATE, TRANSPORT, AND PARTITIONING OF CONTAMINANTS

### 3.3.1 Contaminant Properties

Physical-chemical properties that influence fate and migration of contaminants in the MSU are primarily a function of a given compound's molecular weight and chemical structure and include solubility (tendency to dissolve in water), vapor pressure (tendency to evaporate or volatilize), affinity for adsorbing to organic matter, and partitioning between air and water. In general, adsorption increases with increasing molecular weight while solubility, volatility and ability to partition to air from water decrease. Each of these characteristics can be expressed as a numeric value; characteristics for contaminants of concern are presented in **Table 3-2.** As represented in this table, the contaminants of concern for the MSU have a strong affinity for binding with organic material associated with sediment. Phenolic compounds have the greatest capacity to dissolve in water, followed by naphthalene and 2-methylnaphthalene. All contaminants of concern for the MSU have limited ability to vaporize to air.

### 3.3.2 Fate and Transport

Once released to the environment, contaminant interactions with various environmental media are complex. Along with the physical and chemical properties that affect whether a contaminant will occur as a bound solid, dissolved liquid, or vapor, interactions with biota and the physical environment will determine the ultimate fate and ecological and human health consequences.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

At the PSR MSU, a number of chemical, physical, and biological processes are of concern because they affect the dispersal of site-related contaminants and the degree to which living organisms can be exposed and potentially harmed. These processes include:

- Adsorption to sediment,
- Dissolution into the water column,
- Bioaccumulation,
- Degradation,
- Free-phase DNAPL migration,
- Groundwater transport of dissolved DNAPL constituents,
- Sediment transport, and
- Sediment deposition.

The dominant ongoing processes driving fate and environmental effects at the PSR MSU are adsorption to sediment, selective dissolution of LPAHs from sediment to the water column, and accumulation in biota. The following is a more detailed discussion of each of these processes as they apply to PSR sediments.

### *3.3.2.1 Contaminant Adsorption to Sediment*

Adsorption to sediment organic material by contaminants dissolved in groundwater or surface water was a primary process for the contaminants of concern that were historically released from the site. Adsorption is controlled only by the solubility of the individual compounds and their sediment/water partitioning coefficients ($K_d$). Composition of a mixture does not influence compound solubility. The $K_d$ for each compound is defined as the ratio of sediment adsorbed concentration to dissolved concentration. The $K_d$ relationship assumes sorption is reversible and that the sorbed and dissolved concentrations are in equilibrium. $K_d$s are not routinely available or measured for most organic compounds. Instead, they are calculated from the organic carbon partitioning coefficient ($K_{oc}$) and the organic carbon fraction ($f_{oc}$) present in the sediment using the relationship:

$$K_d = [\text{sediment conc}]/[\text{water conc}] = K_{oc} * f_{oc}$$

This empirical relationship is based on the presumption that hydrophobic organic compounds such as PAHs adsorb or bind to sediment organic matter and not inorganic mineral grains. The equation accurately estimates partitioning coefficients for sediment organic carbon

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

concentrations between 0.5 and 4 percent. Calculated values of $K_d$ are presented in **Table 3-3** for constituents associated with creosote, assuming an average sediment organic carbon content of 2 percent. The higher the $K_d$ value, the more strongly compounds are adsorbed to sediment. Therefore, HPAHs will be adsorbed most strongly, LPAHs less strongly, and phenolic compounds would be least strongly adsorbed. For example, PAH equilibrium sediment/water ratios range from about 40 for naphthalene to 76,000 for dibenz(a,h)anthracene. Ratios greater than 1.0 reflect a greater affinity for binding with other organic matter rather than remaining in the dissolved phase. Thus, sediment becomes enriched and is a "sink" or receptor for contamination.

Because sediment PAH concentrations in the MSU are much higher than estimated by equilibrium partitioning from water, it is likely that contaminated sediment reflects historical, direct discharge from the facility rather than solely adsorption of contaminants from water.

*3.3.2.2 Contaminant Dissolution and Partitioning to Water*

The processes controlling contaminant adsorption to sediment, partitioning between sediment and water, and dissolution to the water column are closely related. However, the mechanism of each of these processes varies depending on whether contamination is present as a residual or free-phase DNAPL in sediment pore spaces or if compounds are adsorbed to sediment.

3.3.2.2.1 Free-Phase or Residual Saturation

In the case of creosote-residual in sediment or the presence of free-phase material, the effective solubility of a mixture is less than that of the pure compounds and is determined by both their solubility and relative concentration in the mixture according to Raoult's law.

$$Sol_{i\,(eff)} = Sol_i * X_i$$

where $Sol_{i\,(eff)}$ = effective solubility for compound i
$Sol_i$ = solubility of pure compound i
$X_i$ = mole fraction of compound i

**Table 3-4** presents effective solubilities of creosote components using upland DNAPL as representative of a fresh release and assuming an average molecular weight of 300 g/mole for creosote **(Electric Power Research Institute 1992).** These effective solubility calculation results are also used in **Section 3.3.2.6** to model groundwater transport to sediment. It can be seen that the highest effective solubilities are found for PCP, methylphenols, and LPAHs. As creosote weathers in the marine environment, selective dissolution of the more soluble 2- and 3-ring LPAHs and phenols would occur, increasing the average molecular weight of the solid and making it more "tar-like" and less mobile. This is reflected in samples collected from other offshore stations, for example, **Figure 3-3** (Station EB98), where PCP and most other phenols

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

are not detected and the concentrations of 2- and 3-ring LPAHs have declined relative to HPAH, when compared to nearshore stations.

3.3.2.2.2 Dissolution of Adsorbed Contaminants

The same processes that govern adsorption of contaminants as described in **Section 3.3.2.1** also control dissolution from sediment to interstitial water and the surrounding water column. Partitioning continuously occurs from sediment to water to maintain the sediment/water partition ratio ($K_d$) as cleaner, overlying water comes in contact with contaminated sediment.

Dissolution of the more soluble, lower molecular weight constituents occurs more readily compared to HPAHs. Calculated values of $K_d$ are presented in **Table 3-3** for constituents associated with creosote to determine which compounds are most likely to dissolve into the water column. The calculation assumes an average sediment organic carbon content of 2 percent. The lower the $K_d$ value, the less strongly compounds are sorbed to sediment and, therefore, are more likely to preferentially dissolve to the water column. The same trend that was observed for free-phase material is predicted for sediment-adsorbed contaminants with LPAHs and phenols more readily partitioning to the water phase than HPAHs, though all contaminants of concern are more likely to sorb than dissolve. Because sediment and overlying water chemical concentrations are not in equilibrium due to continual dilution with fresh seawater and diffusion of dissolved contaminants, the dissolution process is ongoing rather than static and the relative composition of sediment contaminants would slowly change over time with concentrations of 2- and 3-ring LPAHs declining relative to HPAH and reducing the overall mobility of the remaining material.

Because sediment PAH concentrations in the MSU are much higher than predicted by equilibrium partitioning, it is likely that sediment-bound PAHs will provide an ongoing source of PAHs to interstitial porewater and the overlying water column.

*3.3.2.3 Bioaccumulation*

Aquatic organisms in contact with PAHs dissolved in water or adsorbed to sediments can accumulate PAHs in their tissues. Predators on these organisms can also accumulate PAHs from consumption of their prey. Bioconcentration factors (BCFs) of PAHs in fish and crustaceans range from 100 to 2,000 (**Eisler 1987**), indicating that concentrations in tissues can occur at levels orders of magnitude higher than initial concentrations in water. In general, bioconcentration is greater for HPAHs than for LPAHs. Sediment-sorbed PAHs can be accumulated, although at fairly low rates (**Eisler 1987**), by bottom-dwelling invertebrates and fish through sediment ingestion, dermal absorption, or uptake of dissolved constituents across membranes such as gills. Approximate tissue to sediment (bioaccumulation) ratios are estimated to be 0.6 to 1.2 for amphipods, 0.1 for clams, and 0.05 for fish and shrimp (**Varanasi et al. 1985**). Concentrations of PAHs were measured in clam tissue and sediment as part of the MSU investigation. Uptake of PAHs could not be estimated in the clam bioassay due to the limited

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

number of samples and because clams exhibited negative growth (i.e., stopped feeding) during the study.

Some invertebrates and all vertebrates can metabolically break down PAHs that enter their bodies. The ability of fish to metabolize PAHs may explain why benzo(a)pyrene is frequently not detected or found only at very low levels in fish from environments heavily contaminated with PAHs (**Varanasi and Gmur 1980; 1981**). Metabolic breakdown of PAHs occurs relatively quickly with half-lives for elimination of PAHs in fish ranging from less than 2 days to 9 days (**Niimi 1987**). Because of this rapid elimination, fish tissue samples collected during the RI were not analyzed for PAHs. However, biotransformation of PAHs by the mixed function oxidase enzyme system in the fish liver can result in the formation of carcinogenic and mutagenic intermediates, and exposure to PAHs has been linked to the development of tumors in fish (**Eisler 1987**). External lesions and tumors were observed in some flatfish specimens collected within the MSU.

Molluscs also eliminate accumulated PAHs, but at much slower rates than fish due to the absence of some enzyme systems. Neff (**1982**) reported that oysters (*Crassostrea gigas*) eliminated the following percentages of accumulated PAHs during a 7-day elimination period: benzo(a)pyrene, 0 percent; benz(a)anthracene, 32 percent; fluoranthene, 66 percent; and anthracene, 79 percent.

*3.3.2.4 Degradation*

The most important processes contributing to degradation of PAHs in water are photooxidation and biodegradation by aquatic microorganisms (**Neff 1982**). Neither of these pathways are considered significant because PAHs are physically adsorbed to sediment, essentially removing them from the water column, and oxic conditions necessary for significant bacterial activity do not typically extend very deep into sediments.

While PAHs are susceptible to photolysis, this process is significant only at the surface and upper portions of the water column since ultraviolet light, required to initiate the process, is readily absorbed by water and its intensity rapidly diminishes with depth. Therefore, photolysis is not likely to be a significant degradation pathway, except in intertidal surface sediment where some exposure to light occurs on a seasonal basis.

In general, LPAHs can be significantly metabolized by microbes under aerobic conditions. However, under anoxic conditions typically found in fine-grained marine sediment, degradation is extremely slow (**Neff 1982**). Oxic conditions are only anticipated in the biologically disturbed layer, which typically ranges from 1 to 15 centimeters in shallower bottom depths of Puget Sound. Therefore, degradation of LPAHs and HPAHs is unlikely in sediment beneath this surface layer.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### *3.3.2.5 Free-Phase and Dissolved Creosote Migration*

Historical wood-treating practices at the PSR facility resulted in the release of creosote and related products to soil, groundwater, surface water, and sediments. Once released, these contaminants undergo a number of physical processes.

Free-phase creosote DNAPL has a density greater than water and will generally migrate vertically through soils, sediments, and groundwater until reaching a lithologic unit that forms an impermeable barrier, where it will pool. Changes in grain size or soil water content may cause significant lateral migration until gravitational forces overcome the resistance to flow and vertical migration will then continue until the mobile portion of the DNAPL plume is exhausted. The heterogeneity of the underlying soils and historical estuarine sediment at the PSR site has contributed to discontinuous layering of residual and free-phase DNAPL under both the Upland Unit and MSU.

The most important factor in determining where free-phase DNAPL can migrate is sediment or soil porosity (specifically the pore size distribution). Porosity is determined by grain size and controls the point at which creosote ceases downward flow as a free-phase liquid and remains in a state of residual saturation. Free-phase DNAPL will enter the largest pores first and the smallest last. DNAPL flow is impeded by its viscosity and the tendency to be adsorbed onto the sediment grains forming the pores (**Villaume 1985**). If grain size and porosity are sufficiently high (i.e., sandy sediment), smaller pores are unlikely to be present so that long vertical columns of creosote are not required to overcome capillary forces and downward migration can occur.

It was noted during the subsurface sediment coring activities that abundant petroleum/creosote staining or saturated product was observed in the upper layer (0 to 8 feet below mudline) with sheening observed in lower layers (8 to 20 feet below mudline) of a number of coring locations. In addition, residual DNAPL (as evidenced by strong to moderate staining) was observed in two deep coring locations (EB16 and EB114). At location EB16, staining/sheen was observed between 0 and 20 feet below mudline and again between 58 and 70 feet below mudline. At Station EB114, in addition to shallow staining or residual product, free phase DNAPL was present in approximately 2-inch-thick sand stringers present between 74 and 78 feet below mudline. These observations suggest that shallower contamination (0 to 20 feet below mudline) is a result of historical direct release to Elliott Bay with burial by filling activities and possibly downward migration for a short distance. Since intervening layers do not appear to be contaminated, the deeper residual creosote suggests free-phase DNAPL flow has occurred from the upland site along high porosity sand stringers or other preferential flow pathways. The depth, extent, and magnitude of DNAPL migration are not fully characterized as deep coring was performed only at three locations. Given the heterogeneity of DNAPL distribution, it is unlikely that the extent of deep subsurface DNAPL could be quantified. However, based on the depth of free-phase DNAPL observed in sand stringers, DNAPL is unlikely to surface through the sediment.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### *3.3.2.6 Dissolved Groundwater Transport of DNAPL Constituents*

Interactions between residual or free-phase creosote DNAPL in subsurface soil or sediment and groundwater contribute to additional transport of creosote constituents. A dissolved creosote plume is formed by dissolution of creosote constituents to groundwater as groundwater flows past areas of residual or free-phase DNAPL. As described in **Section 3.3.2.2**, LPAHs and phenolic compounds are the creosote constituents most likely to dissolve into the groundwater.

Significant concentrations of creosote constituents are present in upland groundwater in both dissolved and DNAPL forms (**RETEC 1997**). The fate and transport of dissolved creosote constituents in groundwater is governed by groundwater flows, diffusion and dispersion, sorption (retardation by binding to organics), and biodegradation. Groundwater flow (or advection) serves to move contaminants outward from the source in the direction of flow. Diffusion and dispersion act to create a plume that spreads laterally from the main transport pathway. Sorption tends to control the rate at which the plume migrates. Biodegradation is typically minimal for organics under anoxic conditions and therefore has little effect on reductions of contaminant mass. Site-specific conditions within the Upland Unit would suggest than groundwater transport of creosote constituents to Elliott Bay may be occurring in the shoreline between Crowley Marine and the main pier.

In order to evaluate the potential impact of groundwater transport on sediment quality, groundwater fate and transport modeling was conducted as part of both the Upland and MSU RI. BIOSCREEN, an EPA fate and transport model (**EPA 1996**), was used to estimate the attenuation of PAHs between shoreline wells and the point of discharge in the MSU.

The Upland RI modeling effort focused on water quality at the point of potential discharge. Ambient water quality criteria (AWQC) were used to determine if potential impacts could occur. The results suggested that groundwater discharging from the west-central portion of the site may exceed AWQC for selected PAHs.

The MSU RI modeling was conducted to address contaminant loading to sediment over time. The approach used in this analysis was to assume that sediment contaminant loading was entirely from dissolved contaminants in groundwater discharging at the sediment/water interface and to assume that the entire mass of the dissolved contaminants was retained in the sediment. The groundwater quality data and groundwater flow data from the upland wells were combined to calculate a sediment loading factor. This loading factor was converted to a sediment concentration as a measure of the potential, over time, for sediments to exceed the applicable sediment quality standards. The loading analysis focused on the role of groundwater advection and retardation in predicting sediment concentrations at the sediment-water interface.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

3.3.2.6.1 Modeling Approach

BIOSCREEN is based on the Domenico analytical solution (**Domenico 1987**) and uses the following assumptions:

- Uniform and constant aquifer properties,
- One-dimensional groundwater flow,
- First-order decay, degradation or transformation of contaminants, and
- Constant source area and concentrations.

The model was used to predict maximum groundwater concentrations in the centerline of the contaminant plume under steady-state conditions. Groundwater quality data, chemical properties, and hydrogeologic and aquifer characteristics are consistent with those presented for the fate and transport analysis in the Upland RI/FS (**RETEC 1997**). PAH data from the fifteen shoreline wells (three wells in five clusters) were used to develop inputs to the model. The wells are spaced at 75- to 200-foot intervals and span shallow-(+9 to -6 feet MLLW), intermediate (-20 to -40 feet MLLW), and deep (-75 to -85 feet MLLW) screen intervals within each well cluster.

The discharge zones for these wells were identified as the sediment/bay interface at the bottom depths corresponding approximately to the upland screen interval **(Figure 3-4).** The discharge zones are summarized below.

- Shallow Zone—The portion of the sediment/bay interface from the shoreline to an elevation of -25 feet MLLW.
- Intermediate Zone—the portion of the sediment/bay interface between an elevation of -25 to -50 feet MLLW.
- Deep Zone—the portion of the sediment/bay interface below an elevation of -50 feet MLLW.

DNAPL has been detected in four (MW-5S, MW-5I, RW-1I and RW-1D) of the fifteen shoreline wells. Because of the presence of DNAPL in at least one well in each screen interval category, the modeled dissolved groundwater quality concentrations were based on the theoretical dissolved phase concentration. The theoretical dissolved phase concentrations are based on the effective solubility of each PAH present in a DNAPL mixture. The concentrations of individual constituents are based on these calculated solubilities. Actual concentrations of chemicals measured in wells are generally much lower. Effective solubilities were calculated in the Upland RI (**RETEC 1997**), using the principle that concentrations are proportional to the mole fraction of the constituents in pure DNAPL as described by Raoult's law. This calculation included only

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

those creosote constituents that were measured as part of the Upland RI, resulting in greater solubility estimates than would be predicted if all creosote constituents were accounted for because fewer creosote chemicals are accounted for. However, this represents a conservative approach and was retained for the MSU RI modeling effort. The DNAPL composition used for each calculation was based on the analysis of samples from wells EW-6 and MW-5I **(Appendix I)** and included only PAHs. Naphthalene, acenaphthrene, fluorene, phenanthrene and anthracene were included in the model because they are the PAHs with the highest existing concentration in both groundwater and sediment.

Sorption, dispersion and tidal dilution were used as the primary attenuation mechanisms for dissolved groundwater constituents. Attenuation is partly a function of groundwater travel distance. The horizontal travel distance from each shoreline well to the sediment interface was estimated based on well locations and on bathymetry **(Figure 1-3)**. The distances from the shoreline for each discharge zone are as follows:

- Shallow Zone—55 to 250 feet from shore (average = 145 ft).
- Intermediate Zone—200 to 430 feet from shore (average = 300 ft).
- Deep Zone—greater than 430 feet from shore.

The shortest horizontal distance between the sediment interface and the middle of the screened interval was used as the model distance to receptor for the each discharge zone. Use of the average distance was evaluated to address the uncertainty associated with this model input.

3.3.2.6.2 Chemicals of Concern

Groundwater quality data from the 15 shoreline wells were used as input to the model. The locations of the shoreline wells are shown on **Figure 1-3**. A statistical summary of groundwater quality data from shoreline wells is provided in **Appendix I**. Review of these data indicate that PAHs are the only significant COCs present in groundwater which have the potential to contaminant sediment.

3.3.2.6.3 Fate and Transport Approach

A multistep screening approach was used for the fate and transport modeling. This approach is conservative and helps to assess parameters important in natural attenuation. The results of analysis were used to calculate a sediment loading factor, which is the sediment concentration added to a sediment layer one meter thick per year (mg/kg-yr). This assumes that chemical concentrations are evenly distributed, that all chemical mass is retained by the sediment layer, no attenuation takes place in the sediment layer, and that the mass loading rate is constant. The contaminant mass loading rate is given in mg/kg per year, or the increase in chemical concentration in the sediment, given the assumptions above. The steps are summarized below.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Step 1: The initial step was based on the assumption that no attenuation occurs during groundwater transport and that the entire contaminant mass is retained on the sediment layer. The sediment loading factors to the sediment layer were calculated from the dissolved PAH concentration and groundwater flux rates.

Step 2: BIOSCREEN was used to predict chemical concentrations at the sediment interface. The hydrogeologic and aquifer characteristics from the Upland RI were used. The shortest distance from the well screen and sediment interface was used. PAH concentrations were calculated based on the effective solubilities presented in the Upland RI (**RETEC 1997**). No tidal dilution was used.

Step 3: The predicted PAH concentrations from Step 2 were reduced using a tidal dilution factor of 100 for the shallow zone and a tidal dilution factor of 4 for the intermediate and deep zones. These dilution factors were based on the Upland Unit tidal study **(RETEC 1997)**. The sediment concentration loading factors were used to calculate the resulting sediment layer concentrations after 10, 20, and 30 years.

3.3.2.6.4 Results

The model input parameters and results are presented in **Appendix I** and are summarized in **Table 3-5**. The predicted sediment layer concentrations were also compared to the sediment LAET and 2LAET as a reference to determine the significance of the sediment loading factors. Comparison to the sediment LAET and 2LAET assumes that the starting sediment chemical concentration is zero, such as would exist for uncontaminated sediment or a clean sediment cap.

The model results predict that sediment concentrations will occur above the 2LAET after 10 years in the intermediate discharge zone for naphthalene and fluorene. After 20 years, sediment concentrations are predicted to be at or above the 2LAET for naphthalene, fluorene and acenaphthalene in the intermediate zone and for naphthalene in the shallow zone. This modeling effort showed no exceedances of the LAET or the 2LAET occurring in the deep discharge zone.

The range of exceedances for naphthalene in the shallow zone were low (less than 2 times the LAET) for both the 20- and 30-year evaluation. However, the exceedance ratios for naphthalene in the intermediate zone were much higher (15 times the LAET at year 10; 47 times the LAET at year 30). Fluorene in the intermediate zone was predicted to exceed the LAET by about 9 times the LAET after 20 years, and 26 times the LAET after 30 years. Acenaphthene did not exceed 2.2 times the LAET after 30 years.

3.3.2.6.5 Uncertainties

Conservative assumptions and conservative input parameters were used in estimating sediment loading rates. To evaluate the effect of uncertainty, the distance to sediment interface and PAH concentrations were varied to assess the effect of changing these parameters on selected sediment

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

layer concentrations in the shallow and intermediate discharge zones. The modifications in model inputs were made only for those contaminants that had an exceedance of the LAET at year 10 (naphthalene, acenaphthene, fluorene, anthracene).

The initial model analysis used the shortest distance from the well screen to sediment/bay interface. The model was modified to use an average distance rather than the minimum distance. These results indicate that for the shallow discharge zone, naphthalene is sensitive to the distance to the sediment/bay interface. Naphthalene concentrations drop below the LAET when the distance is increase from 55 to 145 feet.

Acenaphthene was also sensitive to changes in the distance to the sediment/bay interface assumption, dropping to just above (1.2 times) the 2LAET at year 30 if an average distance of 300 feet is used. However, naphthalene continued to exceed the 2LAET in the intermediate discharge zone, and fluorene exceeded the LAET, even with a change in the distance input.

Another modification that was made to evaluate the uncertainties in the model outcome was to use an alternative approach to calculating effective solubility (see **Table 3-4**). This approach accounts for all of the constituents that are present in a typical creosote mixture and uses an average molecular weight of 300 g/mole; whereas, the method for calculating the mole fraction used in the Upland RI/FS (**RETEC 1997**) was based only on those compounds that were analyzed (i.e., not all creosote compounds were analyzed; therefore, the mole fraction of each analyte would be overestimated). As a result, these calculated theoretical solubilities are lower than those calculated in the Upland RI/FS. Actual chemical concentrations in groundwater were sometimes greater than the predicted chemical concentration based on these revised effective solubilities. These differences may have been caused by differences in the actual creosote mixtures present at the site, or the presence of suspended solids in the groundwater samples. The model was modified to use the maximum concentrations of either the predicted chemical concentration or the actual concentration measured in groundwater. The results of this analysis indicate that in the shallow discharge zone, naphthalene is sensitive to concentration input and no longer exceeds sediment criteria with a change in initial groundwater concentration. However, a change in the initial concentration did not change the occurrence of a 2LAET exceedance in the intermediate discharge zone for naphthalene. Fluorene and acenaphthene in the intermediate discharge zone are also sensitive to the initial concentration in that exceedances only occurred at the higher input concentrations.

These results have been discussed as being applicable to the entire nearshore area of the MSU. However, the maximum concentrations used in the model were primarily derived from wells where DNAPL has been noted during past monitoring events. These wells are located in the west-central portion of the site between Crowley Marine and the main pier. Thus, groundwater transport of contaminants likely only affects the portion of the MSU adjacent to this area. Current surface sediment quality offshore of these shoreline wells exceeds sediment quality standards (see **Figure 5-14**). Given that current contamination in these areas exists at

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

concentrations greater than that predicted by partitioning between groundwater and sediment, dumping and discharge of creosote wastes is probably the primary contributor to sediment contamination. Groundwater transport of creosote constituents may contribute some fraction of the current contamination; however, it may be less than that predicted by the model. Groundwater transport of contamination will need to be addressed as part of the FS for the MSU.

### *3.3.2.7 Contaminated Surface Sediment Transport*

Migration of contaminated surface sediment represents a potentially minor mechanism for contaminant transport within and from the PSR MSU. Sediment transport is influenced both by currents and bathymetry. Bottom currents in Elliott Bay move in a clockwise gyre **(GeoSea 1994)** and tend to move sediment along depth contours. Downslope migration also tends to occur due to gravity. These processes imply that surface sediment would typically be swept along depth contours off the West Seattle shoreline toward the Duwamish Head with net migration to deeper water. In practice, little or no evidence based on longshore chemical gradients was observed for migration along the shoreline. This may be due to the very low current velocities that have been predicted for near-bottom currents. Instead, concentration gradients suggest that contaminated sediment transport appears to be offshore toward deeper water (downslope). Given the presence of steep bottom slopes in the MSU, settling of contaminated material from historical surface releases was likely driven by gravitational forces rather than longshore migration of contaminated sediment.

### *3.3.2.8 Sediment Deposition*

Burial of contaminated surface sediment by clean, newly settled material (i.e., natural recovery) is unlikely to be significant in the MSU because sedimentation rates in this portion of Elliott Bay are probably fairly low. In general, a sediment accumulation rate of greater than 1 cm/yr is generally required for natural recovery to be considered a viable alternative. The Duwamish River represents the main source of sediment that would contribute to natural recovery in the MSU. Damming of the Green River and extensive shoreline development have removed opportunities for sediment loading to the Duwamish River and waterways. In addition, the U.S. Army Corps of Engineers constructed a sediment trap in the Duwamish Waterway by excavating a deeper area in the waterway in order to control the amount and areal extent of maintenance dredging that would be required over time. Sediments that are transported out of the Duwamish corridor tend to be either deposited at the toe of the salt wedge as it migrates up and down the river or retained in the freshwater plume as it enters Elliott Bay. Given the low bottom currents in the bay, longshore transport processes from the mouth of the Duwamish River to the MSU are likely to be slow. The transport of suspended sediment tends to occur in the more buoyant surface layer and is more strongly controlled by prevailing weather patterns. As a result, suspended sediment discharged from the Duwamish River tends to be carried towards the downtown Seattle waterfront, where it has the opportunity to settle (although total accumulation is minimal).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Sediment deposition studies were not performed as part of the MSU remedial investigation. Two studies have been performed in Elliott Bay, around Harbor Island and along the Seattle waterfront, to estimate the rate of sediment deposition. Because all of Elliott Bay has similar characteristics and shares the same sediment sources, these two studies were used as surrogates for processes occurring at the MSU.

In the Harbor Island RI, historical and more recent dredging records were examined to identify areas of persistent accumulation or erosion in the waterways. In general, there is little evidence of long-term accumulations of sediment in the area of Harbor Island, which is further evidenced by the limited dredging activities that have been required to maintain navigation. In contrast, the Harbor Island supplemental RI calculated sedimentation rates around 1 centimeter per year (cm/yr) for the East and West waterways.

In a study performed for the Elliott Bay/Duwamish Restoration Program **(Ecology 1995a),** net sedimentation for the Seattle waterfront ranged from only 0.06 to 0.12 cm/yr, suggesting insufficient sedimentation in the MSU to support natural recovery in an approximate 10-year period. As an additional evaluation of the potential for natural recovery in the MSU, the data from surface sediments were compared to the top core interval at each co-located core station. In almost all cases, PAH concentrations were higher in surface sediments compared to subsurface sediment. This trend in surface sediment suggests minimal sedimentation is occurring.

Overall, both of these studies suggest that there is insufficient new sediment accumulation in Elliott Bay to bury and isolate contaminated sediment at the MSU.

## 3.4 CONCEPTUAL SITE MODEL

Current sediment contamination in the MSU is a result of both historical release and on-going transport processes. Historical sources and transport mechanisms include:

- Historical, direct release or disposal of used or waste creosote and associated wood preservative carrier oil from the Upland Unit have contaminated sediments in the southwestern portion of Elliott Bay and represent the primary source in the MSU. Because the facility was originally built on pilings over the water and the area was subsequently filled, there is both surface and subsurface sediment contamination.

- Historical, direct release of process wastewater from the Upland Unit to Elliott Bay have contributed to sediment contamination due to the partitioning of dissolved contaminants to sediment. This pathway no longer exists.

- Historical downward and lateral migration of free-phase creosote via preferential flow pathways (e.g., sand) towards Elliott Bay. Actual discharge of subsurface free phase

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

creosote at the sediment-water interface is not anticipated due to upland cleanup actions.

- Historical erosion of contaminated soil by surface water runoff transport to Elliott Bay may have contributed minor amounts of contamination to sediment. This pathway no longer exists as surface contamination has been removed and the previous upland site has been paved.

- Historical surface water runoff transport of contaminated stormwater from the Upland Unit to Elliott Bay may have contributed minor amounts of contamination to the marine sediments, based on partitioning to sediment. This pathway no longer exists.

- Transport of contaminated groundwater from the Upland Unit to Elliott Bay may still contribute to sediment contamination via dissolved contaminant advection and dispersion with subsequent partitioning to sediment; however, the low water solubility of most PAHs results in this being a minor contributor to overall sediment contamination.

While historical releases have resulted in significant surface and subsurface sediment contamination, remedial activities at the Upland Unit have removed most of the contaminant transport pathways listed above. Specific actions taken to remove source material and transport pathways include:

- Excavation and removal of free product and contaminated shallow subsurface soil have removed contaminant sources that might otherwise have continued to migrate to the MSU.

- Paving of the Upland Unit has removed erosion of surface soil and infiltration by precipitation and subsequent contaminant leaching as possible transport pathways.

- Installation of a slurry wall near the shoreline has limited migration of shallow free-phase creosote and contaminated shallow groundwater to Elliott Bay.

The only remaining likely contaminant migration pathways are transport of deeper contaminated groundwater or free-phase creosote outside the slurry wall from the facility to Elliott Bay via preferential flow pathways (e.g., sand stringers) with subsequent partitioning to sediment and longshore or downslope migration of contaminated surface sediment in the MSU. PAHs will continue to slowly leach from contaminated sediment, partitioning into the interstitial porewater, and potentially being accumulated by benthic organisms. Conceptual site models depicting these fate and transport mechanisms are presented in **Figures 3-5 and 3-6**.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 4

# DATA QUALITY, ANALYSIS, AND PRESENTATION

## 4.1 INTRODUCTION

Data collected during the RI sampling program were used to delineate the nature and extent of surface and subsurface sediment contamination, assess risks to human health and ecological receptors, and analyze the fate and transport of contaminants. The quality and treatment of the collected data affects the assumptions associated with these tasks, any statistical analyses, the interpretation of the results, and the uncertainty associated with the results. Accordingly, summaries of the quality of the data and the methods used to analyze the data and present the results are provided in the following subsections.

Additional data were collected during the RI sampling program to support the assessment of the feasibility of various remedial options (i.e., contaminant mobility tests and sediment engineering parameters). The quality of the water results for the contaminant mobility tests are discussed herein, but the detailed evaluations of these data will be conducted in the FS.

## 4.2 DATA QUALITY

### 4.2.1 Chemical Data

#### *4.2.1.1 Surface and Subsurface Sediment*

Sediment samples were evaluated for various organic and inorganic compounds using analytical methods defined by the EPA and Puget Sound Estuary Program (PSEP). Detailed discussions of analytical procedures were provided in a series of sampling plans (**WESTON 1996b and 1996c**); validation findings are presented in **Appendix E (Section E.1)**.

The data validation review of sediment results indicated that all data were acceptable; however, approximately 7 percent of the results were considered to be estimates due to minor quality control or quantitation limit deviations. These results were biased high or low, depending on the nature of the deviation. Quantitation limit estimates resulted when valid identifications were reported, but values were below specified quantitation limits. Overall, none of the sediment results were rejected, indicating a high level of data completeness. Weathering was identified for Aroclor 1242 based on convolution of sample peak ratios. Aroclor 1242 results in 28 samples were qualified as estimates due to this weathering. Aroclor 1254 was also identified in these samples, although the correlation between sample and standard Aroclor patterns was somewhat inconsistent.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

#### *4.2.1.2 Fish and Clam Tissue*

Fish and clam tissue samples were evaluated for various organic and inorganic compounds using analytical methods defined by the EPA. Detailed discussions of analytical procedures were provided in the sampling and analysis plan (**WESTON 1996b**); validation findings are presented in **Appendix E (Section E.1)**.

The data validation review of fish and clam tissue results indicated that all data were acceptable, with the exception of naphthalene, 2-methylnaphthalene and 1-methylnaphthalene in one tissue sample out of 21 samples. Results for these analytes were rejected based on unacceptable surrogate recoveries. Additionally, approximately 10 percent of the results were considered to be estimates due to minor quality control or quantitation limit deviations; these results were biased high or low, depending upon the nature of the deviation. Quantitation limit estimates resulted when valid identifications were reported, but values were below specified quantitation limits. The majority of the fish and clam tissue results were acceptable; however, rejected naphthalene and methylnaphthalene data slightly reduced the overall level of completeness.

#### *4.2.1.3 Contaminant Mobility Water Results*

The water samples resulting from the MET and DRET contaminant mobility tests were evaluated for various semivolatile compounds using analytical methods defined by the EPA. Detailed discussions of analytical procedures were provided in a series of sampling plans (**WESTON 1996c and 1996d**); validation findings are presented in **Appendix E (Section E.1)**.

The data validation review of water results indicated that all data were acceptable; however, approximately 16 percent of the results were considered to be estimates due to minor quality control or quantitation limit deviations. One sample was analyzed one day past the holding time maximum and thus accounted for approximately 11 percent of the qualifications. The qualified results may be biased high or low, depending upon the nature of the deviation. Quantitation limit estimates resulted when valid identifications were reported, but values were below specified quantitation limits. Overall, none of the water results were rejected, indicating a high level of data completeness.

### 4.2.2 Sediment Bioassays and Benthic Community Data

Toxicity test data for the two acute bioassays and the clam mortality and growth bioassay conducted by Parametrix, Inc., as well as the benthic infaunal enumeration and identification conducted by Marine Taxonomic Services, were reviewed by WESTON to ensure that the tests and infauna sorting and taxonomic identification quality assurance/quality control (QA/QC) procedures were conducted in accordance with PSEP protocols (**Tetra Tech 1987 and PTI 1995**) and that the resulting data were valid and useful. Detailed validation reports are provided in **Appendix E (Section E.2)**.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Overall, the bioassay and benthic data were determined to be valid and generally of high quality based on acceptable test conditions and negative and positive control results, in addition to rigorous QA/QC. The only performance standard failures occurred for the reference sediments (from Carr Inlet and the Elliott Bay background stations) tested for the amphipod and echinoderm larval acute bioassays. As described in the validation memoranda, the reasons for the failures were unclear, given the observed test conditions and that positive and negative control responses were within specified limits. In accordance with recent guidance from **Ecology (1997)**, the results of the control sediments, which met all specified performance standards, were subsequently substituted for reference in the evaluations of these data, as well as the clam bioassay results.

## 4.3 DATA ANALYSIS

### 4.3.1 Nature and Extent of Sediment Chemical Contamination

Surface and subsurface sediment chemical data were compared with available sediment effects-based screening values [i.e., Washington State Sediment Management Standards (SMS) and Puget Sound Apparent Effects Thresholds (AETs)] to evaluate the nature and extent of contaminated sediments in the MSU (see **Section 5** for results). In addition, because regulatory sediment effects-based screening values are not available for dioxins and furans, the extent of contamination by these compounds was evaluated by comparing these data with Elliott Bay background concentrations that were established as part of the RI sampling program. **Tables 4-1 and 4-2** present the screening criteria used in the nature and extent evaluation. The process of comparing MSU data with these screening values included the following:

- Normalizing MSU sediment nonionic/nonpolar organic chemical concentrations to sample-specific TOC content, for samples with TOC values between 0.5 and 4.0 percent (inclusive)
- Calculating chemical group sums (e.g., total LPAHs)
- Deriving and summing 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) equivalents for congener-specific dioxin and furan (PCDD/PCDF) data.

Additional detail regarding the sediment chemical screening process is provided in **Appendix F**.

### 4.3.2 Human Health and Ecological Risk Evaluations

Detailed descriptions of the analytical methods used to evaluate the RI data for the purposes of conducting the ecological and human health risk assessment are provided in the Ecological and Human Health Risk Assessment Technical Memorandum (see **Appendix K**). In brief, the following types of data analysis were conducted:

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Selection of Contaminants of Potential Concern
  - Sediment Chemical-Specific Evaluations
    - Frequency of detection
    - Presence at concentrations exceeding SMS and AET chemical criteria
    - Potential for bioaccumulation
    - Presence at concentrations exceeding average Elliott Bay background concentrations
  - Fish and Clam Tissue Chemical-Specific Evaluations
    - Frequency of detection
    - Presence at concentrations exceeding average Elliott Bay background concentrations
    - Presence at concentrations exceeding EPA risk-based concentrations (RBCs)

- Calculations of Exposure Point Concentrations
  - Human Health Risk
    - Calculations of average chemical concentrations
    - Calculations of 95th upper confidence limits
  - Ecological Risk
    - Use of maternal-egg transfer model

- Ecological Toxicity Assessment and Risk Characterization
  - Statistical comparisons of bioassay results with Washington State SMS Sediment Quality Standard (SQS) and Cleanup Screening Level (CSL) biological criteria
  - Statistical comparisons of clam sublethal responses and tissue chemical concentrations with responses and tissue concentrations observed in clams exposed to Elliott Bay background sediments
  - Evaluations of benthic infaunal data using a number of community metrics and analysis techniques, including qualitative and statistical comparisons among MSU and background stations for:
    - Abundance
    - Diversity
    - Community structure
  - Comparisons of MSU fish and egg tissue concentrations with toxicity benchmarks derived from scientific literature

- Human Health Risk Characterization
  - Calculations of cancer risk
  - Calculations of noncancer hazard indices

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 4.4 GIS DATA PRESENTATION

A geographic information system (GIS) was used to prepare the figures presenting the analyte concentration and spatial distribution data for surface sediments sampled in the MSU. The following subsections detail how these data are presented.

### 4.4.1 Display of Concentration Information

Concentrations were posted for an analyte or group of analytes for each sampling station. Undetected analytes are represented by actual quantitation limits followed by a "U" qualifier. Data normalized to TOC content are displayed for those analytes for which existing standards warrant such manipulation. Symbols are used to depict whether data are presented on a dry-weight (circle) or TOC-normalized (triangle) basis. Color-coding is used to depict whether the measured concentration exceeds its SMS SQS or CSL chemical criteria, or, where applicable, its lowest AET (LAET) or second-lowest AET (2LAET). Symbols for stations that exceed SQS or LAET chemical criteria are displayed in yellow; symbols for stations that exceed CSL or 2LAET chemical criteria are displayed in orange. If the given chemical was not detected or was detected at a concentration below these chemical screening criteria, then the symbol for that station is displayed in grey. If the detection limit for a chemical exceeded the lowest applicable screening criterion, then the symbol for that station is displayed in green.

| | | |
|---|---|---|
| Dry-Weight | ● | MSU Detection Limit Exceeds Screening Criteria |
| | ◍ | MSU Concentration Below SQS or LAET Screening Value |
| | ○ | MSU Concentration Above SQS or LAET Screening Value |
| | ◍ | MSU Concentration Above CSL or 2LAET Screening Value |
| TOC-Normalized (TOCN) | ◬ | MSU Concentration Below TOCN SQS Screening Value |
| | △ | MSU Concentration Above TOCN SQS Screening Value |
| | ◬ | MSU Concentration Above TOCN CSL Screening Value |

The presentation format for the dioxin and furan sediment data differed slightly than that described above, as the color-coding was based on the magnitude of the exceedance (over background) observed. For this presentation, symbols for stations with dioxin/furan concentrations greater than 10 times the background value were displayed in red; symbols for stations with concentrations between 2 and 10 times the background value were displayed in orange; symbols for stations with concentrations between 1 and 2 times the background value were displayed in yellow; and stations with concentrations less than the background value were displayed in grey. The display ranges were selected to best represent areas of slight to substantial contamination relative to background.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- MSU Concentration ≤ 1 Times Background Value
- MSU Concentration Between 1 and 2 Times Background Value
- MSU Concentration Between 2 and 10 Times Background Value
- MSU Concentration > 10 Times Background Value

### 4.4.2 Display of Spatial Extent of Chemicals Exceeding Criteria

The spatial distribution of surface sediment chemicals exceeding regulatory standards or screening value was displayed using Thiessen polygons, which were created from the network of sampling points located in the MSU. Polygons were developed by forming line segments connecting each sampling point with its nearest neighbors. A perpendicular bisector was constructed for each of these lines, and a polygon was defined as the area within all of the bisecting lines. The edge of each polygon was halfway between each sampling point and its nearest neighbor in that direction. Each polygon has an associated sampling point that is within the polygon, but not necessarily at the center. The most significant property of the Thiessen polygon is that every location within it is closer to its associated sampling point than to any other sampling point.

Similar to the chemical-specific displays, color-coding is used to depict whether the polygon represents an area associated with chemical concentrations above SQS/LAET or CSL/2LAET criteria. Polygons representing areas for which surface sediment PAH data exceeded SQS or LAET chemical criteria are displayed in yellow; polygons for stations associated with CSL or 2LAET chemical criteria exceedances are displayed in orange. If the station did not exceed either set of criteria, then the polygon for that station is displayed in grey.

- MSU station within polygon not associated with PAHs at concentrations greater than SQS or LAET screening values
- MSU station within polygon associated with PAHs at concentrations greater than SQS or LAET screening values
- MSU station within polygon associated with PAHs at concentrations greater than CSL or 2LAET screening values

It is important to note that Thiessen polygons are a presentation device, not a method for estimating concentrations between sampling points. The only points where a concentration is established are at the sampling points themselves.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 5

# NATURE AND EXTENT OF CONTAMINATION

## 5.1 INTRODUCTION

As described in **Section 4.3.1,** concentrations of contaminants in surface and subsurface sediment were compared with SMS or AET chemical criteria, as well as Elliott Bay background screening levels for PCDD/PCDF, to evaluate the nature and extent of chemical contamination in the MSU. A general description of the procedures used to screen the chemical data is provided in **Section 4.3.1**; a more detailed discussion is presented in **Appendix F**.

The following sections are intended to provide an overview of the distribution of contaminants of concern in the MSU. More detailed discussions of the results of the Phase 1 and Phase 2 sediment chemical sampling events, focusing on individual chemical constituents of concern and specific sampling stations at which sediment chemical criteria were exceeded, were provided in the Phase 1 and Phase 2 Technical Memoranda (**WESTON 1996e and 1997a**). Similar detailed discussions of data collected and/or analyzed subsequent to those sampling events (i.e., results of previously archived Phase 2 surface and subsurface samples and Phase 3 data) are presented in **Appendix G**. Supplemental figures depicting the distribution of individual PAHs are provided in **Appendix H, Figures H-1 through H-16**.

Overall, PAHs were determined to be the primary contaminant of concern in MSU surface and subsurface sediments, with up to 100 acres and one million cubic yards of sediment identified as contaminated based on comparisons with available sediment chemical screening criteria (see **Sections 5.4** and **5.6**, below).

## 5.2 MSU SURFACE SEDIMENT CHEMICAL RESULTS

**Table 5-1** provides a summary of the MSU surface sediment chemical data and frequency of exceedance of screening criteria on a chemical-specific basis; complete listings of MSU surface sediment analytical data are presented in **Appendix D (Table D-1 and D-6)**. Chemical ratios depicting site concentrations relative to their respective screening criteria are also provided in **Appendix D (Tables D-2 through D-5 and D-7)**. The physical data (e.g., grain size and TOC) collected as part of the RI surface sediment sampling events are discussed in detail in **Section 2.1.6.6**. The following subsections present a summary of findings.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 5.2.1 Semivolatile Organic Compounds (SVOCs)

#### *5.2.1.1 Polycyclic Aromatic Hydrocarbons (PAHs)*

PAHs were analyzed at 106 surface stations located throughout the MSU.

Concentrations of total LPAHs exceeded SQS or LAET screening criteria in nearly 60 percent of the samples analyzed. The CSL or 2LAET screening criteria were also exceeded in nearly one-third of these samples (**Figure 5-1**). On average, the concentrations of total LPAHs measured at stations located inshore of the Outer Harbor Line ("nearshore" stations) were twice as high as those measured at stations located seaward of the Outer Harbor Line ("offshore" stations), with nearshore station concentrations generally 4 times greater than CSL or 2LAET screening values and offshore stations characterized by CSL or 2LAET exceedance ratios (ERs; represent ratio of contaminant present in MSU sample relative to specific screening value; **Table 4-1**) of, on average, approximately 2. Two stations, EB09 and EB13 (located northeast of the former tank storage facility), exhibited highly elevated concentrations of LPAHs relative to other nearshore stations, with total LPAH concentrations nearly 60 and 230 times greater than the 2LAET screening value, respectively. The concentrations of TOC at these stations were also elevated (ranging from 6 to 7.5 percent), precluding an appropriate comparison of these PAH data with SMS criteria. Of the individual LPAHs measured, acenaphthene, naphthalene, and fluorene were most frequently detected at concentrations greater than CSL or 2LAET criteria, occurring at between 34 and 43 percent of the stations sampled.

In contrast to the LPAHs, concentrations of total HPAHs exceeded SQS or LAET screening criteria in only 45 percent of the samples analyzed, and exceeded CSL or 2LAET criteria at only 10 percent of the stations sampled (**Figure 5-2**). In addition, only slight differences were observed in HPAH concentration with increasing distance offshore: nearshore stations were characterized by an average CSL/2LAET ER slightly greater than 2 (2.2); offshore stations exhibited an average CSL/2LAET ER slightly less than 2 (1.9). However, similar to the observed distribution of LPAHs, Stations EB09 and EB13 were characterized by highly elevated concentrations of total HPAHs, at nearly 100 and 270 times greater than the 2LAET screening value.

#### *5.2.1.2 Phenols*

Phenolic compounds (2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, PCP, and phenol) were analyzed at a total of 44 stations (predominantly nearshore) (**Figures 5-3 through 5-7**). Of these compounds, 2,4-dimethylphenol was most widely distributed at concentrations greater than its CSL criterion, occurring at multiple nearshore and offshore stations located north-northeast of the former tank storage area and at a limited number of nearshore stations west of the West Slip. Similar distributional patterns were observed for the other phenolic compounds, but with markedly fewer screening criteria exceedances and most exceedances occurring at nearshore stations.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

#### *5.2.1.3 Dibenzofuran*

Dibenzofuran was analyzed at a total of 67 stations and was present in concentrations above the screening criteria at nearly every station analyzed (**Figure 5-8**). Highest concentrations, exceeding CSL or 2LAET chemical criteria, generally occurred at nearshore stations located north-northeast of the former tank storage area.

### 5.2.2 Polychlorinated Biphenyls (PCBs)

PCBs were detected at all 42 locations analyzed (**Figure 5-9**) and were present at total concentrations above SQS or LAET chemical criteria at 60 percent of these sampling locations. The majority of these exceedances occurred in sediments collected west-northwest of the Main and West slips. In the nearshore reach of this area, near the discharge point for the Longfellow Creek overflow, the concentrations of PCBs exceeded the CSL chemical criterion; CSL (or 2LAET) exceedances for PCBs were not observed at any other MSU station.

### 5.2.3 Dioxins and Furans

Dioxins and furans (reported as 2,3,7,8-TCDD equivalents) were detected in each of the 38 surface sediment samples analyzed. Measured concentrations exceeded the dry-weight screening value (1.052 ng/kg) in all samples analyzed, and exceeded the International Joint Commission, Great Lakes Science Advisory Board's proposed sediment quality guideline for 2,3,7,8-TCDD (**Iannnuzi et al. 1995**) of 10 ng/kg dry-weight at nearly 75 percent of the locations sampled. Similarly, detected concentrations of 2,3,7,8-TCDD exceeded the TOC-normalized background screening level (122.34 ng/kg; **Figure 5-10**) in all but one sample (collected at Station EB80). Highest 2,3,7,8-TCDD TOC-normalized concentrations generally occurred in the nearshore area west of the West Slip or in the offshore area north of the Main Slip, with concentrations decreasing to below the TOC-normalized background value (and the dry-weight proposed screening guideline) in sediment collected farthest offshore (Station EB80).

### 5.2.4 Inorganic Substances

Arsenic, cadmium, chromium, copper, lead, mercury, and zinc were detected in surface sediments collected from the majority of the stations at which they were analyzed. However, only copper, mercury, and zinc were measured at concentrations exceeding chemical screening criteria (**Table 5-1**).

#### *5.2.4.1 Copper*

Copper was detected in surface sediment collected from the nearshore area east of the former tank storage area at a concentration (410 mg/kg) slightly above both its SQS and CSL chemical criterion (390 mg/kg) (**Figure 5-11**). No other detected concentrations of copper exceeded chemical screening criteria.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

#### *5.2.4.2 Mercury*

Mercury was the inorganic most frequently detected in surface sediment at concentrations above its chemical screening criteria, occurring at nearly 40 percent of the 53 locations analyzed at concentrations exceeding its SQS chemical criterion, and at over 20 percent of the sampling locations at concentrations in excess of its CSL chemical criterion (**Figure 5-12**). Highest concentrations occurred at nearshore stations located east of the eastern upland property boundary (near the former Lockheed property).

#### *5.2.4.3 Zinc*

Zinc was detected in surface sediment collected from three nearshore stations (located north and east of the former tank storage facility and west of the West Slip) at concentrations greater than SQS chemical criterion, but was not present at concentrations greater than its CSL chemical criterion at any station (**Figure 5-13**).

## 5.3 BACKGROUND SURFACE SEDIMENT CHEMICAL RESULTS

Complete listings of the surface sediment analytical data for the Elliott Bay background stations are presented in **Appendix D (Table D-8)**. In general, chemicals of concern were not detected at the background stations at concentrations exceeding chemical screening criteria.

### 5.3.1 SVOCs

#### *5.3.1.1 PAHs*

PAHs were analyzed at each of the four Elliott Bay background sampling stations (BK01, BK02, BK03, and BK04; see **Figure 1-6**). Concentrations of several individual as well as total LPAHs and HPAHs exceeded their respective SQS screening criteria at background location BK01 (offshore of Magnolia) during the Phase 1 sampling event, but were not detected at concentrations in excess of these criteria during Phase 2 sampling at the same location. PAHs were not detected at any other background station at concentrations greater than SMS or AET screening values.

#### *5.3.1.2 Phenols*

Phenolic compounds were analyzed at the three background stations sampled during the Phase 1 event (i.e., BK01, BK02, and BK03), but were not detected at concentrations greater than SMS screening criteria at any location. However, the detection limit for 2,4-dimethylphenol at each location exceeded the SQS chemical criterion for this compound.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

#### *5.3.1.3 Dibenzofuran*

Similar to the phenolic compounds, dibenzofuran was analyzed at the three background stations sampled during the Phase 1 event, but was not detected at concentrations greater than SMS screening criteria at any location.

### 5.3.2 PCBs

PCBs were analyzed at each of the background sampling stations and were detected at one location (BK04, offshore of Alki) at a TOC-normalized concentration approximately 2.4 times greater than the SQS screening criterion for total PCBs. PCBs were detected at each of the other three sampling stations, but at concentrations below SMS or AET screening values.

### 5.3.3 Dioxins and Furans

Dioxins and furans (reported as 2,3,7,8-TCDD equivalents) were detected in sediments collected from each of the four Elliott Bay background stations, but detected concentrations did not exceed the sediment quality guideline for 2,3,7,8-TCDD of 10 ng/kg that has been proposed for the Great Lakes region (**Iannuzi et al. 1995**).

### 5.3.4 Inorganic Substances

Inorganics were measured in sediments collected from the three background stations sampled during the Phase 1 event, but were not detected at concentrations in excess of their respective SQS chemical screening criteria.

## 5.4 AREAS OF MSU SURFACE SEDIMENT EXCEEDING CHEMICAL CRITERIA

Based on their widespread distribution at concentrations in excess of effects-based chemical screening criteria, PAHs represent the primary contaminants of concern in MSU surface sediments. The results of the comparisons of these data with SMS and AET screening values were therefore used to define the extent of contamination. A given station was designated as exceeding SQS/LAET or CSL/2LAET chemical criteria based on individual PAH results (i.e., a singular PAH exceedance of its CSL/2LAET chemical criterion was sufficient for including the station in the areas defined as CSL/2LAET exceedance areas). The area associated with each sampling point was derived using Thiessen polygons, as described in **Section 4.4.2**.

The results of this evaluation indicated that stations exceeding SQS/LAET chemical criteria encompass an area of approximately 100 acres, while stations exceeding CSL/2LAET criteria account for approximately 50 of these acres (see **Figure 5-14**).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 5.5 MSU SHALLOW SUBSURFACE SEDIMENT CHEMICAL RESULTS

**Table 5-2** provides a summary of the shallow subsurface (0 to 20 feet below mudline) chemical data and frequency of exceedance of screening criteria on a chemical-specific basis; similar presentations are provided in **Tables 5-3 through 5-7** for data summarized according to each 4-foot composite interval. **Figure 5-15** depicts the maximum depth of SQS/LAET chemical exceedances at each core location; a similar presentation based on comparisons with CSL/2LAET chemical criteria is provided in **Figure 5-16**. Complete listings of analytical results are presented in **Appendix D (Table D-9)**; chemical exceedance ratios based on comparisons with SMS and AET chemical criteria are also provided in **Appendix D (Tables D-10 through D-13)**. The following subsections present a summary of findings.

### 5.5.1 SVOCs

#### *5.5.1.1 PAHs*

Concentrations of total LPAHs exceeded SQS or LAET screening criteria in approximately half of the 65 samples analyzed, representing 15 of the 17 locations sampled and one to five samples per location. The CSL or 2LAET screening criteria were also exceeded in nearly 40 percent of these samples representing 12 sampling locations.

Concentrations of individual and total LPAHs generally decreased with depth below surface and distance offshore. Intervals sampled closest to the surface were characterized by the highest LPAH concentrations, ranging up to orders of magnitude above CSL or 2LAET screening criteria. These concentrations typically decreased to lower-level SQS or LAET exceedances or to clean sediments with depth below surface. Overall, the maximum depth of LPAH contamination was established at all but four locations (i.e., EB12, EB13, EB27, and EB113). Refusal at shallow depths (7 and 12 feet below mudline) was encountered at two of these locations (EB12 and EB113), and individual and/or total LPAHs were detected at concentrations exceeding SQS/LAET or CSL/2LAET chemical screening criteria in the deepest intervals sampled at the remaining two locations (16 to 20 feet below mudline).

In areas sampled between the Upland Unit and Outer Harbor Line, concentrations of total LPAHs typically exceeded CSL or 2LAET chemical criteria at maximum depths between 12 and 20 feet below mudline. Seaward of the Outer Harbor Line to the outermost station sampled (EB78; -54 m MLLW), the maximum depth of CSL or 2LAET exceedances generally decreased to 4 to 8 feet below mudline.

Similar to the observed distribution of LPAHs, concentrations of total HPAHs exceeded SQS or LAET screening criteria in approximately 40 percent of the 65 samples analyzed, representing 14 of the 17 sampling locations and one to four samples per location. However, fewer CSL or 2LAET screening criteria exceedances were observed, occurring in less than 25 percent of the samples analyzed and representing only seven stations. HPAHs also exhibited a pattern similar

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

to LPAHs in decreasing concentrations with depth below surface and distance offshore, but the concentrations of individual and total HPAHs were typically lower than LPAHs relative to their respective screening criteria and the depths of maximum concentrations shallower, by an average of 4 feet.

Also similar to the distribution of LPAHs, the maximum depth of HPAH contamination was established at all but three locations (i.e., EB12, EB27, and EB113). Refusal at shallow depths (7 and 12 feet below mudline) precluded complete chemical characterization at stations EB12 and EB113, and one individual HPAH (fluoranthene) was detected at a concentration slightly greater than its LAET screening value in the deepest interval sampled at Station EB27 (16 to 20 feet below mudline).

#### *5.5.1.2 Phenols*

Phenolic compounds were analyzed at only two core locations (EB13 and EB41) and only 4-methylphenol and 2,4-dimethylphenol were detected. Both organics were measured at concentrations exceeding CSL chemical criteria at depths up to 4 feet below mudline at Station EB13, and 2,4-dimethylphenol also exceeded its CSL criterion in the 4- to 8-foot core interval collected at this station. Phenolic compounds were not detected at concentrations exceeding chemical screening criteria at Station EB41.

#### *5.5.1.3 Dibenzofuran*

Dibenzofuran was analyzed at only two core locations (EB13 and EB41) and was detected at concentrations exceeding CSL or 2LAET chemical criteria at depths up to 16 feet bgs at Station EB13. The concentration of dibenzofuran at this coring station decreased to a value only slightly greater than the SQS chemical criterion in the 16- to 20-foot bgs core sample. At Station EB41, only the 0- to 4-foot below mudline core interval contained dibenzofuran at a concentration exceeding screening criteria (both SQS and CSL).

### 5.5.2 PCBs

PCBs were detected in only one of the 10 core intervals (collected at Stations EB13 and EB41) submitted for analysis. The measured concentration, which occurred in the 0- to 4-foot below mudline core interval collected at Station EB13, exceeded the LAET criterion for total PCBs, but did not exceed the 2LAET chemical criterion.

### 5.5.3 Inorganic Substances

Of the eight inorganics measured, only mercury was detected in subsurface sediments at a concentration exceeding its SQS and CSL chemical criteria, occurring at a depth of 4 to 8 feet below mudline at Station EB13. The measured concentration only slightly exceeded the CSL chemical criterion.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 5.6 AREAS AND VOLUMES OF MSU SUBSURFACE SEDIMENT EXCEEDING CHEMICAL CRITERIA

Preliminary estimates of the volume of contaminated sediment at the site were made using Thiessen polygons to represent the area associated with each unique sediment sampling point (**Figure 5-14**) and the depth of contamination as either measured in sediment cores, or predicted by the USGS non-native sediment footprint (**Figure 2-4**). The depth of contamination at stations falling outside the USGS non-native sediment area was assumed to be only at the surface and was estimated at 4 feet below mudline (i.e., one dredge cut). Within the "footprint" of non-native sediment, depths were estimated based on the nearest core locations. Depths were assigned in 4-foot increments up to 20 feet below mudline, with the deepest depths generally closest to the shoreline and shallower depths offshore. Adjustments were made to account for steep slopes (less likely to accumulate material) versus flatter areas more likely to accumulate or retain dumped material.

The area exceeding CSL chemical criteria for PAHs covered about 50 acres and contained approximately 500,000 cubic yards of contaminated material. Approximately 7 acres and 48,000 cubic yards were at depths greater than 60 meters MLLW (the practical limit of dredging).

About 100 acres of sediment had PAHs at levels above their respective SQS chemical criterion. This area represents a volume of about one million cubic yards. About 25 acres of the area exceeding SQS chemical criteria, representing approximately 150,000 cubic yards of contaminated material, were at depths greater than 60 meters MLLW.

Estimates of volumes associated with various cleanup options will be refined in the FS.

## 5.7 DEEP SUBSURFACE SEDIMENT RESULTS

Results of the field UV screening conducted at the three deep subsurface coring locations (EB14, EB16 and EB114) were discussed in detail in the Phase 2 Technical Memorandum (**WESTON 1997a**). Overall, the results of the screening indicated that polycyclic aromatics are present in deep sediments (greater than 60 feet bgs) at two of the three deep coring stations (i.e., EB16 and EB114). These data were not included in the calculations of areas and volumes of MSU subsurface sediments exceeding chemical criteria.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 6

# HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

## 6.1 INTRODUCTION

Human health and ecological risk assessments were conducted as part of the RI to evaluate the potential for current and future impacts of site-related contaminants on receptors (including people) inhabiting or visiting the MSU. The overall approach focused on risks associated with site-related chemicals where the effects are not addressed by the SMS. The estimated risks represent "residual risks," or the risk remaining after a given area of the MSU is remediated. The SMS SQS and CSL chemical exceedance areas (**see Section 5.3 and Figure 5-14**) were used to establish preliminary cleanup areas that formed the basis of the residual risk estimates. In addition, baseline risks, or those risks that currently exist at the site, were calculated to determine reductions in risk for several cleanup scenarios.

The human health and ecological risk assessments are presented in their entirety in **Appendix K**. This section of the RI briefly summarizes the key elements of those assessments and subsequent estimates of risks to human and aquatic receptors.

## 6.2 CONCEPTUAL SITE MODEL AND SELECTED RECEPTORS

### 6.2.1 Conceptual Site Model

A conceptual site model was developed to show potential transport of site-related contaminants to human and ecological receptors that may occur in the vicinity of the site (see **Figures 3-5 and 3-6**). As demonstrated by the model, sediments represent the primary impacted environmental medium under current conditions and, because they tend to retain contaminants, may continue to act as a source of contaminant exposure for various receptors under current or future conditions. Receptors that may be exposed to contaminated sediments via ingestion, dermal contact, and/or respiration include benthic organisms, fish, shellfish, birds, and humans.

### 6.2.2 Selected Receptors

#### *6.2.2.1 Human Health*

The human health risk assessment evaluated potential cancer and noncancer risks to subsistence fishers, as represented by tribal fishers, who may consume above-average amounts of fish and shellfish from the site. Estimates of the amount of fish and shellfish that may be eaten by tribal fishers were derived from a seafood consumption study for two Puget Sound tribes (**Toy et al. 1996**).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

#### *6.2.2.2 Ecological Risk*

The ecological risk assessment was based on measurements or estimates of effects to benthic invertebrates, bottom fish, and fish eggs. Site-specific data evaluated in the risk assessment included results of sediment bioassay tests and benthic infaunal identification and enumeration, as well as chemical data for fish tissues collected from the site and shellfish exposed to site sediments in a laboratory. Estimates of potential impacts to fish eggs were based on a maternal transfer to egg model.

## 6.3 CONTAMINANT SELECTION

Contaminants evaluated in the risk assessments were chosen separately for human and ecological receptors. Contaminants were selected to focus the assessments on those site-related chemicals of greatest potential concern for each receptor. Contaminants carried forward in both risk assessments included those chemicals that exceeded SMS criteria, were known to bioaccumulate, were widespread throughout the site, and exceeded Elliott Bay background concentrations. Additionally, contaminants were retained for the human health risk assessment if they exceeded risk-based screening values or if screening values were not available. Overall, individual PAHs, as well as dioxins and furans, were retained for both risk assessments. PCBs and mercury were not evaluated because the relationship to wood-treating activities could not be shown, the distribution of these contaminants suggested other sources, and the areas associated with these contaminants generally corresponded with PAH-contaminated areas.

## 6.4 EXPOSURE ASSESSMENT

### 6.4.1 Human Health

The human health exposure assessment focused on exposures to site-related contaminants through consumption of fish and shellfish collected from the MSU under a tribal fisher scenario. Fish were chosen as a medium of concern because they were found to contain contaminants that were also detected in sediment collected from the MSU and that were associated with historical site activities. English sole collected from the MSU were used as a surrogate species to represent bottom fish because of their abundance at the site, extensive contact with sediments, and limited home range. Shellfish were also evaluated in the exposure assessment because edible shellfish (primarily crab and shrimp) are found at the site. Clams were used as a surrogate species for all shellfish because of their close association with sediment and potential for human consumption. However, most shellfish consumption related to the MSU is expected to come from shrimp and crab because of the limited intertidal habitat available for clamming and restricted access to the shoreline.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Consumption rates for fish and shellfish as presented in the findings of a fish consumption survey of the Tulalip and Squaxin Island Tribes of Puget Sound (**Toy et al. 1996**) were used in the human health risk assessment as the data represent Native American fish and shellfish consumption patterns specific to the Puget Sound area. Data from this study, as well as **Liao and Polissar (1996)**, which provided a more detailed analysis of the Toy et al. **(1996)** shellfish consumption data, were also used to modify the portions of consumed fish and shellfish that are likely to come from the MSU.

Fish and shellfish tissue exposure point concentrations for current and future conditions were estimated using a simple linear bioaccumulation model.

### 6.4.2 Ecological Risk

The ecological exposure assessment focused on deriving exposure point concentrations for sediment, benthic infauna, clams, fish, and fish eggs. Contaminant-specific exposure point concentrations for surface sediment were represented on a station-specific basis (rather than combined for the area) because the receptors within the benthic community are expected to have limited movement and are more likely to spend their entire lives at single, defined locations within the sediment environment. Benthic exposures were also evaluated on a station-by-station basis and were represented by measures of major taxa group and species abundance and richness. Contaminant exposure to clams inhabiting the MSU was estimated by directly measuring the concentration of contaminants of potential concern (COPCs) in unpurged, whole body bent-nose clam tissues exposed to site sediments in a laboratory test. Contaminant exposure based on bioaccumulation in English sole was estimated by directly measuring 2,3,7,8-TCDD in whole-body adult tissues of fish collected from the site. 2,3,7,8-TCDD exposure to the eggs of English sole was estimated using a maternal-egg transfer approach.

## 6.5 TOXICITY ASSESSMENT

### 6.5.1 Human Health

The toxicity assessment for human health quantifies the relationship between the estimated exposure (dose) to a COPC and the increased likelihood of adverse effects. Risks of contracting cancer due to site exposure are evaluated based on toxicity factors (cancer slope factors; CSF) promulgated by EPA. Non-cancer injuries rely on published reference doses (RfDs).

CSFs are used to estimate the probability that a person would develop cancer given a site-specific exposure dose. This chemical-induced risk calculated based on the CSF is in addition to the risk of developing cancer due to other causes over a lifetime. Consequently, the risk estimates generated in risk assessments are frequently referred to as incremental or excess lifetime cancer risks.

*This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.*

RfDs represent a daily contaminant intake below which no adverse human health effects are expected to occur. To evaluate noncarcinogenic health effects, the human health impact of contaminants is approximated using a hazard quotient (HQ). Hazard quotients are calculated by comparing the estimates of site-specific human exposure doses with RfDs.

#### *6.5.1.1 Cancer Slope Factors*

Contaminant-specific CSFs are developed by EPA for specific exposure routes (e.g., oral). The likelihood that an agent is a human carcinogen is evaluated using EPA's weight-of-evidence classification (**EPA 1989b**). The available data derived from human and animal studies are reviewed and characterized as sufficient, limited, inadequate, no data, or evidence of no effect. Based on the extent to which a contaminant has been demonstrated to be a carcinogen in experimental animals and/or humans, the contaminant is assigned a weight-of-evidence classification indicating the degree to which cancerous effects have been demonstrated or can be predicted for humans. EPA derives slope factors for those contaminants that demonstrate the dose-response relationship of a substance's carcinogenic effects.

Of the site-related COPCs detected in fish and shellfish that were of concern for human health, only dioxins and some PAHs were considered to be carcinogenic. The potential cancer risks posed by selected PAHs were evaluated using the toxicity equivalency factor (TEF) approach. First introduced by EPA Region IV (**1992**), this approach assigned toxicity potency factors to carcinogenic PAHs relative to the toxicity of benzo(a)pyrene [B(a)P]. A total B(a)P equivalent concentration is derived by multiplying each individual carcinogenic PAH concentration by its equivalency factor and summing the results. The TEFs used in the risk assessment are presented in **Appendix K**.

Carcinogenic PAHs were combined and referred to as total B(a)P equivalents. Carcinogenicity from B(a)P equivalents was evaluated using the CSF for benzo(a)pyrene.

Dioxin and furan compounds were also evaluated using a TEF approach by which 2,3,7,8-TCDD equivalents were derived by multiplying each individual dioxin and furan congener by its equivalency factor and summing the results (see also **Appendix F, Section F.2**). A CSF for dioxin was found in the Health Effects Summary Tables (**EPA 1995**). All CSFs used in the risk assessment are presented in **Appendix K**.

#### *6.5.1.2 Noncancer Reference Doses*

As with CSFs, RfDs are developed for specific exposure routes (e.g., oral, dermal) for non-cancer health-effects. In general, RfDs are derived from a no-observed-adverse-effect level (NOAEL) or a lowest-observed-adverse-effect level (LOAEL) in humans or the most sensitive species of animal tested. Because the NOAEL represents an experimentally determined threshold level, these data are preferred for deriving an RfD. However, not all data sets are adequate to derive a NOAEL, in which case the RfD is derived from the LOAEL. NOAEL or

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

LOAEL data are then adjusted to represent an estimated daily dose in mg/kg-day for an RfD. In deriving an RfD, EPA divides the NOAEL or LOAEL by a series of uncertainty factors ranging in value from 1 to 10 to account for various sources of uncertainty that may apply to the toxicity data.

Additionally, a modifying factor of 1 to 10 may be incorporated in the derivation of an RfD to reflect additional uncertainties in the critical study or in the entire database. EPA also assigns a qualitative level of confidence (i.e., low, medium, or high) to the study used to derive the toxicity value, to the overall database, and to the RfD. The relative degree of uncertainty associated with the RfDs and the level of confidence that EPA assigns to the data and the toxicity value are included in the quantification of the uncertainty associated with risk assessments.

An RfD was identified for one noncarcinogenic PAH. No RfDs were available for dioxin, benzo(a)pyrene, or its equivalents, or benzo(g,h,i)perylene or phenanthrene. Lack of a reference dose does not imply that non-cancerous effects may not occur. As an example, there is a growing body of evidence that exposure to dioxins may result in significant reproductive, cognitive development, or immune system effects. The scientific community and regulators are reviewing studies as they become available but no agreement has been reached as to what would constitute a scientifically-defensible RfD. The reference dose used in the risk assessment is presented in **Appendix K**.

### 6.5.2 Ecological Risk

Several different criteria were used to evaluate potential toxicity to a range of receptors at the site. Effects-based criteria (i.e., SMS and AET chemical screening values) were used to evaluate toxicity to benthic organisms exposed to contaminated sediment. These criteria represent chemical-specific threshold concentrations above which adverse ecological impacts to the benthic community would be expected. Site-specific toxicological impacts from combined chemical contamination were also evaluated by comparing growth and mortality responses of organisms exposed to sediment collected from the site to responses of organisms in control sediments. These toxicological tests included amphipod, echinoderm embryo, and clam bioassays and comparisons with SMS biological criteria (or criteria modeled after SMS). Site-specific toxicological impacts from combined chemical contamination were also evaluated by comparing site-collected benthic infaunal community data, including measures of abundance and diversity, to similar samples collected from Elliott Bay (background).

Chemical-specific toxicity evaluations were conducted for measured concentrations of COPCs in fish collected from the site and in clams exposed to site-collected sediment. Estimates of fish egg concentrations were made based on a simple maternal transfer model. Toxicity to fish and eggs was also evaluated using literature-based effects concentrations of chemicals in fish tissues and background concentrations of chemicals in clam tissue.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 6.6 HUMAN HEALTH RISK CHARACTERIZATION AND UNCERTAINTIES

Results of the human health risk assessment suggest that cancer risks to subsistence fishers are of primary concern under current conditions. Cancer risks represent an individual's chance of developing cancer due to eating seafood from the MSU, over and above those exposures associated with general activities in a lifetime.

Current excess risks for contracting cancer from ingestion of fish and shellfish collected from the site are approximately 1 in a 1,000 (1.4E-03). Cleanup of sediments with PAHs above the SMS CSLs would reduce these risks to about 1 in 10,000 (9.6E-05), while remediation of sediments with concentrations above the SQS would bring risks closer to 1 in 100,000 (4.1E-05). A summary of total cancer risks and noncancer hazards is provided in **Appendix K**.

Residual risks following sediment cleanup will fall within EPA's risk management range (1 in 10,000 to 1 in a million), albeit at the lower end of the range. However, using the current risk assumptions, the Washington MTCA risk management range (1 in 100,000 to 1 in a million) would not be achieved, even if the entire site was remediated due to an Elliott Bay background risk on the order of 1 in 100,000 (2.9E-05).

The likelihood of noncancer health threats from ingestion of fish and shellfish collected from the site appears to be minimal. However, noncancer effects from exposure to dioxins was not evaluated due to lack of a scientifically-defensible promulgated reference dose. The scientific community and regulatory agencies are currently reviewing available studies that would support the development of an RfD. If an RfD becomes available, EPA will review sediment remedies in light of this information.

A number of uncertainties affect the risk estimates. Although actual exposures were quantified to best represent a reasonable maximum exposure, uncertainty related to potentially reduced exposure duration and utilization of the MSU for harvesting fish and shellfish suggest that the calculated risk values may overestimate actual risks to subsistence fishers who utilize the site. Other major uncertainties that may have resulted in under- or overestimates of risk are summarized in **Appendix K**.

## 6.7 ECOLOGICAL RISK CHARACTERIZATION AND UNCERTAINTIES

Results of the ecological risk assessment showed that existing contamination has low to moderate impacts on benthic invertebrate communities residing in the MSU. Remediation of areas exceeding CSL chemical criteria would reduce impacts to benthic communities experiencing moderate impacts. Remediation of areas with PAHs above the SQS would reduce impacts to benthic communities experiencing low impacts. No risks were calculated for clams because of a lack of effects data in the literature. However, clams are exposed to site-related contaminants at levels exceeding Elliott Bay background levels, indicating the possibility that

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

deleterious impacts could occur to this receptor. Remediation of any of the areas in the MSU would reduce exposures of sessile benthic organisms, such as clams, at the site, thus reducing the risk of injury to these organisms. No risks to fish or fish eggs based on exposure to bioaccumulative contaminants in sediment were identified for the existing conditions in the MSU.

Uncertainties associated with the ecological risk evaluations that may have resulted in under- or overestimates of risk include the suitability of the background stations used in the comparisons with site-related data, the degree of accuracy associated with the laboratory toxicity tests in reflecting *in situ* conditions, the assumptions regarding the bioavailability of the COCs in sediment, and the predictiveness of literature-based effects levels in assessing potential site-related impacts to fish and fish eggs. Another uncertainty is that effects of PAH exposure of fish was not assessed. Extensive documentation of deleterious effects associated with chlorinated organics (including PAHs) exists in the literature. Effects include development of lesions or tumors, induction of DNA adducts leading to mutations or cancer, impairment for cortisol stress response, and reduction in genetic diversity. Because PAH concentrations in tissues are emphermal, and measures of chemical byproducts of the metabolic breakdown of PAHs cannot be used to estimate dose, development of screening tools that can be related to sediment exposure is problematic. It is likely that sediment criteria designed to protect benthic communities are several times to an order of magnitude higher than concentrations that would be protective of fish. However, humans represent a sensitive receptor for exposure to PAHs in fish used as food. It is likely that sediment PAH concentrations designed to protect human health will also protect fish health. Further discussion of uncertainties in ecological risk characterizations are provided in **Appendix K**.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 7

# POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) potentially affecting cleanup of the PSR MSU were preliminarily identified as part of the RI/FS Work Plan (**WESTON 1996a**). These ARARs include chemical-specific, action-specific, and location-specific categories, as well as items to be considered (TBCs). The preliminary listings previously provided as part of the work plan are reproduced in **Tables 7-1 through 7-4**. These ARARs will be re-evaluated as part of the detailed analysis of alternatives; final ARAR determinations will be made during the preparation of the Record of Decision (ROD) and will represent the specific proposed cleanup actions.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 8

# SUMMARY OF FINDINGS

## 8.1 INTRODUCTION

This section summarizes the findings of the remedial investigation of contaminated sediments in the PSR MSU.

## 8.2 CHARACTERIZATION OF NATURE AND EXTENT OF CHEMICAL CONTAMINATION

The following summarize the findings regarding contaminant distribution:

- PAHs are the primary contaminant of concern in surface and subsurface sediments based on their widespread distribution at concentrations in excess of effects-based chemical screening criteria.

- Concentrations of PAHs tend to decrease with distance offshore of the Upland Unit and depth below the sediment surface; however, the maximum vertical extent of contamination was not established at three nearshore stations located offshore of the former tank storage facility and on the relatively flat bottom shelf west of the West Slip because of core refusal at depths still associated with chemical contamination.

- Other contaminants of concern, including phenolic compounds, dibenzofuran, and dioxins and furans, tended to co-occur with PAHs and were similarly present at highest concentrations at nearshore locations (predominantly inshore of the Outer Harbor Line).

- Elevated concentrations of mercury and PCBs relative to SMS screening criteria appear to be more localized, occurring primarily east of the Upland Unit (mercury) and near the Longfellow Creek overflow discharge (PCBs). These contaminants do not appear to be related to releases from the Upland Unit.

The following summarize the findings with regard to sediment PAH chemical exceedance areas:

- Stations exhibiting SQS/LAET PAH chemical exceedances encompass an area of approximately 100 acres, representing a volume of about one million cubic yards.

- Stations exhibiting CSL/2LAET PAH chemical exceedances encompass an area of approximately 50 acres, representing a volume of about 500,000 cubic yards.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 8.3 CHARACTERIZATION OF POTENTIAL CONTAMINANT SOURCES, FATE, AND TRANSPORT

The evaluation of potential contaminant sources to the MSU focused on comparisons of sediment chemical data with similar data available for the Upland Unit or Elliott Bay background sediment sampling locations. The evaluation of contaminant fate and transport for MSU sediments focused on the principal contaminants of concern for the risk assessment (i.e., PAHs and dioxins/furans), as well as potential DNAPL migration pathways. The following conclusions were drawn:

- The comparison of average upland DNAPL composition with sediment PAH concentrations in the MSU showed virtually identical patterns of PAH relative percent composition, thus qualitatively linking sediment PAH contamination to the Upland Unit based on an apparent common source.

- The comparison of dioxin/furan concentrations in sediment collected from the MSU adjacent to the Upland Unit with Elliott Bay background concentrations indicated that highest concentrations (relative to background) decreased with distance offshore of the Upland Unit, suggesting the source is the Upland Unit.

- The most dominant, currently occurring processes influencing contaminant concentrations and migration are likely to be adsorption to sediment, potential groundwater transport of dissolved constituents in areas of subsurface residual or free product, selective dissolution of PAHs (primarily LPAHs) from sediment to the water column, and accumulation in benthic species.

- The intermediate discharge zone (between -25 and -50 feet MLLW) in the west-central portion of the site represents the area most likely to be affected by groundwater contaminant transport over time with naphthalene and fluorene being the main creosote constituents that would contribute to sediment loading.

- Groundwater contribution to sediment contamination under current conditions is minor compared to the existing mass in sediments from historical disposal or direct discharge of creosote wastes from the facility.

- Groundwater transport of contaminants needs to be addressed in the FS because of the potential for recontaminating remediated sediment.

- Observations of sediment stratigraphy and residual product in shallow and deep sediment cores suggest that shallower PAH contamination (i.e., 0 to 20 feet below mudline) is a result of historical direct release to Elliott Bay with burial by filling activities and possibly downward migration of DNAPL for a short distance. Because

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

intervening sediment layers were not contaminated, the presence of residual DNAPL in deeper core sediments suggests migration of free-phase creosote from the Upland Unit has occurred within high porosity sand stringers or other preferential flow pathways. However, based on the depth of DNAPL, it is unlikely to daylight through the sediment.

- Little or no evidence was observed for longshore migration of contaminated surface sediment. Instead, concentration gradients suggest that contaminated sediment transport appears to be offshore toward deeper water.

- Deposition and burial of contaminated surface sediment by clean, suspended material (i.e., natural recovery) is unlikely to be significant for the MSU, based on limited evidence of long-term accumulations of sediment in the area of Harbor Island, the location of the MSU relative to likely sediment transport directions (i.e., suspended sediment discharged from the Duwamish Waterway tends to be carried toward the downtown Seattle waterfront, away from the PSR site), and the presence of higher surface than subsurface sediment PAH concentrations in the MSU (suggesting minimal sedimentation has occurred at the site).

## 8.4 CHARACTERIZATION OF HUMAN HEALTH RISKS

The following conclusions were drawn from the human health risk assessment:

- Cancer risks (4E-04) to subsistence fishers are the primary concern under current conditions.

- Noncancer health threats do not appear to be significant (<1.0).

- Risks are reduced by an order of magnitude (7E-05) if sediments with PAHs above their respective CSL criteria are remediated.

- Cleanup to SQS results in a reduction (2E-05) in risk to about a third of the risk based on a CSL cleanup.

- Risks associated with Elliott Bay background concentrations are elevated and represent approximately a 1 in 100,000 excess cancer risk (2.9E-05).

## 8.5 CHARACTERIZATION OF ECOLOGICAL RISKS

The following conclusions were drawn from the ecological risk assessment:

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Existing contamination has low to moderate impacts on benthic invertebrates residing in the MSU.

- Using Elliott Bay background concentrations to represent a potential low effects level, deleterious impacts to clams from exposure to site-related contaminants may be occurring.

- No risks to fish or fish eggs were identified based on exposure to bioaccumulative contaminants in sediment. However, risks to fish from PAH exposures were not evaluated because tissue concentrations were considered a poor representation of exposure and the potential for effects due to metabolic breakdown of these contaminants in vertebrates.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# SECTION 9

# SOURCES OF UNCERTAINTY

## 9.1 INTRODUCTION

This section discusses the uncertainties associated with major findings of the PSR MSU RI. Although this RI cannot eliminate uncertainty, it presents sufficient information to support informed risk management decisions.

The major sources of uncertainty are those that are common to all RIs, including work plan design and implementation and limitations of the sciences and analytical techniques used during the project.

Uncertainties typical of work plan design and implementation include the following:

- Heterogeneity of environmental media,
- Collection of a finite number of samples, and
- Representation of sample locations and spacing.

Uncertainties associated with limitations of the sciences and analytical techniques include the following:

- Analytical laboratory detection limits and associated analytical accuracy and precision, and
- Uncertainty in the toxicity information available for the contaminants present and in the ability to quantify actual exposure.

Uncertainties specific to contaminant fate and transport, nature and extent of contamination and delineation of chemical exceedances areas, and human health and ecological risk assessment are described in the following subsections.

## 9.2 FATE AND TRANSPORT

Assumptions and uncertainties regarding fate and transport that will influence future decisions for the MSU include the following:

- Extrapolation of the behavior of chemicals in environmental media based on laboratory studies of a single chemical may misrepresent the mobility and environmental

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

persistence of contaminants of concern. If mobility is greater than assumed, conclusions regarding cap effectiveness, impacts during dredging, or the potential for recontamination may be in error.

- Assumptions used in the groundwater fate and transport model accurately reflect actual shoreline attenuation processes at the site. Greater or lesser attenuation will have significant effects on any conclusion made regarding groundwater transport of creosote constituents.

- Groundwater quality in shoreline wells containing DNAPL is representative of groundwater quality in the shoreline. Groundwater is actually heterogeneous; using groundwater quality from wells with DNAPL represents a worst-case scenario.

- The assumption that all dissolved contaminants partition to the clean sediment cap reflects actual conditions. This assumption is very conservative; actual partitioning will include some loss to the overlying water column. Thus, sediment loading may be less than predicted.

- Volatilization, degradation, and sediment deposition are not significant processes with regard to chemical behavior and migration of MSU sediments. If volatilization, degradation, or sedimentation rates are greater than assumed, natural recovery may be a more viable cleanup alternative than was concluded.

- DNAPL migration was not considered to have a significant impact on surface sediment quality because daylighting of free product is a highly unlikely scenario. Greater mobility of DNAPL would potentially impact the long-term performance of a cleanup action.

## 9.3 NATURE AND EXTENT OF CONTAMINATION AND DELINEATION OF CHEMICAL EXCEEDANCE AREAS

The following assumptions regarding the nature and extent of contamination will influence future decisions on sediment cleanup:

- Sampling density as represented by the three phases of RI samples and the polygonal areas associated with each sampling location accurately represent surface and subsurface sediment contaminant distribution and extent. Additional sampling may be necessary to refine the boundaries of the chemical exceedance areas and vertical extent of chemical exceedances to support remedial design. Areas and volumes of sediment requiring cleanup may subsequently be modified.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Use of sediment quality criteria to determine impacted areas for which direct biological effects data were not available accurately predicts areas of concern for ecological and human health. If sediment criteria are not as protective as assumed, greater risks to human or ecological health may persist following cleanup of the MSU.

## 9.4 HUMAN HEALTH RISK ASSESSMENT

Uncertainties involved in determining human health risks are discussed in detail in the risk assessment technical memorandum in **Appendix K.** The inherent uncertainties in the risk assessment are accounted for by making assumptions that tend to overestimate risk. The major uncertainties associated with the human health risk assessment include the following:

- Appropriateness of exposure-related assumptions, such as extent, frequency, and duration of exposure to contaminants in fish and shellfish and ingestion rates for tribal fishers. Risks may be either over- or underestimated based on actual site use for collection of fish and shellfish.

- Unavailability of and assumptions associated with the derivation of toxicity factors. This may result in either an over- or underestimation of risk because the actual toxicity in the environment may differ in a number of ways.

- Use of a bioaccumulation model to represent exposure point concentrations. In general, modeling tends to overestimate risks because of the conservative input parameters used.

## 9.5 ECOLOGICAL RISK ASSESSMENT

Uncertainties involved in determining risks to ecological receptors are discussed in detail in the risk assessment technical memorandum (**Appendix K**). Similar to the approach used for conducting the human health risk assessment, the inherent uncertainties in the ecological risk assessment are accounted for by making assumptions that tend to overestimate risk. The major uncertainties associated with the ecological risk assessment include the following:

- The background area selected for comparison with site-specific benthic data was of sufficiently similar habitat characteristics and representative of a healthy invertebrate community. Conclusions may have differed if the reference area was more similar; however, given the high abundance and diversity of many MSU benthic samples, this seems unlikely.

- Laboratory bioassays accurately reflected *in situ* conditions and the indicator species used accurately predicted impacts to sensitive members of the benthic community, and

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

community-level responses as a whole. Actual risks to benthic communities may be over- or underestimated.

- Bioavailability of chemicals in sediment is 100 percent. This assumption tends to overestimate risk because most chemicals are not 100 percent available; however, it is difficult to predict site-specific bioavailability.

- Clam and fish exposure to site-related chemicals is accurately predicted by using average tissue concentrations and maximum detection limits accurately estimated the true concentrations of undetected chemicals in tissues. Exposure estimates may actually be greater or less than actual exposures of organisms occurring in the MSU.

- Chemical concentrations in eggs were modeled based on literature values derived for a different species of fish than that sampled at the site. Exposure to fish living or feeding at the site may have been less than or greater than that assumed.

- The effects levels used for fish, although based on studies of other species of fish and laboratory exposure conditions, adequately predicted effects levels for fish at the site. Effects may have been more or less than that predicted for actual species using the site.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## SECTION 10

## REFERENCES


Barrick, R., S. Becker, R. Pastorak, L. Brown, and H. Beller. 1988. Sediment Quality Values Refinement: 1988 Update and Evaluation of Puget Sound AET. Prepared for Tetra Tech/U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA. PTI Environmental Services, Bellevue, WA.

Calambokidas, J. 1991. Cascadia Research Collective, Olympia, WA. Research Biologist. Personal communication. 29 January.

Dexter, R., D. Anderson, E. Quinlan, L. Goldstein, R. Strickland, S. Pavlou, J. Clayton, R. Kocan, and M. Landolt. 1981. A Summary of Knowledge of Puget Sound Related to Chemical Contaminants. NOAA Technical Memorandum OMPA-13. Boulder, CO. December.

Domenico, P.A. 1987. An Analytical Model for Multidimensional Transport of Decaying Contaminant Species. J. of Hydrology 91:49-58.

Ecology (Washington State Department of Ecology). 1997. Selection of Negative Control Sediments and Use of Control Sediments as Reference Sediments. DMMP Clarification Paper and SMS Draft Technical Information Memorandum. Prepared by D. Fox, U.S. Army Corps of Engineers, and T. Michelsen, Washington State Department of Ecology. 1 April.

Ecology. 1996. Draft Cleanup Action Plan for contaminated Sediments in the Lockheed Aquatic Area, Elliott Bay and Duwamish Estuary, Seattle, WA. April.

Ecology. 1995a. Elliott Bay Waterfront Recontamination Study, Volume 1: Field Investigation Report, Ecology Publication #95-335. July.

Ecology. 1995b. Review of Sediment Management Standards Bioassay Protocols. Publication No. 95-318. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, Olympia, WA. April.

Ecology. 1990. Standards for Confined Disposal of Contaminated Sediments. January.

Eisler, R. 1987. Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD.

Electric Power Research Institute. 1992. Estimating Release of Polycyclic Aromatic Hydrocarbons from Coal Tar at Manufactured Gas Plant Sites. EPRI TR-101060.


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

EPA. 1996. Bioscreen. Natural Attenuation Decision Support System User's Manual Version 1.3.

EPA. 1995. Health Effects Summary Tables (HEAST) Online Database.

EPA. 1992. Guidance on Risk Characterization for Risk Managers and Risk Assessors. Office of the Administrator, Washington, D.C. Memorandum from F. Henry Habicht on 26 February.

EPA. 1989a. Update of Toxicity Equivalency Factors (TEFs) for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs/CDFs). Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, D.C. February.

EPA. 1989b. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual, Part A. EPA/540/1-89/002.

EVS and Hart Crowser. 1995. Harbor Island Sediment Operable Unit, Supplementary Remedial Investigation—Base-Level Data Interpretation Report. Prepared for Harbor Island Sediment Work Group. Prepared by EVS Environment Consultants and Hart Crowser, Seattle, WA.

GeoSea. 1994. Sediment Transport in Elliott Bay and the Duwamish River, Seattle: Implications to Estuarine Management. Prepared for Washington Department of Ecology, Toxics Cleanup Program. Prepared by P. McLaren and P. Ren, GeoSea Consulting (Canada) Ltd., British Columbia, Canada. May.

Harman, R.A., and J.C. Serwold. 1978. Aquatic Disposal Field Investigation, Duwamish Waterway Disposal Site, Puget Sound, Washington, Appendix F: Recolonization of Benthic Macrofauna over a Deep Water Disposal Site. Dredged Materials Research Program, U.S. Army Corps of Engineers, Waterways Experiment Station Technical Report D-77-24.

Iannnuzi, T.J., N.L. Bonnevie, and R.J. Wenning. 1995. An Evaluation of Current Methods for Developing Sediment Quality Guidelines for 2,3,7,8-TCDD. Arch. Environ. Contam. Toxicol. 25:366-377.

Liao, S., and N. Polissar. 1996. Results of Re-Analysis of the Tulalip and Squaxin Island Fish Consumption Data. Technical Memorandum. 30 September.

Neff, J.M. 1982. Accumulation and Release of Polycyclic Aromatic Hydrocarbons from Water, Food, and Sediment by Marine Animals. Symposium: Carcinogenic Polynuclear Aromatic Hydrocarbons in the Marine Environment. U.S. Environmental Protection Agency. Report No. 600/9-82-013.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Niimi, A.J. 1987. Biological Half-Lives of Chemicals in Fishes. *Rev Environ Contam Toxicol.* 99:1 - 46.

NOAA (National Oceanic and Atmospheric Administration). 1981. National Oceanic and Atmospheric Administration Technical Memorandum OMPA-8. April.

Pfeifer, R. 1991. Seattle District Fish Biologist, Washington State Department of Wildlife, Mill Creek, WA. Personal communication with R. Sturim, Roy F. Weston, Inc., Seattle, WA. 10 July.

PTI. 1995. Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments. Prepared for U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA and Puget Sound Water Quality Authority, Olympia, WA. Revised July.

PTI and Tetra Tech. 1988. Elliott Bay Action Program: Evaluation of Potential Contaminant sources. Prepared for Washington State Department of Ecology and the U.S. EPA, Region X - Office of Puget Sound, Seattle, WA.

RETEC. 1998 (pending). Construction Completion Report—Site Cap.

RETEC. 1997. Upland Remedial Investigation and Feasibility Study Report. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle, Seattle, WA. 24 February.

RETEC. 1995a. Tidal Study Task Completion Report. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. December.

RETEC. 1995b. Non-Time Critical Removal Actions Implementation Plan. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for Port of Seattle. March.

RETEC. 1994a. Engineering Evaluation / Cost Analysis. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. December.

RETEC. 1994b. Groundwater Alternatives Memorandum. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. December.

RETEC. 1994c. Current Conditions Report. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. August.

RETEC. 1994d. Test Pit Investigation Report. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. August.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

RETEC. 1994e. Time-Critical Removal Actions Implementation Plan. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle. July.

Stetz, E. 1998. Port of Seattle. Personal communication with N. Musgrove, Roy F. Weston, Inc. 15 January.

Turney, G.L., and D.F. Goerlitz. 1990. Groundwater Monitoring Review, pp 189-198.

Tetra Tech. 1987. Recommended Protocols for Sampling and Analyzing Subtidal Benthic Macroinvertebrate Assemblages in Puget Sound. Final Report TC 3991-04. Prepared for U.S. Environmental Protection Agency Region X, Office of Puget Sound, Seattle, WA. Tetra Tech, Inc., Bellevue, WA. January.

Toy, K.A., N.L. Polissar, S. Liao, and G.D. Mittelstaedt. 1996. A Fish Consumption Study of the Tulalip and Squaxin Island Tribes of the Puget Sound Region. Tulalip Tribes, Department of Environment, Marysville, WA.

USGS (U.S. Geological Survey). 1996. Final Report: Interpretation of Side Scan Sonar, Seismic Reflection, and Bathymetric Data Obtained Over the Pacific Sound Resources, West Seattle Superfund Site, Washington. Administrative Report 96-01. U.S. Geological Survey, Menlo Park, CA. April.

Varanasi, U. and D.J. Gmur. 1981. *In Vivi* Metabolism of Naphthalene and Benzo(a)pyrene in Flatfish. *Chemical Analysis and Biological Fate: Polynuclear Aromatic Hydrocarbons.* Fifth International Symposium. Cooke, M. and A.J. Dennis eds, Battelle Press, Columbus, OH. 367-376.

Varanasi, U., and D.J. Gmur. 1980. Metabolic Activation and Covalent Binding of Benzo(a)pyrene to Deoxyribonucleic Acid Catalyzed by Liver Enzymes of Marine Fish. *Biochem. Pharmacol.* 29: 753 - 762

Villaume, J.F. 1985. Investigations at Sites Contaminated with Dense, Non-Aqueous Phase Liquids (NAPLs). *Ground Water Monitoring Rev.* 5(2):60 - 74.

Warner, E.J., and R.L. Fritz. 1995. The Distribution and Growth of Green River Chinook Salmon and Chum Salmon Outmigrants in the Duwamish Estuary as a Function of Water Quality and Substrate. Muckleshoot Indian Tribe, Fisheries Department, Water Resources Division, 39015 172nd Avenue, S.E., Auburn, WA, 98302.

WESTON. 1997a. Phase 2 Technical Memorandum, Pacific Sound Resources Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. April.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

WESTON. 1997b. Technical Memorandum, Draft Ecological and Human Health Risk Assessments, Pacific Sound Resources Marine Sediments Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. September.

WESTON. 1997c. PSR Marine Sediments Unit, Phase 2 Technical Memorandum Revisions. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. 23 July.

WESTON. 1996a. RI/FS Work Plan, Pacific Sound Resources (PSR) Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. April.

WESTON. 1996b. Sampling and Analysis Plan, Pacific Sound Resources (PSR) Offshore Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. April.

WESTON. 1996c. Sampling and Analysis Plan, Draft Phase 2 Addendum, Pacific Sound Resources (PSR) Offshore Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. August.

WESTON. 1996d. Sampling and Analysis Plan, Phase 2 Addendum, Offshore Sediments Unit, Pacific Sound Resources (PSR). Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. November.

WESTON. 1996e. Phase 1 Technical Memorandum, Pacific Sound Resources (PSR) Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. August.

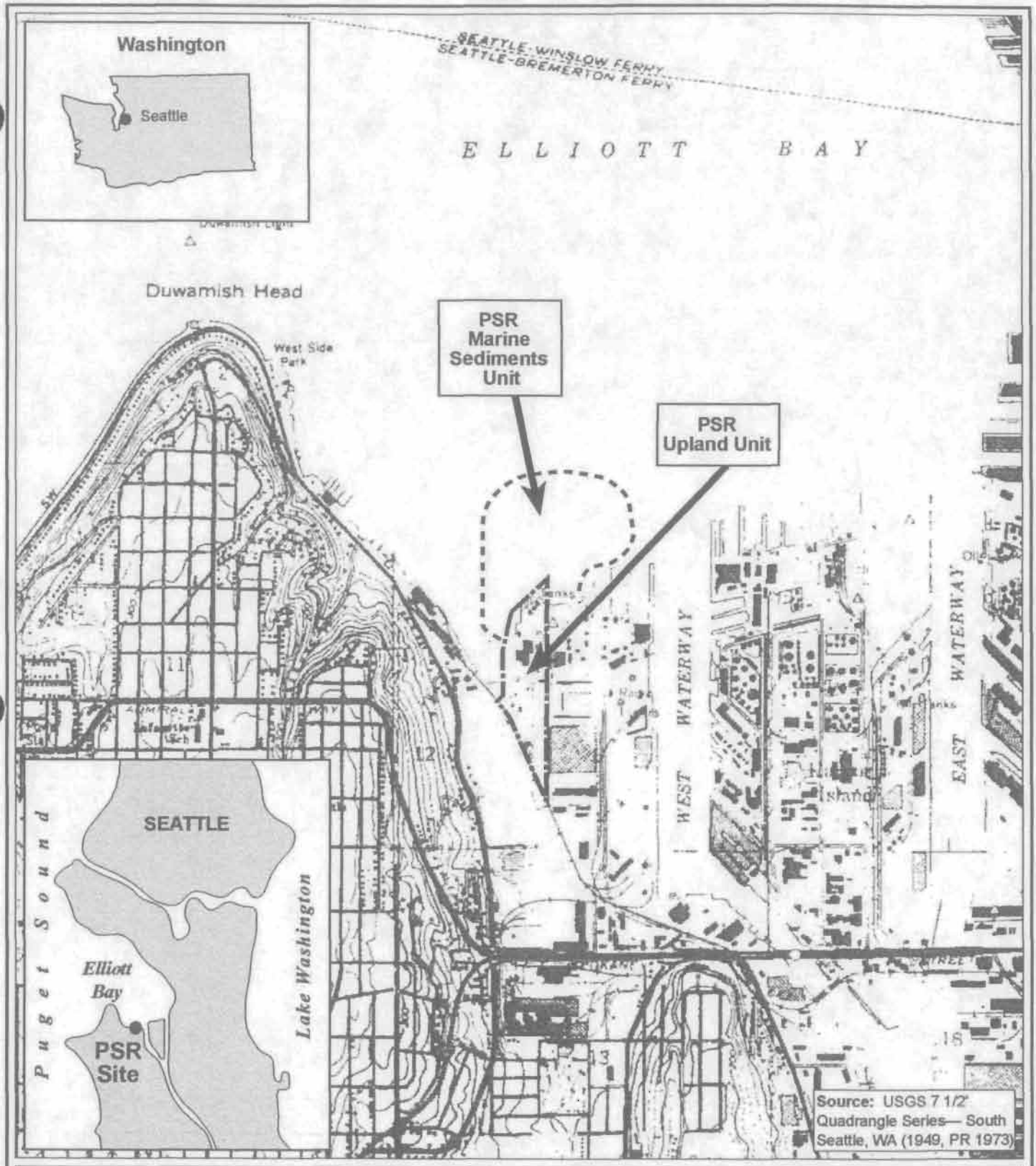
WESTON. 1995. Technical Memorandum, Summary of Existing Information and RI/FS Approach. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. October.

WESTON. 1994a. Pacific Sound Resources, Shoreline Reconnaissance Photograph Log. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. 7 April.

WESTON. 1994b. Remedial Investigation Report, Harbor Island, Seattle Washington (Part 2-Sediment) Volume 1. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. September.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# FIGURES




0 1000 2000
Scale in Feet

# PSR Upland and Marine Sediments Unit Location Map

WESTON
MANAGER DESIGNERS/CONSULTANTS

FIGURE
**1-1**

98-0184 Fig1-1.fh7

NOTE: Shoreline features are approximated based on site reconnaissance (WESTON, 1994a).

TERMINAL 2

RA4 SITE BOUNDARY

ELLIOTT BAY

00+00 01+00 02+00 03+00 04+00 05+00 06+00 07+00 08+00 09+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00

2 2B 3A 3 3B 4A 4B 5 6 6B 6C 7A 7B 8

BEGIN LNAPL RECOVERY TRENCH AT STATION 3+00

LN-1 LN-2 LN-3 LN-4 LN-5 LN-6 LN-7 LN-8 LN-9 LN-10

SLURRY WALL CORRIDOR

CONTAINMENT WALL ALIGNMENT

4-A 4-B 4-C 4-D 4-E 4-F 4-G

LNAPL RECOVERY TRENCH

END LNAPL RECOVERY TRENCH AT STATION 13+00

S.W. FLORIDA STREET

18" SD 12" SD

TERMINAL 5

SOURCE: RETEC, 1997 and WESTON, 1994a

0 50 100 200
SCALE IN FEET

LEGEND
- CONTAINMENT WALL
- LNAPL RECOVERY TRENCH
- LN-6 LNAPL RECOVERY SUMP
- 4B CONTAINMENT WALL CONTROL POINT
- PROCESS RESIDUAL SLUDGE EXCAVATION AREA
- RIPRAP BANK
- INTERTIDAL SANDFLAT/MUDFLAT

| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
|---|---|---|---|---|---|
| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
| REFDWG | REFDESC | REV# | DRWN | REVDATE | REVDESC |
| REFERENCE DWG | DESCRIPTION | NO | DRWN | DATE | REVISION |

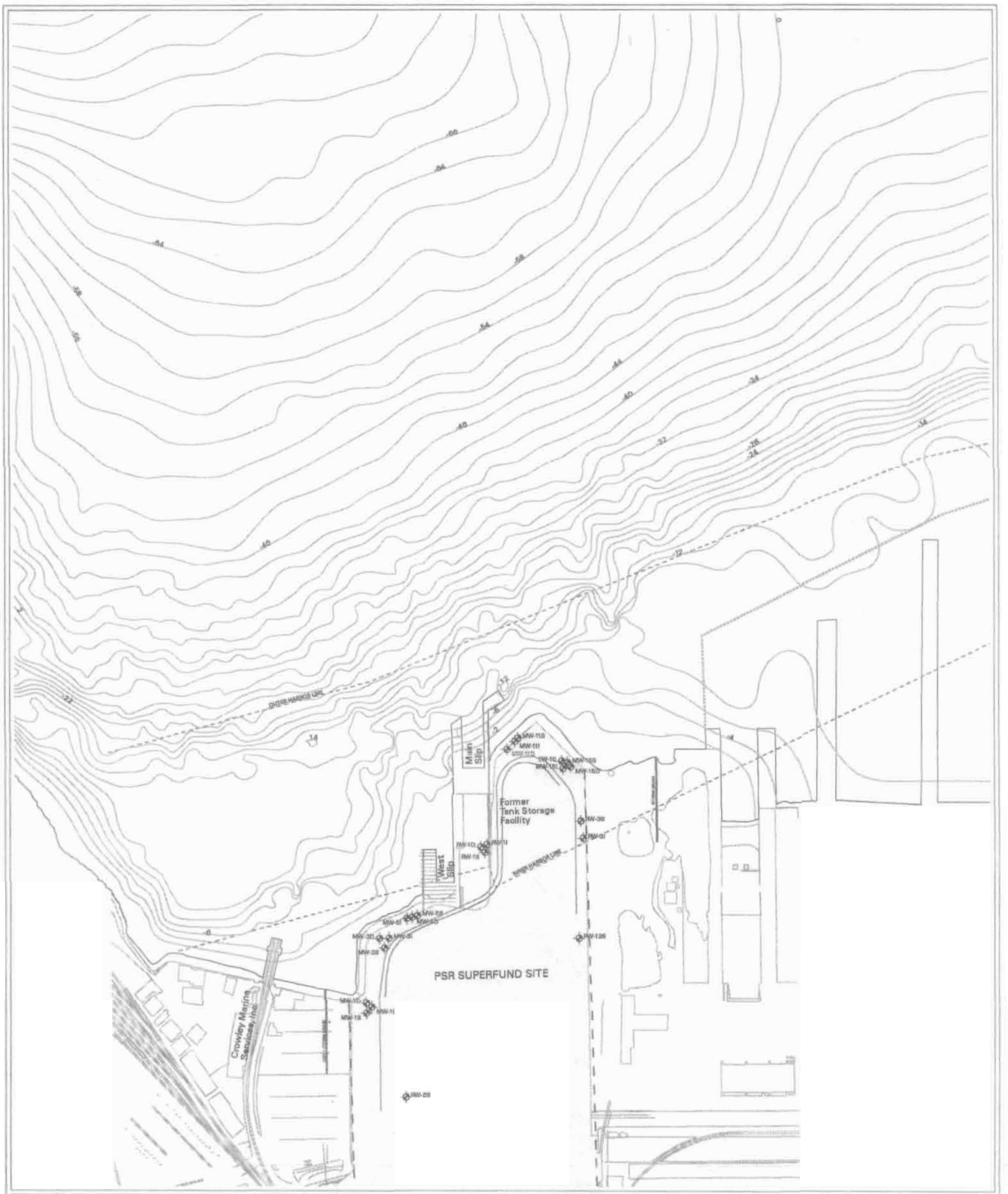
CHKD DATE APPVD DATE

WESTON. MANAGERS ENGINEERS CONSULTANTS

PSR Superfund Site
Locations of Process Residual Sludge Excavation and Shoreline Features

FIGURE 1-2

N:\SDIR\1998\[illegible]98-018A\Fig1-2.dwg




BASEMAP EXPLANATION

- Upland Feature
- Shoreline
- Upland Property Boundary
- Bathymetry
- Drain
- Harbor Line
- Slurry Wall
- LNAPL Recovery Trench
- Lockheed cleanup action plan boundary

SYMBOL EXPLANATION

- Upland groundwater monitoring well
- Capped Area (See also Note 4)

GN MN 21°

SCALE 1:632

10 0 10 20 30 40 50

Feet

PSR Site

NOTES

1) Vertical datum is: Meters Mean Lower Low Water (MLLW).
2) Bathymetric data source: NOAA, 1970 & 1995.
3) Locations of slurry wall, LNAPL trench, and monitoring wells approx. (RETEC, 1996a, 1996b).
4) Areas not capped with asphalt will be covered with clean fill and landscaping.
5) Intertidal pocket beaches exist at the head of each of the slips (West and Main).

WESTON

DATE: April 19, 1998 1:41 PM
JOB NUMBER: 98-0184
VIEW FILE: basemap.view
CHECKED BY: DKH
APPROVED BY: RJAM

# PSR Upland and Marine Sediments Unit Site Features

Figure 1-3

PSR SUPERFUND SITE

SYMBOL EXPLANATION

- Phase 3 Surface (0 - 10 cm) Sediment Collected for Analysis (n = 22)
- Phase 3 Surface Sediment Collected for Archival (n = 9)
- Phase 2 Surface (0 to 10 cm) Sediment Station - Chemistry Only (n = 7)
- Phase 2 Sediment Triad Station - Bioassays, Benthos, Surface (0 to 10 cm) Chemistry (n = 9)
- Phase 2 Surface (0 to 10 cm) Sediment Station - Chemistry and/or Field Immunoassays (n = 26)
- Phase 2 Surface (0 to 10 cm) Sediment Station - Field Immunoassay Only (n = 25)
- Phase 1 Surface (0 to 10 cm) Sediment Sample - Chemistry Only (n = 45)

GN MN 21°

SCALE 1:4400

100 0 100 200 800 400

Feet

PSR Site

NOTES

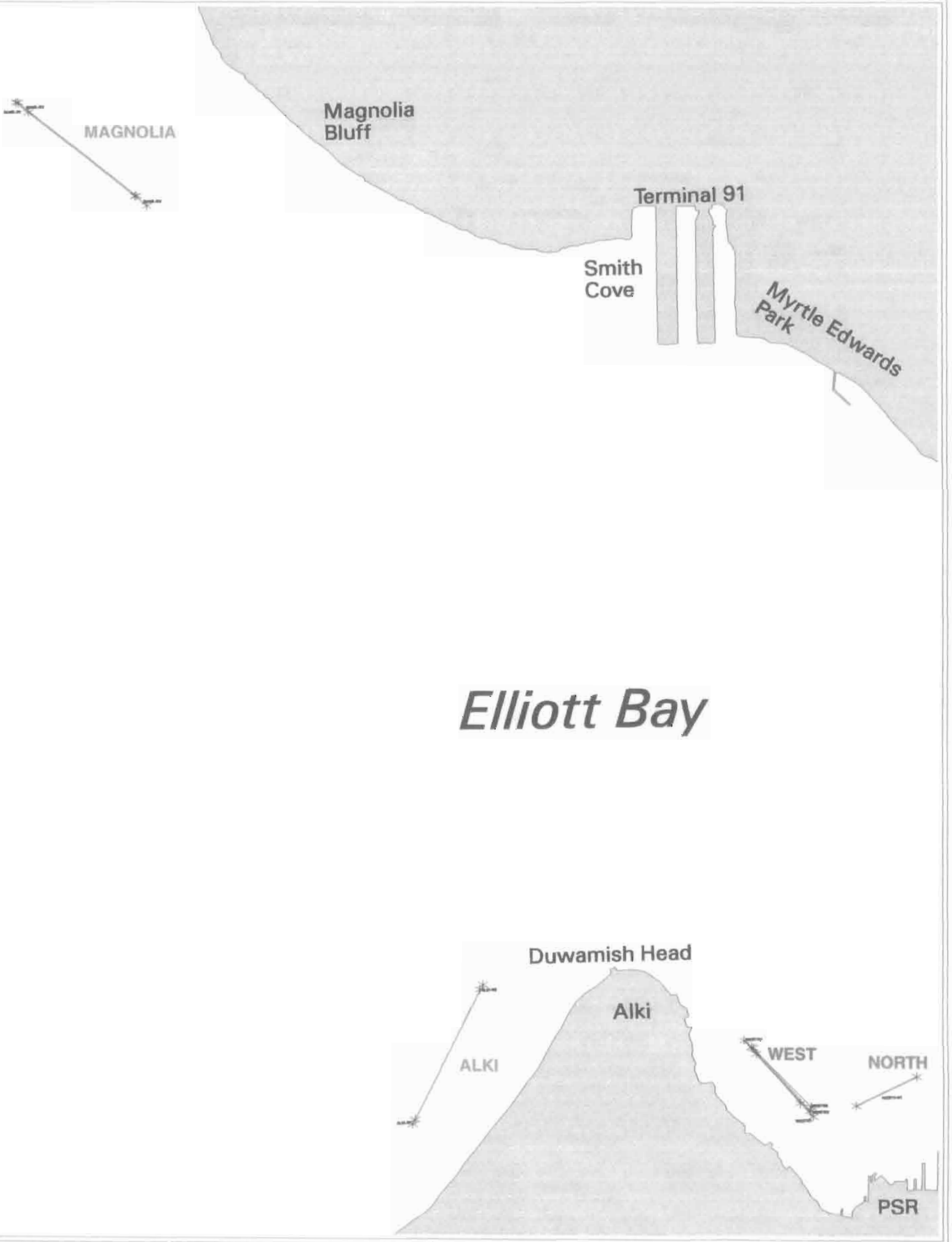
1) See RI Figure 1-3 for site feature notes and global symbols.
2) Phase 2 Recon. stations EB111 and EB112 are located northwest of EB110.
3) Stations EB115 and EB092 located within the Lockheed cleanup action plan boundary.

WESTON

DATE: April 10, 1998 6:06 PM
JOB NUMBER: 98-0184
VIEW FILE: allstns.view
CHECKED BY: DFH
APPROVED BY: NAM

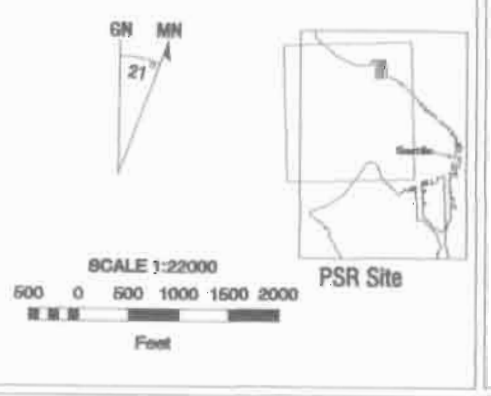
# PSR Marine Sediments Unit Phase 1, 2, and 3 Surface Sediment Chemical and Biological Sampling Locations

Figure 1-4




EXPLANATION

- Background Transect
- North Transect
- West Transect




NOTES

WESTON

DATE: April 01, 1997 9:01 AM
JOB NUMBER: 04000-031-001-4200-02
VIEW FILE: 98-0184 Fig1-5.ai7

CHECKED BY: _____

APPROVED BY: _____

# PSR Marine Sediments Unit
# Site and Background
# Fish Sampling Transects

Figure
**1-5**

BK001
BK001D

Magnolia
Bluff

Terminal 91

Smith
Cove

Myrtle Edwards
Park

BK002

# *Elliott Bay*

Duwamish Head

Alki

BK004

BK003

PSR

**BASEMAP EXPLANATION**

Shoreline

**SYMBOL EXPLANATION**

- Sediment Triad Station - Bioassays, Benthos, Surface (0 to 10 cm) Chemistry
- Surface (0 to 10 cm) Sediment Chemistry Only

GN MN
21°

SCALE 1:22000
500 0 500 1000 1500 2000
Feet

PSR Site

**NOTES**

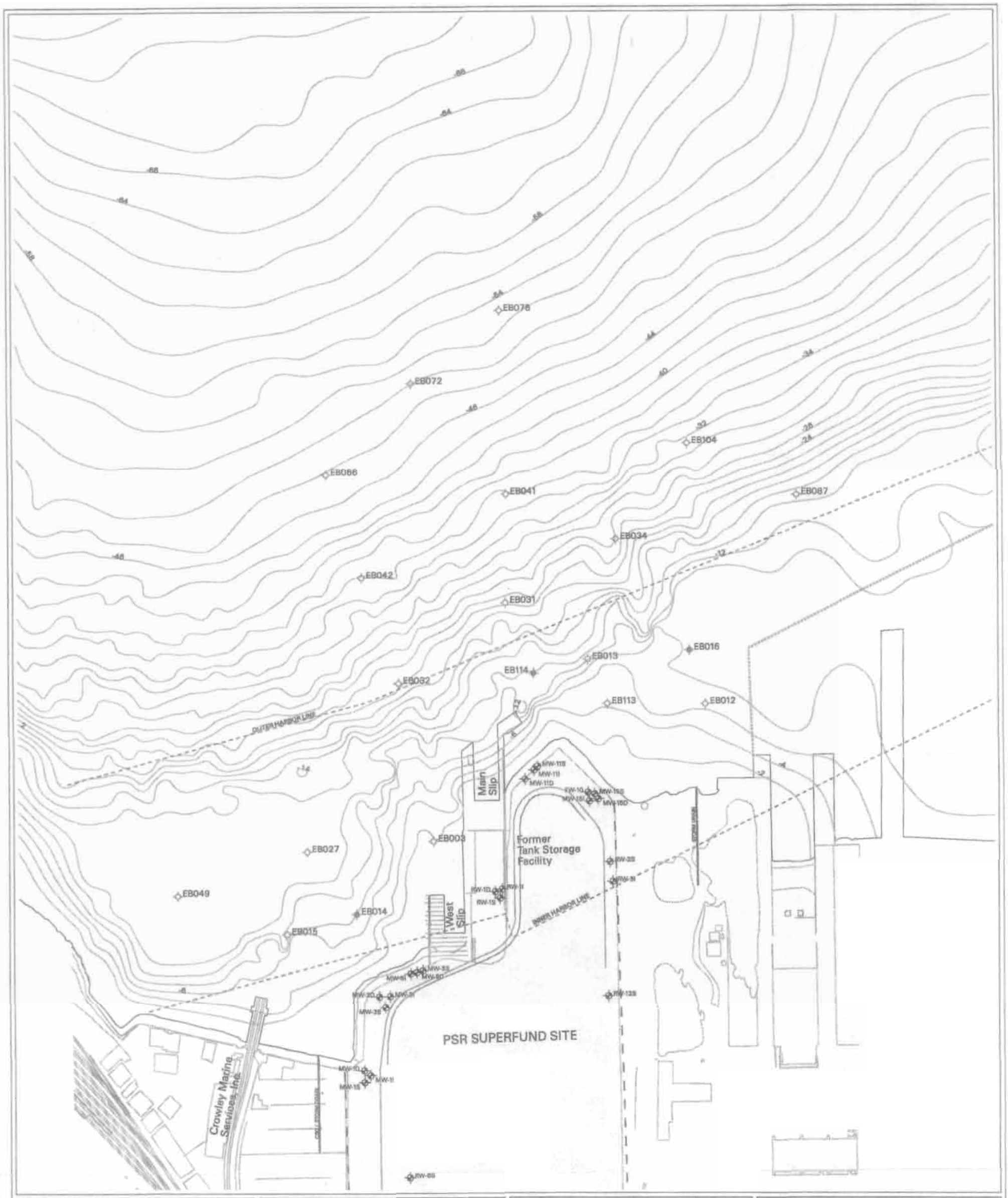
1) Carr Inlet reference station not shown.

WESTON

DATE: April 10, 1998 5:07 PM
JOB NUMBER: 98-0164
VIEW FILE: bkgrdstnlda.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Surface Sediment Background Chemical and Triad Sampling Locations

Figure 1-6




SYMBOL EXPLANATION

- Shallow (0 to 20 ft) Subsurface Sediment Core (n = 17)
- Deep (0 to 96 ft) Subsurface Sediment Core (n = 3)

GN MN
21°

SCALE 1:22000
500 0 500 1000 1500 2000
Feet

PSR Site

NOTES

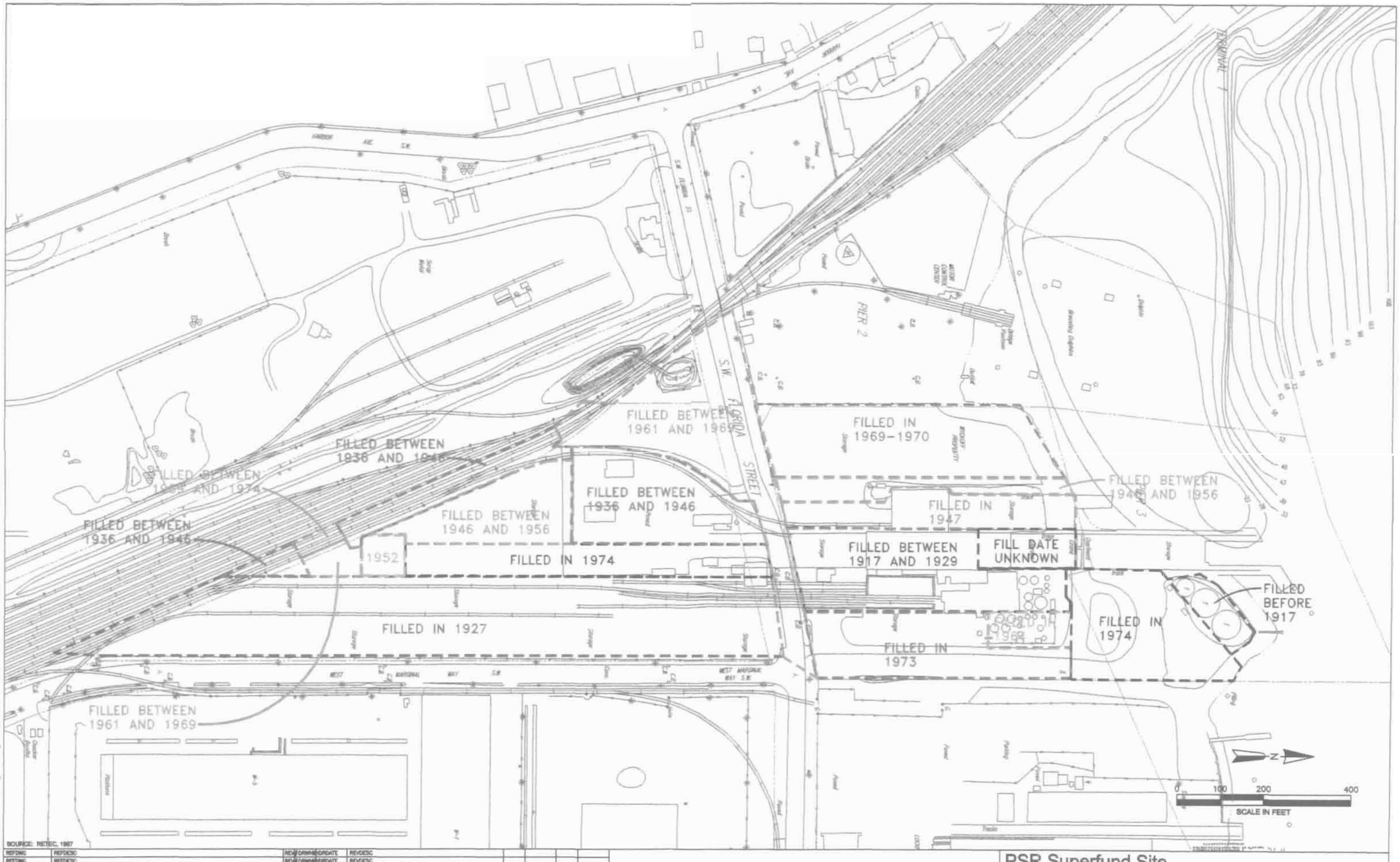
1) See Figure 1-3 for site feature notes and global symbols.
2) Refusal encountered at four stations as follows:
   EB012: 12 ft below mudline
   EB042: 8 ft below mudline
   EB072: 19 ft below mudline
   EB113: 7 ft below mudline

WESTON

DATE: April 10, 1998 5:07 PM
JOB NUMBER: 98-0184
VIEW FILE: subsurface.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Phase 2 Subsurface Sediment Sampling Locations

Figure 1-7




SOURCE: RETEC, 1997

| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
|---|---|---|---|---|---|---|---|---|---|
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | DRDATE | REVDESC | | | | |
| REFERENCE DWG | DESCRIPTION | NO | DRWN | DATE | REVISION | CHKD | DATE | APPVD | DATE |

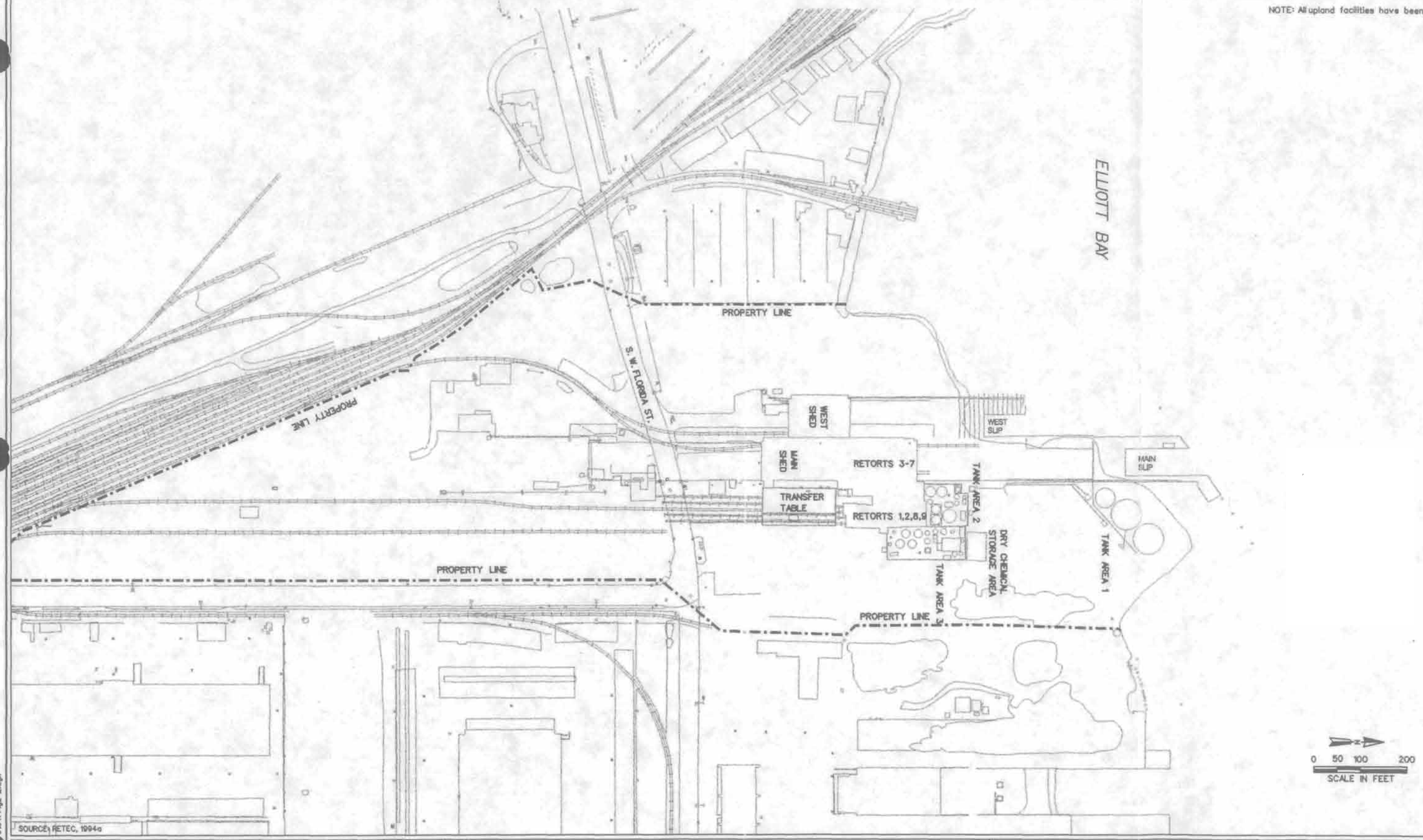
WESTON
MANAGERS DESIGNERS/CONSULTANTS

PSR Superfund Site
Fill Sequence

Figure
2-1

NFSDIR\1998 Jobs\98-0184\Fig2-1.dwg

NOTE: All upland facilities have been removed.



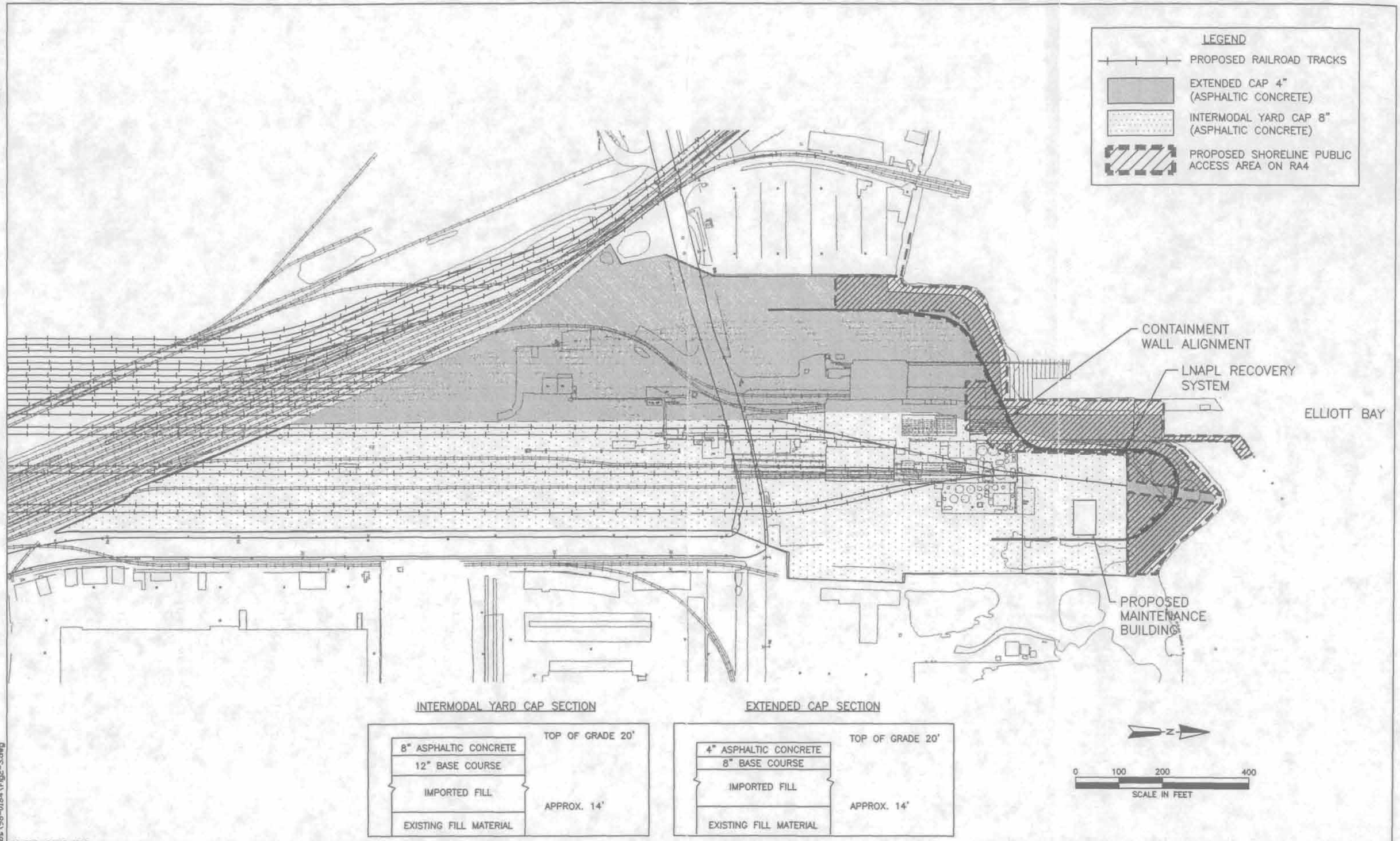

SOURCE: RETEC, 1994a

WESTON

Site Plan with Selected Historical Features

FIGURE 2-2

nfadir/1998 0184/Fig2-2.dgn




SOURCE: RETEC, 1997

| REFERENCE DWG | DESCRIPTION | NO | DRWN | DATE | REVISION | CHKD | DATE | APPVD | DATE |
|---|---|---|---|---|---|---|---|---|---|
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |
| REFDWG | REFDESC | REV | DRWN | ORDATE | REVDESC | | | | |

WESTON
MANAGERS DESIGNERS/CONSULTANTS

PSR Superfund Site
Future Site Layout

Figure
2-3

NFSDIR\1998 Jobs\98-0184\fig2-3.dwg

PSR SUPERFUND SITE

SYMBOL EXPLANATION

- High acoustic backscatter (probable fill)
- Medium acoustic backscatter (potential fill)
- Low acoustic backscatter (possible fill)
- Sunken vessel
- Unknown

Native sediment

GN MN

21°

SCALE 1:22000

500 0 500 1000 1500 2000

Feet

PSR Site

NOTES

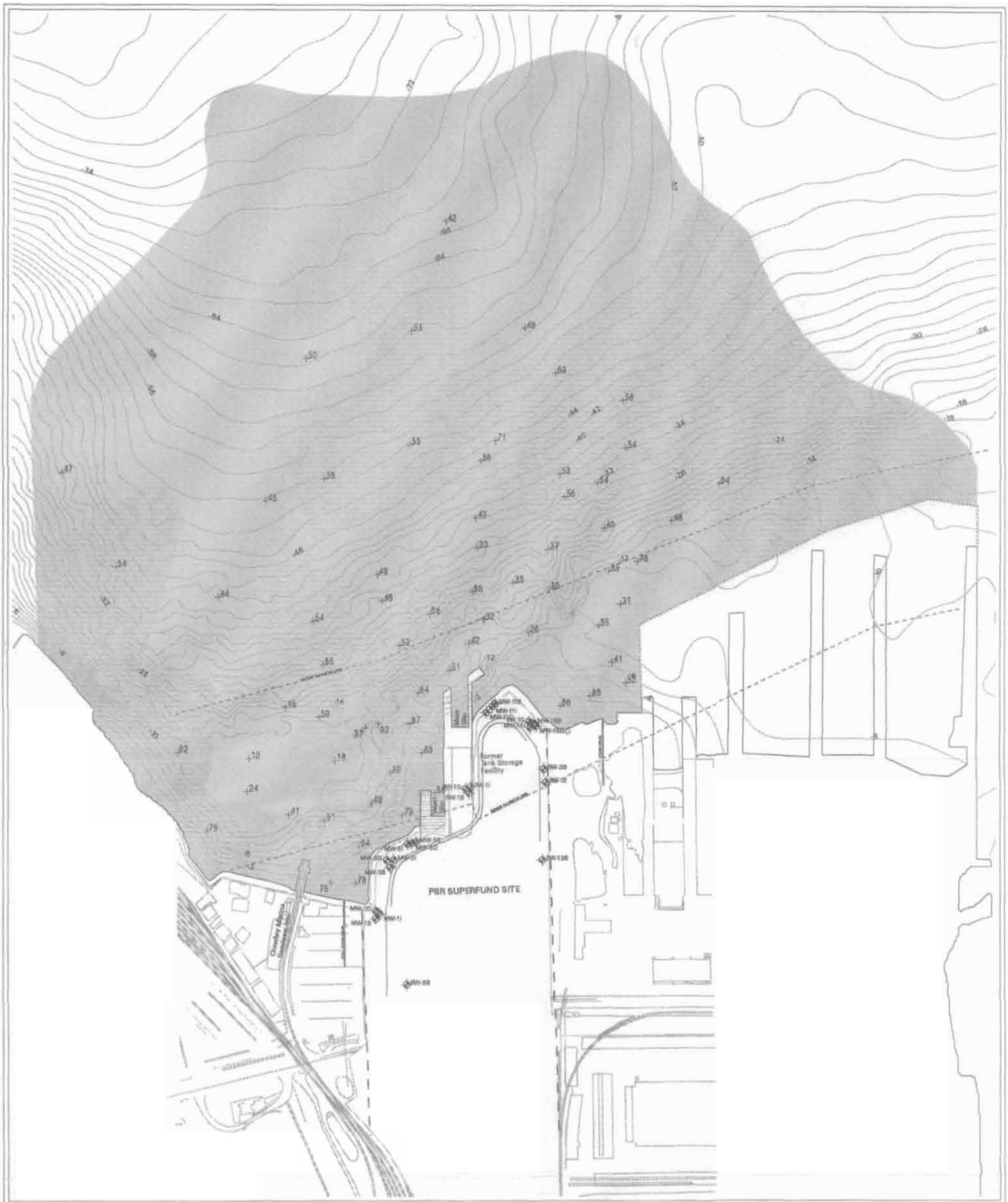
1) See Figure 1-3 for site feature notes and global symbols.
2) Backscatter data source: U.S.G.S., 1996

WESTON

DATE: April 10, 1998 5:08 PM
JOB NUMBER: 98-0184
VIEW FILE: backscat.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Backscatter Intensity Interpretation of Side Scan Sonar Data

Figure 2-4




SYMBOL EXPLANATION

- <= 50
- > 50

NOTES

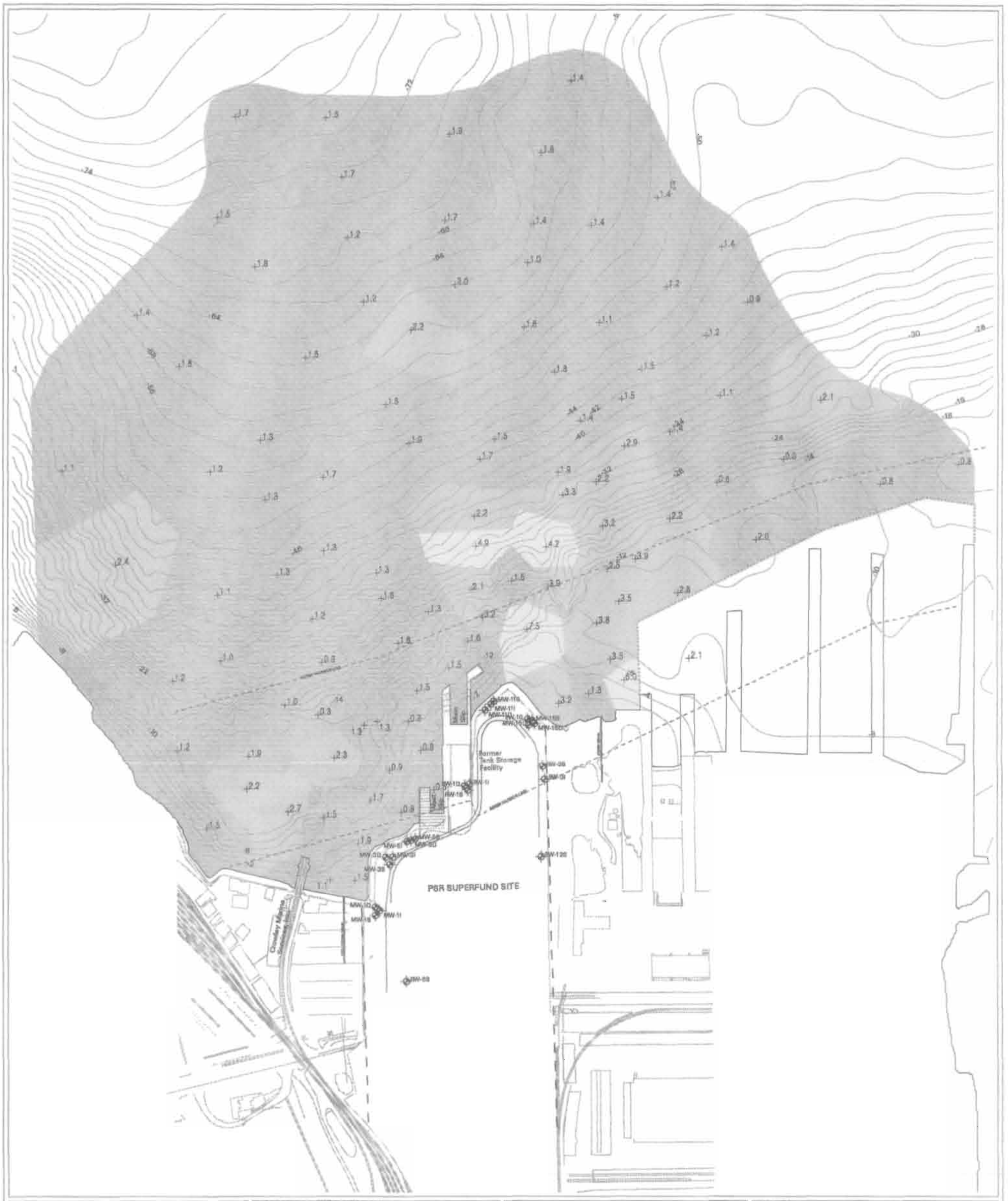
1) See Figure 1-3 for site feature notes and global symbols.
2) All concentrations in percentages

WESTON

DATE: April 10, 1998 5:09 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: MAM

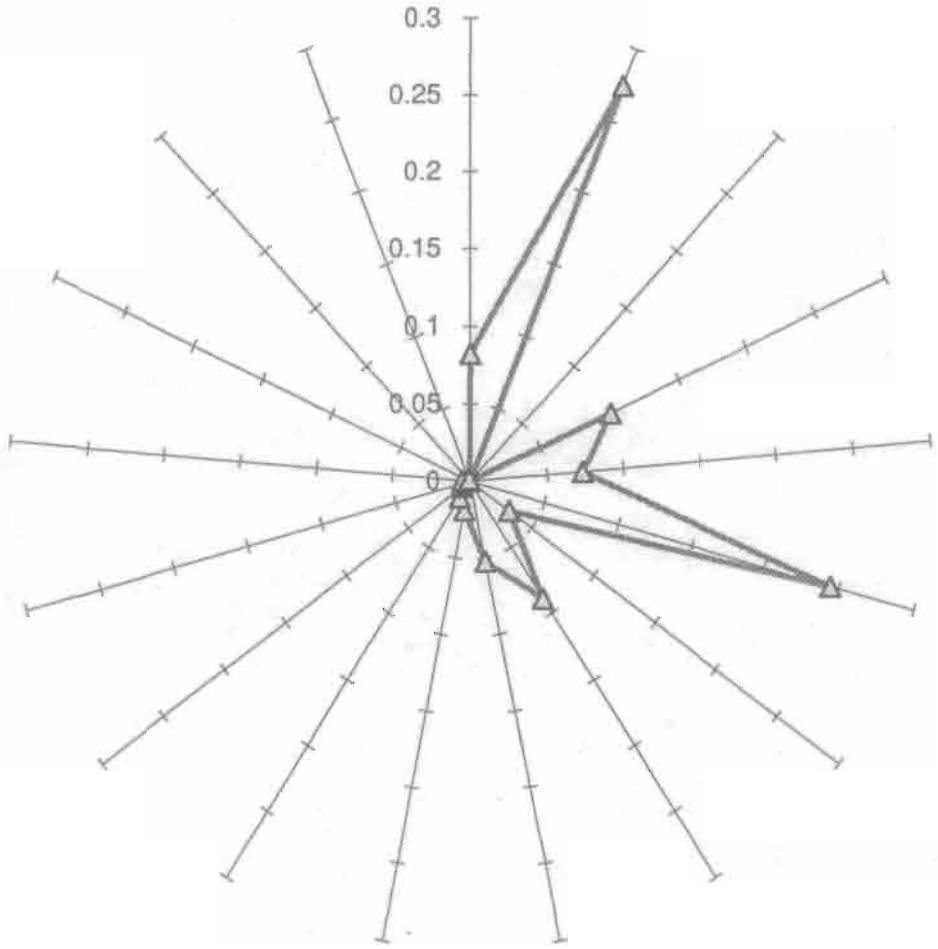
# PSR Marine Sediments Unit Total Percent Sand in Surface Sediment

Figure 2-5




# PSR Marine Sediments Unit Percentages of Total Organic Carbon in Surface Sediment

Figure 2-6

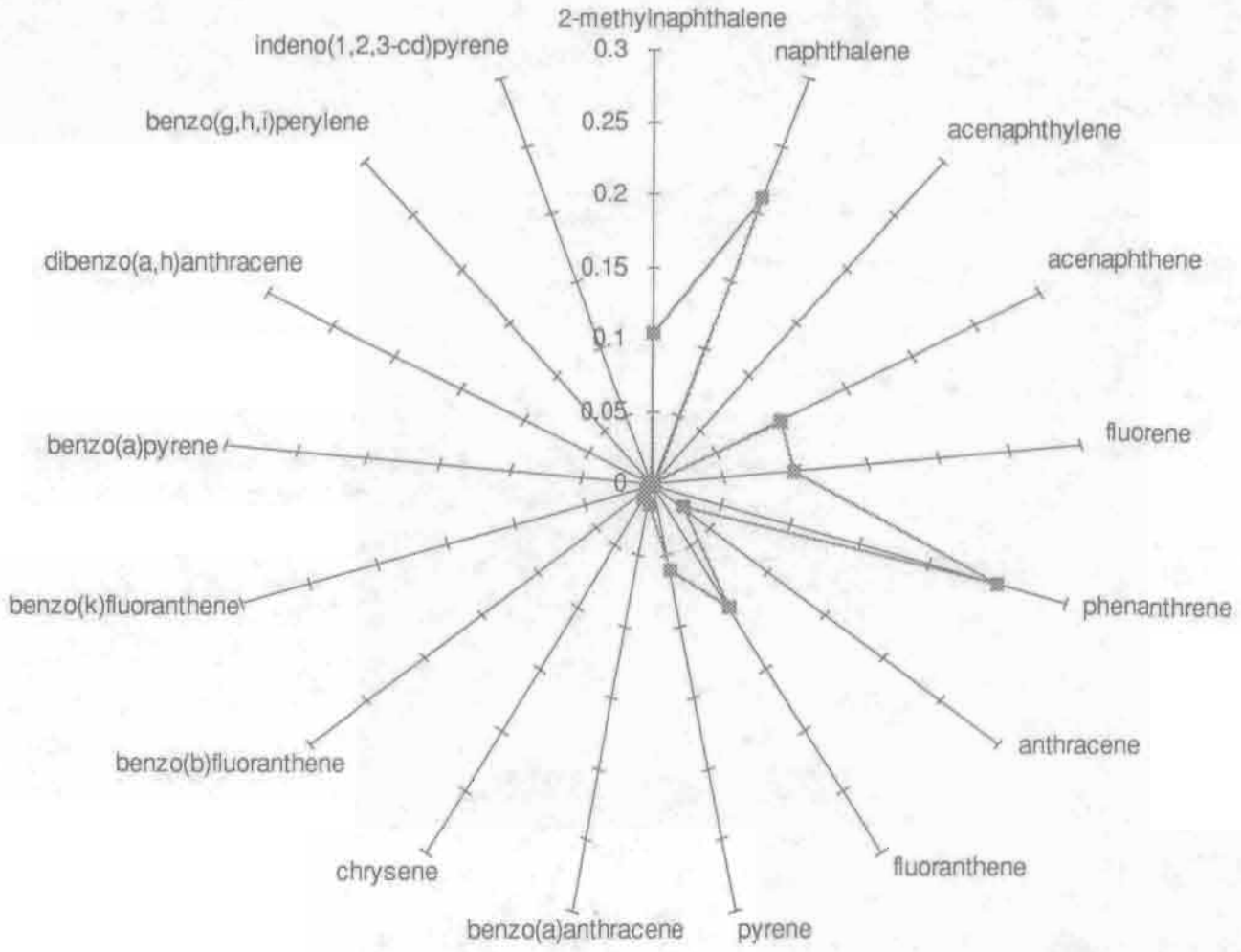



PSR Upland DNAPL PAH Composition

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FIGURE
**3-1**

98-0184.FIG

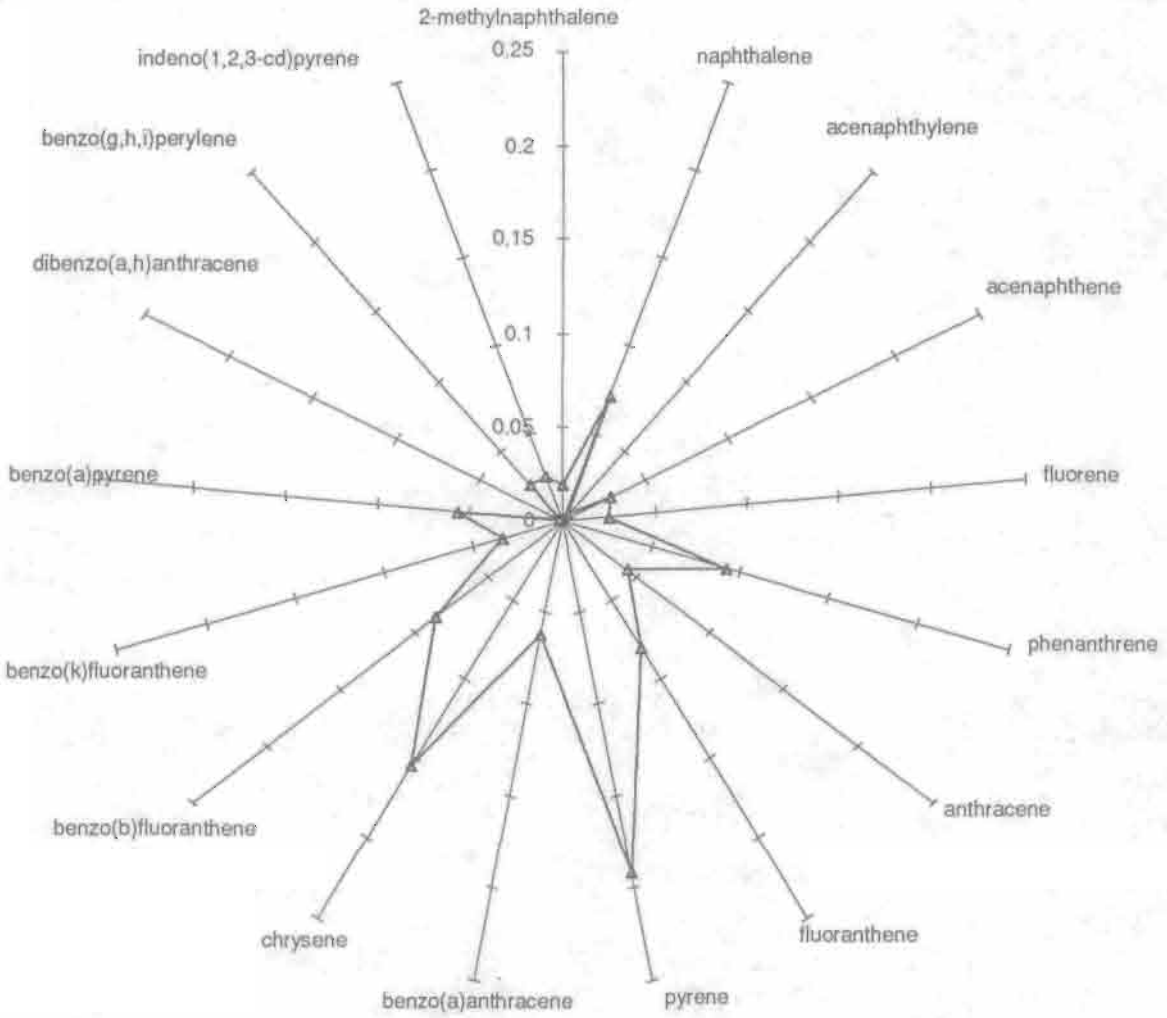



Station EB-27 PAH Composition

WESTON
MANAGERS DESIGNERS CONSULTANTS

FIGURE
**3-2**

98-0184.FIG



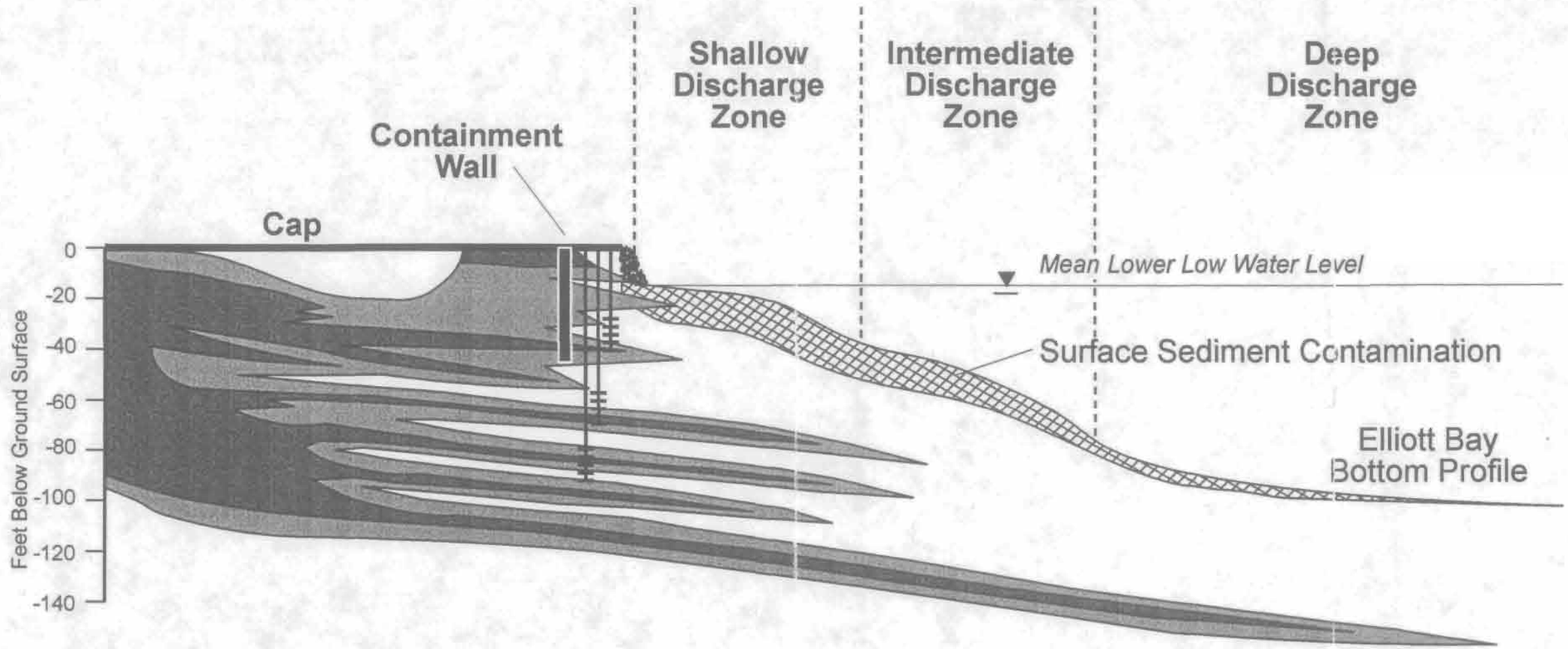

Station EB-98 PAH Composition

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FIGURE

**3-3**

98-0184.FIG



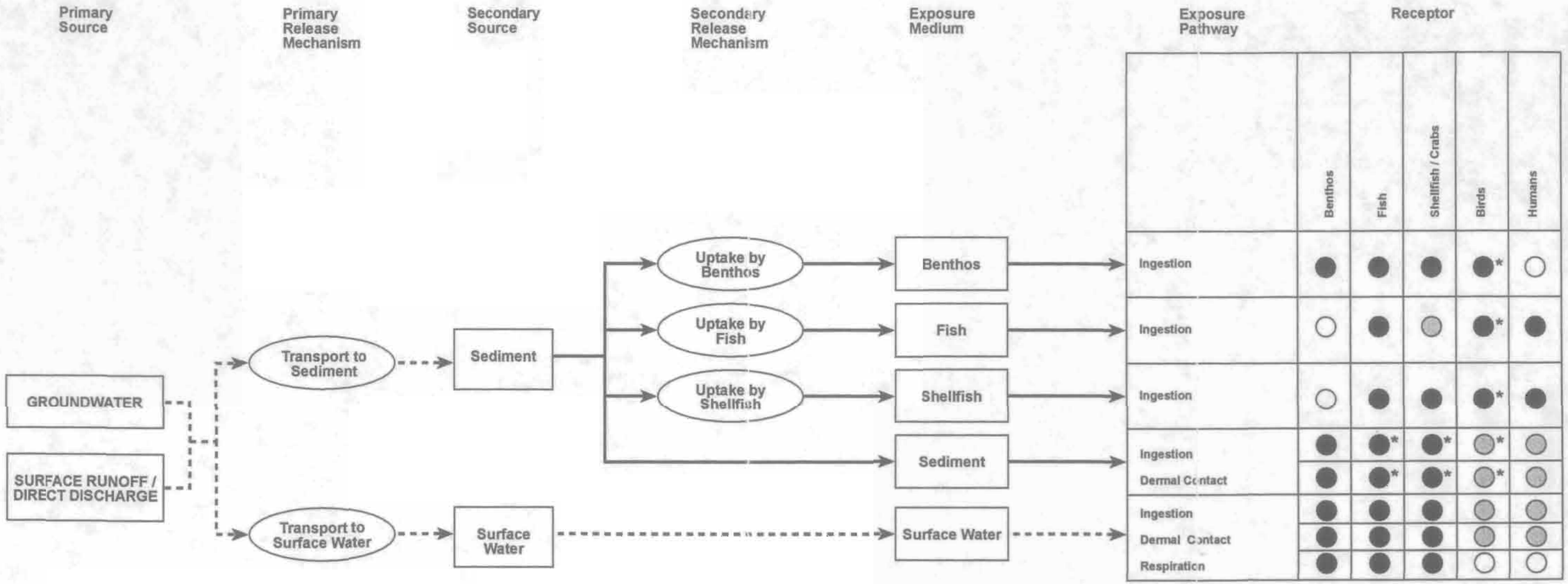

**EXPLANATION**

- Residual NAPL
- Dissolved Phase NAPL
- Well and Screen Interval

Relationship between Shoreline Wells and Discharge Zones

FIGURE
**3-4**

98-0184 fig3-4.fh8




EXPLANATION

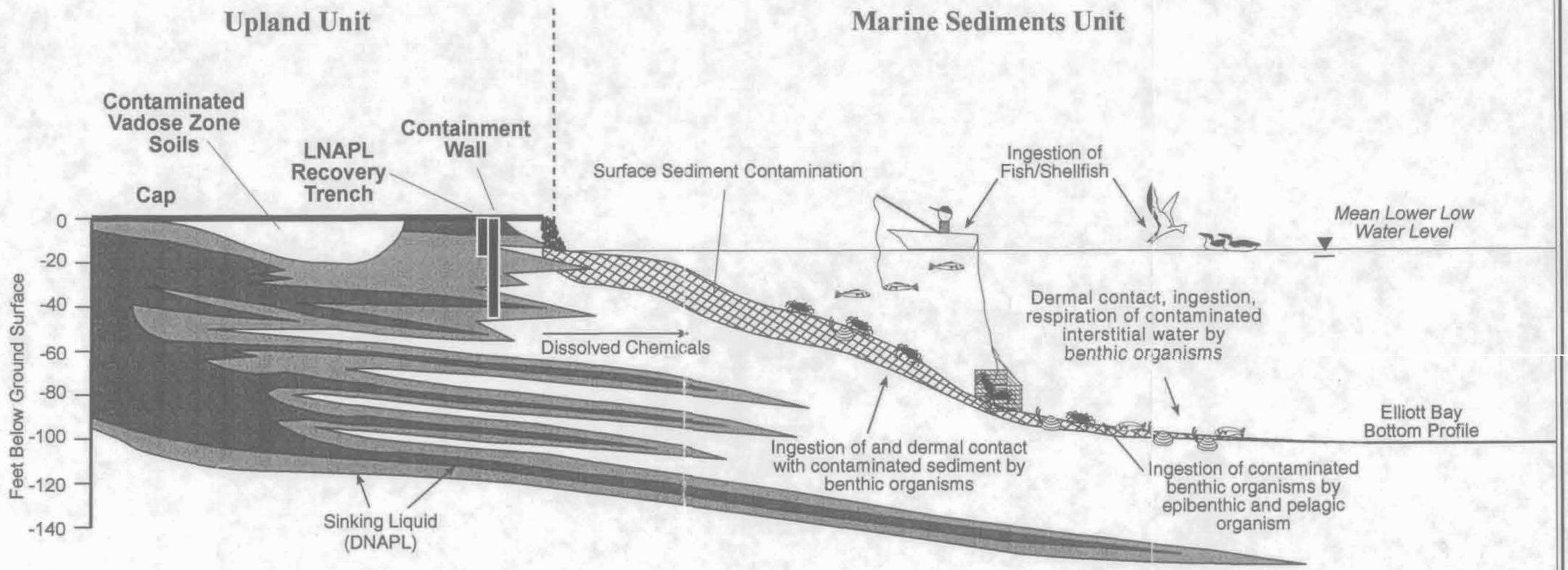
- ○ Not considered a potential exposure pathway
- ● Major exposure pathway
- ◌ Minor exposure pathway
- * Species dependent
- - - - Historical Pathway

WESTON MANAGER DESIGNERS/CONSULTANTS

# PSR Marine Sediments Unit
## Conceptual Site Model of Potential Receptors and Exposure Pathways

FIGURE
**3-5**

98-0184 Fig3-5.fh8




EXPLANATION

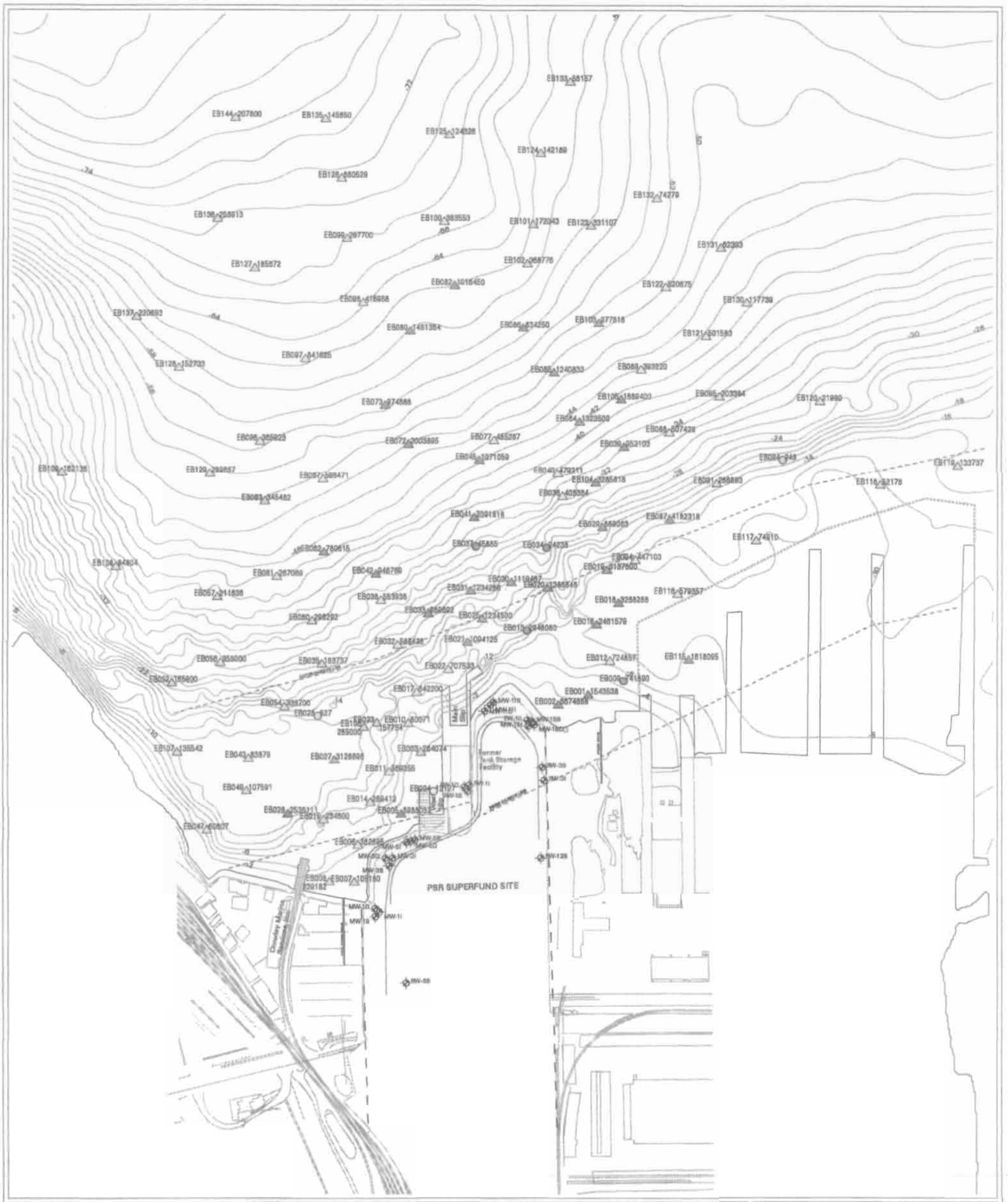
- Residual NAPL
- Dissolved Phase NAPL

WESTON MANAGERS DESIGNERS/CONSULTANT

PSR Conceptual Site Model
of Receptors and Exposure Pathways in the
Offshore Unit Post-Upland Cleanup

FIGURE
**3-6**

98-0184 fig3-6.fh7




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

NOTES

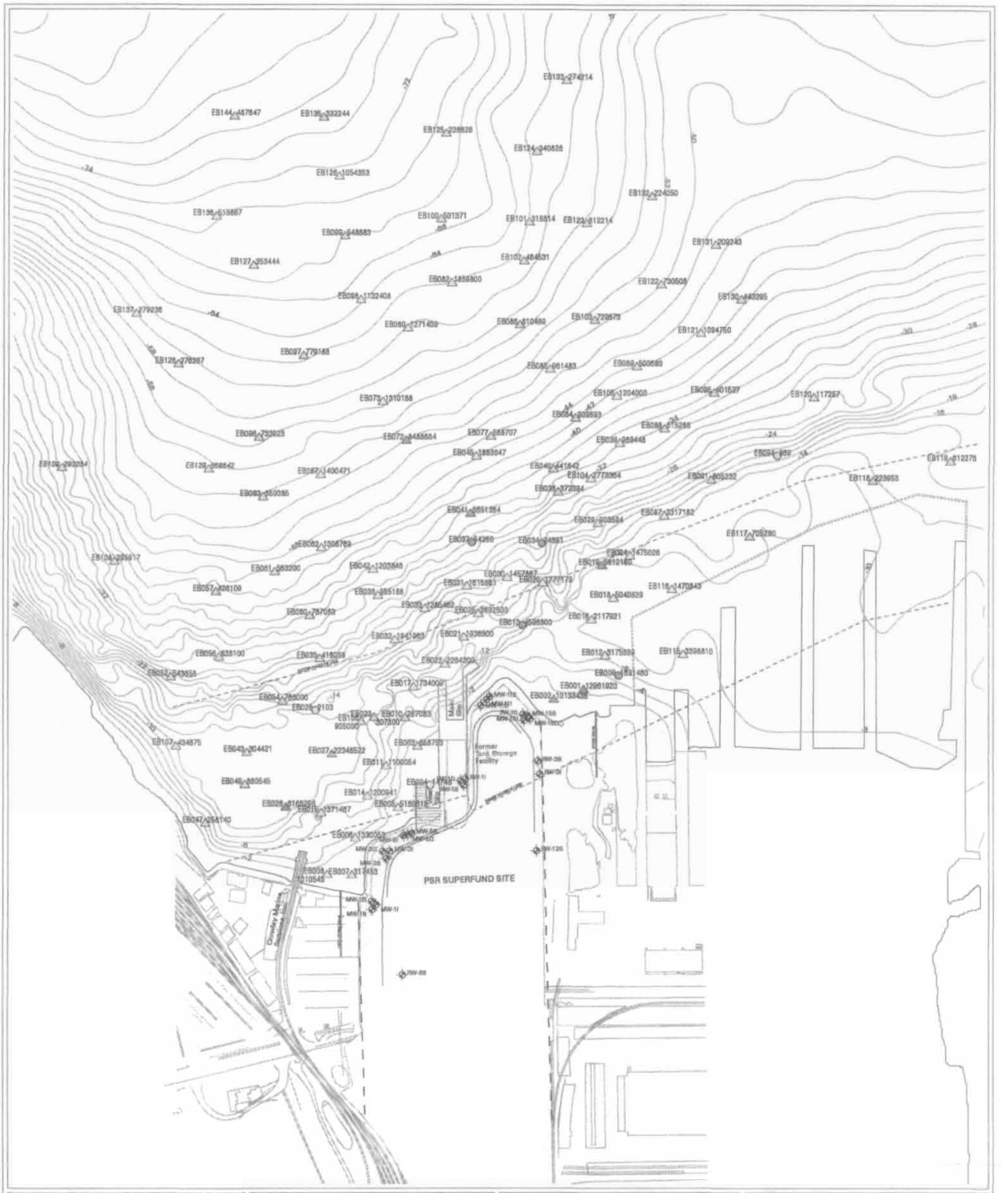
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 5,200 ug/kg
   2LAET: 13,000 ug/kg
   SQS TOC Normalized: 370,000 ug/kg OC
   CSL TOC Normalized: 780,000 ug/kg OC

WESTON

DATE: April 10, 1998 5:31 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total LPAH in Surface Sediment

Figure 5-1




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 12,000 ug/kg
   2LAET: 17,000 ug/kg
   SQS TOC Normalized: 960,000 ug/kg OC
   CSL TOC Normalized: 5,300,000 ug/kg OC

WESTON MANAGERS OF ENGINEERS/CONSULTANTS

DATE: April 13, 1998 11:19 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total HPAH in Surface Sediment

Figure 5-2

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL
- Detection limit exceeds screening criteria

GN MN

21°

PSR Site

SCALE 1:22000

500 0 500 1000 1500 2000

Feet

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
SQS: 29 ug/kg
CSL: 29 ug/kg

WESTON

DATE: April 10, 1998 5:22 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: [signature]

# PSR Marine Sediments Unit Exceedance of 2,4-Dimethylphenol in Surface Sediment

Figure 5-3

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL
- Detection limit exceeds screening criteria

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
SQS: 63 ug/kg
CSL: 63 ug/kg

WESTON

DATE: April 10, 1998 5:23 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of 2-Methylphenol in Surface Sediment

Figure 5-4

PSR SUPERFUND SITE

Former Tank Storage Facility

Main Stem

Seekonk River

Conway Main Recreation Area

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL
- Detection limit exceeds screening criteria

GN MN

21°

SCALE 1:22000

500 0 500 1000 1500 2000

Feet

PSR Site

NOTES

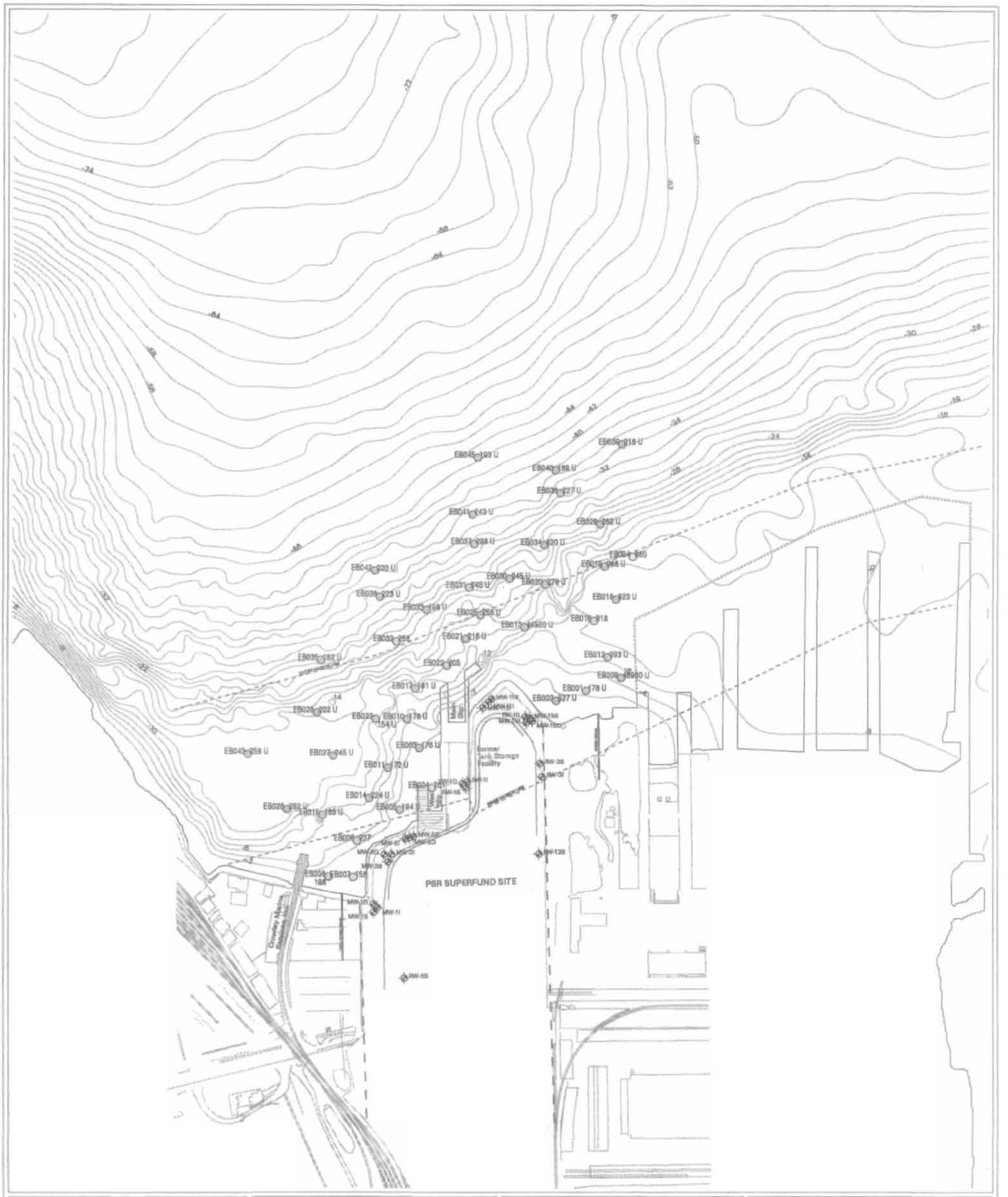
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
SQS: 670 ug/kg
CSL: 670 ug/kg

WESTON

DATE: April 10, 1998 5:24 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of 4-Methylphenol in Surface Sediment

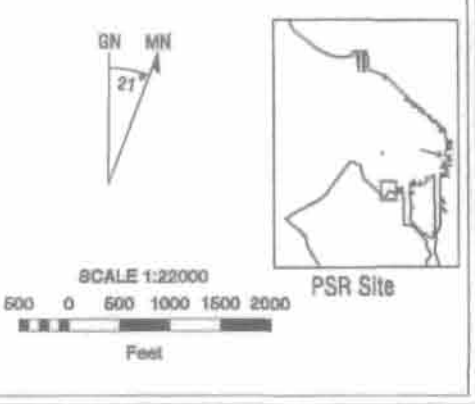
Figure 5-5




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL
- Detection limit exceeds screening criteria




NOTES

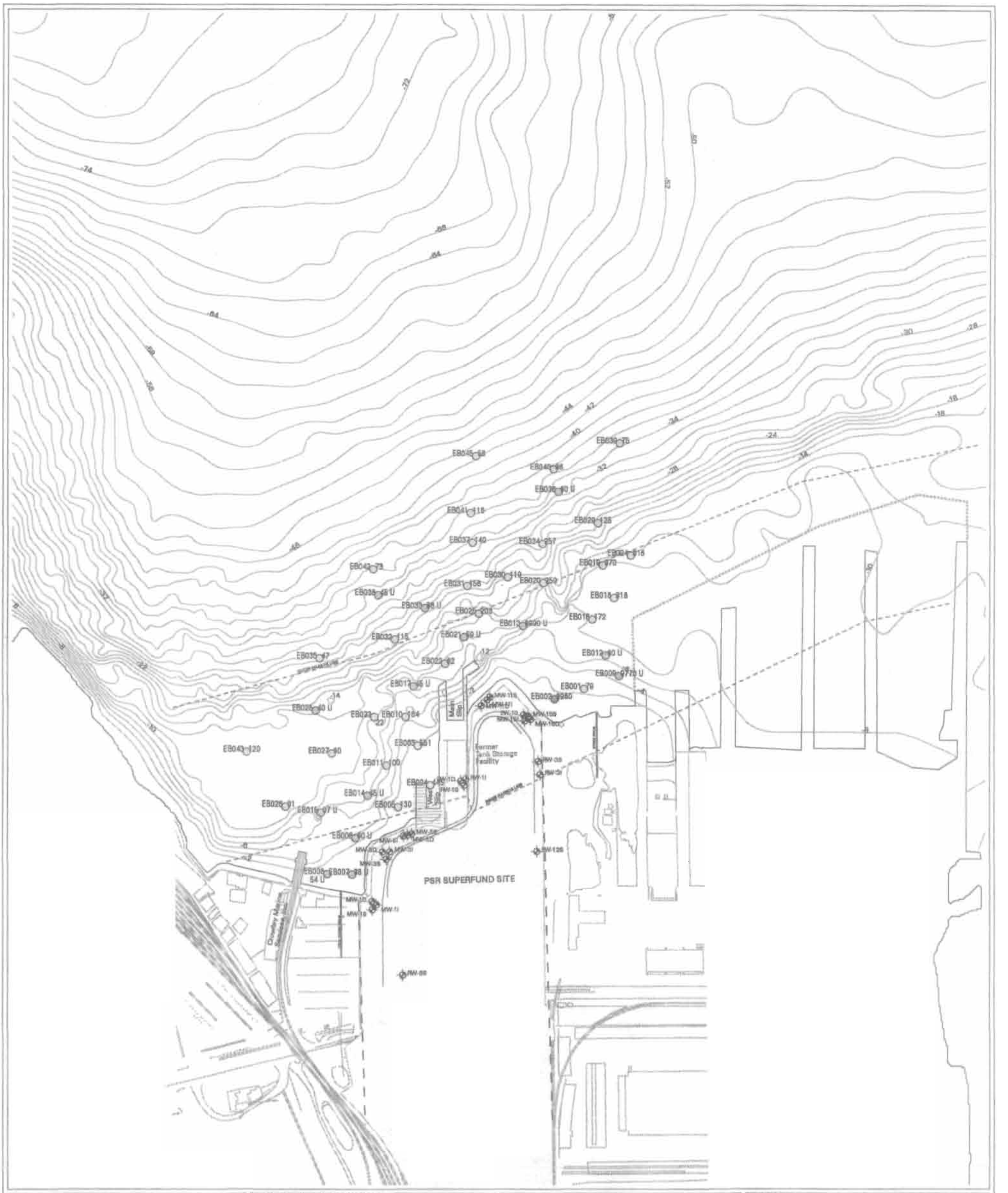
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
SQS: 360 ug/kg
CSL: 690 ug/kg

WESTON

DATE: April 10, 1998 5:25 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Pentachlorophenol in Surface Sediment

Figure 5-6




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL
- Detection limit exceeds screening criteria

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   SQS: 420 ug/kg
   CSL: 1200 ug/kg

WESTON

DATE: April 10, 1998 5:26 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: MAM

# PSR Marine Sediments Unit Exceedance of Phenol in Surface Sediment

Figure 5-7

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
LAET: 540 ug/kg
2LAET: 710 ug/kg
SQS TOC Normalized: 15,000 ug/kg OC
CSL TOC Normalized: 58,000 ug/kg OC

WESTON

DATE: April 10, 1998 5:27 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Dibenzofuran in Surface Sediment

Figure 5-8

**SYMBOL EXPLANATION**

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

**NOTES**

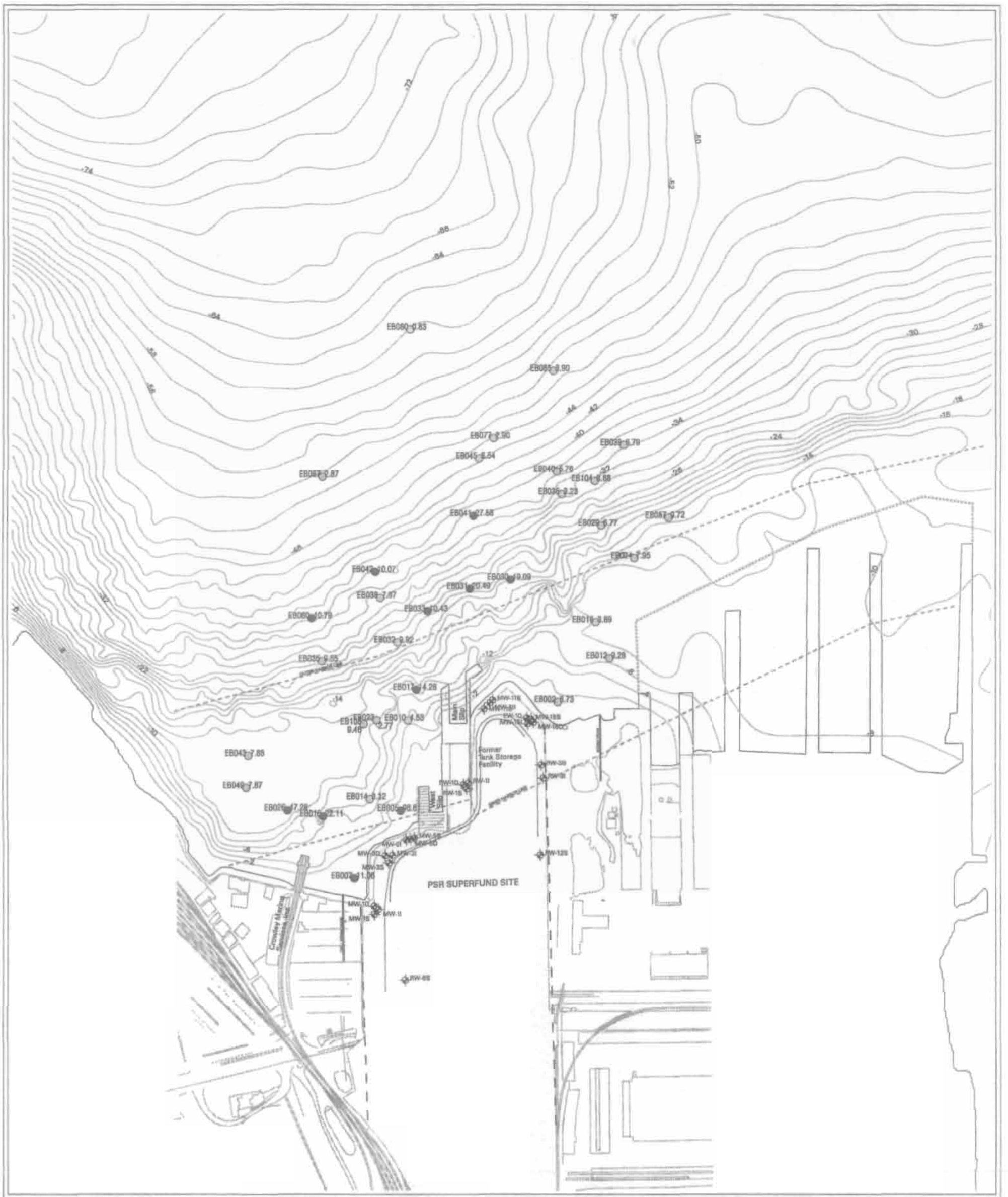
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
LAET: 130 ug/kg
2LAET: 1,000 ug/kg
SQS TOC Normalized: 12,000 ug/kg OC
CSL TOC Normalized: 65,000 ug/kg OC

WESTON

DATE: April 10, 1998 5:36 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total PCB in Surface Sediment

Figure 5-9




SYMBOL EXPLANATION

Exceedance Ratios

- <= 1
- 1 - 2
- 2 - 10
- > 10

NOTES

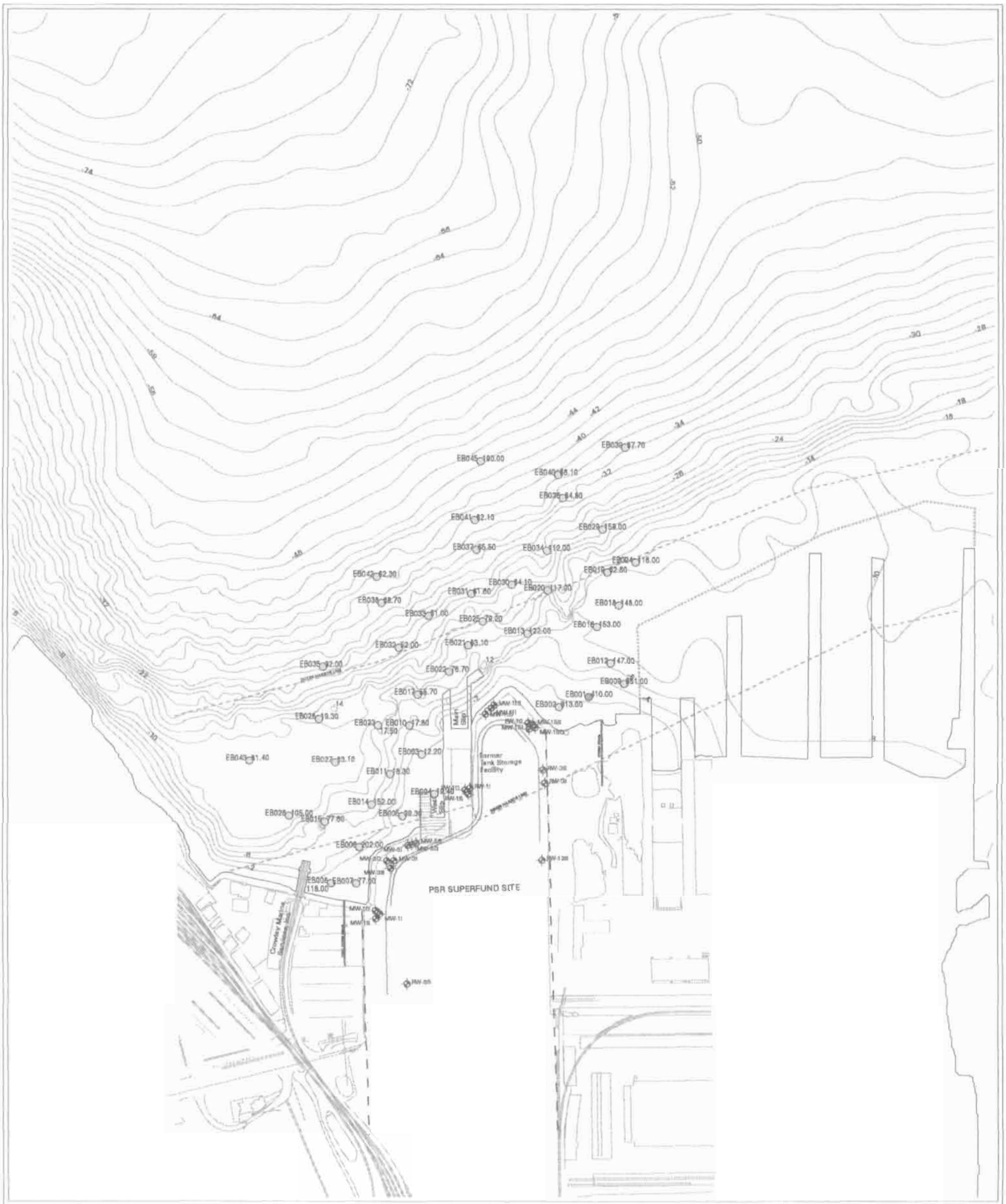
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) Posted values represent background exceedance ratios.
3) Background concentration: 122.34 ng/kg TOCN
4) See Table 4-2 and Appendix D (Table D-8) for data used to derive background concentration.

WESTON

DATE: April 10, 1998 5:14 PM
JOB NUMBER: 96-0184
VIEW FILE: bentstns.view
CHECKED BY: DRH
APPROVED BY: MAM

# PSR Marine Sediments Unit Comparison of Surface Sediment Total 2,3,7,8-TCDD Equivalent to Elliott Bay Background

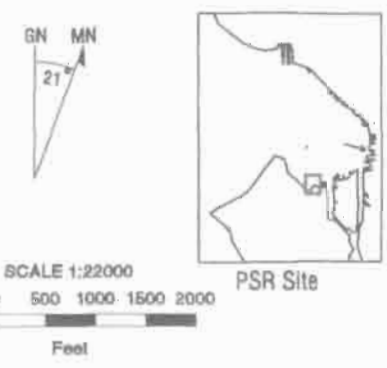
Figure 5-10




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL




NOTES

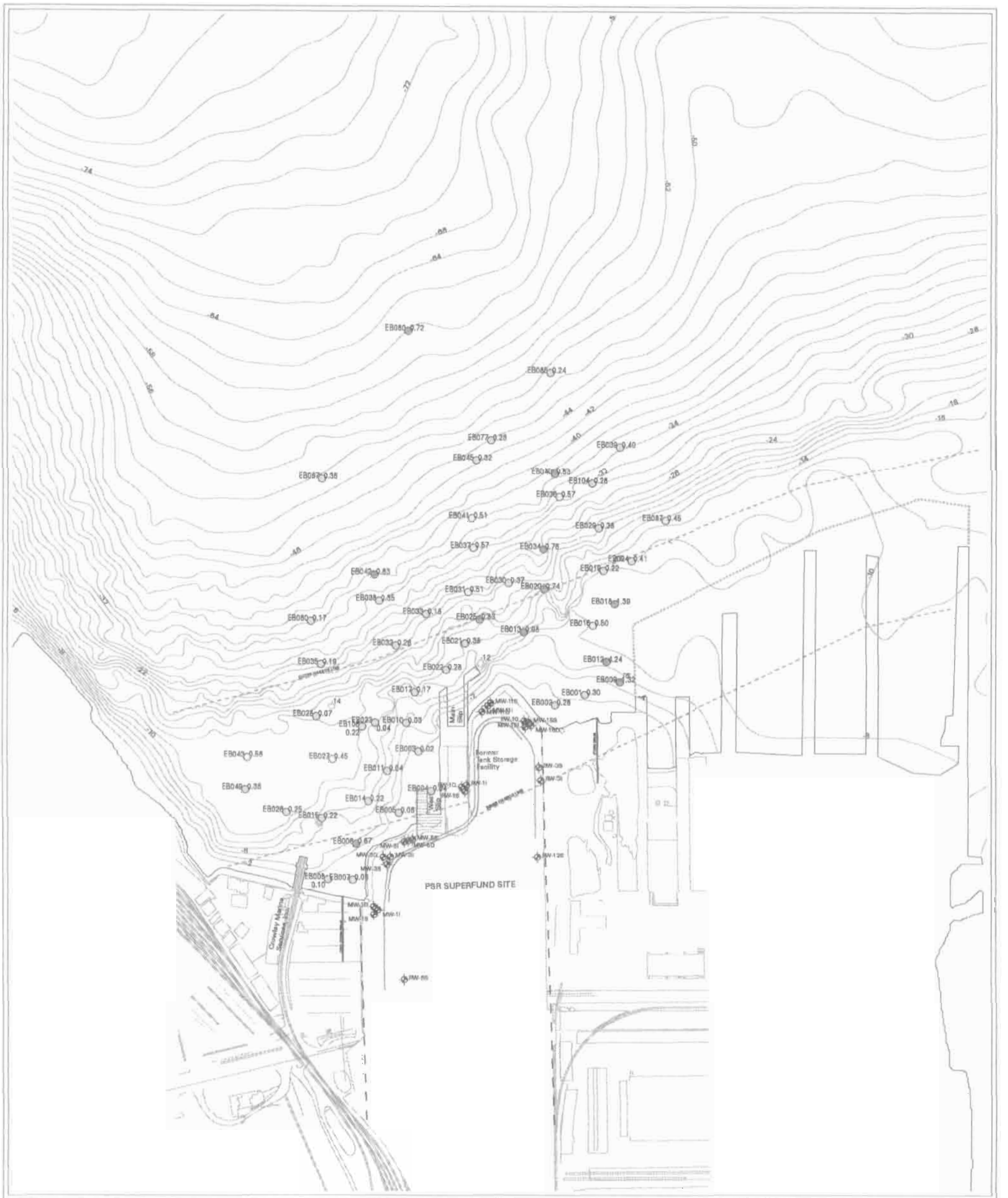
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in mg/kg.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   SQS: 390 mg/kg
   CSL: 390 mg/kg

WESTON

DATE: April 10, 1998 5:41 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total Copper in Surface Sediment

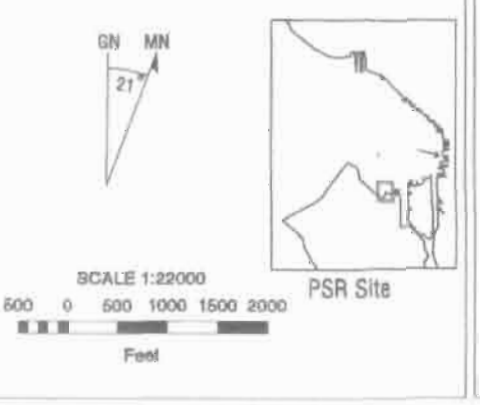
Figure 5-11




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL




NOTES

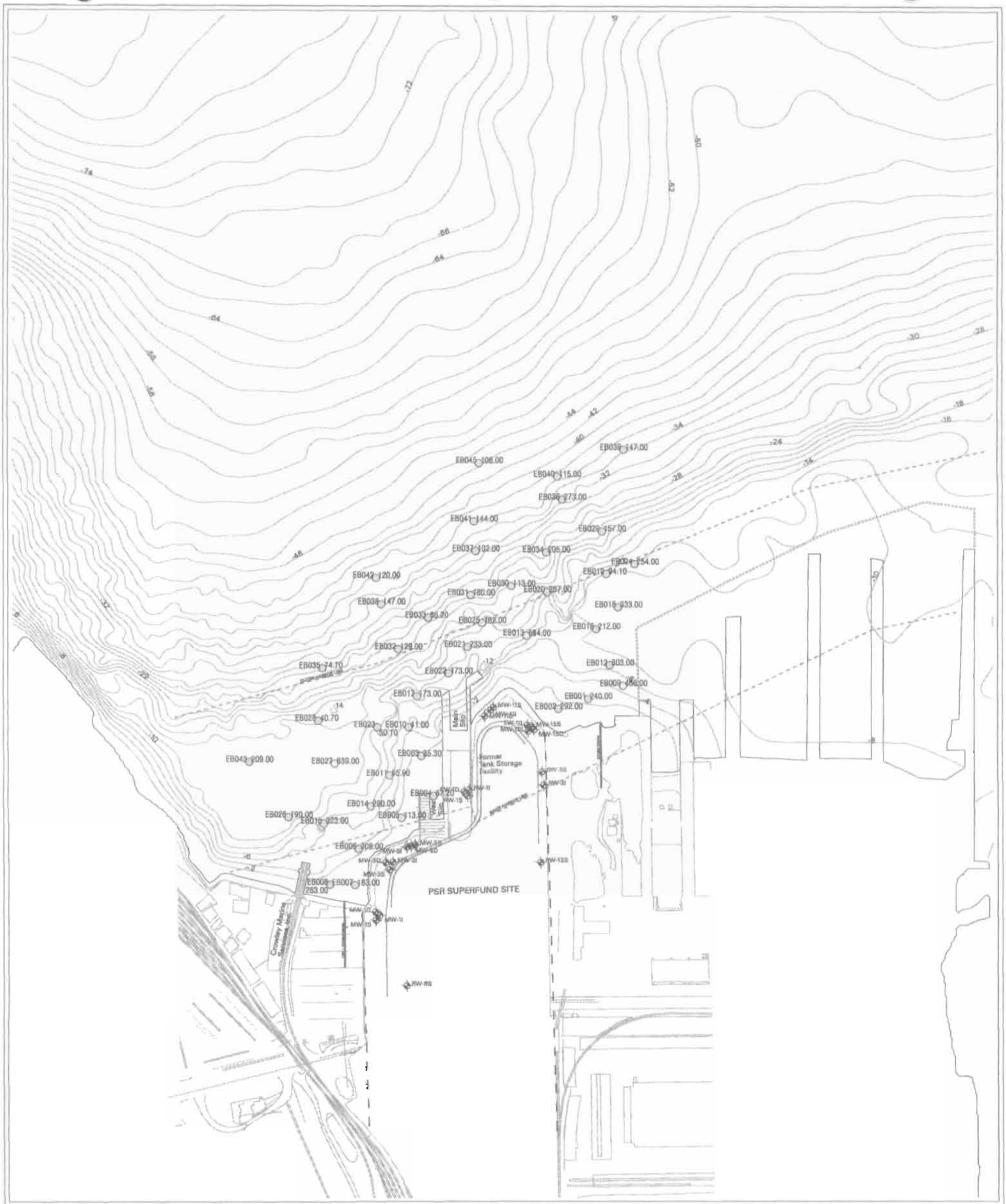
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in mg/kg.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   SQS: 0.41 mg/kg
   CSL: 0.59 mg/kg

WESTON

DATE: April 10, 1998 5:40 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY:

# PSR Marine Sediments Unit Exceedance of Total Mercury in Surface Sediment

Figure 5-12




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below SQS
- Above SQS
- Above CSL

GN MN
21°

SCALE 1:22000

500 0 500 1000 1500 2000

Feet

PSR Site

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in mg/kg.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   SQS: 410 mg/kg
   CSL: 960 mg/kg

WESTON

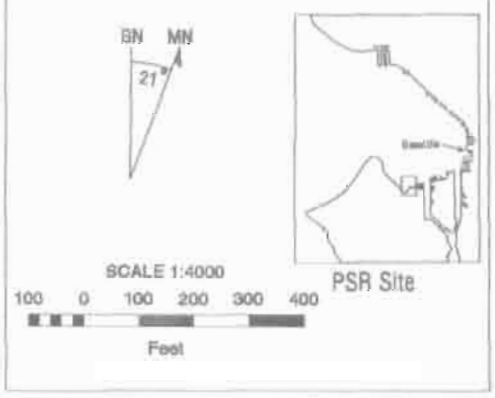
DATE: April 10, 1998 5:42 PM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total Zinc in Surface Sediment

Figure 5-13

SYMBOL EXPLANATION

- Below TOCN SQS or LAET
- Above TOCN SQS or LAET
- Above TOCN CSL or 2LAET




NOTES

1) See RI Figure 1-3 for site features notes and global symbols. See Section 4.4 for symbol interpretation information.
2) Station EB115, which is located within the Lockheed cleanup action plan boundary, is characterized by PAH TOCN CSL exceedances.

WESTON

DATE: April 13, 1998 2:12 PM
JOB NUMBER: 98-0184
VIEW FILE: allpah.view
CHECKED BY: DKH
APPROVED BY: WAM

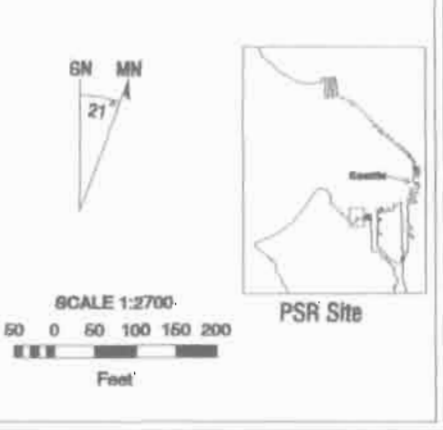
# PSR Marine Sediments Unit Surface Sediment PAH Exceedance Areas

Figure 5-14

LPAH – Low Molecular Weight PAHs
HPAH – High Molecular Weight PAHs
NE – No Exceedance of Screening Criteria

SYMBOL EXPLANATION

- ◇ Shallow (0 to 20 ft) Subsurface Sediment Core (n = 17)
- ◆ Deep (0 to 96 ft) Subsurface Sediment Core (n = 3)




NOTES

1) See Figure 1-3 for site feature notes and global symbology.
2) Posted values represent maximum depth below ground surface (in feet) at which any individual PAH exceeded its respective SQS or LAET chemical screening value (see Appendix F for explanation of screening process).
3) Refusal encountered at three stations as follows:
   EB12 - 12 feet below mudline
   EB42 - 8 feet below mudline
   EB72 - 19 feet below mudline
   EB113 - 7 feet below mudline
4) Contours represent non-native material thickness (in feet) predicted by USGS (1996).
5) Fill boundary for eastern slope is estimated (dashed line).

WESTON

DATE: April 18, 1997 2:04 PM
JOB NUMBER: 04000-031-001-4200-02
VIEW FILE: 98-0184 Fig5-15.ai7
CHECKED BY: _____
APPROVED BY: _____

# PSR Marine Sediments Unit
# Maximum Depth of SQS/LAET PAH Exceedances

Figure
**5-15**

EB078
LPAH 4'
HPAH NE

EB072
LPAH 4'
HPAH NE

EB104
LPAH NE
HPAH NE

EB066
LPAH 12'
HPAH 12'

EB041
LPAH 8'
HPAH 4'

EB087
LPAH 4'
HPAH NE

EB034
LPAH 4'
HPAH NE

EB042
LPAH NE
HPAH NE

EB031
LPAH 4'
HPAH NE

EB016

EB013
LPAH 16'
HPAH 12'

EB114

EB032
LPAH 8'
HPAH 4'

EB113
LPAH 7'
HPAH 7'

EB012
LPAH 12'
HPAH 12'

OUTER HARBOR LINE

Main Slip

EB003
LPAH NE
HPAH NE

Former Tank Storage Facility

EB027
LPAH 20'
HPAH 16'

EB049
LPAH 12'
HPAH 8'

EB014

West Slip

INNER HARBOR LINE

EB015
LPAH 8'
HPAH NE

PSR SUPERFUND SITE

Crowley Marine Services, Inc.

LPAH – Low Molecular Weight PAHs
HPAH – High Molecular Weight PAHs
NE – No Exceedance of Screening Criteria

SYMBOL EXPLANATION

- ◇ Shallow (0 to 20 ft) Subsurface Sediment Core (n = 17)
- ◆ Deep (0 to 96 ft) Subsurface Sediment Core (n = 3)

GN MN
21°

SCALE 1:2700
50 0 50 100 150 200
Feet

PSR Site

NOTES

1) See Figure 1-3 for site feature notes and global symbology.
2) Posted values represent maximum depth below ground surface (in feet) at which any individual PAH exceeded its respective CSL or 2LAET chemical screening value (see Appendix F for explanation of screening process).
3) Refusal encountered at three stations as follows:
   EB12 - 12 feet below mudline
   EB42 - 8 feet below mudline
   EB72 - 19 feet below mudline
   EB113 - 7 feet below mudline
4) Contours represent non-native material thickness (in feet) predicted by USGS (1996).
5) Fill boundary for eastern slope is estimated (dashed line).

WESTON

DATE: April 18, 1997 2:04 PM
JOB NUMBER: 04000-031-001-4200-02
VIEW FILE: 96-0184 Fig5-16.ai7

CHECKED BY: _____

APPROVED BY: _____

# PSR Marine Sediments Unit
# Maximum Depth of CSL/2LAET PAH Exceedances

Figure
**5-16**

# TABLES

## Table 1-1—Summary of Surface Sediment Chemical and Biological Analyses

| Sample Number | | Field Analysis[a] | Physical and Chemical Analysis[b] | | | | | | | Biological Analysis[c] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | Immunoassay | TOC | Grain Size | % Moisture | PAHs[d] | PCBs[e] | PCDD/PCDF | Metals[f] | Bioassays[g] | Bioaccum | Benthos |
| **PSR Marine Sediments Unit** | | | | | | | | | | | | |
| SD1-EB01-0000 | 96162600 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB02-0000 | 96162601 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB03-0000 | 96162602 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB04-0000 | 96162603 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB05-0000 | 96162604 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB06-0000 | 96162605 | -- | X | X | X | X | X | -- | X | -- | -- | -- |
| SD1-EB07-0000 | 96162606 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB08-0000 | 96162607 | -- | X | X | X | X | X | -- | X | -- | -- | -- |
| SD1-EB09-0000 | 96162608 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB10-0000 | 96162609 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB11-0000 | 96162610 | -- | X | X | X | X | X | -- | X | -- | -- | -- |
| SD1-EB12-0000 | 96162611 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB13-0000 | 96162612 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB14-0000 | 96162613 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB15-0000 | 96162614 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB16-0000 | 96162615 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB17-0000 | 96162616 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB18-0000 | 96162617 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB19-0000 | 96162618 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB20-0000 | 96162619 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB20-1000 | 96162620 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB21-0000 | 96162621 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB22-0000 | 96162622 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB23-0000 | 96162623 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB24-0000 | 96162624 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB25-0000 | 96162625 | -- | X | X | X | X | -- | -- | X | -- | -- | -- |
| SD1-EB26-0000 | 96162626 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB27-0000 | 96162627 | -- | X | X | X | X | X | NA | X | -- | -- | -- |
| SD1-EB28-0000 | 96162628 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB29-0000 | 96162629 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB30-0000 | 96162630 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB31-0000 | 96162631 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB32-0000 | 96162632 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB33-0000 | 96162633 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB34-0000 | 96162634 | -- | X | X | X | X | X | X | X | -- | -- | -- |

## Table 1-1—Summary of Surface Sediment Chemical and Biological Analyses

| Sample Number | | Field Analysis[a] | Physical and Chemical Analysis[b] | | | | | | | Biological Analysis[c] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | Immunoassay | TOC | Grain Size | % Moisture | PAHs[d] | PCBs[e] | PCDD/PCDF | Metals[f] | Bioassays[g] | Bioaccum | Benthos |
| SD1-EB35-0000 | 96162635 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB36-0000 | 96162636 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB37-0000 | 96162637 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB38-0000 | 96162638 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB39-0000 | 96162639 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB39-1000 | 96162640 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB40-0000 | 96162641 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB41-0000 | 96162642 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB42-0000 | 96162643 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB43-0000 | 96162648 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-EB44-0000 | 96162649 | -- | A | A | A | A | A | A | A | -- | -- | -- |
| SD1-EB45-0000 | 96162650 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD2-EB46-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB47-0000 | 96382524 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB48-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB49-0000 | 96382526 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB50-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB51-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB52-0000 | 96364550 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB53-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB54-0000 | 96382527 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB54-1000 | 96382525 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB55-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB56-0000 | 96392701 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB57-0000 | 96382528 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB58-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB59-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB60-0000 | 96382529 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB61-0000 | 96364551 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB62-0000 | 96392702 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB63-0000 | 96382530 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB64-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB65-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB66-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB67-0000 | 96382531 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB68-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

## Table 1-1—Summary of Surface Sediment Chemical and Biological Analyses

| Sample Number | | Field Analysis[a] | Physical and Chemical Analysis[b] | | | | | | | Biological Analysis[c] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | Immunoassay | TOC | Grain Size | % Moisture | PAHs[d] | PCBs[e] | PCDD/PCDF | Metals[f] | Bioassays[g] | Bioaccum | Benthos |
| SD2-EB69-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB70-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB71-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB72-0000 | 96382532 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB73-0000 | 96392703 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB74-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB75-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB76-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB77-0000 | 96382533 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB78-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB79-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB80-0000 | 96382534 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB81-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB82-0000 | 96392704 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB83-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB84-0000 | 96392705 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB85-0000 | 96382535 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB86-0000 | 96382536 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB87-0000 | 96382537 | X | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB88-0000 | 96392706 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB89-0000 | 96364552 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB90-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB91-0000 | 96382538 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB92-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB93-0000 | -- | X | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SD2-EB94-0000 | 96364554 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB95-0000 | 96364553 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB96-0000 | 96374565 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB97-0000 | 96382539 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB98-0000 | 96374566 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB99-0000 | 96374567 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB100-0000 | 96382540 | X | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB101-0000 | 96374568 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB102-0000 | 96374569 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB103-0000 | 96374570 | X | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB104-0000 | 96382541 | -- | X | X | -- | X | X | X | X[h] | X | X | X |

## Table 1-1—Summary of Surface Sediment Chemical and Biological Analyses

| Sample Number | | Field Analysis[a] | Physical and Chemical Analysis[b] | | | | | | | Biological Analysis[c] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | Immunoassay | TOC | Grain Size | % Moisture | PAHs[d] | PCBs[e] | PCDD/PCDF | Metals[f] | Bioassays[g] | Bioaccum | Benthos |
| SD2-EB105-0000 | 96382542 | -- | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB106-0000 | 96382543 | -- | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-EB107-0000 | 96382544 | -- | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB108-0000 | 96382547 | -- | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB109-0000 | 96382548 | -- | X | X | -- | X | -- | -- | -- | -- | -- | -- |
| SD2-EB110-0000 | 96382549 | -- | X | A | -- | A | -- | -- | -- | -- | -- | -- |
| SD2-EB111-0000 | 96382550 | -- | X | A | -- | A | -- | -- | -- | -- | -- | -- |
| SD2-EB112-0000 | 96382551 | -- | X | A | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB115-0000 | 97312350 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB116-0000 | 97312351 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB117-0000 | 97312352 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB118-0000 | 97312353 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB119-0000 | 97312354 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB120-0000 | 97312355 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB121-0000 | 97312356 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB122-0000 | 97312357 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB123-0000 | 97312358 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB124-0000 | 97312359 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB125-0000 | 97312360 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB126-0000 | 97312361 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB127-0000 | 97312362 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB128-0000 | 97312363 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB129-0000 | 97312364 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB130-0000 | 97312365 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB131-0000 | 97312366 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB132-0000 | 97312367 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB133-0000 | 97312368 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB134-0000 | 97312369 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB135-0000 | 97312370 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB136-0000 | 97312371 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB137-0000 | 97312372 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB138-0000 | 97312373 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB139-0000 | 97312374 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB140-0000 | 97312375 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB141-0000 | 97312376 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB142-0000 | 97312377 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |

## Table 1-1—Summary of Surface Sediment Chemical and Biological Analyses

| Sample Number | | Field Analysis[a] | Physical and Chemical Analysis[b] | | | | | | | Biological Analysis[c] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | Immunoassay | TOC | Grain Size | % Moisture | PAHs[d] | PCBs[e] | PCDD/PCDF | Metals[f] | Bioassays[g] | Bioaccum | Benthos |
| SD3-EB143-0000 | 97312378 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| SD3-EB144-0000 | 97312379 | -- | X | -- | -- | X | -- | -- | -- | -- | -- | -- |
| SD3-EB145-0000 | 97312380 | -- | A | -- | -- | A | -- | -- | -- | -- | -- | -- |
| **Background Areas** | | | | | | | | | | | | |
| SD1-BK01-0000 | 96162644 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-BK01D-0000 | 96162645 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-BK02-0000 | 96162646 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD1-BK03-0000 | 96162647 | -- | X | X | X | X | X | X | X | -- | -- | -- |
| SD2-BK01-0000 | 96382545 | -- | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-BK04-0000 | 96382546 | -- | X | X | -- | X | X | X | X[h] | X | X | X |
| SD2-CARR-0000 | -- | -- | -- | X[i] | -- | -- | -- | -- | -- | X | -- | -- |

[a]Rapid immunoassay methods for carcinogenic PAHs were specified in the Draft Phase 2 SAP Addendum (WESTON, 1996c); sediment collected at each of the immunoassay stations was also archived for potential future laboratory analyses.

[b]Analytical methods were specified in Section 6 of the Phase 1 SAP (WESTON, 1996b).

[c]Biological testing methods were specified in the Phase 2 SAP Addenda (WESTON, 1996c, 1996d).

[d]All Phase 1 samples (indicated by WESTON Sample ID prefix "SD1") also analyzed for phenolic compounds and dibenzofuran.

[e]Aroclors only.

[f]Metals analyses were limited to aluminum, arsenic, cadmium, copper, iron, lead, mercury, nickel, and zinc.

[g]Amphipod (*Ampelisca abdita*) and echinoderm (*Dendraster excentricus*) acute toxicity tests.

[h]Mercury only.

[i]Grain size data consist only of a field screening measurement (of 49% fines).

X: Analyzed.

-- : Not analyzed.

A: Sample archived and not analyzed for the RI.

NA: Apparent gross contamination; sample not analyzed for the RI based on assumption that PAH contamination would drive cleanup.

Metal, PAH, and PCB analyses performed by EPA Manchester Lab.

PCDD/PCDF analyses performed by Maxim Technologies, Inc.

TOC analyses performed by ARI, Inc.

Grain Size analyses performed by Soil Technology.

Bioassays conducted by Parametrix, Inc.

Benthic enumeration and taxonomic identification performed by Marine Taxonomic Services.

## Table 1-2—Summary of Shallow Subsurface Sediment Compositing Scheme and Chemical Analyses

| Station | Depth Interval (ft bgs) | | WESTON Sample Number | EPA Sample Number | Analysis[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proposed | Actual | | | PAHs | Phenols | Dibenzofuran | Metals | PCBs | TOC | Grain Size | DRET | MET |
| EB03 | 0 - 4 | 0 - 4 | SD2-EB03-0000A | 96392707 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 0 - 4 | 0 - 4 | SD2-EB03-1000A | 96392708 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB03-0040 | 96392709 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB03-1040 | 96392710 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 8 - 12 | 8 - 12 | SD2-EB03-0080 | 96392711 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 8 - 12 | 8 - 12 | SD2-EB03-1080 | 96392712 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 12 - 16 | 12 - 16 | SD2-EB03-0120 | 96392719 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 12 - 16 | 12 - 16 | SD2-EB03-1120 | 96392720 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB03-0160 | 96392721 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB03-1160 | 96392722 | X | -- | -- | -- | -- | X | -- | -- | -- |
| EB12 | 0 - 4 | 0 - 4 | SD2-EB12-0000A | 96404900 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB12-0040 | 96404901 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB12-0080 | 96404902 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| | 16 - 20 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| EB13 | 0 - 4 | 0 - 4 | SD2-EB13-0000A | 96404905 | X | X | X | X | X | X | X | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB13-0040 | 96404906 | X | X | X | X | X | X | X | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB13-0080 | 96404907 | X | X | X | X | X | X | X | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB13-0120 | 96404908 | X | X | X | X | X | X | X | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB13-0160 | 96404909 | X | X | X | X | X | X | X | -- | -- |
| EB15 | 0 - 4 | 0 - 4 | SD2-EB15-0000A | 96392723 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB15-0040 | 96392724 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 8 - 12 | 8 - 12 | SD2-EB15-0080 | 96392725 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 12 - 16 | 12 - 16 | SD2-EB15-0120 | 96392726 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB15-0160 | 96392727 | X | -- | -- | -- | -- | X | -- | -- | -- |
| EB27 | 0 - 4 | 0 - 4 | SD2-EB27-0000A | 96392734 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB27-0040 | 96392735 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 8 - 12 | 8 - 12 | SD2-EB27-0080 | 96392736 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 12 - 16 | 12 - 16 | SD2-EB27-0120 | 96392737 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB27-0160 | 96392738 | X | -- | -- | -- | -- | X | -- | -- | -- |
| EB31 | 0 - 4 | 0 - 4 | SD2-EB31-0000A | 96404910 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB31-0040 | 96404911 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB31-0080 | 96404912 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB31-0120 | 96404913 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB31-0160 | 96404914 | A | -- | -- | -- | -- | A | -- | -- | -- |
| EB32 | 0 - 4 | 0 - 4 | SD2-EB32-0000A | 96404915 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB32-0040 | 96404916 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB32-0080 | 96404917 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB32-0120 | 96404918 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB32-0160 | 96404919 | X | -- | -- | -- | -- | X | -- | -- | -- |

## Table 1-2—Summary of Shallow Subsurface Sediment Compositing Scheme and Chemical Analyses

| Station | Depth Interval (ft bgs) | | WESTON Sample Number | EPA Sample Number | Analysis[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proposed | Actual | | | PAHs | Phenols | Dibenzofuran | Metals | PCBs | TOC | Grain Size | DRET | MET |
| **EB34** | 0 - 4 | 0 - 4 | SD2-EB34-0000A | 96404920 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB34-0040 | 96404921 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB34-0080 | 96404922 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB34-0120 | 96404923 | A | -- | -- | -- | -- | A | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB34-0160 | 96404924 | A | -- | -- | -- | -- | A | -- | -- | -- |
| **EB41** | 0 - 4 | 0 - 4 | SD2-EB41-0000A | 96404925 | X | X | X | X | X | X | X | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB41-0040 | 96404926 | X | X | X | X | X | X | X | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB41-0080 | 96404927 | X | X | X | X | X | X | X | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB41-0120 | 96404928 | X | X | X | X | X | X | X | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB41-0160 | 96404929 | X | X | X | X | X | X | X | -- | -- |
| **EB42** | 0 - 4 | 0 - 4 | SD2-EB42-0000A | 96404930 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB42-0040 | 96404931 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| | 12 - 16 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| | 16 - 20 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| **EB49** | 0 - 4 | 0 - 4 | SD2-EB49-0000A | 96392728 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB49-0040 | 96392729 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 8 - 12 | 8 - 12 | SD2-EB49-0080 | 96392731 | X | -- | -- | -- | -- | X | -- | [X (G1)] | [X (G1)] |
| | 12 - 16 | 12 - 16 | SD2-EB49-0120 | 96392732 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB49-0160 | 96392733 | X | -- | -- | -- | -- | X | -- | -- | -- |
| **EB66** | 0 - 4 | 0 - 4 | SD2-EB66-0000A | 96404935 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB66-0040 | 96404936 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB66-0080 | 96404937 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB66-0120 | 96404938 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB66-0160 | 96404939 | X | -- | -- | -- | -- | X | -- | -- | -- |
| **EB72** | 0 - 4 | 0 - 4 | SD2-EB72-0000A | 96404940 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB72-0040 | 96404941 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB72-0080 | 96404942 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB72-0120 | 96404943 | A | -- | -- | -- | -- | A | -- | -- | -- |
| | 16 - 20 | 16 - 18.7 | SD2-EB72-0160 | 96404944 | A | -- | -- | -- | -- | A | -- | -- | -- |
| **EB78** | 0 - 4 | 0 - 4 | SD2-EB78-0000A | 96404945 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB78-0040 | 96404946 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB78-0080 | 96404947 | A | -- | -- | -- | -- | A | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB78-0120 | 96404948 | A | -- | -- | -- | -- | A | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB78-0160 | 96404949 | A | -- | -- | -- | -- | A | -- | -- | -- |
| **EB87** | 0 - 4 | 0 - 4 | SD2-EB87-0000A | 96404950 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB87-0040 | 96404951 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB87-0080 | 96404952 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB87-0120 | 96404953 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB87-0160 | 96404954 | A | -- | -- | -- | -- | A | -- | -- | -- |

## Table 1-2—Summary of Shallow Subsurface Sediment Compositing Scheme and Chemical Analyses

| Station | Depth Interval (ft bgs) | | WESTON Sample Number | EPA Sample Number | Analysis[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proposed | Actual | | | PAHs | Phenols | Dibenzofuran | Metals | PCBs | TOC | Grain Size | DRET | MET |
| **EB104** | 0 - 4 | 0 - 4 | SD2-EB104-0000A | 96404955 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 8 | SD2-EB104-0040 | 96404956 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | 8 - 12 | SD2-EB104-0080 | 96404957 | A | -- | -- | -- | -- | A | -- | [X (G2)] | [X (G2)] |
| | 12 - 16 | 12 - 16 | SD2-EB104-0120 | 96404958 | A | -- | -- | -- | -- | A | -- | -- | -- |
| | 16 - 20 | 16 - 20 | SD2-EB104-0160 | 96404959 | A | -- | -- | -- | -- | A | -- | -- | -- |
| **EB113** | 0 - 4 | 0 - 4 | SD2-EB113-0000A | 96404960 | X | -- | -- | -- | -- | X | -- | -- | -- |
| | 4 - 8 | 4 - 7 | SD2-EB113-0040 | 96404961 | X | -- | -- | -- | -- | X | -- | [X (G2)] | [X (G2)] |
| | 8 - 12 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| | 12 - 16 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| | 16 - 20 | NR | NR | NR | NR | -- | -- | -- | -- | NR | -- | -- | -- |
| **Group 1** | 4 - 8 | 4 - 8 | SD2-EBC01-0040 | 96392739 | -- | -- | -- | -- | -- | -- | -- | X | X |
| | 8 - 12 | 8 - 12 | SD2-EBC01-0080 | 96404965 | -- | -- | -- | -- | -- | -- | -- | X | X |
| **Group 2** | 4 - 8 | 4 - 8 | SD2-EBC02-0040 | 96404966 | -- | -- | -- | -- | -- | -- | -- | X | X |
| | 8 - 12 | 8 - 12 | SD2-EBC02-0080 | 96404967 | -- | -- | -- | -- | -- | -- | -- | X | X |

[a]Analytical methods were specified in the Phase 1 SAP (WESTON, 1996b) and Draft Phase 2 SAP Addendum (WESTON, 1996c).

[b]Metal analyses limited to arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

X: Analyzed.

A: Sample archived and not analyzed for the RI.

NR: No recovery or refusal encountered; no analysis possible.

--: Not analyzed

G1: Composited as part of Group 1 (EBC01), which included Stations EB15, EB27, and EB49.

G2: Composited as part of Group 2 (EBC02), which included Stations EB12, EB13, EB31, EB32, EB34, EB41, EB42, EB66, EB72, EB78, EB87, EB104, and EB113.

## Table 1-3—Summary of Deep Subsurface Sediment Field and Laboratory Analyses

| Station | Depth Interval (ft bgs) | WESTON Sample Number | EPA Sample Number | Field Analysis[a] | | Laboratory Analysis[b] | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | UV | Immuno-assay | Eng. Param.[c] | PAHs | TOC | Grain Size |
| EB14 | 0 - 3 | SDEB14-0000 | -- | -- | -- | X | -- | -- | -- |
| | 3 - 6 | SDEB14-0030 | -- | -- | -- | X | -- | -- | -- |
| | 8 - 10 | SD2-EB14-0080 | -- | -- | -- | -- | -- | A | A |
| | 12 - 14 | SD2-EB14-0120 | -- | -- | -- | -- | -- | A | A |
| | 20 - 22 | SD2-EB14-0200 | -- | X | -- | -- | A | -- | -- |
| | 22 - 24 | SD2-EB14-0220 | -- | -- | -- | -- | A | -- | -- |
| | 24 - 26 | SD2-EB14-0240 | -- | X | -- | -- | A | -- | -- |
| | 26 - 28 | SD2-EB14-0260 | -- | -- | -- | -- | A | A | A |
| | 28 - 30 | SD2-EB14-0280 | -- | X | -- | -- | A | -- | -- |
| | 30 - 32 | SD2-EB14-0300 | -- | -- | X | -- | A | -- | -- |
| | 32 - 34 | SD2-EB14-0320 | 96464640 | X | -- | -- | A | X | X |
| | 42 - 44 | SD2-EB14-0420 | -- | -- | -- | -- | -- | A | A |
| | 60 - 62 | SD2-EB14-0600 | -- | X | -- | -- | A | -- | -- |
| | 62 - 64 | SD2-EB14-0620 | -- | -- | -- | -- | A | -- | -- |
| | 64 - 66 | SD2-EB14-0640 | -- | X | X | -- | A | -- | -- |
| | 66 - 68 | SD2-EB14-0660 | -- | -- | X | -- | -- | A | A |
| | 68 - 70 | SD2-EB14-0680 | -- | X | X | -- | A | -- | -- |
| | 70 - 72 | SD2-EB14-0700 | 96464641 | -- | X | -- | A | X | X |
| | 72 - 74 | SD2-EB14-0720 | -- | X | X | -- | A | -- | -- |
| | 74 - 76 | SD2-EB14-0740 | -- | -- | X | -- | -- | A | A |
| | 76 - 78 | SD2-EB14-0760 | -- | X | -- | -- | A | -- | -- |
| | 78 - 80 | SD2-EB14-0780 | -- | -- | -- | -- | A | -- | -- |
| | 80 - 82 | SD2-EB14-0800 | -- | X | -- | -- | A | -- | -- |
| | 82 - 84 | SD2-EB14-0820 | -- | -- | -- | -- | A | -- | -- |
| | 84 - 85 | SD2-EB14-0840 | -- | -- | -- | -- | A | -- | -- |
| EB16 | 0 - 3 | SDEB16-0000 | -- | -- | -- | X | -- | -- | -- |
| | 3 - 6 | SDEB16-0030 | -- | -- | -- | X | -- | -- | -- |
| | 12 - 14 | SD2-EB16-0120 | -- | -- | -- | -- | A | A | A |
| | 20 - 22 | SD2-EB16-0200 | -- | X | -- | -- | A | -- | -- |
| | 22 - 24 | SD2-EB16-0220 | -- | X | -- | -- | A | -- | -- |
| | 24 - 26 | SD2-EB16-0240 | -- | -- | -- | -- | A | -- | -- |
| | 26 - 28 | SD2-EB16-0260 | -- | X | -- | -- | A | -- | -- |
| | 28 - 30 | SD2-EB16-0280 | -- | -- | -- | -- | A | A | A |
| | 30 - 32 | SD2-EB16-0300 | -- | X | -- | -- | -- | -- | -- |
| | 32 - 34 | SD2-EB16-0320 | 96464647 | -- | X | -- | -- | X | X |
| | 52 - 54 | SD2-EB16-0520 | -- | -- | -- | -- | -- | A | A |
| | 60 - 62 | SD2-EB16-0600 | -- | X | X | -- | A | -- | -- |
| | 62 - 64 | SD2-EB16-0620 | -- | -- | X | -- | A | A | A |
| | 64 - 66 | SD2-EB16-0640 | -- | X | X | -- | A | -- | -- |
| | 66 - 68 | SD2-EB16-0660 | -- | -- | X | -- | A | -- | -- |
| | 68 - 70 | SD2-EB16-0680 | -- | X | X | -- | A | -- | -- |
| | 70 - 72 | SD2-EB16-0700 | -- | -- | X | -- | A | -- | -- |
| | 72 - 74 | SD2-EB16-0720 | 96464648 | X | X | -- | A | X | X |
| | 74 - 76 | SD2-EB16-0740 | -- | -- | X | -- | A | -- | -- |
| | 76 - 78 | SD2-EB16-0760 | -- | X | X | -- | A | -- | -- |
| | 78 - 80 | SD2-EB16-0780 | -- | -- | X | -- | A | -- | -- |
| | 80 - 82 | SD2-EB16-0800 | -- | -- | X | -- | A | -- | -- |
| | 82 - 84 | SD2-EB16-0820 | -- | -- | X | -- | A | -- | -- |
| | 84 - 85 | SD2-EB16-0840 | -- | -- | X | -- | A | -- | -- |

## Table 1-3—Summary of Deep Subsurface Sediment Field and Laboratory Analyses

| Station | Depth Interval (ft bgs) | WESTON Sample Number | EPA Sample Number | Field Analysis[a] | | Laboratory Analysis[b] | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | UV | Immuno-assay | Eng. Param.[c] | PAHs | TOC | Grain Size |
| EB114 | 0 - 3 | SDEB114-0000 | -- | -- | -- | X | -- | -- | -- |
| | 3 - 6 | SDEB114-0030 | -- | -- | -- | X | -- | -- | -- |
| | 8 - 10 | SD2-EB114-0080 | -- | -- | -- | -- | -- | A | A |
| | 12 - 14 | SD2-EB114-0120 | -- | -- | -- | -- | -- | A | A |
| | 20 - 22 | SD2-EB114-0200 | -- | X | -- | -- | A | -- | -- |
| | 22 - 24 | SD2-EB114-0220 | -- | -- | -- | -- | A | -- | -- |
| | 24 - 26 | SD2-EB114-0240 | -- | X | -- | -- | A | -- | -- |
| | 26 - 28 | SD2-EB114-0260 | -- | -- | -- | -- | A | -- | -- |
| | 28 - 30 | SD2-EB114-0280 | -- | X | X | -- | A | -- | -- |
| | 30 - 32 | SD2-EB114-0300 | 96464642 | X | X | -- | A | X | X |
| | 34 - 36 | SD2-EB114-0340 | -- | -- | X | -- | A | -- | -- |
| | 38 - 40 | SD2-EB114-0380 | 96464643 | -- | -- | -- | -- | X | X |
| | 56 - 58 | SD2-EB114-0560 | 96464644 | -- | -- | -- | -- | X | X |
| | 60 - 62 | SD2-EB114-0600 | -- | X | X | -- | A | -- | -- |
| | 62 - 64 | SD2-EB114-0620 | -- | -- | X | -- | A | -- | -- |
| | 64 - 66 | SD2-EB114-0640 | 96464645 | X | X | -- | A | X | X |
| | 66 - 68 | SD2-EB114-0660 | -- | -- | X | -- | A | -- | -- |
| | 68 - 70 | SD2-EB114-0680 | -- | X | -- | -- | A | -- | -- |
| | 70 - 72 | SD2-EB114-0700 | -- | -- | -- | -- | A | -- | -- |
| | 72 - 74 | SD2-EB114-0720 | -- | X | -- | -- | A | -- | -- |
| | 74 - 76 | SD2-EB114-0740 | -- | -- | -- | -- | A | -- | -- |
| | 76 - 78 | SD2-EB114-0760 | -- | X | -- | -- | A | A | A |
| | 80 - 82 | SD2-EB114-0800 | -- | X | -- | -- | A | -- | -- |
| | 82 - 84 | SD2-EB114-0820 | -- | -- | -- | -- | A | -- | -- |
| | 84 - 86 | SD2-EB114-0840 | -- | X | X | -- | A | -- | -- |
| | 86 - 88 | SD2-EB114-0860 | -- | -- | X | -- | A | -- | -- |
| | 88 - 90 | SD2-EB114-0880 | -- | X | X | -- | A | -- | -- |
| | 90 - 92 | SD2-EB114-0900 | -- | -- | X | -- | A | -- | -- |
| | 92 - 94 | SD2-EB114-0920 | 96464646 | X | X | -- | A | X | X |
| | 94 - 96 | SD2-EB114-0940 | -- | -- | X | -- | A | -- | -- |

[a]Analytical methods were discussed in the revised Phase 2 SAP Addendum (WESTON, 1996d).

[b]Analytical methods were specified in the Phase 1 SAP (WESTON, 1996b).

[c] Engineering parameters consisted of Atterburg limits, engineering classification, specific gravity, grain size, percent moisture, triaxial shear (consolidated and unconsolidated), consolidation tests, and unconfined compressive strength.

X: Analyzed.

--: Not analyzed.

A: Archived; not analyzed for the RI.

## Table 1-4—Summary of Clam and Fish Tissue Chemical Analyses

| Sample Number | | Media | Chemical Analysis[a] | | | | |
|---|---|---|---|---|---|---|---|
| Weston ID | EPA ID | | Lipid | PAHs | PCBs[b] | Diox/Fur | Mercury |
| **PSR Marine Sediments Unit** | | | | | | | |
| CTI-EB49-0000 | 96454330 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB60-0000 | 96454332 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB67-0000 | 96454333 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB77-0000 | 96454334 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB80-0000 | 96454335 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB85-0000 | 96454336 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB87-0000 | 96454337 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB104-0000 | 96454338 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-EB106-0000 | 96454339 | Clam Whole Body[c] | X | X | X | X | X |
| FT2-WEST-ES-WB-R2 | 96382503 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-WEST-ES-WB-R4 | 96382504 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-WEST-ES-WB-R5 | 96382505 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-NORTH-ES-WB-R1 | 96382509 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-NORTH-ES-WB-R2 | 96382510 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-NORTH-ES-WB-R3 | 96382511 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-WEST-ES-FT-R1 | 96382500 | Fish Fillet[d] | X | – | X | X | X |
| FT2-WEST-ES-FT-R3 | 96382501 | Fish Fillet[d] | X | – | X | X | X |
| FT2-WEST-ES-FT-R4 | 96382502 | Fish Fillet[d] | X | – | X | X | X |
| FT2-NORTH-ES-FT-R1 | 96382506 | Fish Fillet[d] | X | – | X | X | X |
| FT2-NORTH-ES-FT-R2 | 96382507 | Fish Fillet[d] | X | – | X | X | X |
| FT2-NORTH-ES-FT-R3 | 96382508 | Fish Fillet[d] | X | – | X | X | X |
| **Background Areas** | | | | | | | |
| CTI-BK01-0000 | 96454340 | Clam Whole Body[c] | X | X | X | X | X |
| CTI-BK04-0000 | 96454341 | Clam Whole Body[c] | X | X | X | X | X |
| FT2-ALKI-ES-WB-R1 | 96382521 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-ALKI-ES-WB-R2 | 96382522 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-ALKI-ES-WB-R3 | 96382523 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-MAGL-ES-WB-R1 | 96382515 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-MAGL-ES-WB-R2 | 96382516 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-MAGL-ES-WB-R3 | 96382517 | Fish Whole Body[d] | X | – | X | X | X |
| FT2-ALKI-ES-FT-R1 | 96382518 | Fish Fillet[d] | X | – | X | X | X |
| FT2-ALKI-ES-FT-R2 | 96382519 | Fish Fillet[d] | X | – | X | X | X |
| FT2-ALKI-ES-FT-R3 | 96382520 | Fish Fillet[d] | X | – | X | X | X |
| FT2-MAGL-ES-FT-R1 | 96382512 | Fish Fillet[d] | X | – | X | X | X |
| FT2-MAGL-ES-FT-R2 | 96382513 | Fish Fillet[d] | X | – | X | X | X |
| FT2-MAGL-ES-FT-R3 | 96382514 | Fish Fillet[d] | X | – | X | X | X |

[a]Analytical methods were specified in the Phase 1 SAP (WESTON, 1996b) and Draft Phase 2 SAP Addendum (WESTON, 1996c).

[b]Aroclors only.

[c]*Macoma nasuta* exposed in laboratory to site-collected sediment.

[d]English sole collected from the site.

X: Analyzed.

–: Not analyzed.

Lipid, PAH, PCB, and Mercury analyses performed by EPA Manchester Lab.

Dioxin/Furan analyses performed by Maxim Technologies, Inc.

**Table 3-1—Chemical Composition of Coal Tar Creosote**

| Constituent | Average Coal Tar Creosote[a] | | Average PSR Upland DNAPL[b] | |
|---|---|---|---|---|
| | Concentrations (mg/L) | Relative percent composition | Concentrations (mg/L) | Relative percent composition |
| Trimethylbenzene | 13,000 | 5.9% | not reported | -- |
| Naphthalene | 36,000 | 16.2% | 60,000 | 25.1% |
| 2-Methylnaphthalene | not reported | -- | 18000 | 7.5% |
| Dimethylnaphthalenes | 21,500 | 9.7% | not reported | -- |
| Trimethylnaphthalenes | 17,800 | 8% | not reported | -- |
| Acenaphthylene | 7,400 | 3.3% | not reported | -- |
| Acenaphthene | 7,200 | 3.2% | 22,000 | 9.2% |
| Fluorene | 9,800 | 4.4% | 16,000 | 6.7% |
| Phenanthrene | 23,000 | 10.4% | 53,500 | 22.4% |
| Methylphenanthrenes | 15,000 | 6.8% | not reported | -- |
| Anthracene | 23,000 | 10.4% | 7,000 | 2.9% |
| Fluoranthene | 32,000 | 14.4% | 19,500 | 8.2% |
| Pyrene | 5,600 | 2.5% | 11,500 | 4.8% |
| Benzo[a]Anthracene | 3,100 | 1.4% | 4,200 | 1.8% |
| Chrysene | 3,100 | 1.4% | 2,750 | 1.2% |
| Benzo[b]Fluoranthene | 3,100 | 1.4% | 1,350 | 0.6% |
| Benzo[k]Fluoranthene | 370 | 0.2% | 1200 | 0.5% |
| Benzo[a]Pyrene | 1,000 | 0.4% | 1,130 | 0.5% |
| Dibenz[a,h]Anthracene | not reported | -- | 150 | 0.1% |
| Indeno[1,2,3-cd]Pyrene | < 250 | <0.1% | 310 | 0.1% |
| Benzo[g,h,i]Perylene | < 250 | <0.1% | 310 | 0.1% |
| Dibenzofuran | not reported | -- | 14500 | 6.1% |
| Carbazole | not reported | -- | 2900 | 1.2% |
| Pentachlorophenol | not present | 0% | 1136 | 0.5% |
| Phenol | 0.99 | <0.1% | not reported | -- |
| 2-Methylphenol | 0.33 | <0.1% | 395 | 0.2% |
| 4-Methylphenol | not reported | -- | 525 | 0.2% |
| 2,4-Dimethylphenol | not reported | -- | 625 | 0.3% |

[a] Turney and Goerlitz (1990)

[b] RETEC (1997)

## Table 3-2—Physical-Chemical Properties of Contaminants of Concern

| Constituent | Molecular Weight (g/mole) | $K_{oc}$ (L/kg) | Water Solubility (ug/L) | Vapor Pressure (mm Hg, 20 - 25°C) | Henry's Law Constant (H) atm-$m^3$/mole |
|---|---|---|---|---|---|
| **LPAH** | | | | | |
| Naphthalene | 128 | 2,000 | 31,000.00 | 0.08 | 4.82E-04 |
| 2-Methylnaphthalene | 142 | 1,200 | 26,000.00 | 10 @ 131°C | |
| Acenaphthylene | 152 | 2,500 | 3,930.00 | 0.03 | 1.48E-03 |
| Acenaphthene | 154 | 7,080 | 3,420.00 | 10 @ 131°C | 9.20E-05 |
| Fluorene | 116 | 13,800 | 1,690.00 | 10 @ 146°C | 6.42E-05 |
| Phenanthrene | 178 | 14,000 | 1,000.00 | 1 @ 118°C | 1.59E-04 |
| Anthracene | 178 | 29,500 | 45.00 | 0.00 | 1.02E-03 |
| **HPAH** | | | | | |
| Fluoranthene | 202 | 107,000 | 206.00 | 0.00 | 6.46E-06 |
| Pyrene | 202 | 105,000 | 132.00 | 2.5 @ 200°C | 5.04E-06 |
| Benzo[a]anthracene | 228 | 398,000 | 5.70 | 0.00 | 1.16E-06 |
| Chrysene | 228 | 398,000 | 1.80 | 0.00 | 1.05E-06 |
| Benzo[b]fluoranthene | 252 | 1,230,000 | 14.00 | 0.00 | 1.19E-05 |
| Benzo[k]fluoranthene | 252 | 1,230,000 | 4.30 | 0.00 | 3.94E-05 |
| Benzo[a]pyrene | 252 | 1,020,000 | 1.20 | 0.00 | 1.55E-06 |
| Dibenz[a,h]anthracene | 278 | 3,800,000 | 0.50 | 0.00 | 7.33E-08 |
| Indeno[1,2,3-cd]pyrene | 276 | 3,470,000 | 0.53 | 0.00 | 6.86E-08 |
| Benzo[g,h,i]perylene | 276 | 1,600,000 | 0.70 | 0.00 | 5.34E-08 |
| ***Other Components*** | | | | | |
| Dibenzofuran | 168 | 1,300 | 10,000.00 | | |
| Carbazole | 167 | 3,390 | 7,480.00 | | |
| Pentachlorphenol | 266.5 | 418 | 1,950,000.00 | | |
| 2-Methylphenol | 108 | 91 | 26,000,000.00 | | |
| 4-Methylphenol | 108 | 91 | 24,000,000.00 | | |
| 2,4-Dimethylphenol | 122 | 209 | 7,870,000.00 | | |

**Table 3-3—Calculated Sediment-Water Partition Coefficients for Selected Contaminants**

| Constituent | $K_{oc}$ (L/kg) | $f_{oc}$ | $K_d$ (L/kg) |
|---|---|---|---|
| Naphthalene | 2,000 | 0.02 | 40.00 |
| 2-Methylnaphthalene | 1,200 | 0.02 | 24.00 |
| Acenaphthylene | 2,500 | 0.02 | 50.00 |
| Acenaphthene | 7,080 | 0.02 | 141.60 |
| Fluorene | 13,800 | 0.02 | 276.00 |
| Phenanthrene | 14,000 | 0.02 | 280.00 |
| Anthracene | 29,500 | 0.02 | 590.00 |
| Fluoranthene | 107,000 | 0.02 | 2,140.00 |
| Pyrene | 105,000 | 0.02 | 2,100.00 |
| Benzo[a]anthracene | 398,000 | 0.02 | 7,960.00 |
| Chrysene | 398,000 | 0.02 | 7,960.00 |
| Benzo[b]fluoranthene | 1,230,000 | 0.02 | 24,600.00 |
| Benzo[k]fluoranthene | 1,230,000 | 0.02 | 24,600.00 |
| Benzo[a]pyrene | 1,020,000 | 0.02 | 20,400.00 |
| Dibenz[a,h]anthracene | 3,800,000 | 0.02 | 76,000.00 |
| Indeno[1,2,3-cd]pyrene | 3,470,000 | 0.02 | 69,400.00 |
| Benzo[g,h,i]perylene | 1,600,000 | 0.02 | 32,000.00 |
| Dibenzofuran | 1,300 | 0.02 | 26.00 |
| Carbazole | 3,390 | 0.02 | 67.80 |
| Pentachlorphenol | 418 | 0.02 | 8.36 |
| 2-Methylphenol | 91 | 0.02 | 1.82 |
| 4-Methylphenol | 91 | 0.02 | 1.82 |
| 2,4-Dimethylphenol | 209 | 0.02 | 4.18 |

Assumes sediment TOC = 2%

**Table 3-4—Raoult's Law Calculation of Contaminant Effective Solubilty**

| Constituent | Solubility (ug/L) | Mol Wt (g/mole) | DNAPL Concentration (mg/kg) | DNAPL Mole Fraction | Effective Solubility (ug/L) |
|---|---|---|---|---|---|
| Naphthalene | 31000 | 128 | 60,000 | 0.14063 | 4,359.3750 |
| 2-Methylnaphthalene | 26000 | 142 | 18,000 | 0.03803 | 988.7324 |
| Acenaphthylene | 3930 | 152 | 0 | 0.00000 | 0.0000 |
| Acenaphthene | 3420 | 154 | 22,000 | 0.04286 | 146.5714 |
| Fluorene | 1690 | 116 | 16,000 | 0.04138 | 69.9310 |
| Phenanthrene | 1000 | 178 | 53,500 | 0.09017 | 90.1685 |
| Anthracene | 45 | 178 | 7,000 | 0.01180 | 0.5309 |
| Fluoranthene | 206 | 202 | 19,500 | 0.02896 | 5.9658 |
| Pyrene | 132 | 202 | 11,500 | 0.01708 | 2.2545 |
| Benzo[a]anthracene | 5.7 | 228 | 4,200 | 0.00553 | 0.0315 |
| Chrysene | 1.8 | 228 | 2,750 | 0.00362 | 0.0065 |
| Benzo[b]fluoranthene | 14 | 252 | 1,350 | 0.00161 | 0.0225 |
| Benzo[k]fluoranthene | 4.3 | 252 | 1,200 | 0.00143 | 0.0061 |
| Benzo[a]pyrene | 1.2 | 252 | 1,130 | 0.00135 | 0.0016 |
| Dibenz[a,h]anthracene | 0.5 | 278 | 150 | 0.00016 | 0.0001 |
| Indeno[1,2,3-cd]pyrene | 0.53 | 276 | 310 | 0.00034 | 0.0002 |
| Benzo[g,h,i]perylene | 0.7 | 276 | 310 | 0.00034 | 0.0002 |
| Dibenzofuran | 10000 | 168 | 14,500 | 0.02589 | 258.9286 |
| Carbazole | 7480 | 167 | 2,900 | 0.00521 | 38.9677 |
| Pentachlorphenol | 1950000 | 266.5 | 1,136 | 0.00128 | 2,493.6585 |
| 2-Methylphenol | 26000000 | 108 | 395 | 0.00110 | 28,527.7778 |
| 4-Methylphenol | 24000000 | 108 | 525 | 0.00146 | 35,000.0000 |
| 2,4-Dimethylphenol | 7870000 | 122 | 625 | 0.00154 | 12,095.2869 |

Assumes creosote average molecular weight = 300 grams/mole

## Table 3-5—Sediment Cap Loading Factors

| Zone | Chemical | Distance to Receptor (ft) | No Attenuation | | Attenuation | | Attenuation + Tidal Dilution | | | | | LAET (mg/kg) | 2LAET (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Max Conc at Receptor | Mass Loading (mg/kg/yr) | Max Conc at Receptor | Mass Loading (mg/kg/yr) | Max Conc at Receptor | Mass Loading (mg/kg/yr) | Mass Loading x 10yrs (mg/kg) | Mass Loading x 20yrs (mg/kg) | Mass Loading x 30yrs (mg/kg) | | |
| Shallow | Naphthalene | 55 | 11.5 | 51.20 | 2.587 | 11.52 | 0.0259 | 0.115 | 1.15 | 2.30 | 3.46 | 2.1 | 2.4 |
| | Naphthalene | 145 | 11.5 | 51.20 | 1.547 | 6.92 | 0.0155 | 0.069 | 0.69 | 1.38 | 2.07 | 2.1 | 2.4 |
| | Naphthalene | 55 | 5.5 | 24.59 | 1.237 | 5.53 | 0.0124 | 0.055 | 0.55 | 1.11 | 1.66 | 2.1 | 2.4 |
| | Phenanthrene | 55 | 1.6 | 7.12 | 0.213 | 0.95 | 0.00213 | 0.00948 | 0.095 | 0.19 | 0.28 | 1.5 | 5.4 |
| | Acenaphthene | 55 | 0.13 | 0.58 | 0.029 | 0.13 | 0.00029 | 0.00129 | 0.013 | 0.026 | 0.039 | 0.5 | 0.73 |
| | Fluorene | 55 | 1.9 | 8.46 | 0.406 | 1.81 | 0.00406 | 0.0181 | 0.18 | 0.36 | 0.54 | 0.54 | 1 |
| | Pyrene | 55 | 0.16 | 0.71 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.6 | 3.3 |
| | Anthracene | 55 | 1.29 | 5.74 | 0.177 | 0.79 | 0.00177 | 0.0078803 | 0.079 | 0.16 | 0.24 | 0.96 | 4.4 |
| Intermediate | Naphthalene | 200 | 11.5 | 119.47 | 1.265 | 13.14 | 0.31625 | 3.29 | 32.85 | 65.71 | 98.56 | 2.1 | 2.4 |
| | Naphthalene | 300 | 11.5 | 119.47 | 0.954 | 9.90 | 0.2385 | 2.48 | 24.76 | 49.51 | 74.27 | 2.1 | 2.4 |
| | Naphthalene | 200 | 5.5 | 57.09 | 0.605 | 6.28 | 0.15125 | 1.57 | 15.70 | 31.40 | 47.10 | 2.1 | 2.4 |
| | Naphthalene | 300 | 5.5 | 57.09 | 0.456 | 4.73 | 0.114 | 1.18 | 11.83 | 23.67 | 35.50 | 2.1 | 2.4 |
| | Phenanthrene | 200 | 1.6 | 16.62 | 0.013 | 0.14 | 0.00325 | 0.0338 | 0.338 | 0.675 | 1.013 | 1.5 | 5.4 |
| | Acenaphthene | 200 | 0.13 | 1.35 | 0.014 | 0.15 | 0.0035 | 0.0364 | 0.364 | 0.727 | 1.091 | 0.5 | 0.73 |
| | Acenaphthene | 200 | 0.4 | 4.15 | 0.044 | 0.46 | 0.011 | 0.11 | 1.14 | 2.28 | 3.43 | 0.5 | 0.73 |
| | Acenaphthene | 300 | 0.13 | 1.35 | 0.011 | 0.11 | 0.00275 | 0.03 | 0.29 | 0.57 | 0.86 | 0.5 | 0.73 |
| | Fluorene | 200 | 1.9 | 19.74 | 0.184 | 1.91 | 0.046 | 0.478 | 4.78 | 9.56 | 14.34 | 0.54 | 1 |
| | Fluorene | 200 | 0.22 | 2.28 | 0.021 | 0.22 | 0.00525 | 0.05 | 0.54 | 1.09 | 1.63 | 0.54 | 1 |
| | Fluorene | 300 | 1.9 | 19.72 | 0.039 | 0.40 | 0.00975 | 0.10 | 1.01 | 2.02 | 3.04 | 0.54 | 1 |
| | Fluorene | 300 | 0.22 | 2.28 | 0.005 | 0.05 | 0.00125 | 0.01 | 0.13 | 0.26 | 0.39 | 0.54 | 1 |
| | Pyrene | 200 | 0.16 | 1.66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.6 | 3.3 |
| | Anthracene | 200 | 1.29 | 13.40 | 0.012 | 0.12 | 0.003 | 0.0312 | 0.312 | 0.623 | 0.935 | 0.96 | 4.4 |
| Deep | Naphthalene | 400 | 11.5 | 13.65 | 0.027 | 0.032 | 0.00675 | 0.0080139 | 0.0801 | 0.1603 | 0.2404 | 2.1 | 2.4 |
| | Phenanthrene | 400 | 1.6 | 1.90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 5.4 |
| | Acenaphthene | 400 | 0.13 | 0.15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0.73 |
| | Fluorene | 400 | 1.9 | 2.26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.54 | 1 |
| | Pyrene | 400 | 0.16 | 0.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.6 | 3.3 |
| | Anthracene | 400 | 1.29 | 1.53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.96 | 4.4 |

## Table 4-1—SMS and AET Chemical Screening Criteria for Sediment COCs

| Chemical | Sediment Management Standards[a] | | Apparent Effects Threshold[k] | |
|---|---|---|---|---|
| | SQS[b] | CSL/MCUL[c] | LAET[i] | 2LAET[j] |
| **Organics (ug/kg)** | | | | |
| Acenaphthylene | 66,000[e] | 66,000[e] | 1,300[h] | 1,300[h] |
| Acenaphthene | 16,000[e] | 57,000[e] | 500[h] | 730[h] |
| Anthracene | 220,000[e] | 1,200,000[e] | 960[h] | 4,400[h] |
| Benz(a)anthracene | 110,000[e] | 270,000[e] | 1,300[h] | 1,600[h] |
| Benzo(a)pyrene | 99,000[e] | 210,000[e] | 1,600[h] | 3,000[h] |
| Total Benzofluoranthenes[g] | 230,000[e] | 450,000[e] | 3,200[h] | 3,600[h] |
| Benzo(g,h,i)perylene | 31,000[e] | 78,000[e] | 670[h] | 720[h] |
| Chrysene | 110,000[e] | 460,000[e] | 1,400[h] | 2,800[h] |
| Dibenz(a,h)anthracene | 12,000[e] | 33,000[e] | 230[h] | 540[h] |
| Dibenzofuran | 15,000[e] | 58,000[e] | 540[h] | 700[h] |
| 2,4-Dimethylphenol | 29[h] | 29[h] | 29[h] | 72[h] |
| Fluoranthene | 160,000[e] | 1,200,000[e] | 1,700[h] | 2,500[h] |
| Fluorene | 23,000[e] | 79,000[e] | 540[h] | 1,000[h] |
| Total HPAH | 960,000[e,f] | 5,300,000[e,f] | 12,000[h] | 17,000[h] |
| Indeno(1,2,3-cd)pyrene | 34,000[e] | 88,000[e] | 600[h] | 690[h] |
| Total LPAH | 370,000[d,e] | 780,000[d,e] | 5200[h] | 13,000[h] |
| 2-Methylnaphthalene | 38,000[e] | 64,000[e] | 670[h] | 1,400[h] |
| 2-Methylphenol | 63[h] | 63[h] | 63[h] | 72[h] |
| 4-Methylphenol | 670[h] | 670[h] | 670[h] | 1,800[h] |
| Naphthalene | 99,000[e] | 170,000[e] | 2,100[h] | 2,400[h] |
| Total PCBs[l] | 12,000[e] | 65,000[e] | 130[h] | 1,000[h] |
| Pentachlorophenol | 360[h] | 690[h] | 360[h] | 690[h] |
| Phenanthrene | 100,000[e] | 480,000[e] | 1,500[h] | 5,400[h] |
| Phenol | 420[h] | 1,200[h] | 420[h] | 1,200[h] |
| Pyrene | 1,000,000[e] | 1,400,000[e] | 2,600[h] | 3,300[h] |
| **Inorganics (mg/kg)** | | | | |
| Arsenic | 57[h] | 93[h] | 57[h] | 93[h] |
| Cadmium | 5.1[h] | 6.7[h] | 5.1[h] | 6.7[h] |
| Chromium (total) | 260[h] | 270[h] | 260[h] | 270[h] |
| Copper | 390[h] | 390[h] | 390[h] | 530[h] |
| Lead | 450[h] | 530[h] | 450[h] | 530[h] |

**Table 4-1—SMS and AET Chemical Screening Criteria for Sediment COCs**

| Chemical | Sediment Management Standards[a] | | Apparent Effects Threshold[k] | |
|---|---|---|---|---|
| | SQS[b] | CSL/MCUL[c] | LAET[i] | 2LAET[j] |
| Mercury | 0.41[h] | 0.59[h] | 0.41[h] | 0.59[h] |
| Zinc | 410[h] | 960[h] | 410[h] | 960[h] |

[a]Chapter 173-204 WAC.
[b]Sediment quality standards.
[c]Cleanup screening levels and minimum cleanup levels.
[d]This value represents the sum of the following compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene; the LPAH criterion does not represent the sum of the criteria values for the individual compounds.
[e]Normalized to total organic carbon content.
[f]This value represents the sum of the following compounds: fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3 cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene; the HPAH criterion does not represent the sum of the criteria values for the individual compounds.
[g]Sum of the concentrations of the "b," "j," and "k" isomers.
[h]Dry-weight basis.
[i]Lowest Apparent Effects Threshold.
[j]Second-lowest Apparent Effects Threshold.
[k]Barrick et al., 1988.
[l]This value represents the sum of detected aroclors.

## Table 4-2—Surface Sediment Background Concentrations of 2,3,7,8-TCDD (Equiv.)[a]

| Compound | Concentration | | | | | | |
|---|---|---|---|---|---|---|---|
| | Phase 1 | | | | Phase 2 | | |
| | BK01 | BK01D[b] | BK02 | BK03 | BK01 | BK04 | Average |
| 2,3,7,8-TCDD Eqiv. (ng/kg DW) | 0.619 | 0.518 | 4.029 | 0.184 | 0.290 | 0.670 | 1.052 |
| 2,3,7,8-TCDD Eqiv. (ng/kg TOCN) | 82.5 | 55.10 | 366.30 | NA | 12.1 | 95.7 | 122.34 |

[a]Methods used for deriving and summing 2,3,7,8-TCDD equivalents are described in **Appendix F**.

[b]Field replicate at Station BK01.

DW: Dry-weight.

TOCN: Normalized to total organic carbon (TOC) content.

NA: Normalization not appropriate; TOC content less than 0.5 percent.

## Table 5-1—Summary Statistics for Surface Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[b] | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[c] | CSL/2LAET[c] | SQS/LAET | CSL/2LAET | |
| **PAHs (ug/kg)** | | | | | | | | | | | | | | |
| Naphthalene | 106 | 104 | 98 | 38 | 85,700 | EB09 | 3,324 | 2,818,182 | EB05 | 59 | 38 | 56 | 36 | 3.55 |
| Acenaphthylene | 106 | 106 | 100 | 10 | 8,380 | EB13 | 676 | 82,174 | EB27 | 4 | 4 | 4 | 4 | 1.18 |
| Acenaphthene | 106 | 105 | 99 | 20 | 397,000 | EB13 | 1,448 | 766,234 | EB05 | 83 | 46 | 78 | 43 | 3.81 |
| Fluorene | 106 | 106 | 100 | 21 | 218,000 | EB13 | 2,133 | 760,000 | EB19 | 74 | 36 | 70 | 34 | 3.04 |
| Phenanthrene | 106 | 106 | 100 | 96 | 549,000 | EB13 | 9,857 | 3,468,750 | EB02 | 64 | 17 | 60 | 16 | 2.49 |
| Anthracene | 106 | 106 | 100 | 42 | 1,750,000 | EB13 | 4,552 | 1,900,000 | EB02 | 17 | 5 | 16 | 5 | 1.39 |
| Total LPAH | 106 | 106 | 100 | 248 | 2,948,080 | EB13 | 21,990 | 6,988,052 | EB05 | 59 | 36 | 56 | 34 | 2.74 |
| Fluoranthene | 106 | 106 | 100 | 164 | 2,060,000 | EB13 | 19,095 | 8,695,652 | EB27 | 57 | 13 | 54 | 12 | 2.99 |
| Pyrene | 106 | 106 | 100 | 187 | 1,140,000 | EB13 | 16,048 | 6,956,522 | EB27 | 17 | 14 | 16 | 13 | 2.59 |
| Benzo(a)anthracene | 106 | 106 | 100 | 61 | 382,000 | EB13 | 11,714 | 1,891,304 | EB27 | 26 | 12 | 25 | 11 | 2.56 |
| Chrysene | 106 | 106 | 100 | 100 | 526,000 | EB13 | 16,238 | 1,860,870 | EB27 | 44 | 10 | 42 | 9 | 2.24 |
| Total Benzofluoranthenes | 106 | 106 | 100 | 177 | 302,900 | EB13 | 27,333 | 1,743,478 | EB27 | 32 | 16 | 30 | 15 | 1.56 |
| Benzo(a)pyrene | 106 | 106 | 100 | 84 | 114,000 | EB13 | 12,857 | 726,087 | EB27 | 29 | 11 | 27 | 10 | 1.62 |
| Indeno(1,2,3-cd)pyrene | 106 | 106 | 100 | 45 | 34,400 | EB13 | 6,190 | 215,652 | EB27 | 41 | 9 | 39 | 8 | 1.50 |
| Dibenz(a,h)anthracene | 106 | 99 | 93 | 4.2 | 10,700 | EB13 | 1,029 | 79,130 | EB27 | 30 | 7 | 28 | 7 | 1.49 |
| Benzo(g,h,i)perylene | 106 | 106 | 100 | 46 | 26,600 | EB13 | 5,238 | 177,826 | EB27 | 41 | 7 | 39 | 7 | 1.61 |
| Total HPAH | 106 | 106 | 100 | 869 | 4,596,600 | EB13 | 117,257 | 22,346,522 | EB27 | 48 | 11 | 45 | 10 | 2.03 |
| 2-Methylnaphthalene | 106 | 105 | 99 | 16 | 26,000 | EB13 | 1,119 | 646,753 | EB05 | 42 | 31 | 40 | 29 | 2.26 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 44 | 26 | 59 | 21 | 1,310 | EB09 | -- | -- | -- | 23 | 23 | 52 | 52 | |
| 2-Methylphenol | 44 | 31 | 70 | 7.2 | 601 | EB09 | -- | -- | -- | 6 | 6 | 14 | 14 | |
| 4-Methylphenol | 44 | 43 | 98 | 17 | 6,770 | EB02 | -- | -- | -- | 4 | 4 | 9 | 9 | |
| Pentachlorophenol | 44 | 8 | 18 | 158 | 380 | EB24 | -- | -- | -- | 1 | 0 | 2 | 0 | |
| Phenol | 44 | 30 | 68 | 22 | 3,980 | EB02 | -- | -- | -- | 3 | 1 | 7 | 2 | |
| Dibenzofuran | 67 | 67 | 100 | 40 | 62,800 | EB13 | 1,895 | 800,000 | EB19 | 54 | 29 | 81 | 43 | 3.53 |
| 2-Chloronaphthalene | 51 | 0 | 0 | <3.5 | <149 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 51 | 46 | 90 | 13 | 3,090 | EB87 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 28 | 28 | 100 | 31 | 4,570 | EB87 | -- | -- | -- | -- | -- | -- | -- | -- |
| Retene | 28 | 28 | 100 | 115 | 635 | EB87 | -- | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | | |
| Total PCBs | 42 | 42 | 100 | 24 | 1,340 | EB06 | 3,923 | 78,182 | EB08 | 25 | 2 | 60 | 5 | 1.14 |
| **DIOXINS/FURANS (ng/kg)** | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD (Equiv.) | 38 | 38 | 100 | 1.97 | 156 | EB26 | 102 | 11,819 | EB05 | -- | -- | -- | -- | -- |

## Table 5-1—Summary Statistics for Surface Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[b] | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[c] | CSL/2LAET[c] | SQS/LAET | CSL/2LAET | |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | | |
| Arsenic | 44 | 39 | 89 | 4.7 | 24 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Cadmium | 44 | 37 | 84 | 0.38 | 2.7 | EB08 | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Chromium | 44 | 44 | 100 | 9.2 | 251 | EB09 | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Copper | 44 | 44 | 100 | 12 | 410 | EB01 | -- | -- | -- | 1 | 1 | 2 | 2 | 1.05 |
| Lead | 44 | 44 | 100 | 6.7 | 192 | EB09 | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Mercury | 53 | 53 | 100 | 0.02 | 4.2 | EB12 | -- | -- | -- | 19 | 11 | 36 | 21 | 1.98 |
| Zinc | 44 | 44 | 100 | 35 | 639 | EB27 | -- | -- | -- | 3 | 0 | 7 | 0 | -- |

--: Not applicable.

<: Not detected at dry-weight detection limit shown.

[a]Average ERs calculated using only those individual ERs >1.0 and excluding stations EB09 and EB13; these two stations were consistently characterized by chemical concentrations orders of magnitude above 2LAET screening values, which substantially skewed the average values and effectively masked any apparent differences or trends in contaminant distribution.

[b]Frequencies based on total number of stations analyzed.

[c]The nonionic/nonpolar organic chemical data for the following stations were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see also Appendix F): EB04, EB09, EB13, EB28, EB34, EB37, EB94.

## Table 5-2—Summary Statistics for Shallow Subsurface (0 to 20 feet bgs) Sediment COCs

| Constituent | # of Core Intervals Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Core Intervals Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[b] | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[c] | CSL/2LAET[c] | SQS/LAET. | CSL/2LAET | |
| **PAHs (ug/kg)** | | | | | | | | | | | | | | |
| Naphthalene | 65 | 56 | 86 | 4.0 | 3,310,000 | EB13-0000A | 588 | 91,142,857 | EB27-0080 | 29 | 26 | 45 | 40 | 98.23 |
| Acenaphthylene | 65 | 39 | 60 | 1.4 | 33,800 | EB27-0080 | 240 | 965,714 | EB27-0080 | 9 | 9 | 14 | 14 | 4.20 |
| Acenaphthene | 65 | 54 | 83 | 2.1 | 1,490,000 | EB27-0080 | 339 | 42,571,429 | EB27-0080 | 36 | 30 | 55 | 46 | 131.79 |
| Fluorene | 65 | 51 | 78 | 5.0 | 1,490,000 | EB27-0080 | 806 | 42,571,429 | EB27-0080 | 34 | 29 | 52 | 45 | 80.15 |
| Phenanthrene | 65 | 60 | 92 | 4.2 | 3,750,000 | EB27-0080 | 1,069 | 107,142,857 | EB27-0080 | 32 | 21 | 49 | 32 | 61.89 |
| Anthracene | 65 | 61 | 94 | 1.2 | 1,950,000 | EB13-0000A | 271 | 11,600,000 | EB27-0080 | 18 | 11 | 28 | 17 | 59.05 |
| Total LPAH | 65 | 63 | 97 | 1.2 | 10,359,800 | EB27-0080 | 291 | 295,994,286 | EB27-0080 | 32 | 25 | 49 | 38 | 73.11 |
| Fluoranthene | 65 | 57 | 88 | 7.8 | 1,530,000 | EB27-0080 | 1,300 | 43,714,286 | EB27-0080 | 28 | 18 | 43 | 28 | 56.49 |
| Pyrene | 65 | 62 | 95 | 4.0 | 933,000 | EB27-0080 | 909 | 26,657,143 | EB27-0080 | 19 | 16 | 29 | 25 | 27.95 |
| Benzo(a)anthracene | 65 | 45 | 69 | 4.7 | 221,000 | EB27-0080 | 1,784 | 6,314,286 | EB27-0080 | 20 | 16 | 31 | 25 | 16.04 |
| Chrysene | 65 | 49 | 75 | 2.6 | 201,000 | EB27-0080 | 371 | 5,742,857 | EB27-0080 | 21 | 14 | 32 | 22 | 10.69 |
| Total Benzofluoranthenes | 65 | 51 | 78 | 3.6 | 147,900 | EB27-0080 | 1,055 | 4,225,714 | EB27-0080 | 19 | 14 | 29 | 22 | 5.32 |
| Benzo(a)pyrene | 65 | 40 | 62 | 6.1 | 61,700 | EB27-0080 | 813 | 1,762,857 | EB27-0080 | 20 | 13 | 31 | 20 | 3.36 |
| Indeno(1,2,3-cd)pyrene | 65 | 43 | 66 | 2.7 | 17,700 | EB27-0080 | 397 | 505,714 | EB27-0080 | 20 | 7 | 31 | 11 | 5.38 |
| Dibenz(a,h)anthracene | 65 | 34 | 52 | 1.7 | 6,210 | EB27-0080 | 304 | 177,429 | EB27-0080 | 18 | 8 | 28 | 12 | 3.22 |
| Benzo(g,h,i)perylene | 65 | 42 | 65 | 2.9 | 14,400 | EB27-0080 | 426 | 411,429 | EB27-0080 | 20 | 8 | 31 | 12 | 3.70 |
| Total HPAH | 65 | 62 | 95 | 4.0 | 3,132,910 | EB27-0080 | 909 | 89,511,714 | EB27-0080 | 26 | 15 | 40 | 23 | 20.60 |
| 2-Methylnaphthalene | 65 | 61 | 94 | 1.2 | 1,570,000 | EB27-0080 | 200 | 44,857,143 | EB27-0080 | 28 | 25 | 43 | 38 | 75.81 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 10 | 2 | 20 | 316 | 3,680 | EB13-0000A | -- | -- | -- | 2 | 2 | 20 | 20 | 68.89 |
| 2-Methylphenol | 10 | 0 | 0 | <9.1 | <335 | -- | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| 4-Methylphenol | 10 | 3 | 30 | 107 | 2,060 | EB13-0000A | -- | -- | -- | 1 | 1 | 10 | 10 | 3.07 |
| Pentachlorophenol | 10 | 0 | 0 | <18 | <670 | -- | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Phenol | 10 | 0 | 0 | <9.1 | <335 | -- | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Dibenzofuran | 10 | 8 | 80 | 27 | 612,000 | EB13-0000A | 15,778 | 3,013,158 | EB13-0080 | 6 | 5 | 60 | 50 | 198.13 |
| 2-Chloronaphthalene | 49 | 1 | 2 | 10,600 | 10,600 | EB72-0000A | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 49 | 30 | 61 | 0.003 | 95,400 | EB27-0080 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 59 | 57 | 97 | 1.2 | 897,000 | EB27-0080 | -- | -- | -- | -- | -- | -- | -- | -- |
| Retene | 49 | 49 | 100 | 12 | 83,300 | EB113-0040 | -- | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | | |
| Total PCBs | 10 | 1 | 10 | 291 | 291 | EB13-0000A | -- | -- | -- | 1 | 0 | 10 | 0 | -- |

## Table 5-2—Summary Statistics for Shallow Subsurface (0 to 20 feet bgs) Sediment COCs

| Constituent | # of Core Intervals Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Core Intervals Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[b] | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[c] | CSL/2LAET[c] | SQS/LAET | CSL/2LAET | |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | | |
| Arsenic | 10 | 7 | 70 | 4.5 | 11.0 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Cadmium | 10 | 2 | 20 | 0.34 | 1.6 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Chromium | 10 | 10 | 100 | 10 | 67 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Copper | 10 | 10 | 100 | 7.6 | 62 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Lead | 10 | 10 | 100 | 3.0 | 102.0 | EB41-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Mercury | 10 | 9 | 90 | 0.023 | 0.71 | EB13-0000A | -- | -- | -- | 1 | 1 | 10 | 10 | 1.20 |
| Nickel | 10 | 10 | 100 | 8.8 | 26 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |
| Zinc | 10 | 10 | 100 | 20 | 252 | EB13-0000A | -- | -- | -- | 0 | 0 | 0 | 0 | -- |

--: Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

<: Not detected at dry-weight detection limit shown.

[a]Average ERs calculated using only those individual ERs >1.0.

[b]Frequencies based on total number of stations analyzed.

[c]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see **Table F-1** in **Appendix F** for sample list).

## Table 5-3—Summary Statistics for Shallow Subsurface (0 to 4 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **PAHs (ug/kg)** | | | | | | | | | | | | | |
| Naphthalene | 17 | 17 | 100 | 43 | 3,310,000 | EB13 | 6,358 | 5,666,667 | EB32 | 15 | 13 | 88 | 76 |
| Acenaphthylene | 17 | 16 | 94 | 3.5 | 14,100 | EB13 | 522 | 80,000 | EB32 | 3 | 3 | 18 | 18 |
| Acenaphthene | 17 | 17 | 100 | 16 | 833,000 | EB113 | 2,388 | 5,541,667 | EB32 | 16 | 13 | 94 | 76 |
| Fluorene | 17 | 17 | 100 | 30 | 821,000 | EB13 | 4,463 | 6,625,000 | EB32 | 15 | 12 | 88 | 71 |
| Phenanthrene | 17 | 17 | 100 | 150 | 2,290,000 | EB13 | 22,388 | 16,833,333 | EB32 | 14 | 9 | 82 | 53 |
| Anthracene | 17 | 17 | 100 | 144 | 1,950,000 | EB13 | 21,493 | 1,645,833 | EB32 | 7 | 4 | 41 | 24 |
| Total LPAH | 17 | 17 | 100 | 386 | 9,166,100 | EB13 | 57,612 | 36,392,500 | EB32 | 14 | 12 | 82 | 71 |
| Fluoranthene | 17 | 17 | 100 | 404 | 972,000 | EB113 | 60,299 | 9,625,000 | EB32 | 13 | 7 | 76 | 41 |
| Pyrene | 17 | 17 | 100 | 320 | 547,000 | EB13 | 47,761 | 5,375,000 | EB32 | 8 | 8 | 47 | 47 |
| Benzo(a)anthracene | 17 | 17 | 100 | 185 | 174,000 | EB13 | 26,000 | 1,270,833 | EB32 | 9 | 7 | 53 | 41 |
| Chrysene | 17 | 17 | 100 | 406 | 172,000 | EB13 | 34,100 | 1,175,000 | EB32 | 9 | 6 | 53 | 35 |
| Total Benzofluoranthenes | 17 | 17 | 100 | 125 | 104,400 | EB13 | 18,582 | 1,399,231 | EB66 | 10 | 7 | 59 | 41 |
| Benzo(a)pyrene | 17 | 17 | 100 | 48 | 40,600 | EB13 | 7,104 | 674,615 | EB66 | 9 | 7 | 53 | 41 |
| Indeno(1,2,3-cd)pyrene | 17 | 17 | 100 | 16 | 14,600 | EB13 | 2,388 | 206,923 | EB66 | 10 | 5 | 59 | 29 |
| Dibenz(a,h)anthracene | 17 | 17 | 100 | 5.8 | 5,800 | EB13 | 866 | 106,154 | EB66 | 9 | 5 | 53 | 29 |
| Benzo(g,h,i)perylene | 17 | 17 | 100 | 13 | 9,040 | EB13 | 1,896 | 193,846 | EB66 | 10 | 4 | 59 | 24 |
| Total HPAH | 17 | 17 | 100 | 1,570 | 2,001,440 | EB13 | 234,269 | 18,992,917 | EB32 | 14 | 7 | 82 | 41 |
| 2-Methylnaphthalene | 17 | 17 | 100 | 6.8 | 890,000 | EB13 | 1,015 | 2,560,000 | EB27 | 14 | 12 | 82 | 71 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2 | 1 | 50 | 3,680 | 3,680 | EB13 | -- | -- | -- | 1 | 1 | 50 | 50 |
| 2-Methylphenol | 2 | 0 | 0 | <57 | <335 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 2 | 2 | 100 | 107 | 2,060 | EB13 | -- | -- | -- | 1 | 1 | 50 | 50 |
| Pentachlorophenol | 2 | 0 | 0 | <113 | <670 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Phenol | 2 | 0 | 0 | <57 | <335 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenzofuran | 2 | 2 | 100 | 13,900 | 612,000 | EB13 | 926,667 | 926,667 | EB41 | 2 | 2 | 100 | 100 |
| 2-Chloronaphthalene | 15 | 1 | 7 | 10,600 | 10,600 | EB72 | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 15 | 14 | 93 | 2.6 | 56,000 | EB113 | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 17 | 17 | 100 | 12 | 470,000 | EB13 | -- | -- | -- | -- | -- | -- | -- |
| Retene | 15 | 15 | 100 | 55 | 3,440 | EB113 | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | |
| Total PCBs | 2 | 1 | 50 | 291 | 291 | EB13 | -- | -- | -- | 1 | 0 | 50 | 0 |

## Table 5-3—Summary Statistics for Shallow Subsurface (0 to 4 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | |
| Arsenic | 2 | 2 | 100 | 4.5 | 11 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Cadmium | 2 | 2 | 100 | 0.34 | 1.6 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Chromium | 2 | 2 | 100 | 24 | 67 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Copper | 2 | 2 | 100 | 36 | 62 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Lead | 2 | 2 | 100 | 81 | 102 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Mercury | 2 | 2 | 100 | 0.30 | 0.71 | EB13 | -- | -- | -- | 1 | 1 | 50 | 50 |
| Nickel | 2 | 2 | 100 | 21 | 26 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Zinc | 2 | 2 | 100 | 62 | 252 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |

--: Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

<: Not detected at dry-weight detection limit shown.

[a]Frequencies based on total number of stations analyzed.

[b]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see Table F-1 in Appendix F for sample list).

## Table 5-4—Summary Statistics for Shallow Subsurface (4 to 8 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **PAHs (ug/kg)** | | | | | | | | | | | | | |
| Naphthalene | 17 | 16 | 94 | 10 | 326,000 | EB27 | 1,467 | 10,181,818 | EB13 | 8 | 7 | 47 | 41 |
| Acenaphthylene | 17 | 13 | 76 | 1.4 | 2,160 | EB113 | 240 | 69,091 | EB13 | 2 | 2 | 12 | 12 |
| Acenaphthene | 17 | 15 | 88 | 2.1 | 208,000 | EB27 | 347 | 6,303,030 | EB27 | 10 | 9 | 59 | 53 |
| Fluorene | 17 | 13 | 76 | 9.5 | 210,000 | EB27 | 1,080 | 6,363,636 | EB27 | 10 | 9 | 59 | 53 |
| Phenanthrene | 17 | 15 | 88 | 17 | 492,000 | EB27 | 2,240 | 14,909,091 | EB27 | 9 | 7 | 53 | 41 |
| Anthracene | 17 | 16 | 94 | 2.6 | 143,000 | EB113 | 800 | 2,095,238 | EB66 | 7 | 4 | 41 | 24 |
| Total LPAH | 17 | 16 | 94 | 22 | 1,287,720 | EB27 | 5,173 | 39,021,818 | EB27 | 9 | 7 | 53 | 41 |
| Fluoranthene | 17 | 16 | 94 | 7.8 | 311,000 | EB113 | 2,909 | 7,253,968 | EB66 | 8 | 6 | 47 | 35 |
| Pyrene | 17 | 17 | 100 | 8.3 | 171,000 | EB113 | 3,418 | 5,253,968 | EB66 | 7 | 5 | 41 | 29 |
| Benzo(a)anthracene | 17 | 13 | 76 | 14 | 34,600 | EB113 | 1,784 | 1,761,905 | EB66 | 7 | 6 | 41 | 35 |
| Chrysene | 17 | 14 | 82 | 6.6 | 40,100 | EB113 | 880 | 3,333,333 | EB66 | 8 | 5 | 47 | 29 |
| Total Benzofluoranthenes | 17 | 16 | 94 | 4.6 | 20,440 | EB27 | 1,055 | 1,028,571 | EB66 | 6 | 4 | 35 | 24 |
| Benzo(a)pyrene | 17 | 11 | 65 | 6.1 | 9,140 | EB27 | 813 | 422,222 | EB66 | 8 | 3 | 47 | 18 |
| Indeno(1,2,3-cd)pyrene | 17 | 12 | 71 | 3.1 | 2,730 | EB27 | 413 | 86,032 | EB66 | 5 | 2 | 29 | 12 |
| Dibenz(a,h)anthracene | 17 | 9 | 53 | 1.7 | 948 | EB27 | 304 | 35,873 | EB66 | 6 | 1 | 35 | 6 |
| Benzo(g,h,i)perylene | 17 | 11 | 65 | 3.8 | 2,200 | EB27 | 507 | 80,476 | EB66 | 6 | 2 | 35 | 12 |
| Total HPAH | 17 | 17 | 100 | 8.3 | 584,321 | EB113 | 7,382 | 19,256,349 | EB66 | 8 | 5 | 47 | 29 |
| 2-Methylnaphthalene | 17 | 17 | 100 | 1.2 | 196,000 | EB27 | 627 | 5,939,394 | EB27 | 8 | 7 | 47 | 41 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2 | 1 | 50 | 316 | 316 | EB13 | -- | -- | -- | 1 | 1 | 50 | 50 |
| 2-Methylphenol | 2 | 0 | 0 | <18 | <48 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 2 | 1 | 50 | 108 | 108 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Pentachlorophenol | 2 | 0 | 0 | <36 | <241 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Phenol | 2 | 0 | 0 | <18 | <48 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenzofuran | 2 | 2 | 100 | 407 | 28,900 | EB13 | 2,627,273 | 2,627,273 | EB13 | 2 | 2 | 100 | 100 |
| 2-Chloronaphthalene | 15 | 0 | 0 | <4.1 | <339 | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 15 | 8 | 53 | 19 | 15,200 | EB113 | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 17 | 17 | 100 | 1.2 | 118,000 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| Retene | 15 | 15 | 100 | 12 | 83,300 | EB113 | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | |
| Total PCBs | 2 | 0 | 0 | <6.0 | <6.5 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |

## Table 5-4—Summary Statistics for Shallow Subsurface (4 to 8 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| INORGANICS (mg/kg) | | | | | | | | | | | | | |
| Arsenic | 2 | 1 | 50 | 5.3 | 5.3 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Cadmium | 2 | 0 | 0 | <0.15 | <0.15 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Chromium | 2 | 2 | 100 | 15 | 16 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Copper | 2 | 2 | 100 | 9.2 | 16 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Lead | 2 | 2 | 100 | 3.5 | 11 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Mercury | 2 | 2 | 100 | 0.03 | 0.24 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Nickel | 2 | 2 | 100 | 9.0 | 13 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Zinc | 2 | 2 | 100 | 22 | 34 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |

--: Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

<: Not detected at dry-weight detection limit shown.

[a]Frequencies based on total number of stations analyzed.

[b]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see **Table F-1** in **Appendix F** for sample list).

## Table 5-5—Summary Statistics for Shallow Subsurface (8 to 12 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **PAHs (ug/kg)** | | | | | | | | | | | | | |
| Naphthalene | 13 | 11 | 85 | 4.0 | 3,190,000 | EB27 | 588 | 91,142,857 | EB27 | 4 | 4 | 31 | 31 |
| Acenaphthylene | 13 | 7 | 54 | 4.2 | 33,800 | EB27 | 677 | 965,714 | EB27 | 2 | 2 | 15 | 15 |
| Acenaphthene | 13 | 10 | 77 | 2.1 | 1,490,000 | EB27 | 339 | 42,571,429 | EB27 | 6 | 5 | 46 | 38 |
| Fluorene | 13 | 10 | 77 | 5.0 | 1,490,000 | EB27 | 806 | 42,571,429 | EB27 | 6 | 5 | 46 | 38 |
| Phenanthrene | 13 | 12 | 92 | 12 | 3,750,000 | EB27 | 1,750 | 107,142,857 | EB27 | 6 | 3 | 46 | 23 |
| Anthracene | 13 | 13 | 100 | 1.5 | 406,000 | EB27 | 291 | 11,600,000 | EB27 | 3 | 2 | 23 | 15 |
| Total LPAH | 13 | 13 | 100 | 1.6 | 10,359,800 | EB27 | 291 | 295,994,286 | EB27 | 6 | 4 | 46 | 31 |
| Fluoranthene | 13 | 12 | 92 | 12 | 1,530,000 | EB27 | 1,824 | 43,714,286 | EB27 | 4 | 4 | 31 | 31 |
| Pyrene | 13 | 13 | 100 | 5.0 | 933,000 | EB27 | 909 | 26,657,143 | EB27 | 3 | 2 | 23 | 15 |
| Benzo(a)anthracene | 13 | 9 | 69 | 4.7 | 221,000 | EB27 | 2,661 | 6,314,286 | EB27 | 3 | 2 | 23 | 15 |
| Chrysene | 13 | 9 | 69 | 4.0 | 201,000 | EB27 | 588 | 5,742,857 | EB27 | 3 | 2 | 23 | 15 |
| Total Benzofluoranthenes | 13 | 9 | 69 | 20 | 147,900 | EB27 | 4,339 | 4,225,714 | EB27 | 2 | 2 | 15 | 15 |
| Benzo(a)pyrene | 13 | 8 | 62 | 15 | 61,700 | EB27 | 2,484 | 1,762,857 | EB27 | 2 | 2 | 15 | 15 |
| Indeno(1,2,3-cd)pyrene | 13 | 9 | 69 | 2.7 | 17,700 | EB27 | 397 | 505,714 | EB27 | 2 | 2 | 15 | 15 |
| Dibenz(a,h)anthracene | 13 | 6 | 46 | 2.8 | 6,210 | EB27 | 500 | 177,429 | EB27 | 2 | 2 | 15 | 15 |
| Benzo(g,h,i)perylene | 13 | 9 | 69 | 2.9 | 14,400 | EB27 | 426 | 411,429 | EB27 | 2 | 1 | 15 | 8 |
| Total HPAH | 13 | 13 | 100 | 5.0 | 3,132,910 | EB27 | 909 | 89,511,714 | EB27 | 3 | 2 | 23 | 15 |
| 2-Methylnaphthalene | 13 | 13 | 100 | 1.8 | 1,570,000 | EB27 | 418 | 44,857,143 | EB27 | 4 | 4 | 31 | 31 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2 | 0 | 0 | <9.1 | <54 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 2-Methylphenol | 2 | 0 | 0 | <9.1 | <54 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 2 | 0 | 0 | <9.1 | <54 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Pentachlorophenol | 2 | 0 | 0 | <18 | <109 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Phenol | 2 | 0 | 0 | <9.1 | <54 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenzofuran | 2 | 2 | 100 | 27 | 22,900 | EB13 | 3,013,158 | 91,142,857 | EB13 | 1 | 1 | 50 | 50 |
| 2-Chloronaphthalene | 9 | 0 | 0 | <5.2 | <263 | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 9 | 5 | 56 | 26 | 95,400 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 11 | 11 | 100 | 1.6 | 897,000 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| Retene | 9 | 9 | 100 | 26 | 5,380 | EB12 | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | |
| Total PCBs | 2 | 0 | 0 | <6.0 | <9.0 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |

## Table 5-5—Summary Statistics for Shallow Subsurface (8 to 12 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | |
| Arsenic | 2 | 1 | 50 | 5.3 | 5.3 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Cadmium | 2 | 0 | 0 | <0.15 | <0.15 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Chromium | 2 | 2 | 100 | 10 | 19 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Copper | 2 | 2 | 100 | 7.6 | 17 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Lead | 2 | 2 | 100 | 4.9 | 5.5 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Mercury | 2 | 1 | 50 | 0.03 | 0.03 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Nickel | 2 | 2 | 100 | 8.8 | 13 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Zinc | 2 | 2 | 100 | 20 | 31 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |

--: Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

<: Not detected at dry-weight detection limit shown.

[a]Frequencies based on total number of stations analyzed.

[b]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see Table F-1 in Appendix F for sample list).

## Table 5-6—Summary Statistics for Shallow Subsurface (12 to 16 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **PAHs (ug/kg)** | | | | | | | | | | | | | |
| Naphthalene | 10 | 7 | 70 | 6.7 | 79,800 | EB27 | 933 | 8,142,857 | EB27 | 2 | 2 | 20 | 20 |
| Acenaphthylene | 10 | 2 | 20 | 24 | 825 | EB27 | 4,286 | 84,184 | EB27 | 1 | 1 | 10 | 10 |
| Acenaphthene | 10 | 6 | 60 | 6.5 | 41,000 | EB27 | 1,032 | 4,183,673 | EB27 | 2 | 2 | 20 | 20 |
| Fluorene | 10 | 6 | 60 | 7.4 | 40,500 | EB27 | 1,190 | 4,132,653 | EB27 | 2 | 2 | 20 | 20 |
| Phenanthrene | 10 | 9 | 90 | 7.7 | 97,100 | EB27 | 1,069 | 9,908,163 | EB27 | 2 | 2 | 20 | 20 |
| Anthracene | 10 | 8 | 80 | 1.9 | 13,500 | EB27 | 271 | 1,377,551 | EB27 | 1 | 1 | 10 | 10 |
| Total LPAH | 10 | 9 | 90 | 7.7 | 272,725 | EB27 | 1,069 | 27,829,082 | EB27 | 2 | 2 | 20 | 20 |
| Fluoranthene | 10 | 8 | 80 | 9.1 | 53,100 | EB27 | 1,300 | 5,418,367 | EB27 | 2 | 1 | 20 | 10 |
| Pyrene | 10 | 9 | 90 | 4.2 | 32,300 | EB27 | 1,186 | 3,295,918 | EB27 | 1 | 1 | 10 | 10 |
| Benzo(a)anthracene | 10 | 4 | 40 | 4.9 | 8,690 | EB27 | 9,492 | 886,735 | EB27 | 1 | 1 | 10 | 10 |
| Chrysene | 10 | 7 | 70 | 2.6 | 8,460 | EB27 | 371 | 863,265 | EB27 | 1 | 1 | 10 | 10 |
| Total Benzofluoranthenes | 10 | 6 | 60 | 8.8 | 5,630 | EB27 | 1,467 | 574,490 | EB27 | 1 | 1 | 10 | 10 |
| Benzo(a)pyrene | 10 | 3 | 30 | 31 | 2,350 | EB27 | 4,873 | 239,796 | EB27 | 1 | 1 | 10 | 10 |
| Indeno(1,2,3-cd)pyrene | 10 | 4 | 40 | 2.9 | 723 | EB27 | 483 | 73,776 | EB27 | 1 | 0 | 10 | 0 |
| Dibenz(a,h)anthracene | 10 | 1 | 10 | 225 | 225 | EB27 | 22,959 | 22,959 | EB27 | 1 | 0 | 10 | 0 |
| Benzo(g,h,i)perylene | 10 | 4 | 40 | 3.0 | 571 | EB27 | 500 | 58,265 | EB27 | 1 | 0 | 10 | 0 |
| Total HPAH | 10 | 9 | 90 | 4.2 | 112,049 | EB27 | 2,857 | 11,433,571 | EB27 | 1 | 1 | 10 | 10 |
| 2-Methylnaphthalene | 10 | 8 | 80 | 1.4 | 36,200 | EB27 | 200 | 3,693,878 | EB27 | 2 | 2 | 20 | 20 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2 | 0 | 0 | <11 | <19 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 2-Methylphenol | 2 | 0 | 0 | <11 | <19 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 2 | 0 | 0 | <11 | <19 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Pentachlorophenol | 2 | 0 | 0 | <23 | <38 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Phenol | 2 | 0 | 0 | <11 | <19 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenzofuran | 2 | 1 | 50 | 1,030 | 1,030 | EB13 | 183,929 | 183,929 | EB13 | 1 | 1 | 50 | 50 |
| 2-Chloronaphthalene | 6 | 0 | 0 | <4.6 | <21 | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 6 | 2 | 33 | 0.003 | 2,690 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 8 | 7 | 88 | 1.4 | 21,400 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| Retene | 6 | 6 | 100 | 20 | 265 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | |
| Total PCBs | 2 | 0 | 0 | <4.8 | <11.5 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |

## Table 5-6—Summary Statistics for Shallow Subsurface (12 to 16 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | |
| Arsenic | 2 | 2 | 100 | 5.2 | 6.3 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Cadmium | 2 | 0 | 0 | <0.15 | <0.15 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Chromium | 2 | 2 | 100 | 16 | 21 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Copper | 2 | 2 | 100 | 17 | 18 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Lead | 2 | 2 | 100 | 4.9 | 5.9 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Mercury | 2 | 2 | 100 | 0.03 | 0.04 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Nickel | 2 | 2 | 100 | 13 | 13 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Zinc | 2 | 2 | 100 | 32 | 33 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |

-- Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

< Not detected at dry-weight detection limit shown.

[a]Frequencies based on total number of stations analyzed.

[b]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see Table F-1 in Appendix F for sample list).

## Table 5-7—Summary Statistics for Shallow Subsurface (16 to 20 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **PAHs (ug/kg)** | | | | | | | | | | | | | |
| Naphthalene | 8 | 5 | 63 | 7.1 | 1,920 | EB27 | 37,778 | 37,778 | EB13 | 0 | 0 | 0 | 0 |
| Acenaphthylene | 8 | 1 | 13 | 18 | 18 | EB27 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Acenaphthene | 8 | 6 | 75 | 4.3 | 1,450 | EB27 | 717 | 20,952 | EB13 | 2 | 1 | 25 | 13 |
| Fluorene | 8 | 5 | 63 | 6.6 | 1,440 | EB27 | 20,317 | 20,317 | EB13 | 1 | 1 | 13 | 13 |
| Phenanthrene | 8 | 7 | 88 | 4.2 | 3,560 | EB27 | 3,417 | 48,889 | EB13 | 1 | 0 | 13 | 0 |
| Anthracene | 8 | 7 | 88 | 1.2 | 643 | EB27 | 1,600 | 7,397 | EB13 | 0 | 0 | 0 | 0 |
| Total LPAH | 8 | 8 | 100 | 1.2 | 9,031 | EB27 | 5,733 | 135,333 | EB13 | 1 | 0 | 13 | 0 |
| Fluoranthene | 8 | 4 | 50 | 23 | 2,440 | EB27 | 20,952 | 20,952 | EB13 | 1 | 0 | 13 | 0 |
| Pyrene | 8 | 6 | 75 | 4.0 | 1,480 | EB27 | 1,367 | 12,508 | EB13 | 0 | 0 | 0 | 0 |
| Benzo(a)anthracene | 8 | 2 | 25 | 22 | 368 | EB27 | 3,540 | 3,540 | EB13 | 0 | 0 | 0 | 0 |
| Chrysene | 8 | 2 | 25 | 24 | 386 | EB27 | 3,746 | 3,746 | EB13 | 0 | 0 | 0 | 0 |
| Total Benzofluoranthenes | 8 | 3 | 38 | 3.6 | 238 | EB27 | 4,397 | 4,397 | EB13 | 0 | 0 | 0 | 0 |
| Benzo(a)pyrene | 8 | 1 | 13 | 91 | 91 | EB27 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Indeno(1,2,3-cd)pyrene | 8 | 1 | 13 | 25 | 25 | EB27 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenz(a,h)anthracene | 8 | 1 | 13 | 9.8 | 9.8 | EB27 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Benzo(g,h,i)perylene | 8 | 1 | 13 | 21 | 21 | EB27 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Total HPAH | 8 | 6 | 75 | 4.0 | 5,058 | EB27 | 1,367 | 45,143 | EB13 | 0 | 0 | 0 | 0 |
| 2-Methylnaphthalene | 8 | 6 | 75 | 2.2 | 419 | EB27 | 20,952 | 20,952 | EB13 | 0 | 0 | 0 | 0 |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2 | 0 | 0 | <11 | <11 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 2-Methylphenol | 2 | 0 | 0 | <11 | <11 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| 4-Methylphenol | 2 | 0 | 0 | <11 | <11 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Pentachlorophenol | 2 | 0 | 0 | <22 | <22 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Phenol | 2 | 0 | 0 | <11 | <11 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Dibenzofuran | 2 | 1 | 50 | 99 | 99 | EB13 | 15,778 | 15,778 | EB13 | 1 | 0 | 50 | 0 |
| 2-Chloronaphthalene | 4 | 0 | 0 | <4.6 | <5.4 | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 4 | 1 | 25 | 214 | 214 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| 1-Methylnaphthalene | 6 | 5 | 83 | 1.7 | 304 | EB27 | -- | -- | -- | -- | -- | -- | -- |
| Retene | 4 | 4 | 100 | 34 | 44 | EB32 | -- | -- | -- | -- | -- | -- | -- |
| **PCBs (ug/kg)** | | | | | | | | | | | | | |
| Total PCBs | 2 | 0 | 0 | <11 | <11 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |

## Table 5-7—Summary Statistics for Shallow Subsurface (16 to 20 feet bgs) Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%)[a] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET[b] | CSL/2LAET[b] | SQS/LAET | CSL/2LAET |
| **INORGANICS (mg/kg)** | | | | | | | | | | | | | |
| Arsenic | 2 | 1 | 50 | 7.2 | 7.2 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Cadmium | 2 | 0 | 0 | <0.15 | <0.15 | -- | -- | -- | -- | 0 | 0 | 0 | 0 |
| Chromium | 2 | 2 | 100 | 18 | 18 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Copper | 2 | 2 | 100 | 17 | 20 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Lead | 2 | 2 | 100 | 3.0 | 4.8 | EB13 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Mercury | 2 | 2 | 100 | 0.02 | 0.17 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Nickel | 2 | 2 | 100 | 14 | 15 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |
| Zinc | 2 | 2 | 100 | 32 | 35 | EB41 | -- | -- | -- | 0 | 0 | 0 | 0 |

--: Not applicable: Constituent not detected, screening criteria based on dry-weight data or not available, or TOC content outside range for normalization.

<: Not detected at dry-weight detection limit shown.

[a]Frequencies based on total number of stations analyzed.

[b]The nonionic/nonpolar organic chemical data for several core intervals were compared with AETs based on TOC content outside the range determined to be appropriate for normalization (see Table F-1 in Appendix F for sample list).

**Table 7-1—Potential Chemical-Specific ARARs for PSR**

| Medium/Requirement | Standard/Criteria | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Federal Water Pollution Control Act/Clean Water Act (CWA) (33 USCA 1251-1376; 40 CFR 100-149) | Ambient water quality criteria for the protection of aquatic organisms and human health | Discharge to surface water | 40 CFR 131 | CERCLA requires the attainment of water quality criteria where relevant and appropriate to the circumstances of the release. Marine chronic criteria anticipated to be relevant and appropriate to groundwater. Acute criteria anticipated to be relevant and appropriate to surface water whenever releases occur to surface water (during capping, dredging, and/or disposal actions). |
| Washington State Water Quality Standards for Surface Waters | State Water Quality Standards; conventional water quality parameters and toxic criteria | Discharge to surface water | Chapter 173-201-045, -047 WAC | Implementation of federal requirement to develop state water quality control plan. Narrative and quantitative limitations for surface water protection. Anticipated as relevant and appropriate for capping, dredging, and/or disposal actions. Elliott Bay has been classified as "Class A" water. |
| Washington Sediment Management Standards | Numerical and narrative criteria for sediment quality standards, cleanup screening levels, and minimum cleanup levels. | Numerical criteria applicable to sediment in Puget Sound marine waters. Narrative sediment quality standards, cleanup screening levels, and minimum cleanup levels applicable to all waters of the state. | Chapter 173-204-310 through -520 WAC; Chapter 173-340-760 WAC | Anticipated to be applicable to site remediation (i.e., capping, dredging, and/or disposal actions). |

**Table 7-2—Preliminary Action-Specific ARARs for PSR**

| Actions | Requirement | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Discharge to waters of the state | Requirement for use of all known available and reasonable technologies for treating wastewater prior to discharge to waters of the state | Releases to state waters | State Water Pollution Control Act (RCW 90.48), Water Resources Act (RCW 90.54) | Potentially applicable to remedial actions involving discharges to surface or groundwater (i.e., dewatering operations at disposal sites). |
| Construction in state waters | Requirements for construction and development projects for the protection of fish and shellfish | State waters | Construction in State Waters, Hydraulic Code Rules (RCW 75.20; Chapter 220 1101 WAC) | Substantive requirements of Army Corps of Engineers permit potentially relevant and appropriate for dredging, capping or disposal actions. |
| Discharge to surface waters | Point-source standards for discharges into surface water bodies | Point-source discharge or site runoff directed to surface water body | State Discharge Permit Program; NPDES Program (Chapter 173-216, 220 WAC) | Potentially relevant and appropriate for dewatering operations at disposal sites. |
| | Federal, unenforceable criteria for water quality to protect human health and aquatic life | | Federal Water Quality Criteria (40 CFR 131) | CERCLA requires the attainment of water quality criteria where relevant and appropriate to the circumstances of the release. potentially relevant and appropriate to dredging, capping, and/or disposal activities that could impact surface water quality. |
| | State Water Quality Standards for Surface Water | Water discharge to sewer, surface water; site runoff directed to a waterbody | Chapter 173-201-045, -047 WAC | Narrative and quantitative limitations for surface and groundwater protection, based upon beneficial uses. potentially relevant and appropriate to dredging, capping, and/or disposal activities that could impact surface water quality. |

**Table 7-2—Preliminary Action-Specific ARARs for PSR**

| Actions | Requirement | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Hazardous waste management | State dangerous waste management requirements | Management of wastes that pass criteria for WA dangerous waste as specified in Chapter 173-303-070 WAC | General Facility Standards (Chapter 173-303-280-395 WAC) | Potentially applicable to upland disposal (only) of investigation-derived waste generated during remedial activities. |
| Hazardous waste disposal | Effective Nov. 8, 1988, disposal of contaminated soil or debris is subject to land disposal prohibitions of treatment standards | RCRA Hazardous Waste<br><br>State dangerous Waste | Federal: 40 CFR 268 federal land disposal restrictions<br><br>State: land disposal restrictions (Chapter 173-303-140, -141 WAC) | Potentially applicable to upland disposal (only) of investigation-derived waste generated during remedial activities. |
| Solid waste management/ disposal | Requirements for solid waste management | Solid waste (nonhazardous) | Federal: Solid Waste Disposal Act (42 USC Sec. 325103259, 6901-6991), as administered under 40 CFR 257, 258<br><br>State: Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC) | Potentially applicable to upland disposal (only) of investigation-derived waste generated during remedial activities. |

**Table 7-2—Preliminary Action-Specific ARARs for PSR**

| Actions | Requirement | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Dredging/filling | Requirements for the discharge of dredged/fill material into navigable waters or wetlands | Waters of the U.S. | CWA 33 USC 401 *et seq.*; 33 USC 1413; 33 USC 1251-1316; 40 CFR 230, 231, 404; 33 CFR 320-330<br><br>Hydraulic Code Rules on Dredging (Chapter 220-110-130, -320 WAC)<br><br>Aquatic Land Management Open Water Disposal Sites (Chapter 332-30-166 WAC) | Anticipated to be applicable to dredging, capping and/or disposal actions. Deposited materials could be considered point-source discharges under NPDES. *See also Construction in State Waters under Action-Specific ARARs for Waters.* |
| Noise control | Maximum noise levels | Activities which may result in exceedance of maximum noise levels | Noise Control Act of 1974 (RCW 70.107; Chapter 173-60 WAC) | Potentially applicable to construction activities (i.e., dredging, capping, and/or disposal). |

**Table 7-3—Potential Location-Specific ARARs for PSR**

| Location | Requirement | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Within/adjacent to wetlands | Action must be performed so as to minimize the destruction, loss, or degradation of wetlands. Requirement for no net loss of remaining wetlands. | Wetland as defined by Executive Order 11990, Section 7 | Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A). EPA Wetland Actions Plan. Jan. 1989, OWWP | Open waters and estuarine intertidal located in and near the site, and may be affected by dredging, capping, or disposal actions in or around the area. |
| Habitats upon which endangered or threatened species depend | Actions must be performed so as to conserve endangered or threatened species, including consultation with the Department of the Interior | Determination of the presence of endangered or threatened species or designated critical habitats on or adjacent to the site that could be impacted by contamination and/or remedial activities | Endangered Species Act of 1973 (16 USC 1531 *et seq.*); 50 CFR Part 200, 50 CFR Part 402 | Elliott Bay shorelines are salmonid migratory routes, which may be affected by dredging, capping, and/or disposal actions. |
| Within oceans or waters of the U.S. | Permit requirements for activities that may obstruct or alter a navigable waterway | Obstruction or alteration of a navigable waterway | Section 10 of the Rivers and Harbors Appropriations Act (33 USC 403) | Applicable for remedial actions affecting navigable portions of harbor. |
| Habitat for fish, plants, or birds | Prohibits water pollution with any substance deleterious to fish, plant life, or bird life and requires consultation with the U.S. Fish & Wildlife Service and appropriate state agencies. | Federally permitted or licensed project in waters of any stream or body of water | U.S. Fish and Wildlife Coordination Act. 16 USC 661 *et seq.* | Potentially applicable to dredging, capping, or disposal activities. Elliott Bay shorelines used as salmonid migratory routes and include potential use by bald eagles, etc. |

**Table 7-3—Potential Location-Specific ARARs for PSR**

| Location | Requirement | Prerequisite | Citation | Comments |
|---|---|---|---|---|
| Within shoreline | Actions must be consistent with sma policies, which favor water-related uses, access, habitat protection. | Shoreline management act (SMA) and Seattle shoreline management program. The coastal zone management act (CZMA) requires federal agencies to abide by state and local shoreline regulations. | Chapter 90.58 RCW; 173-14 WAC;<br>16 usc 1451 *et seq.*, 15 CFR 923 | Potentially applicable to dredging or filling within the shoreline. |
| Within state-owned aquatic lands | Final remedy should be consistent with state laws, which promote public access, water-dependent uses, use of renewable resources, and revenue to the state. | State aquatic lands management laws and public trust doctrine | Ch. 79.90-79.96 RCW; 332-20 WAC | Potentially applicable to remedial actions performed within state-owned aquatic lands. |
| Within/adjacent to migratory bird path | Protection of ecosystems of special importance to migratory birds against detrimental alteration, pollution, and other environmental degradation | Near migratory bird path and/or ecosystems of special importance | Migratory Bird Treaty Act of 1918 (16 USC 70 3 *et seq.*) | Potentially applicable. Migratory birds occur in habitats near the site. |

**Table 7-4—Potential Items to be Considered for PSR**

| Federal, State, and Local Criteria, Advisories, and Procedures | Comment |
|---|---|
| Guidelines developed by the Elliott Bay/Duwamish Restoration Panel | Guidelines for habitat restoration |
| Puget Sound Water Quality Management Plan | Defines objectives for standards regarding the confined disposal of contaminated sediment |
| Puget Sound Dredged Disposal Analysis guidelines | Guidelines for assessing the suitability of dredged material for unconfined disposal relevant to cap material specifications |
| *Standards for Confined Disposal of Contaminated Sediments*, Washington Department of Ecology (January 1990) | Contains policy and technical data reviewed and/or used in the development of state sediment management standards |
| Federal and State Water Quality Guidance Documents | Guidelines to be maintained during dredging, dewatering, or capping activities in order to protect surface water quality |
| Area of Contamination Interprogram Policy, developed by Washington Department of Ecology | Guidelines for the management of dredged sediment meeting the criteria as a state dangerous waste |
| Sediment Quality Criteria for the Protection of Human Health | Proposes draft sediment quality standards based on risks to humans |

## LIST OF APPENDICES


| Appendix | Title |
|---|---|
| A | Immunoassay Test Kit Analysis |
| B | Surface Sediment Field Sample Records |
| C | Subsurface Sediment Coring Logs |
| D | Sediment Analytical and Chemical Screening Results |
| E | Chemical and Biological Data Validation Summaries |
| F | Sediment Chemical Data Screening Procedures |
| G | Phase 2 Archived Sample and Phase 3 Laboratory Results |
| H | Individual PAH Contaminant Distribution Figures |
| I | Groundwater Transport of Dissolved Creosote Constituents |
| J | Response to Comments Received on Interim Deliverables |
| K | Ecological and Human Health Risk Assessment Technical Memorandum (see Volume II) |


This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# APPENDIX A

# IMMUNOASSAY TEST KIT ANALYSIS

# APPENDIX A

# IMMUNOASSAY TEST KIT ANALYSIS

## A.1 INTRODUCTION

Immunoassay testing techniques was used to screen for the extent of polycyclic aromatic hydrocarbon- (PAH-) contaminated material to assist in the final positioning of sampling stations representing the boundary between clean and contaminated areas as part of the Phase 2 reconnaissance survey. Stations selected for chemical analysis were determined using site-specific correlation between U.S. Environmental Protection Agency (EPA) laboratory and carcinogenic PAH (CPAH) test kit results from archived Phase 1 sediment samples which would likely exceed lowest apparent effects threshold (LAET) and second-LAET (2LAET) criteria for high molecular weight PAHs (HPAH). Immunoassay testing was also used to confirm the presence and relative magnitude of PAHs in deep subsurface sediments where indicated by visual and UV fluorescence. None of the immunoassay results were used to define the areal or vertical extent of PAH contamination in the PSR Marine Sediments Unit (MSU).

## A.2 PHASE 1 EPA LABORATORY AND IMMUNOASSAY PAH CORRELATION

Eighteen archived samples that were analyzed by the EPA Region X Laboratory during the Phase 1 investigation were analyzed for both total PAHs and CPAHs by EPA Method 4035 using Ohmicron Corporation's RaPID Assay™ PAH and CPAH immunoassay test kits, respectively, as described in the Sampling and Analysis Plan Phase 2 Addendum (**WESTON 1996**). Samples for the correlation study were selected based on reported laboratory concentrations near criteria of concern, specifically ranging between the LAET and 2AET high molecular weight PAHs (HPAH) sediment criteria of 12,000 and 17,000 µg/kg (dry-weight basis), respectively. AETs were used in place of SMS because total organic carbon ([TOC]—required to normalize data for comparison to sediment management standards [SMS]) is not determined as part of the immunoassay analysis.

The CPAH test kit has a quantitation range of 10 to 500 µg/kg (wet-weight basis) as benzo(a)pyrene, which is the test kit reference compound. A 200-fold dilution of the sample extracts (in addition to the 50 times dilution specified in the procedure) was required to ensure concentrations were within the required quantitation range. Dilution was performed by serial dilution using the manufacturer's Universal Range Extension™ kit immediately following sample extraction and the initial 50-fold extract dilution.

Because creosote, the major contaminant attributed to the PSR site, contains predominantly HPAHs, and the CPAH test kit exhibits low selectivities toward most LPAHs, it is less likely to be influenced by fuel oil or petroleum hydrocarbons that may be present in samples. Since each

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

PAH (including alkyl-substituted and other non-target-list PAHs) exhibits a different selectivity to the antibody reagents, results are not identical to laboratory analysis. Despite these differences in selectivities, there was a strong linear correlation between CPAH test kit and laboratory HPAH results. No significant correlation was found between EPA laboratory total or LPAH results and immunoassay screening using the total PAH test kit. Therefore, the CPAH test kit was selected for all subsequent screening.

Immunoassay results are reported on a wet-weight basis, while the AET criteria are expressed on a dry-weight basis. In order to perform the comparison to AET criteria, the HPAH AETs were converted to a wet-weight basis, assuming an average of 50 percent solids in the surface sediment samples. This assumption results in a "wet-weight" LAET of 6,000 µg/kg and a "wet-weight" 2LAET of 8,500 µg/kg. The actual percent solids in Phase 1 surface sediment samples ranged from 41 to 72 percent (n=18), with an average of 56 percent. A value of 50 percent solids was selected as a conservative estimate for all PSR surfaces.

EPA Region X Laboratory and immunoassay CPAH results are summarized in **Table A-1**. HPAHs are the sum of 4-, 5-, and 6-ring PAH compounds and are expressed on a wet-weight basis to allow for direct comparison with CPAH test kit results.

The linear regression plot for the data is presented in **Figure A-1**. Analytical laboratory and immunoassay results showed a strong linear relationship, particularly in the range of concentrations near the sediment criteria used to evaluate the data. The coefficient of determination ($r^2$) of 0.834 also indicates a strong correlation between the laboratory HPAH and CPAH test kit results. Two data points, EB04 and EB35, appear to be outliers and were not included in the calculation of the regression equation..

## A.3 PHASE 2 SEDIMENT CPAH SCREENING

Immunoassay testing of surface sediment samples collected as part of the Phase 2 reconnaissance study was used to screen for the extent of PAH contaminated sediment to refine the sediment sampling program. The extent of contamination was estimated in the MSU using the site-specific correlation between EPA laboratory and CPAH test kit results obtained from analysis of archived Phase 1 samples. Corrected immunoassay results were compared to the LAET and 2LAET for HPAH on a wet-weight basis to identify stations to be used for establishing site boundaries. A 50 percent solids concentration was assumed, as was done for Phase 1 results.

A comparison was performed between EPA laboratory and CPAH immunoassay results for Phase 2 samples analyzed by both methods to evaluate how well the screening analysis predicted if stations exceeded AET criteria using the Phase 1 correlation data. Phase 2 reconnaissance laboratory and screening results are presented in **Table A-2**.

The linear regression plot for the data is presented in **Figure A-2**. Analytical laboratory and immunoassay results showed a linear relationship, but it was not as strong as that found for the

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Phase 1 data. The coefficient of determination ($r^2$) of 0.507 indicates a correlation between the laboratory HPAH and CPAH test kit results. Concentrations above the quantitation range (Station EB72) and one apparent outlier (Station EB87) were not included in the calculation of the regression equation.

The estimation of those areas that might exceed LAET or 2LAET criteria for HPAHs (as an indication of site contaminant extent) was confounded by an increasing presence of LPAHs as a major component of sediment contamination in sediments farther offshore. Although the CPAH kit will respond to all PAHs, this test was unable to predict the LPAH exceedances that were confirmed by the laboratory analyses.

All Phase 2 CPAH screening results are summarized in **Table A-3** and depicted in **Figure A-3**.

## A.4 DEEP SUBSURFACE SEDIMENT CORES

Immunoassay analysis was performed on selected deep sediment core intervals to confirm the presence and relative magnitude of PAHs where indicated by visual and UV fluorescence. Only a limited number of samples were analyzed because there were not sufficient test kits available to analyze all sampled intervals. Samples that exhibited definite residual saturation or the presence of free-phase material were not analyzed. Instead, samples from several intervals immediately above and below saturated material were analyzed to estimate the thickness of the contaminated layer. Additional interval samples were selected based on geological interpretation of most likely depths for migration of contaminants from the upland site. Immunoassay results and estimated HPAH concentrations (using the Phase 2 correlation results) are presented in **Table A-4**. It should be noted that the correlation between immunoassay CPAH and laboratory HPAH results was developed for concentrations near AET criteria and estimated results outside this range may not be accurate.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## REFERENCES

WESTON (Roy F. Weston, Inc.). 1996. Sampling and Analysis Plan, Phase 2 Addendum, Offshore Sediments Unit, Pacific Sound Resources (PSR). Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. November.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## FIGURES

A-1 Comparison of Laboratory Analytical and Immunoassay Results for Phase 1 Samples

A-2 Comparison of Laboratory Analytical and Immunoassay Results for Phase 2 Samples

A-3 PSR Marine Sediments Unit Phase 2 Reconnaissance Survey Immunoassay Results for Total Carcinogenic PAHs

## TABLES

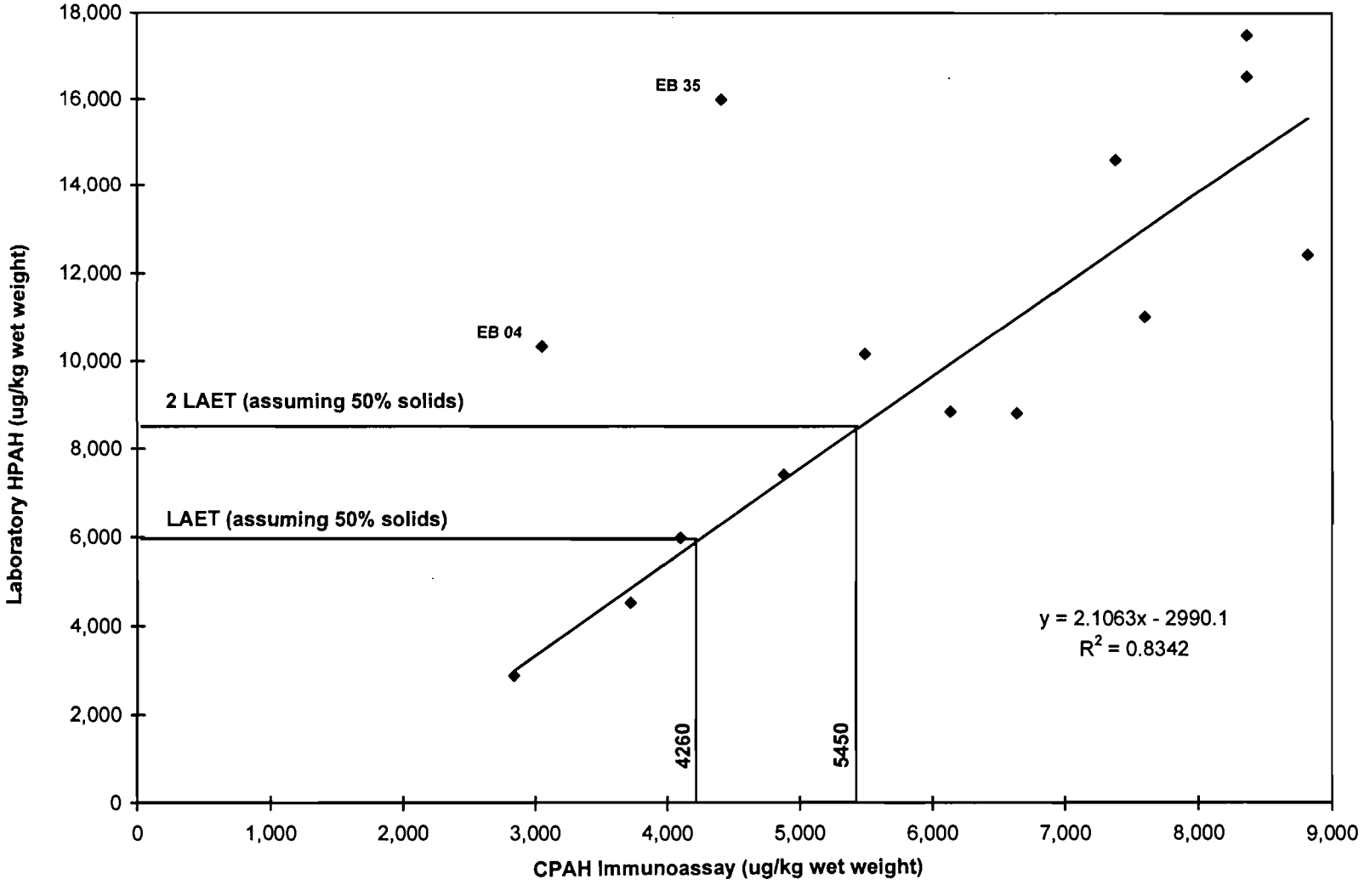
A-1 PSR Sediment Phase 1 PAH Data Comparison

A-2 PSR Sediment Phase 2 PAH Data Comparison

A-3 PSR Phase 2 Reconnaissance Screening CPAH Immunoassay Test Results

A-4 PSR Deep Core CPAH Immunoassay Test Results

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

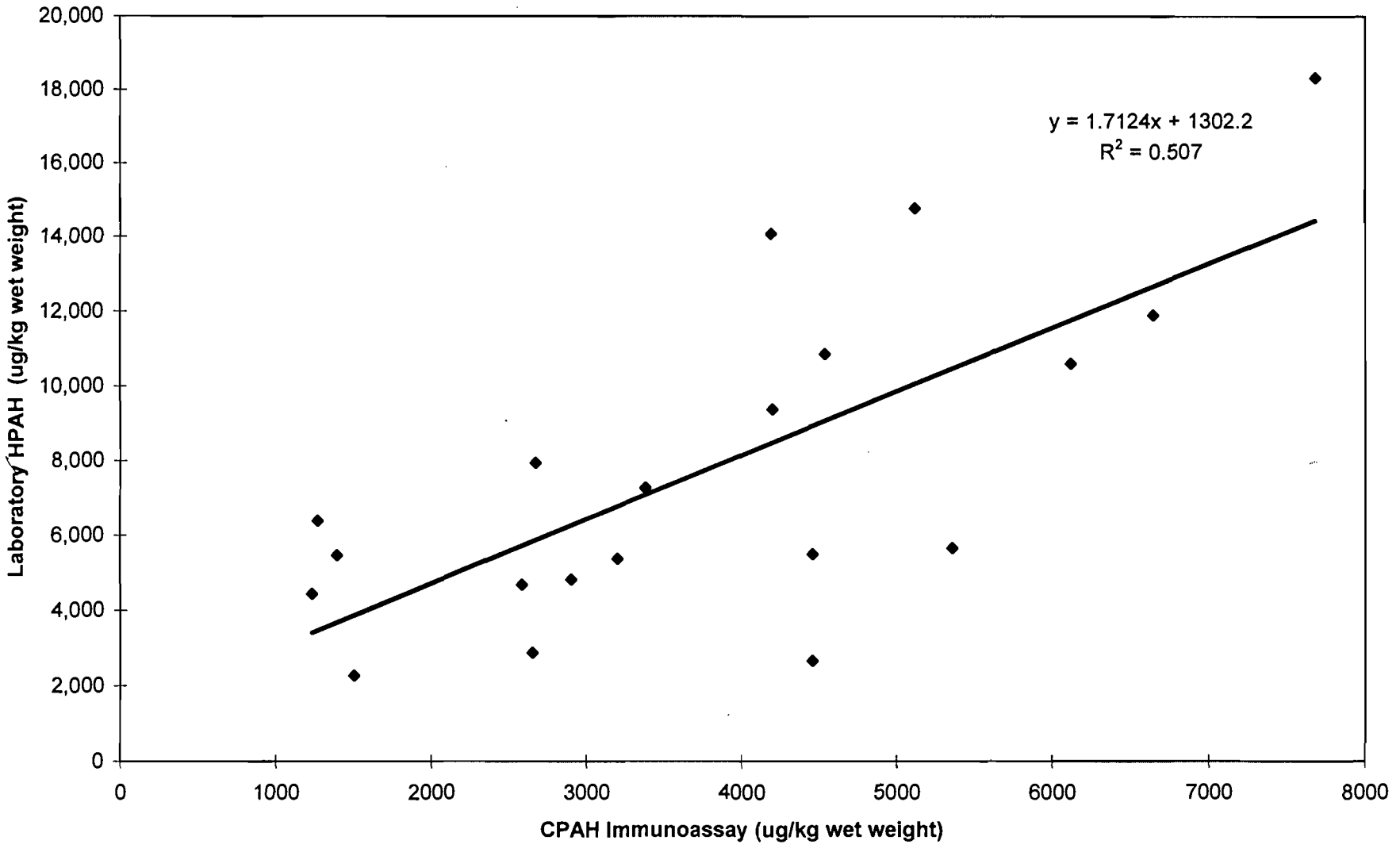



Comparison of Laboratory Analytical and Immunoassay Results for Phase 1 Samples

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FIGURE
A-1

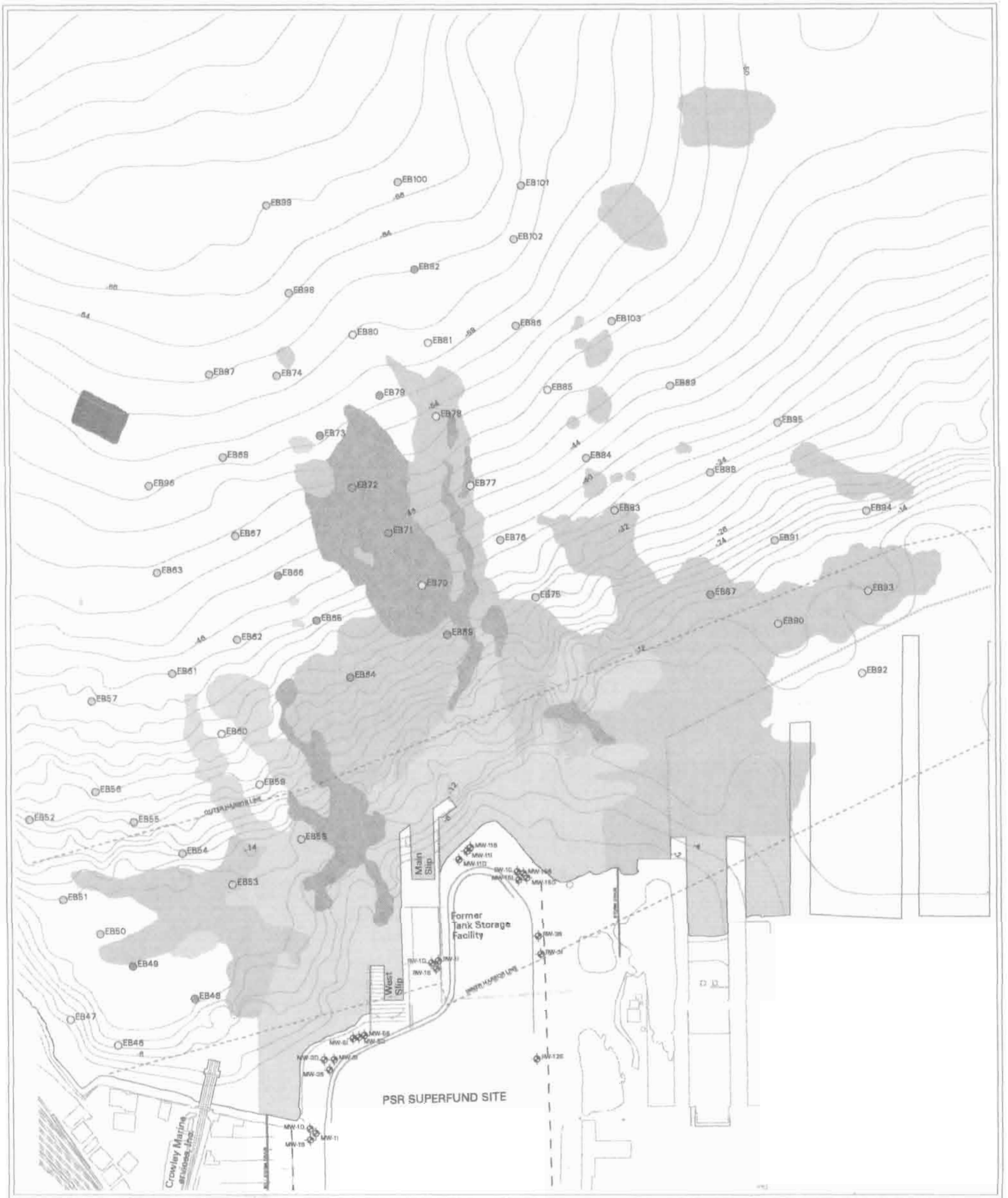
98-0184.a2




Comparison of Laboratory Analytical and Immunoassay Results for Phase 2 Samples

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FIGURE
**A-2**




SYMBOL EXPLANATION

- Estimated to be Below LAET
- Estimated to be Above LAET and below 2LAET
- Estimated to be Above 2LAET

GN MN 21

PSR Site

SCALE 1:2900

50 0 50 100 150 200

Feet

NOTES

1) See Figure 1-3 for site features and Figure DRH36 for interpretation of backscatter data.
2) Data are estimates only based on linear regression.

WESTON

DATE: April 13, 1998 10:08 AM
JOB NUMBER: 98-0184
VIEW FILE: reconpah.view
CHECKED BY: DCH
APPROVED BY: NAM

# PSR Marine Sediments Unit Phase 2 Reconnaissance Survey Immunoassay Results for Total Carcinogenic PAHs

Figure A-3

## Table A-1—PSR Sediment Phase 1 PAH Data Comparison[a]

| Station | EB04 | EB06 | EB11 | EB14 | EB21 | EB22 | EB25 | EB30 | EB31 |
|---|---|---|---|---|---|---|---|---|---|
| EPA Sample Number | 96162603 | 96162605 | 96162610 | 96162613 | 96162621 | 96162622 | 96162624 | 96162630 | 96162631 |
| Compounds (dry wt basis) | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg |
| Naphthalene | 690 | 1,160 | 720 | 572 | 4,260 | 2,360 | 1,380 | 6,700 | 10,600 |
| Acenaphthylene | 131 | 324 | 76 | 239 | 526 | 425 | 467 | 332 | 670 |
| Acenaphthene | 266 | 508 | 462 | 338 | 2,460 | 948 | 1,770 | 2,530 | 3,280 |
| Fluorene | 1,360 | 723 | 647 | 511 | 2,190 | 1,060 | 1,940 | 1,650 | 2,500 |
| Phenanthrene | 2,950 | 2,550 | 1,940 | 1,630 | 5,250 | 3,330 | 7,530 | 3,750 | 6,060 |
| Anthracene | 6,730 | 2,010 | 1,450 | 1,630 | 2,820 | 2,490 | 4,350 | 1,830 | 2,810 |
| Fluoranthene | 4,520 | 4,120 | 2,210 | 2,590 | 5,080 | 5,630 | 17,900 | 4,080 | 5,680 |
| Pyrene | 2,560 | 5,300 | 2,730 | 5,640 | 8,480 | 5,880 | 13,700 | 7,120 | 14,600 |
| Benzo(a)anthracene | 1,260 | 1,910 | 1,060 | 1,570 | 2,290 | 2,810 | 4,430 | 1,140 | 1,640 |
| Chrysene | 2,820 | 3,480 | 1,420 | 2,770 | 3,920 | 6,290 | 7,840 | 1,970 | 2,770 |
| Benzo(b)fluoranthene | 1,500 | 4,380 | 1,150 | 3,320 | 4,900 | 5,370 | 5,510 | 3,120 | 4,070 |
| Benzo(k)fluoranthene | 607 | 1,270 | 521 | 1,340 | 1,740 | 1,940 | 2,150 | 1,110 | 1,390 |
| Benzo(a)pyrene | 727 | 2,290 | 650 | 1,690 | 2,440 | 3,060 | 3,080 | 1,760 | 2,040 |
| Dibenzo(a,h)anthracene | 116 | 400 | 74 | 243 | 366 | 423 | 426 | 204 | 264 |
| Benzo(g,h,i)perylene | 275 | 921 | 178 | 551 | 758 | 1,150 | 1,080 | 615 | 659 |
| Indeno(1,2,3-cd)pyrene | 363 | 1,200 | 238 | 702 | 1,010 | 1,410 | 1,410 | 749 | 810 |
| % solids | 70.80% | 57.80% | 72.40% | 55.30% | 55.80% | 52.60% | 41.30% | 50.40% | 48.70% |
| | | | | | | | | | |
| HPAH (wet wt basis) | 10,442 | 14,607 | 7,407 | 11,290 | 17,289 | 17,865 | 23,758 | 11,021 | 16,521 |
| CPAH Immunoassay Result (wet wt basis) | 2,980 | 7,380 | 4,880 | > 12,800 | > 11,100 | > 12,900 | > 16,200 | 7,600 | 8,360 |

[a] These data were used in the development of a linear regression.

## Table A-1—PSR Sediment Phase 1 PAH Data Comparison[a]

| Station | EB32 | EB33 | EB35 | EB36 | EB38 | EB39 | EB40 | EB42 | EB43 |
|---|---|---|---|---|---|---|---|---|---|
| EPA Sample Number | 96162632 | 96162633 | 96162635 | 96162636 | 96162638 | 96162639 | 96162641 | 96162643 | 96162648 |
| Compounds (dry wt basis) | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg |
| Naphthalene | 2,960 | 4,790 | 11,800 | 5,030 | 2,610 | 6,935 | 3,720 | 4,680 | 374 |
| Acenaphthylene | 363 | 326 | 456 | 200 | 265 | 283 | 187 | 368 | 95 |
| Acenaphthene | 1,180 | 1,700 | 3,290 | 1,860 | 1,030 | 2,350 | 1,010 | 1,350 | 153 |
| Fluorene | 938 | 1,350 | 2,000 | 1,570 | 948 | 2,101 | 877 | 1,220 | 160 |
| Phenanthrene | 2,440 | 3,160 | 4,260 | 3,500 | 2,820 | 5,160 | 2,430 | 3,190 | 496 |
| Anthracene | 1,550 | 1,540 | 2,430 | 1,250 | 1,190 | 1,785 | 881 | 1,500 | 316 |
| Fluoranthene | 6,830 | 2,680 | 4,900 | 2,810 | 2,740 | 4,545 | 2,040 | 3,200 | 541 |
| Pyrene | 9,600 | 5,550 | 9,660 | 4,680 | 4,360 | 8,890 | 2,810 | 4,510 | 1,550 |
| Benzo(a)anthracene | 2,650 | 966 | 1,220 | 740 | 1,070 | 1,255 | 466 | 830 | 349 |
| Chrysene | 3,996 | 1,700 | 1,940 | 1,190 | 1,860 | 1,885 | 702 | 1,520 | 620 |
| Benzo(b)fluoranthene | 3,520 | 2,370 | 2,850 | 1,250 | 2,150 | 2,120 | 987 | 2,120 | 1,000 |
| Benzo(k)fluoranthene | 1,170 | 938 | 1,030 | 440 | 768 | 847 | 366 | 935 | 458 |
| Benzo(a)pyrene | 1,820 | 1,340 | 1,470 | 670 | 1,190 | 1,215 | 543 | 1,270 | 610 |
| Dibenzo(a,h)anthracene | 253 | 178 | 206 | 0 | 170 | 222 | 0 | 170 | 111 |
| Benzo(g,h,i)perylene | 528 | 458 | 528 | 232 | 450 | 468 | 231 | 502 | 247 |
| Indeno(1,2,3-cd)pyrene | 690 | 531 | 587 | 277 | 525 | 537 | 250 | 593 | 298 |
| % solids | 56.30% | 60.90% | 65.60% | 48.70% | 57.60% | 56.60% | 53.90% | 56.60% | 49.70% |
| | | | | | | | | | |
| HPAH (wet wt basis) | 17,485 | 10,177 | 16,000 | 5,985 | 8,803 | 12,443 | 4,525 | 8,858 | 2,875 |
| CPAH Immunoassay Result (wet wt basis) | 8,360 | 5,500 | 4,720 | 4,100 | 6,640 | 8,820 | 3,720 | 6,140 | 2,840 |

[a] These data were used in the development of a linear regression.

## Table A-2—PSR Sediment Phase 2 PAH Data Comparison

| Sample | EB47 | EB49 | EB54 | EB56 | EB57 | EB60 | EB62 | EB63 | EB67 |
|---|---|---|---|---|---|---|---|---|---|
| EPA Sample Number | 96382524 | 96382526 | 96382527 | 96392701 | 96382528 | 96382529 | 96392702 | 96382530 | 96382531 |
| Compounds (dry wt basis) | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg |
| 2-Methylnaphthalene | 48 | 118 | 301 | 312 | 210 | 235 | 792 | 348 | 723 |
| Naphthalene | 120 | 314 | 997 | 1,060 | 796 | 946 | 3,940 | 1,500 | 3,190 |
| Acenaphthylene | 25 | 102 | 120 | 158 | 102 | 96 | 223 | 158 | 240 |
| Acenaphthene | 64 | 153 | 340 | 282 | 191 | 366 | 1,050 | 498 | 1,150 |
| Fluorene | 98 | 212 | 317 | 309 | 195 | 372 | 985 | 445 | 1,080 |
| Phenanthrene | 368 | 1,000 | 965 | 1,170 | 698 | 1,080 | 2,910 | 1,330 | 2,870 |
| Anthracene | 234 | 586 | 550 | 581 | 346 | 696 | 1,040 | 560 | 1,610 |
| Fluoranthene | 834 | 2,290 | 1,290 | 1,640 | 882 | 1,590 | 3,400 | 1,480 | 6,670 |
| Pyrene | 665 | 4,590 | 1,820 | 2,050 | 1,280 | 1,990 | 5,850 | 2,690 | 7,320 |
| Benzo(a)anthracene | 411 | 1,400 | 572 | 592 | 302 | 672 | 1,020 | 496 | 1,580 |
| Chrysene | 599 | 2,130 | 938 | 907 | 459 | 1,290 | 1,600 | 780 | 2,390 |
| Benzo(b)fluoranthene | 528 | 2,840 | 1,100 | 1,180 | 668 | 1,380 | 2,140 | 1,150 | 2,300 |
| Benzo(k)fluoranthene | 188 | 1,250 | 450 | 461 | 213 | 556 | 725 | 416 | 922 |
| Benzo(a)pyrene | 304 | 2,000 | 705 | 721 | 380 | 860 | 1,200 | 658 | 1,310 |
| Dibenzo(a,h)anthracene | 51 | 360 | 105 | 105 | 70 | 118 | 145 | 101 | 196 |
| Benzo(g,h,i)perylene | 135 | 972 | 324 | 342 | 211 | 348 | 473 | 336 | 542 |
| Indeno(1,2,3-cd)pyrene | 157 | 1,100 | 356 | 363 | 222 | 401 | 461 | 348 | 578 |
| % solids | 69.00% | 56.00% | 63.00% | 65.40% | 61.50% | 59.70% | 55.20% | 55.60% | 59.20% |
| | | | | | | | | | |
| Lab HPAH (wet wt basis) | 2,672 | 10,602 | 4,826 | 5,468 | 2,883 | 5,495 | 9,392 | 4,701 | 14,094 |
| CPAH Screen Result (wet wt basis) | 4,455 | 6,120 | 2,900 | 1,390 | 2,650 | 4,460 | 4,200 | 2,580 | 4,190 |

## Table A-2—PSR Sediment Phase 2 PAH Data Comparison

| Sample | EB72 | EB73 | EB77 | EB80 | EB82 | EB84 | EB85 | EB86 | EB87 |
|---|---|---|---|---|---|---|---|---|---|
| EPA Sample Number | 96382532 | 96392703 | 96382533 | 69382534 | 96392704 | 96392705 | 96382535 | 96382536 | 96382537 |
| Compounds (dry wt basis) | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg | µg/kg |
| 2-Methylnaphthalene | 1,430 | 1,220 | 699 | 2,720 | 1,440 | 1,940 | 2,240 | 1,110 | 7,910 |
| Naphthalene | 9,070 | 5,340 | 2,530 | 11,400 | 6,360 | 7,680 | 7,260 | 4,160 | 29,600 |
| Acenaphthylene | 554 | 265 | 115 | 380 | 339 | 249 | 145 | 158 | 411 |
| Acenaphthene | 4,500 | 1,800 | 955 | 4,260 | 2,470 | 1,970 | 2,720 | 1,670 | 7,990 |
| Fluorene | 4,440 | 1,670 | 804 | 3,510 | 2,470 | 1,860 | 2,680 | 1,690 | 9,410 |
| Phenanthrene | 13,100 | 4,760 | 2,110 | 9,870 | 5,930 | 5,300 | 7,610 | 4,550 | 24,400 |
| Anthracene | 6,410 | 1,760 | 765 | 2,730 | 2,760 | 1,470 | 1,920 | 1,120 | 20,200 |
| Fluoranthene | 58,700 | 4,590 | 2,080 | 7,690 | 6,250 | 3,940 | 5,820 | 3,950 | 21,800 |
| Pyrene | 57,000 | 7,270 | 2,910 | 11,300 | 10,400 | 4,320 | 6,320 | 4,800 | 25,600 |
| Benzo(a)anthracene | 12,400 | 1,200 | 494 | 1,360 | 3,550 | 664 | 902 | 636 | 4,730 |
| Chrysene | 14,200 | 2,190 | 847 | 1,980 | 5,610 | 871 | 1,060 | 869 | 6,130 |
| Benzo(b)fluoranthene | 8,150 | 2,240 | 1,010 | 2,250 | 5,000 | 1,250 | 1,400 | 1,100 | 6,480 |
| Benzo(k)fluoranthene | 3,570 | 1,020 | 359 | 882 | 1,870 | 398 | 436 | 369 | 2,110 |
| Benzo(a)pyrene | 4,400 | 1,340 | 577 | 1,280 | 2,590 | 669 | 709 | 596 | 3,460 |
| Dibenzo(a,h)anthracene | 425 | 161 | 75 | 168 | 252 | 85 | 85 | 88 | 398 |
| Benzo(g,h,i)perylene | 1,020 | 475 | 223 | 519 | 783 | 264 | 282 | 269 | 1,030 |
| Indeno(1,2,3-cd)pyrene | 1,420 | 477 | 256 | 542 | 891 | 275 | 293 | 291 | 1,240 |
| % solids | 56.30% | 56.80% | 64.20% | 52.80% | 49.30% | 62.50% | 62.80% | 56.10% | 50.20% |
| | | | | | | | | | |
| Lab HPAH (wet wt basis) | 90,803 | 11,907 | 5,669 | 14,769 | 18,338 | 7,960 | 10,869 | 7,275 | 36,635 |
| CPAH Screen Result (wet wt basis) | >17900 | 6,650 | 5,360 | 5,120 | 7,680 | 2,670 | 4,540 | 3,380 | 6,130 |

## Table A-2—PSR Sediment Phase 2 PAH Data Comparison

| Sample | EB88 | EB91 | EB97 | EB100 |
|---|---|---|---|---|
| EPA Sample Number | 96392706 | 96382538 | 96382539 | 96382540 |
| Compounds (dry wt basis) | µg/kg | µg/kg | µg/kg | µg/kg |
| 2-Methylnaphthalene | 591 | 140 | 812 | 537 |
| Naphthalene | 2,360 | 504 | 3,920 | 2,290 |
| Acenaphthylene | 169 | 63 | 178 | 98 |
| Acenaphthene | 915 | 135 | 1,100 | 900 |
| Fluorene | 751 | 143 | 971 | 723 |
| Phenanthrene | 2,060 | 541 | 3,130 | 1,810 |
| Anthracene | 849 | 221 | 967 | 699 |
| Fluoranthene | 2,120 | 630 | 2,630 | 1,920 |
| Pyrene | 2,400 | 876 | 4,670 | 3,110 |
| Benzo(a)anthracene | 598 | 219 | 617 | 427 |
| Chrysene | 853 | 326 | 980 | 642 |
| Benzo(b)fluoranthene | 1,040 | 475 | 1,340 | 910 |
| Benzo(k)fluoranthene | 371 | 182 | 507 | 368 |
| Benzo(a)pyrene | 613 | 300 | 806 | 534 |
| Dibenzo(a,h)anthracene | 78 | 45 | 116 | 88 |
| Benzo(g,h,i)perylene | 263 | 161 | 392 | 255 |
| Indeno(1,2,3-cd)pyrene | 278 | 175 | 409 | 269 |
| % solids | 62.50% | 67.00% | 51.20% | 52.20% |
| | | | | |
| Lab HPAH (wet wt basis) | 5,384 | 2,271 | 6,383 | 4,449 |
| CPAH Screen Result (wet wt basis) | 3,200 | 1,500 | 1,270 | 1,230 |

**Table A-3—PSR Phase 2 Reconnaissance Screening**
**CPAH Immunoassay Test Results**

| Sample Station | CPAH Screening Result (µg/kg, wet wt) | EPA HPAH Result (µg/kg, wet wt) | Calculated HPAH Concentration (µg/kg, wet weight) Rd2 Correlation |
|---|---|---|---|
| EB46 | 4,550 | not analyzed | 9,093 |
| EB47 | 4,455 | 2,672 | 8,931 |
| EB48 | 12,400 | not analyzed | 22,536 |
| EB49 | 6,120 | 10,602 | 11,782 |
| EB50 | 2,120 | not analyzed | 4,932 |
| EB51 | 3,270 | not analyzed | 6,902 |
| EB52 | 3,110 | not analyzed | 6,628 |
| EB53 | 1,980 | not analyzed | 4,693 |
| EB54 | 2,900 | 4,826 | 6,268 |
| EB55 | 2,180 | not analyzed | 5,035 |
| EB56 | 1,390 | 5,468 | 3,682 |
| EB57 | 2,650 | 2,883 | 5,840 |
| EB58 | 2,080 | not analyzed | 4,864 |
| EB59 | 4,510 | not analyzed | 9,025 |
| EB60 | 4,460 | 5,495 | 8,939 |
| EB61 | 2,750 | not analyzed | 6,011 |
| EB62 | 4,200 | 9,392 | 8,494 |
| EB63 | 2,580 | 4,701 | 5,720 |
| EB64 | 6,020 | not analyzed | 11,611 |
| EB65 | not analyzed - free product | not analyzed | not analyzed |
| EB66 | > 13,200 | not analyzed | > 24,000 |
| EB67 | 4,190 | 14,094 | 8,477 |
| EB68 | 4,200 | not analyzed | 8,494 |
| EB69 | > 13,960 | not analyzed | > 25,000 |
| EB70 | 4,520 | not analyzed | 9,042 |
| EB71 | > 47,500 | not analyzed | > 82,000 |
| EB72 | > 17,900 | 90,803 | > 31,000 |
| EB73 | 6,650 | 11,907 | 12,689 |
| EB74 | 3,240 | not analyzed | 6,850 |
| EB75 | 3,240 | not analyzed | 6,850 |
| EB76 | 3,360 | not analyzed | 7,056 |
| EB77 | 5,360 | 5,669 | 10,480 |
| EB78 | 4,640 | not analyzed | 9,248 |
| EB79 | > 15,400 | not analyzed | > 27,000 |
| EB80 | 5,120 | 14,769 | 10,069 |
| EB81 | 4,820 | not analyzed | 9,556 |
| EB82 | 7,680 | 18,338 | 14,453 |
| EB83 | 4,040 | not analyzed | 8,220 |
| EB84 | 2,670 | 7,960 | 5,874 |
| EB85 | 4,540 | 10,869 | 9,076 |
| EB86 | 3,380 | 7,275 | 7,090 |
| EB87 | 6,130 | 36,635 | 11,799 |
| EB88 | 3,200 | 5,384 | 6,782 |
| EB89 | 2,350 | not analyzed | 5,326 |
| EB90 | 2,560 | not analyzed | 5,686 |
| EB91 | 1,500 | 2,271 | 3,871 |

**Table A-3—PSR Phase 2 Reconnaissance Screening**
**CPAH Immunoassay Test Results**

| Sample Station | CPAH Screening Result (µg/kg, wet wt) | EPA HPAH Result (µg/kg, wet wt) | Calculated HPAH Concentration (µg/kg, wet weight) Rd2 Correlation |
|---|---|---|---|
| EB92 | 4,800 | not analyzed | 9,522 |
| EB93 | 1,470 | not analyzed | 3,819 |
| EB94 | 780 | not analyzed | 2,638 |
| EB95 | 2,160 | not analyzed | 5,001 |
| EB96 | 2,340 | not analyzed | 5,309 |
| EB97 | 1,270 | 6,383 | 3,477 |
| EB98 | 2,370 | not analyzed | 5,360 |
| EB99 | 1,580 | not analyzed | 4,008 |
| EB100 | 1,230 | 4,449 | 3,408 |
| EB101 | 980 | not analyzed | 2,980 |
| EB102 | 1,270 | not analyzed | 3,477 |
| EB103 | 1,610 | not analyzed | 4,059 |

> Concentrations were above the range for the test comparison calibration.

## Table A-4—PSR Deep Core CPAH Immunoassay Test Results

| Station EB16 Depth (ft) below mudline | Observations | UV Fluoresence Estimated Conc (µg/kg) | Immunoassay CPAH Conc (µg/kg; wet wt) | Est HPAH Conc (µg/kg; wet wt) Rd 2 Correlation |
|---|---|---|---|---|
| 0-2 | | | | |
| 2-4 | | | | |
| 4-6 | | | | |
| 6-8 | | | | |
| 8-10 | trace odor/sheen | | | |
| 10-12 | | | | |
| 12-14 | odor/trace sheen | | | |
| 14-16 | | | | |
| 16-18 | | | | |
| 18-20 | | | | |
| 20-22 | sandy | <1,000 | | |
| 22-24 | sandy | ~ 1,000 | | |
| 24-26 | sandy | | | |
| 26-28 | sandy | < 1,000 | | |
| 28-30 | sulfide odor | | | |
| 30-32 | sandy | < 1,000 | | |
| 32-34 | sulfide odor | | 118 | 1504 |
| 34-36 | | | | |
| 36-38 | | | | |
| 38-40 | | | | |
| 40-42 | | | | |
| 42-44 | | | | |
| 44-46 | sulfide odor | | | |
| 46-48 | | | | |
| 48-50 | | | | |
| 50-52 | | | | |
| 52-54 | | | | |
| 54-56 | | | | |
| 56-58 | | | | |
| 58-60 | trace free product | | | |
| 60-62 | strong odor/staining | ~ 1,000 | 882 | 2812 |
| 62-64 | strong odor/staining | | 8514 | 15881 |
| 64-66 | strong odor/staining | ~ 1,000 | 1802 | 4388 |
| 66-68 | moderate odor/staining | | 2671 | 5876 |
| 68-70 | moderate odor/staining | ~ 1,000 | 167 | 1588 |
| 70-72 | mild odor | | 595 | 2321 |
| 72-74 | mild odor | < 1,000 | 726 | 2545 |
| 74-76 | mild odor | | 179 | 1609 |
| 76-78 | mild odor | ~ 1,000 | 435 | 2047 |
| 78-80 | mild odor | | 1048 | 3097 |
| 80-82 | moderate odor | | 165 | 1585 |
| 82-84 | mild odor | | <9.7 | |
| 84-85 | mild odor | | 687 | 2478 |

## Table A-4—PSR Deep Core CPAH Immunoassay Test Results

| Station EB14 Depth (ft) below mudline | Observations | UV Fluoresence Estimated Conc (µg/kg) | Immunoassay CPAH Conc (µg/kg; wet wt) | Est HPAH Conc (µg/kg; wet wt) Rd 2 Correlation |
|---|---|---|---|---|
| 0-2 | | | | |
| 2-4 | | | | |
| 4-6 | | | | |
| 6-8 | moderate odor | | | |
| 8-10 | | | | |
| 10-12 | slight odor | | | |
| 12-14 | slight odor | | | |
| 14-16 | slight odor | | | |
| 16-18 | slight odor | | | |
| 18-20 | | | | |
| 20-22 | | < 1,000 | | |
| 22-24 | | | | |
| 24-26 | | << 1,000 | | |
| 26-28 | | | | |
| 28-30 | | << 1,000 | | |
| 30-32 | slight sheen | | 124 | 1514 |
| 32-34 | | << 1,000 | | |
| 34-36 | | | | |
| 36-38 | sulfide odor | | | |
| 38-40 | | | | |
| 40-42 | | | | |
| 42-44 | | | | |
| 44-46 | | | | |
| 46-48 | | | | |
| 48-50 | | | | |
| 50-52 | | | | |
| 52-54 | | | | |
| 54-56 | | | | |
| 56-58 | | | | |
| 58-60 | | | | |
| 60-62 | | << 1,000 | | |
| 62-64 | | | | |
| 64-66 | | << 1,000 | 31 | 1355 |
| 66-68 | | | 45 | 1379 |
| 68-70 | | << 1,000 | 80 | 1439 |
| 70-72 | | | 48 | 1384 |
| 72-74 | | 0 | 731 | 2554 |
| 74-76 | | | 154 | 1566 |
| 76-78 | | 0 | | |
| 78-80 | | | | |
| 80-82 | | 0 | | |
| 82-84 | | | | |
| 84-85 | | | | |

## Table A-4—PSR Deep Core CPAH Immunoassay Test Results

| Station EB114 Depth (ft) below mudline | Observations | UV Fluoresence Estimated Conc (µg/kg) | Immunoassay CPAH Conc (µg/kg; wet wt) | Est HPAH Conc (µg/kg; wet wt) Rd 2 Correlation |
|---|---|---|---|---|
| 0-2 | | | | |
| 2-4 | | | | |
| 4-6 | | | | |
| 6-8 | sulfide odor | | | |
| 8-10 | mild odor | | | |
| 10-12 | mild odor | | | |
| 12-14 | mild odor/trace sheen | | | |
| 14-16 | mild odor | | | |
| 16-18 | | | | |
| 18-20 | | | | |
| 20-22 | | << 1,000 | | |
| 22-24 | | | | |
| 24-26 | | << 1,000 | | |
| 26-28 | | | | |
| 28-30 | | << 1,000 | 550 | 2244 |
| 30-32 | | << 1,000 | 95 | 1465 |
| 32-34 | | | | |
| 34-36 | odor/sheen | | 54500 | 94628 |
| 36-38 | odor/sheen | | | |
| 38-40 | mild odor | | | |
| 40-42 | mild odor | | | |
| 42-44 | | | | |
| 44-46 | | | | |
| 46-48 | | | | |
| 48-50 | sulfide odor | | | |
| 50-52 | | | | |
| 52-54 | | | | |
| 54-56 | | | | |
| 56-58 | | | | |
| 58-60 | | | | |
| 60-62 | | << 1,000 | 300 | 1816 |
| 62-64 | moderate odor/staining | | 1700 | 4213 |
| 64-66 | mild odor | << 1,000 | 86 | 1449 |
| 66-68 | odor/ staining | | 250 | 1730 |
| 68-70 | odor/ sheen | >> 10,000 | | |
| 70-72 | odor/ sheen | | | |
| 72-74 | odor/staining | ~ 10,000 | | |
| 74-76 | free product | | | |
| 76-78 | free product | ~ 10,000 | | |
| 78-80 | strong odor/staining | | | |
| 80-82 | strong odor/staining | ~ 10,000 | | |
| 82-84 | strong odor/staining | | | |
| 84-86 | moderate odor/staining | ~ 1,000 | 38000 | 66373 |
| 86-88 | odor | | 1080 | 3151 |
| 88-90 | odor | < 1,000 | 1810 | 4401 |
| 90-92 | odor | | 7900 | 14830 |
| 92-94 | mild odor | << 1,000 | 3300 | 6953 |
| 94-96 | trace odor | | 16000 | 28700 |

# APPENDIX B

# SURFACE SEDIMENT FIELD SAMPLE RECORDS

# PHASE 1 LABORATORY TESTING STATIONS

## Field Observations of Potential Anthropogenic Materials in Phase 1 Surface Sediment Samples

| Station | Sheen Description | Petroleum Odor Description | Wood Debris |
|---|---|---|---|
| EB01 | On surface | Slight to moderate | Fragments |
| EB02 | Pockets throughout | Some | Dense |
| EB03 | Slight | None | None |
| EB04 | Some on surface | None | None |
| EB05 | Present | Slight | None |
| EB06 | Some | Slight | None |
| EB07 | Some on surface | None | None |
| EB08 | On surface | Slight | None |
| EB09 | Bubble on surface; more in subsurface | None [strong sulfide] | High density fragments |
| EB10 | On surface & when homogenized | None | None |
| EB11 | Splotches present | Slight | None |
| EB12 | Few bubbles when homogenized | None [slight sulfide] | Some |
| EB13 | None described | Strong | Some |
| EB14 | On surface | Moderate to heavy | Some twigs |
| EB15 | On surface | None [slight sulfide] | None |
| EB16 | None | None | None |
| EB17 | Trace on water | None | None |
| EB18 | Some when homogenized | None | Some |
| EB19 | On water in grab | None [sulfide] | Fine fragments |
| EB20 | None | None | Trace |
| EB21 | None | None | None |
| EB22 | Present | None | None |
| EB23 | Pockets | Strong | Some |
| EB24 | None | None | Lots of fine |
| EB25 | Droplets | None | Present & chunk |
| EB26 | Droplets | None [strong sulfide] | Present |
| EB27 | Heavy throughout | Strong | Trace |
| EB28 | Droplets on surface | None | Trace |
| EB29 | None | None | Fragments |
| EB30 | Some droplets | None | Present |
| EB31 | None | None | Trace |
| EB32 | Heavy on wood | None | Present |
| EB33 | None | None | Present |
| EB34 | None | None | Present |
| EB35 | Small droplets | None | None |
| EB36 | None | None | Chips |
| EB37 | Appeared when homogenized | None | Fragments |
| EB38 | Slight in grab water | None | None |
| EB39 | None | None | None |
| EB40 | None | None | Present |
| EB41 | Pocket on surface | None | Some |
| EB42 | None | None | None |
| EB43 | Appeared when grab open for disposal | None | None |
| EB44 | Heavy w/large globules | Heavy | None |
| EB45 | Small droplets | None | Small chunk |
| VI01 | Droplets on surface | Present | Some |
| VI02 | None | None | None |

## Field Observations of Potential Anthropogenic Materials in Phase 1 Surface Sediment Samples

| Station | Sheen Description | Petroleum Odor Description | Wood Debris |
|---|---|---|---|
| VI03 | Droplets on surface | Moderate | None |
| VI04 | In bottom layers | Moderate | None |
| VI05 | Small droplets | None | None |
| VI06 | Bubbles on surface | None | None |
| VI07 | None | None | None |
| VI08 | None | None | None |
| VI09 | None | None | None |
| VI10 | Bubbles on surface | None | None |
| VI11 | None | None | Some |
| VI12 | Bubbles on surface | None | Some |
| VI13 | Surface bubbles & subsurface globules | Heavy | None |
| VI14 | Surface bubbles & subsurface globules | Strong | None |
| VI15 | Droplets on surface | None | None |
| VI16 | Bubble on surface | None [slight sulfide] | Some |
| VI17 | None | None | None |
| VI18 | None | None | None |

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: BROKEN - windy - some Rain

Sample No.: EB01 - 96162600
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261980 y=217148

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1696 | 5M | | | NO | — washout — cobble in jaws | | | | | |
| 2 | 1649 | 5M | 1261984.7 | 217151.4 | NO | — washout — | | | " | " | " |
| | | | | | Will move station seaward. | | | | | | |
| 3 | 1652 | 5M | 1261962.8 | 217161.2 | Yes | 7cm | - some BROWN SILT during. | | | | |
| | | | | | Coarse Sand - 1 cm diam. Sheen on | | | | | | |
| | | | | | surface greyish/black sand. | | | | | | |
| | | | | | Wood fragments. Slight to moderate | | | | | | |
| | | | | | petroleum odor. → Tide = 9.9 | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 9.3 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Stern

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN / cloudy / windy 15 knots

Sample No.: EB02 - 96162601
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261857 y=217116

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1702 | 4M | 1261856.9 | 217118.8 | NO | 2cm | - will move away from rip- | | | | |
| | | | | | | rap. | | | | | |
| 2 | 1707 | 4.5M | 1261859.4 | 217129 | | 7cm | - dense wood debris - some | | | | |
| | | | | | | sheening - Brown silty film on | | | | | |
| | | | | | | surface - grayish black silty | | | | | |
| | | | | | | med sand. Sheen pockets found | | | | | |
| | | | | | | throughout grab. - some sulfur | | | | | |
| | | | | | | odor - some petroleum odor | | | | | |
| | | | | | | moderate shell fragments | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 10.3 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: windy (5 knots - cloudy - some sun

Sample No.: EB03-96162602
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261393 y=216962

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1717 | 5.5M | 1261392 | 216960 | NO | — | large rock in Grab | | | | |
| 2 | 1723 | 5.5M | 1261397 | 216962.3 | NO | — | poor penetration - will move north 20 ft. | | | | |
| 3 | 1727 | 5M | 1261383.9 | 216982.3 | Yes | 6 cm | - grayish brown | coarse sand | | | |
| | | | | | | | kelp on surface - worm tubes - some shearing (slight) - no odor. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 10.5 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: Cloudy - some sun

Sample No.: EB04-96162603
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261409 y=216835.9

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1739 | 4M | – | – | No - | washout | | | | | |
| 2 | 1741 | 4M | 1261423.5 | 216814 | Yes | 7cm | Brownish/gray | | | | - some sheening |
| | | | | | | on the surface - surface layer | | | | | |
| | | | | | | ≈2 mm is brown silt - below surface | | | | | |
| | | | | | | coarse to med sand - no odor | | | | | |
| | | | | | | no wood / no shells / gray - no odor | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | tide = | 10.9 rising |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

ler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: Cloudy - windy (10 Knots) some SUN

Sample No.: EB05-96162604
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261308 y=216766.8

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1750 | 5m. | 1261309.9 | 2167730 | Yes | 6cm | - Brown silt clay - gray-black | | | | |
| | | | | | | Med | SAND - petroleum sheens | | | | |
| | | | | | | present | - slight petro. odor | | | | |
| | | | | | | Red | seaweed (Rhodophyta) | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - cloudy

Sample No.: EB06-96162605
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261182 y=216670.5

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1803 | 55 | 1261184.4 | 216666.7 | NO | 4cm | - poor penetration | | | | Tide=11.3 |
| 2 | 1808 | 7 | 1261159.8 | 216671.8 | Yes | 11cm | - D.O. (Drab olive) surface | | | | veneer |
| | | | | | to dark gray silty, med. sand. Some | | | | | | |
| | | | | | Sheening - slight petroleum | | | | | | |
| | | | | | Some worm tubes - slight petroleum | | | | | | |
| | | | | | odor | Tide=11.4 | | | | | |
| | | | | | | | | | | Tide= | 11.3 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - Cloudy - light rain

Sample No.: EB07-96162606
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261135 y=216529.3

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1818 | 4M | 1261132 | 216531 | NO - washout - rocks | | | | | | |
| 2 | 1820 | 4M | 1261143.9 | 216547 | Yes | 7cm | D.O. | veneer (≈<2mm) on surface | | | |
| | | | | | | some sheen on surface - no odor | | | | | |
| | | | | | | grayish/black - mud sand | | | | | |
| | | | | | | trace shell - no wood. Some | | | | | |
| | | | | | | worms present. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 11.5 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible]T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy / some light rain / low wind

Sample No.: EB08-96162607
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261043 y=216562

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18:30 | 5M | 1261058.3 | 216551.9 | Yes | 7cm | Moved east due to cable | | | | |
| | | | | | obstruction | | | | | | |
| | | | | | - D.O. ≈ 2 mm - red/coarse sand | | | | | | |
| | | | | | below - Sheening on surface - some | | | | | | |
| | | | | | trace shell fragments - some worms. | | | | | | |
| | | | | | some kelp/seaweed fragment. Slight | | | | | | |
| | | | | | petroleum odor | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 11.5 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19
Weather: Cloudy - calm

Sample No.: EB09- 96162608
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1262080 y=217195.8

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 907 | 7M | 1262070 | 217193 | no - washout / gravel | | | | | | |
| 2 | 911 | 7.5M | 1262084 | 217201.9 | Yes | 14cm | | Strong sulfide odor | | | |
| | | | | | Brown silt layer on surface (< ½ cm) | | | | | | |
| | | | | | ½ cm diam. sheen bubble on surface | | | | | | |
| | | | | | Black (> ½ cm) med sand with high density | | | | | | |
| | | | | | of wood fragments. More sheening | | | | | | |
| | | | | | in subsurface - trace shell fragments | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 6.8 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - calm

Sample No.: EB10-96162609
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261343 y=217080

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 921 | 7m | 1261344 | 217081.4 | Yes | 6cm | - Sheen circles on surface (2cm) | | | | |
| | | | | | | some Kelp - neogeardiela - some brown | | | | | |
| | | | | | | silt dusting - to med/coarse grayish | | | | | |
| | | | | | | brown sand - trace shell fragments | | | | | |
| | | | | | | Sheens when homogenized. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 6.1 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - some Rain - windy!

Sample No.: EB11-96162610
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261281 y=216918.7

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1631 | 11 M | — | — | NO — washout | | | | | | |
| 2 | 1633 | 11 M | 1261273.6 | 216917.5 | Yes | Gor | med to coarse Sand gray | | | | |
| | | | | | Dusting of Brown silt on surface. | | | | | | |
| | | | | | Trace Shell fragment - wood debris NO | | | | | | |
| | | | | | Sheen present (splotches) - slight | | | | | | |
| | | | | | petrol. smell | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 9.3 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN / Cloudy

Sample No.: EB12-96162611
Sample Location: Elliott Bay
Prop. Coordinates: X= 1262037 y=217278.6

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1612 | 8 | — | — | NO - cable/rope in jaws. | | | | | | |
| 2 | 1618 | 8.5 | 1262640 | 217273.4 | Yes | 13cm | ~2 cm Brown silt layer | | | | |
| | | | | | Below, fine to med. silty sand grayish | | | | | | |
| | | | | | Black - slight sulfur odor - some wood | | | | | | |
| | | | | | debris - worm tubes, trace shell frags. | | | | | | |
| | | | | | Few sheen bubbles when homogenized | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 8.7 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: BROKEN

Sample No.: EB13-96162612
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261753 y=217379.3

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1524 | 10.5M | 1261754 | 217372 | No. | over | penetrated | | | | |
| 2 | 1540 | 10.5M | 1261758 | 217383 | Yes | 15cm | Thin | brown | silt | on surface (2.2mm) | |
| | | | | | Black | silty | fine | sand | — with | strong | |
| | | | | | petrol | odor | — some worm tubes | | | | |
| | | | | | some | wood | debris | — not | shells | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide | =7.0 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
ST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy / Rain (light)

Sample No.: EB14-96162613
Sample Location: Elliott Bay
Prop. Coordinates: X=1261200 Y=216816.9

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1506 | 11M | 1261205 | 216815 | Yes | 11M | -sheen (2) 4 cm diameter | | | | on surface |
| | | | | | < ½ cm of F. Brown silt on surface | | | | | | |
| | | | | | Blackish/gray silty fine sand | | | | | | |
| | | | | | Moderate/heavy petroleum odors | | | | | | |
| | | | | | some wood fragments (twigs) & shells | | | | | | |
| | | | | | or worm tubes | | | | | | |
| | | | | | | | | | | Title= | 5.2 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - calm

Sample No.: EB15-96162614
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261052 y=216755.1

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 853 | 13m | 1261043 | 216762 | Yes | 8cm | - Brown silt dusting on surface | | | | |
| | | | | | | Sheen on surface - slight sulfur | | | | | |
| | | | | | | odor - Gray med to fine sand | | | | | |
| | | | | | | Trace sheen fragments - few | | | | | |
| | | | | | | worm tubes - no wood fragments | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 7.5 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
R = Green
T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BASKEN - Cloudy - windy - 15 knots

Sample No.: EB16-96162615
Sample Location: Elliott Bay
Prop. Coordinates: X=1261996 y=217404.3

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1444 | 9.5M | | | Yes | 11cm | 1½ cm of BROWN | fine | | | silt |
| | | | | | | | ½ is | gray (dark) | | silty | medium to |
| | | | | | | | fine sand - no odor - some worn | | | | |
| | | | | | | | tube - shell fragments - no | | | | |
| | | | | | | | sheen/ring | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide= | 4.4 Rising |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Broken/windy/some sun

Sample No.: EB17-96162616
Sample Location: Elliott Bay
Prop. Coordinates: X=1261373 y=217186.6

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1410 | 11M | 1261376.3 | 217186.1 | Yes | 9cm | ≈1cm | of Brown | | silt on | surface |
| | | | | | Dark | gray | medium | Sand | | below | - many |
| | | | | | worm | tubes | - no odor | - | | trace | sheen |
| | | | | | in $H_2O$ | in | gray | | | | |
| | | | | | | | sheen in | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide= | 3.0 Rising |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
-- Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 9/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Windy 5/6 Knots - Some Sun/Clouds

Sample No.: EB18 - 96162617
Sample Location: Elliott Bay
Prop. Coordinates: X=1262068 y=217476.5

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1358 | 10.5M | 1262027.6 | 217473.1 | Yes | 15cm | Brown silt veneer (1-2cm) | | | | |
| | | | | | | | Gray/Black silty fine sand | | | & worm tubes | |
| | | | | | | | some wood debris on surface - | | | No odor | |
| | | | | | | | Reject - TOC was not filled before | | | | |
| | | | | | | | dump. | | | | |
| | | | | | | | | | | | |
| 2 | 1428 | 11M | 1262076 | 217471 | NO - | | | | | | |
| 3 | 1432 | 11M | 1262074 | 217470 | Yes | 13cm | - <1cm Brown silt veneer | | | | |
| | | | | | | | Gray/Black silty fine sand & worm | | | | |
| | | | | | | | tubes - some wood debris - some | | | | |
| | | | | | | | sheening when sample is homogenized. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | → | Tide = 3.7 1428 | |
| | | | | | | | | | | Tide = 3.4 | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 2.6 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Broken - windy/cloudy

Sample No.: EB19 - 96162618
Sample Location: Elliott Bay
Prop. Coordinates: X= 1262033 y=217582.4

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1203 | 9 M | 1262038 | 217585 | Yes | 11cm | Thin | (22MM) | veneer - brown silt | | |
| | | | | | Below surface is blackish/gray silty | | | | | | |
| | | | | | fine sand - c/ fine wood fragment | | | | | | |
| | | | | | sheen appears in $H_2O$ in grab | | | | | | |
| | | | | | Sulfur smell - wood tubes. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 0.4 falling | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/18/96
Weather: Broken - some Sun

Sample No.: EB20 - 96162619 Duplicate Station
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261832 y=217524.9

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1149 | 17 | 1261832.6 | 217529.7 | Yes | 14 | Brown < 1/2 cm silt layer | | | | |
| | | | | | Black/Gray | | silty med. Sand - crab | | | | |
| | | | | | Shell at | surface - | worm tubes - ND | | | | |
| | | | | | odor - | ND | Sheens - trace wood | | | | |
| | | | | | debris. | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - SOME SUN

Sample No.: EB21 - 96162621
Sample Location: Elliott Bay
Prop. Coordinates: X=1261558 y=217349.3

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1134 | 12M | 1261554 | 217350 | Yes | 10cm | Thin | Brown | silt | layer | ≈2MM - |
| | | | | | Brown/Gray fine silty sand - some worm | | | | | | |
| | | | | | tubes, no odor, no sheens, some | | | | | | |
| | | | | | shell fragments on surface | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide ≈ 0.5 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/16/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - 15 Knots - Cloudy

Sample No.: EB22 - 96162622
Sample Location: Elliott Bay
Prop. Coordinates: X=1261489 y=217260.7

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1119 | 13 | | | NO | - wash out - wood in jaws | | | | | |
| 2 | 1124 | 13 | 1261486.8 | 217260.6 | Yes | 10 | Top layer ≈ ½cm brown silt | | | | |
| | | | | | | | >2cm gray/brown fine silty | | | | |
| | | | | | | | Sand - worm tubes - trace | | | | |
| | | | | | | | shells - no odor - sheen | | | | |
| | | | | | | | present. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide | = 0.8 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/16

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Broken - cloudy

Sample No.: EB23 - 96162623
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261233 y=217086.9

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1048 | 13M | 1261230.4 | 217085 | NO | 5 | - poor penetration | | | | |
| 2 | 1053 | 13M | 1261236.9 | 217085.1 | yes | 6 | - Top layer (D:O < ½ CM) Med. | | | | |
| | | | | | | sand - (> ½ CM - gray/BROWN med. | | | | | |
| | | | | | | sand) - sheen pockets - strong | | | | | |
| | | | | | | petroleum odor - some wood, | | | | | |
| | | | | | | shell & wood debris | | | | | |
| 3 | 1103 | 13M | 1261240.8 | 217087.1 | NO | 5 | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Tide = 1.1

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible]T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** falling
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: BROKEN - 10 KNOTS - SOME SUN

Sample No.: EB24 - 96162624
Sample Location: Elliott Bay
Prop. Coordinates: X=1262129 y=217620.6

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1015 | 12M | 1261235.7 | 217616.5 | Yes | 11 | Top layer 0.0 (< ½cm) of silt. | | | | |
| | | | | | | | Lots of fine wood debris - loose | | | | |
| | | | | | | | worm tubes - no odor - sheens | | | | |
| | | | | | | | trace shell fragments + toothpick | | | | |
| | | | | | | | layer is - dark gray silty fine | | | | |
| | | | | | | | sand. worm tubes | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 2.9 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Ste

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/16/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Breezy / Cloudy

Sample No.: EB25 - 96162625
Sample Location: Elliott Bay
Prop. Coordinates: X=1261616 y=217426.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 9:58 | 16 M | 1261607.2 | 217130.1 | Yes | 10 | Not | Some worm tubes - wood | | | |
| | | | | | | debris/barnacles - top layer (1cm) | | | | | |
| | | | | | | D.O. silt. Gray - Brown silty fine sand | | | | | |
| | | | | | | below (2cm) some sheen droplets | | | | | |
| | | | | | | present. - Wood chunk (5cm) of | | | | | |
| | | | | | | sheen on | | | | | |
| | | | | | | | | | | Tide = 3.9 ft. | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/16/96
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Sunny - some clouds

Sample No.: EB26 - 96162626
Sample Location: Elliott Bay
Prop. Coordinates: X= 1260919 Y=216791.8
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 9:55 | 14M | 1260921.6 | 216786.1 | Yes | 14 | ½ cm of Brown sand - | | | | going |
| | | | | | | | to (7½ cm) - Black | silty | | | med. sand |
| | | | | | | | Strong sulfur odor. | | | | Worm |
| | | | | | | | tubes, wood debris, sheen | | | | |
| | | | | | | | droplets present. | | | | |
| | | | | | | | | | | Tide = 2.6 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Cloudy - Sunset

Sample No.: EB27 - 96162627
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X= 1261084 y=216967.3

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1921 | 15.5M | 1261086.6 | 216964.3 | Yes | 13 | | | Strong | Heavy | Sheen |
| | | | | | | | Upper layer brown silt (<2cm) | | | | |
| | | | | | | | >2M - gray silty med sand | | | | |
| | | | | | | | areas black & sheens | | | | |
| | | | | | | | throughout layers. - some | | | | |
| | | | | | | | worm tubes - trace wood | | | | |
| | | | | | | | debris. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 7.1 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible]T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Partly cloudy

Sample No.: EB28 - 96162628
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X=1261032 y=217113.4

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| I | 1908 | 19m | 1261034.9 | 217112.5 | Yes | 10cm | Sheen on surface - (droplet) | | | | |
| | | | | | | | Brownish gray | fine | sand - no | | |
| | | | | | | | odor - worm tubes - trace | | | | |
| | | | | | | | wood debris & shells | | | | |
| | | | | | | | | | | | |
| | | | | | | | SHELL TUBES - TRACE WOOD | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 7.6 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Partly Cloudy

Sample No.: EB29 - 96162629
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X=1262023 y=217732.9

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1854 | 25.5' | 1262026 | 217732 | Yes | 11cm | Wood fragment - some shells | | | | |
| | | | | | Thin (<2cm) brown surface layer | | | | | | |
| | | | | | >2 cm - dark gray silty fine sand. | | | | | | |
| | | | | | No odor - ND sheen | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | Tide = 7.7 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy - 2 knots wind

Sample No.: EB30 - 96162630
Sample Location: Elliott Bay
Prop. Coordinates: X=1261709 y=217552.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1643 | 23M | 1261210.6 | 217553.2 | Yes | 10cm | BR silty sand | <2cm from surface. | | | |
| | | | | | | 72cm. | Dark Brown silty fine sand - | | | | |
| | | | | | | | some sheen droplets. | | | | |
| | | | | | | | worn - tube/wood debris | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide | = 8.3 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Partly cloudy

Sample No.: EB31 - 96162631
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X=1261569 y=217525.1

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1831 | 27M | 1261573 | 2175266 | Yes | 13 | - BR-silty sand in upper 2 cm. | | | | |
| | | | | | | >2 cm gray silty med. sand - | | | | | |
| | | | | | | worm tubes - wood debris (trace) | | | | | |
| | | | | | | No odor - [illegible] | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide | = 8.5 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible] = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Partly cloudy

Sample No.: EB32 - 96162632
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X=1261317 y=217354.2

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1754 | 26 | 1261316 | 217348.7 | Yes | 12cm | Thin brown layer a <2cm from | | | | |
| | | | | | | | surface - BR/Gray - 2cm. Silty | | | | |
| | | | | | | | red sand - some wood debris | | | | |
| | | | | | | Heavy | sheen on wood - orange wood | | | | |
| | | | | | | | chunks - no odor | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 9.4 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly Cloudy - scattered showers

Sample No.: EB33 - 96162633
Sample Location: Elliott Bay
Prop. Coordinates: X=1261425 y=217452.2

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1722 | 28M | 1261425.0 | 217447.9 | N | poor penetration | | | | | |
| 2 | 1729 | 27M | 1261421.5 | 217457 | N | 7 - poor seal - bottle in grab | | | | | |
| 3 | 1741 | 27.5M | 1261422.8 | 217454 | Yes | 12 | Brown - <2cm Brown layer | | | | |
| | | | | | Silty | Med. sand - ~~>2cm gray~~ | | | | | |
| | | | | | wood debris - trace shells. | | | | | | |
| | | | | | No odor - no sheens | | | | | | |
| | | | | | | | | | | drab olive (D.O.) | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 9.7 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible]T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy

Sample No.: EB34 - 96162634
Sample Location: Elliott Bay
Prop. Coordinates: X=1261835 y=217663.3

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1709 | 28.5 | 1261833.2 | 217665.7 | Yes | 13 | BR/GR | Silty med. sand - worm | | | |
| | | | | | tubes and wood debris - no odor - | | | | | | |
| | | | | | No sheens | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 10.3 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Sunny

Sample No.: EB35 - 96162635
Sample Location: Elliott Bay
Prop. Coordinates: X=1261061 y=217290.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1639 | 32 | 1261054.7 | 2172918.8 | Yes | 10 | BR-layer <1 cm veneer on | | | | |
| | | | | | | | surface | | | | |
| | | | | | | | GRay sand (med) below | | | | |
| | | | | | | | Some shell frags - small | | | | |
| | | | | | | | sheen droplets - no odor. | | | | |
| | | | | | | | | | | | |
| | | | | GRAIN SIZE = 70% sand | | | | | | | |
| | | | | | | | 30% fines | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide | = 10.5 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
= Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rick Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy - wind 6 knots

Sample No.: EB36 - 96162636
Sample Location: Elliott Bay
Prop. Coordinates: X=1261900 y=217841

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1612 | ~~36H~~ | 1261897.7 | 217835.6 | N - | washout / | wood | in jaws | | | |
| 2 | 1618 | 35.5 | 1261899.1 | 217847.1 | N - | " | " | " | " | | |
| 3 | 1624 | 36.5 | 1261899 | 217844 | Yes | 10cm | GR Silty med. sand - no odor | | | | |
| | | | | | | | No rock - no sheen | | | | |
| | | | | | | | Wood chips, worm tubes. | | | | |
| | | | | | | | | | | Tide | = 10.7 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard L. Stur

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/15/96
Weather: Sunny - some clouds

Sample No.: EB37 - 96162637
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X=1261594 y=217677.1

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1549 | 35 | 1261589.2 | 217677.1 | No | - wood debris in jaws - washout. | | | | | |
| 2 | 1554 | 35 | 1261591.9 | 217676.4 | Yes | 13 | BR | Med Sand - some barnacles | | | |
| | | | | | on surface - Brown layer <1 cm at surface | | | | | | |
| | | | | | >1 cm gray - wood fragments. No odor | | | | | | |
| | | | | | No sheens - in grab | | | | | | |
| | | | | | Small sheens appear when sample | | | | | | |
| | | | | | is homogenized. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tides | = 10.5 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Sunny - some clouds

Sample No.: EB38 - 96162638
Sample Location: Elliott Bay
Prop. Coordinates: X=1261268 Y=217503.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1519 | 36 | 1261262 | 2175039 | YES | 13 | <0.5cm = BROWN SILT<br>>0.5cm = DARK BROWN/GREY | | | | SILTY SAND |
| | | | | | | | | | NONE | NONE | |
| | | | | | | | slight | sheen on the | H2O surrounding | | |
| | | | | | | | the | sediment | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide=10.2 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/15/95
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly Cloudy - 60's

Sample No.: EB40 - 96162640 ~~DUPLICATE STATION~~
Sample Location: Elliott Bay
Prop. Coordinates: X=1261877 y=217926.5
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1441 | 40M | 1261879.8 | 217924.1 | Yes | 14 | GR/BR | fine sand | NO | NO | wood |
| | | | | | | | - uniform color, little | | | | debris |
| | | | | | | | variation | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Grain size test 80-90% > 63 microns - mass | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 9.5 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: April 15-95
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy

Sample No.: EB41 - 96162642
Sample Location: Elliott Bay
Prop. Coordinates: X=1261587 y=217785.5
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1425 | 41 | 1261589 | 217778 | Yes | 11.5 | GR | SD/SC | NO | 3 - on surface | |
| | | | | | | | Sheen pocket | | | ~ 2 cm in | |
| | | | | | | | diameter - some | | | wood debris | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 15 April 1996

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy - 60's - some rain

Sample No.: EB42 - 96162643
Sample Location: Elliott Bay
Prop. Coordinates: X=1261250 y=217595.6

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1410 | 41 | 1261248 | 217594.3 | yes | 11.5 | Bkgy - Fine sandy silt, no odor | | | | |
| | | | | | | | thin < 1cm veneer - rpd brown | | | | |
| | | | | | | | silt - trace shell fragments. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 8.3 |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RT = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/16/96
Weather: Broken Cloudy

Sample No.: EB43-96162648
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: X= Y= New station per. Dena

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1016 | 14m | 1260793.5 | 216978 | Yes | 16cm | grayish brown silty sand (surface) | | | | |
| | | | | | worm tubes present - @ 3-4 cm below → | | | | | | |
| | | | | | gray fine sand - no sheens, odor, | | | | | | |
| | | | | | or wood debris. Sheens appeared | | | | | | |
| | | | | | when grab was opened to be | | | | | | |
| | | | | | disposed. | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/18/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Broken - windy - Some sun

Sample No.: EB45-96162650
Sample Location: Elliott Bay
Prop. Coordinates: X= Y=

Sampling Method: 0.1 m² van Veen Grab
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1342 | 46M | 1261613.6 | 217978 | Yes | 11cM | Some | Brown silt dusting on | | | |
| | | | | | surface - remainder of grab is | | | | | | |
| | | | | | med. to coarse sand - gray - trace | | | | | | |
| | | | | | shell fragment, some worm tubes, | | | | | | |
| | | | | | Set wood chunk. Some small | | | | | | |
| | | | | | sheen droplets ≈ ½ cm diameter. | | | | | | |
| | | | | | No odor. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible]T = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - overcast

Sample No.: BK01 - 96162644 DUPLICATE STATION
Sample Location: Offshore of Magnolia Bluff
Prop. Coordinates: To be determined in the field
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1618 | 23M | 1246190 | 238934 | NO | — | insufficient | volume - grain | | | |
| | | | | | size - a | little | coarse | | | 91% Sand | |
| | | | | | | | | | | 9% Fines | |
| 2 | 1633 | 38M | 1245959 | 238130.4 | NO | — | 4.50 | coarse grain size | | | |
| | | | | | | | | | | 91% Sand | |
| | | | | | | | | | | 9% Fines | |
| 3 | 1649 | 60.5 | 1245500 | 237385.7 | NO | — | washout | | | | |
| 4 | 1658 | 62 | 1245396 | 2372294 | Yes | 6CM | Thin | mottled Brown | | | Tide=7.0 |
| | | | | | (≈ < ½ cm) | | D.O. | Medium Sand - some | | | |
| | | | | | shells + | | Sea | cucumbers | | | |
| | | | | | grain | | size | 77% | sand | 96162644 | |
| 5 | 1715 | 63M | 1245385 | 2372279 | Yes | 7 cm | Thin | mottled Brown / | | | Tide=8.0 |
| | | | | | (≈ ½ cm) - | beneath | - D.O. | medium | sand | | |
| | | | | | some | shells + | cucumbers | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rebel

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Overcast - some rain - wind (10kts)

Sample No.: BK02 - 96162646
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Offshore of Myrtle Edwards Park - Elliott Bay
Analysis: Metals / SVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture
Prop. Coordinates: To be determined in the field

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1533 | 21.5M | 1262587.4 | 230138 | No — water grab - could have tripped. | | | | | | |
| 2 | 1536 | 24M | 1262485 | 230140 | No - water grab | | | | | | |
| 3 | 1539 | 24M | 1262475 | 230191 | Yes 9cm This (≈2 mm) brown silt on surface | | | | | | |
| | | | | | D.O. (Drab olive) fine sand - no odor | | | | | | |
| | | | | | trace shells - some worm tubes - | | | | | | |
| | | | | | No sheening!! | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | Grain Size analysis = | | | | 67% | Sand | |
| | | | | | | | | | 33% | Fines | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 4.6' rising | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# PHASE 1 VISUAL INSPECTION STATIONS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: calm - cloudy - some rain

Sample No.: VI-01
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1130 | 13.5 | 1260995 | 2169825 | Yes | | BROWN silt layer | | | | ≈ ½ cm |
| | | | | | | | Petrol. sheen | on surface - some | | | |
| | | | | | | | worm tubes - odor present - some | | | | |
| | | | | | | | wood debris | very fine consolidated | | | |
| | | | | | | | silt/clay | | | | |
| | | | | | | | | | | | |
| | | | | | | | approx. 4-6 droplets | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 1.1" | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
ST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Calm - cloudy - light rain

Sample No.: VI-02
Sample Location: Elliott Bay

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1140 | 13.5M | 1260894 | 2169709 | | — Brown silt on surface - fine silt/clay - brownish gray | | | | | |
| | | | | | | Shell debris on surface - no odor | | | | | |
| | | | | | | or petroleum bubbles on surface. | | | | | |
| | | | | | | - Brittle star - worm tubes | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Broken - cloudy - Slight RAIN

Sample No.: V.1.-03
Sample Location: Elliott Bay

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1149 | 13.5M | 1261049 | 216966.9 | Yes | — | Brown | silt | - on surface | | - thin (22MM) |
| | | | | | | Sheen droplets on surface | | | | | |
| | | | | | | Grayish-Brown silty-very-fine | | | | | |
| | | | | | | sand - moderate odor - worm | | | | | |
| | | | | | | tubes - no subsurface sheening | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
ST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - Some rain - Cold

Sample No.: V.I.-04
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 14m | 1260810 | 216796.9 | | - coarse | Sand - Brown | - on surface | | | |
| | | | | | Sand is | ≈5cm | - beneath is | silty | | | |
| | | | | | very | fine | sand - | moderate | petrol. | | |
| | | | | | odor - | shearing | in | bottom | layers | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 0.3 |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - calm

Sample No.: V.I.-05
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1224 | 13.5 | 1260733.9 | 216795 | Yes | — Brown silt layer on surface | | | | | |
| | | | | | | approx <1cm - below very fine silty | | | | | |
| | | | | | | sand grayish brown - no odor - | | | | | |
| | | | | | | some sheening - worm tubes | | | | | |
| | | | | | | ↳ small droplets - trace | | | | | |
| | | | | | | shell fragments. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - calm

Sample No.: VI-06
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1236 | 23M | 1261042 | 217223 | | | Brown silt layer dusty | | | | |
| | | | | | | | B.O. (Drab olive) - fine sand | | | | |
| | | | | | | | uniform - Run off water in grab | | | | |
| | | | | | | | had one sheen - three sheen bubbles | | | | |
| | | | | | | | on sediment - trace shell fragment. | | | | |
| | | | | | | | ↳ on surface layer | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - calm

Sample No.: U1-07
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1243 | 15M | 1260889 | 217113.3 | | | Thin | Brown | silt | layer | on surface |
| | | | | | | <½ cm - Brownish gray very fine | | | | | |
| | | | | | | sand - trace sheen - some large | | | | | |
| | | | | | | worm tubes (2) no sheen | | | | | |
| | | | | | | no odor - clean from apperance | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = | 0.0 Rising |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: calm - cloudy

Sample No.: VI-08
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1249 | 31M | 1260968 | 217295 | | | Almost identical to VI-07 | | | | |
| | | | | | | | BROWN silt on surface (< 1cm) | | | | |
| | | | | | | | BROWNISH GRAY, silty fine sand | | | | |
| | | | | | | | NO SHEEN, NO odor - trace | | | | |
| | | | | | | | shell fragments - some | | | | |
| | | | | | | | worms | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Calm - cloudy - 50's (mid)

Sample No.: VI-09
Sample Location: Elliott Bay

Sampling Method: 0.1 m² van Veen Grab
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1254 | 34m | 1261101.2 | 217390.9 | | | Thin Grown silt <½ cm - grayish | | | | |
| | | | | | | | Brown - Med sand - some | | | | |
| | | | | | | | worm tubes - trace shells | | | | |
| | | | | | | | No odor - no sheening | | | | |
| | | | | | | | Appears clean. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - windy (8 knots)

Sample No.: VI-10
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1349 | 50M | 1261189 | 2180907 | Yes | | Thin brown | silt | | veneer (<½cm) | Surface |
| | | | | | Below → | | gray | med SAND | | - trace shell | |
| | | | | | | | fragments + 2/3 | sheen bubbles | | | |
| | | | | | | | on surface - some worm tubes | | | | |
| | | | | | | | Appears fairly clean. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 0.8 RISING | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - windy (8 knots) low 50's

Sample No.: VI-11
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1356 | 43M | 1261708 | 217983 | Yes | | Brown silt on surface (≈2cm) | | | | |
| | | | | | | | med silty sand grayish brown - | | | | |
| | | | | | | | some worms - no odor - or | | | | |
| | | | | | | | sheening - some wood debris | | | | |
| | | | | | | | trace shell fragments. | | | | |
| | | | | | | | Appears clean | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 1.3' rising | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
ST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: cloudy - windy (15 knots)

Sample No.: VI-12
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1404 | 33m | 1261620.8 | 2179x.8 | | | Brown silt w/ weed on surface | | | | |
| | | | | | | | real sand beneath - grayish | | | | |
| | | | | | | | brown - many worms - some | | | | |
| | | | | | | | wood debris - sheen bubbles | | | | |
| | | | | | | | (2) on surface - trace | | | | |
| | | | | | | | shell fragments - no | | | | |
| | | | | | | | odor. | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy - light rain - windy

Sample No.: VT-13
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1412 | 48 m | 1261522 | 217490.9 | | | Brown silt surface layer (3.2 cm) - sheen bubble on surface - subsurface large 3 cm diameter globules fine sand black/gray. Heavy petroleum odor - Petroleum is embedded in the sandy portions of the grab. Some worm tubes. | | | | |
| | | | | 100' west of EB 45 | | | | | | | |
| | | | | | | | | | | Tide = 6.7' RLW | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
= Green
= Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature:

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4100-02
Date: 4/19/96

Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - windy (15 KNOTS GUST)

Sample No.: VI-14
Sample Location: Elliott Bay

Sampling Method: 0.1 m² van Veen Grab
Analysis: Visual inspection for gross contamination

Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1422 | 44.5 | 1261592 | 2179214 | | | Brown sandy silt on surface | | | | |
| | | | | | | | (>2 cm) - Below (>2 cm) surface | | | | |
| | | | | | | | dark gray mud | | | | |
| | | | | | | | Heavy sheen globules below | | | | |
| | | | | | | | surface - some sheen bubbles | | | | |
| | | | | | | | on surface - some worm | | | | |
| | | | | | | | tube - strong odor | | | | |
| | | | | | | | trace shell fragments | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide 1.8' | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Cloudy/overcast/windy 10 kts, 220°

Sample No.: VI-15
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1431 | 38.5 | 1261466 | 217982 | | | Thin Brown silt layer ¼cm | | | | |
| | | | | | | 2 | Sheen droplets on surface | | | | |
| | | | | | | - | No subsurface sheening | | | | |
| | | | | | | | Brownish/gray med sand | | | | |
| | | | | | | | no worm tubes, shell debris, | | | | |
| | | | | | | | or wood | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | ≈100 ft | west of VI-13 | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 2.2' rising | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible] = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Overcast, windy (>15 Kts), Some Rain

Sample No.: V-16
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1443 | 40M | 1261216.5 | 217872 | Yes | | Brown silt layer ≈ ½-1 cm thick. Dark gray silty fine sand 7-2 cm - moderate sulfide smell - worm tubes - some wood fragments - sheen bubble on surface - no sheen below surface | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | ≈100 | east of | | EB 44 (Dirty station) | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg, N. Musgrove
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Overcast

Sample No.: V1-17
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: Visual inspection for gross contamination
Prop. Coordinates: N/A Station location determined in field. Station is for visual inspection.

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1448 | 46m | 1261462 | 217880 | | Brown silt layer (22mm) - | | | | | |
| | | | | | | silty fine sand (gray) trace | | | | | |
| | | | | | | shell fragments - some | | | | | |
| | | | | | | worms - (flat worm) no | | | | | |
| | | | | | | odor - no sheen - | | | | | |
| | | | | | | appear clean | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | Tide = 3.0 | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
[illegible] = Green
[illegible] = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes, R. Sturim, K. Ritenburg
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4100-02
Subcontractor(s): BioMarine Enterprises
Date: 4/19/96
Weather: Overcast - Rain (lite) wind ≤ 10 kts.

Sample No.: VI-18
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: ~~Metals / GVOCs / PCBs / Dioxins & Furans / TOC / Grain Size / % Moisture~~
Prop. Coordinates: X= Y=

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1508 | 59m | 1266826.7 | 218071.5 | Yes | | Thin | dusting of | brown | silt (≤ 1 cm) | |
| | | | | | | | fine to medium | sand | | | grayish |
| | | | | | | | brown - some trace | shell | | | |
| | | | | | | | fragments + worm | tubes | | | |
| | | | | | | | No odor. No sheening | | | | |
| | | | | | | | appears clean. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | tide | 3.6' |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

# PHASE 2 IMMUNOASSAY STATIONS

## Field Observations of Potential Anthropogenic Materials in Phase 2 Surface Sediment Samples

| Station | Sheen Description | Petroleum Odor Description | Non-Plant Wood Debris |
|---|---|---|---|
| **Reconnaissance Stations** | | | |
| EB46 | Trace / small droplets | None | None |
| EB47 | Trace / small droplets | None | None |
| EB48 | Sheening on water in grab | None [slight sulfide odor] | Wood debris |
| EB49 | Some when homogenized | None | None |
| EB50 | No sheen | None | None |
| EB51 | Small droplet on surface | None | Small twigs on surface |
| EB52 | No sheen | None | None |
| EB53 | Trace / small droplets | None | None |
| EB54 | Trace / small droplets | None | None |
| EB55 | No sheen | None [slight sulfide odor] | large piece of wood in grab |
| EB56 | No sheen | None | None |
| EB57 | No sheen | None [slight sulfide odor] | None |
| EB58 | No sheen | None | None |
| EB59 | Trace / small droplets | None | None |
| EB60 | Some when homogenized | None | None |
| EB61 | Trace / small droplets | None | None |
| EB62 | Trace / small droplets | None [slight sulfide odor] | None |
| EB63 | No sheen | None | None |
| EB64 | No sheen | None | None |
| EB65 | Heavy sheening present | Strong product odor | None |
| EB66 | Trace / small droplets | Slight petroleum odor | None |
| EB67 | No sheen | None | None |
| EB68 | Some when homogenized | None | None |
| EB69 | Some when homogenized | None | many wood chips |
| EB70 | No sheen | None | None |
| EB71 | Moderate sheening | Slight petroleum odor | wood debris |
| EB72 | Some when homogenized | None | None |
| EB73 | Trace / small droplets | None [slight sulfide odor] | None |
| EB74 | No sheen | None | None |
| EB75 | Some when homogenized | None | wood debris |
| EB76 | No sheen | None | None |
| EB77 | No sheen | None | None |
| EB78 | No sheen | None | None |
| EB79 | Heavy sheening/creosote present | Strong product odor | None |
| EB80 | No sheen | None | None |
| EB81 | Some when homogenized | None | None |
| EB82 | No sheen | None | None |
| EB83 | Some when homogenized | None | None |
| EB84 | Some when homogenized | None | None |
| EB85 | No sheen | None | None |
| EB86 | No sheen | None | None |
| EB87 | Some when homogenized | None | None |
| EB88 | No sheen | None | None |
| EB89 | No sheen | None | None |
| EB90 | Some when homogenized | None [moderate sulfide odor] | None |
| EB91 | No sheen | None | None |
| EB92 | Some when homogenized | None | None |
| EB93 | Some when homogenized | None | None |
| EB94 | No sheen | None | None |

## Field Observations of Potential Anthropogenic Materials in Phase 2 Surface Sediment Samples

| Station | Sheen Description | Petroleum Odor Description | Non-Plant Wood Debris |
|---|---|---|---|
| **Reconnaissance Stations (continued)** | | | |
| EB95 | Trace / small droplets | None | None |
| EB96 | No sheen | None | None |
| EB97 | Some when homogenized | None | None |
| EB98 | Some when homogenized | None | None |
| EB99 | No sheen | None | None |
| EB100 | Some when homogenized | None | None |
| EB101 | No sheen | None [slight sulfide odor] | wood debris |
| EB102 | Trace / small droplets | None | None |
| EB103 | No sheen | None | None |
| **PSR Offshore Unit Chemistry / Bioassay / Infauna Stations** | | | |
| EB47 | Trace / small droplets | None | None |
| EB49 | Trace / small droplets | None | Occasional wood debris |
| EB54 | No sheen | None | None |
| EB57 | No sheen | None [slight sulfide odor] | None |
| EB60 | Occasional small droplets | None | None |
| EB63 | No sheen | None | None |
| EB67 | Occasional small droplets | None | None |
| EB72 | Heavy sheening/creosote present | Strong product odor | None |
| EB77 | Trace / small droplets | None | Occasional wood debris |
| EB80 | No sheen | None | Occasional wood debris |
| EB85 | No sheen | None | Occasional wood debris |
| EB86 | No sheen | None | None |
| EB87 | Some sheening | None | Occasional wood debris |
| EB91 | No sheen | None | None |
| EB97 | No sheen | None | None |
| EB100 | No sheen | None | None |
| EB104 | Some sheening | None | Occasional wood debris |
| EB105 | No sheen | None | None |
| EB106 | Trace / small droplets | None | Occasional wood debris |
| EB107 | Some when homogenized | None | None |
| EB108 | Trace / small droplets | None | None |
| EB109 | No sheen | None | None |
| EB110 | No sheen | None | None |
| EB111 | No sheen | None | None |
| EB112 | No sheen | None | None |
| **Background Chemistry / Bioassay / Infauna Stations** | | | |
| BK01 | No sheen | None | None |
| BK04 | No sheen | None | None |

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather:

Station No.: EB 46
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,769 Y= 216,648

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1145 | 9M | | | NO | → | cobble in jaws | | | | Station moved 20' N. away from Rip-Rap |
| 2 | 1148 | 11M | | | NO | → | clean fouled in jaws of van Veen | | | | |
| 3 | 1149 | 11.5M | | | NO | → | rock in jaws, washout | | | | |
| 4 | 1152 | 10.5M | | | NO | → | rock in jaws, washout | | | | |
| 5 | 1154 | 11.5M | 1260739 | 216674 | Yes | 6cm | D.O. | C-MSD | None | 3 | |
| | | | | | Many shell fragments on surface - some | | | | | | |
| | | | | | large stones/pebbles on surface - bits | | | | | | |
| | | | | | of seaweed - | | | | | | |
| | | | | | Sheen droplets in sample (≈ 1-2 cm dia.) | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | Grain size = 16% Fines | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Stur

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy-calm-High 60s

Station No.: EB 47
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,620 Y= 211a, 743

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 2 | 1133 | 7M | 1260622 | 216741 | YES | 7cm | DK GRY | C/M SD | NONE | 3 | |
| | | | | | Many rocks/shells in grab (station | | | | | | |
| | | | | | is close to Rip-Rap) | | | | | | |
| | | | | | Many shells/seaweed - worm tubes | | | | | | |
| | | | | | Some small sheen droplets (<1-2cm) | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** Include presence of biota, debris, or redox layer

Sampler Signature: Rebecca Ste

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm - High 60's

Station No.: EB 48
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,260,939 Y= 216,786

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1208 | 15M | 1260935 | 216783 | YOS | 10 cm | | M-F SD | SL H2S | 3 | |
| | | | | | D.O | ≈ 1 cm | RPD - Dark | Grey | below | | |
| | | | | | worm | tubes - | wood | debris | | | |
| | | | | | Sheening | on | water | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm - high 60's

Station No.: EB 49
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,811 Y= 216,875

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1306 | 16M | 1260783 | 216869 | Yes | 16cm | D.O. | F-SD | NONE | | |
| | | | | | Trace Shell fragments on surface | | | | | | |
| | | | | | Worm tubes present | | | | | | |
| | | | | | Sheen (trace) on water in grab | | | | | | |
| | | | | | Polychaete - small droplets appear | | | | | | |
| | | | | | in bowl when homogenized | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rebecca Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: cloudy - high 60's - calm

Station No.: EB 50
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,701 Y= 216,953

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1124 | 15M | 1260209 | 216953 | Yes | 9cm | D.O. | F-MSD | NONE | NONE | |
| | | | | | Worm tubes on surface - shell hash - | | | | | | |
| | | | | | on surface (trace) | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9/5/96
Weather: Cloudy - Mid-60's

Station No.: EB 51
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,108 Y= 217,030

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1110 | 18.5M | | | NO | → | wash out | | | | |
| 2 | 1112 | 18.5M | 1260106 | 217033 | NO → | | wash out | | | | |
| 3 | 1119 | 18M | | | NO → | | Empty | | | | |
| 4 | 1121 | 18M | | | NO → | | Empty | debris seen on depth sounder - station 4 & 15' to the Southwest | | | |
| 5 | 1127 | 19M | | | Yes | 10cm | | Brittle stars / tiny worms on surface - polychaetes Fine to medium sand - D.O. small sheen droplet (<1cm) on surface only - NO RPD | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Otto

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: cloudy - mid 60s

Station No.: EB 52
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,535 Y= 217,245

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1144 | 33 | 1260539 | 217242 | Yes | 15CM | D.O. | Fine to Med | | silty sand-light | |
| | | | | | | | brown dusting on surface-no | | | | |
| | | | | | | | odor-no sheening on surface. | | | | |
| | | | | | | | some worm tubes | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard [illegible]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 53
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,045 Y= 217,051

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1422 | 16.5 | | | -Poor Recovery | | | | | | |
| 2 | 1426 | 16.5 | 1261040 | 217053 | -water gray - station moved | | | | | | |
| 3 | 1429 | 16 | 1261639 | 217067 | 18' North/West of target | | | | | | |
| | | | | | Yes | 7cm | D.O. | M. silty SD | | | |
| | | | | | Small sheen droplet inside | | | | | | |
| | | | | | sample - a few worm tubes | | | | | | |
| | | | | | no shell frag. + dry sediment | | | | | | |
| | | | | | not holding much H2O. | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rebecca Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm - high 60's

Station No.: EB 54
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,260,918 Y= 217,149

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1315 | 23M | 1260918 | 217148 | Yes | 11cm | D.O | F-SD | None | None | |
| | | | | | Lots of shell fragments (barnacles + | | | | | | |
| | | | | | some Jingles) → Pododesmus macroschist | | | | | | |
| | | | | | Some worms + tubes | | | | | | |
| | | | | | Some Sheening when grab is opened | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy-calm

Station No.: EB 55
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,803 Y= 217,229

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1108 | 30 | 1260800 | 217229 | Yes | 12cm | D.O. | M-F SD | SL H2S | NONE | |
| | | | | | Large piece of wood inside | | | | | | |
| | | | | | Trace shell fragments on surface | | | | | | |
| | | | | | Some worm tubes/burrows | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | Grain size = 47% Fines | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rachel Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Cloudy - breezing - high 60s

Station No.: EB 516
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,260,711 Y= 217,306

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1156 | 36 | 1260706 | 217306 | Yes | 12.5 | D.O. | Fine Sandy | | silt - no odor | |
| | | | | | | | | Few worm | | tubes - no | |
| | | | | | | | | sheening - uniform D.O. | | | |
| | | | | | | | | color | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-95
Weather: Breaking some clouds - High 60s

Station No.: EB 57
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,260,703 Y= 217,537

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1208 | 46 | 1260704 | 217532 | Yes | 13.5 | D.O. | MFSD | H2S | slight | some shell |
| | | | | | | | fragments on surface no sheening | | | | |
| | | | | | | | light brown dusting on surface | | | | |

Color Codes
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

Texture Codes
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

Odor Codes
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

Petroleum Code
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

Other:
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Stur

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 58
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,213 Y= 217,174

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1412 | 17M | 1261214 | 217275 | Yes | 10cm | D.O | CLAY-SILT SOME SD ON | | Surface | |
| | | | | | Worms/tubes | | | | | | |
| | | | | | No odor | | | | | | |
| | | | | | no sheen | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Partly cloudy/calm

Station No.: EB 59
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,117 Y= 217,311

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1334 | 31 | 126115 | 217313 | Yes | 7cm | D.O GREY | F-M SAND | NONE | 3 | |
| | | | | | Worm tubes present - worm present | | | | | | |
| | | | | | Sheen droplets present (not many) | | | | | | |
| | | | | | (≤ ½ cordia) | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Partly cloudy - calm

Station No.: EB 10
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,088 (18) Y= 217,442

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1325 | 31 | 1260125 | 217442 | Yes | 12 | D.O. | F-SD | NONE | 3 | |
| | | | | | Small sheen droplets on surface | | | | | | |
| | | | | | No shell fragments | | | | | | |
| | | | | | NO debris - sheen drops appear | | | | | | |
| | | | | | (~6) when sample homogenized. | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9/5/96
Weather: BROKEN - SOME CLOUDS - MID 60's

Station No.: EB 101
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,897 Y= 217,1016

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1219 | 49 | 1260908 | 217595 | YES | 15 | D.O. | M-FSD | NONE | SMALL | DROPLET |
| | | | | | | | ABOUT | 1-2 MM IN | SIZE - | LT. BROWN | |
| | | | | | | | DUSTING | ON SURFACE - | SOME | | |
| | | | | | | | WORM | TUBES - | TRACE | SHELL | |
| | | | | | | | FRAGMENTS | ON | SURFACE | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 102
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,068 Y= 217,673

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1051 | 46 | 1261075 | — | NO | → | large cobble in Jaws | | | | |
| 2 | 1057 | 46 | 1261071 | 217675 | YES | 15.5 | D.O. | M-FSD | SLH2S | 3 | |
| | | | | | Sheen droplets on surface (+ 1-2 cm dia) | | | | | | |
| | | | | | Some worm tubes present | | | | | | |
| | | | | | Trace shell fragments | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly cloudy - Mid 60s

Station No.: EB 103
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,260,872 Y= 217,850

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1230 | 55.5 | 1260878 | 217847 | Yes | 16cm | D.O | F-MSD | None | None | |
| | | | | | | Trace shell fragments on surface | | | | | |
| | | | | | | light brown dusting on surface | | | | | |
| | | | | | | some polychaetes. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard A. Stern

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 104
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,363 Y= 217,575

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1403 | 36M | 1261351 | 217572 | Yes | 12CM | D.O | F-SD SAND CORS | NONE | NONE | |
| | | | | | Light brown dusting on surface | | | | | | |
| | | | | | trace shell frags - some worms / tubes | | | | | | |
| | | | | | no debris | | | | | | |
| | | | | | | | | | | | |
| | | | | | → small sheen droplet (2½ cm dia) appeared | | | | | | |
| | | | | | at surface of jarred sediment | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy / calm

Station No.: EB 65
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,265 Y= 217,713

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1343 | 45m | 1,262272 | 217716 | Yes | 16cm | D.O. | M-FSD | Heavy | Heavy | |
| | | | | | Drab Olive dusting on surface | | | | | | |
| | | | | | Free product/heavy sheen below | | | | | | |
| | | | | | surface → carmel/syrupy | | | | | | |
| | | | | | product oozing from sediment | | | | | | |
| | | | | | floating in grab water | | | | | | |
| | | | | | | | | | | | |
| | | | | * | No sample collected due to | | | | | | |
| | | | | | gross contamination | | | | | | |
| | | | | | | | | | | | |
| | | | | | Sediment is bucketed for | | | | | | |
| | | | | | upland disposal | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 616
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,179 Y= 217,833

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1036 | SOM | 1261178 | 217831 | Yes | 4.5 | D.O. | M-F SD | SL TPH | 3 | |
| | | | | | Lite brown dusting on surface | | | | | | |
| | | | | | Trace shell fragments | | | | | | |
| | | | | | Sheen droplet (<2cm dia) on surface | | | | | | |
| | | | | | Some worm tubes | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Grain size = 46% fines | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rebecca Stone

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 107
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,080 Y= 217,938

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1012 | 54 | 1261075 | 217,941 | NO | — | POOR | recovery | NONE | | |
| 2 | 1019 | 54 | 1261075 | 217934 | Yes | 12.5 | D.O. | M-SD | 0 | | |
| | | | | | Light brown sheen on surface | | | | | | |
| | | | | | Worms / tubes present | | | | | | |
| | | | | | Dark gray with red flecks - | | | | | | |
| | | | | | looks like Duwamish sand | | | | | | |
| | | | | | Trace shell fragments | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-5-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly sunny - 69°F

Station No.: EB 108
Sample Location: Elliott Bay
Proposed Coordinates: X= 1,261,049 Y= 218,138
Sampling Method: 0.1 m² van Veen Grab
Analysis: cPAHs/PAHs (Immunoassay field test)

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1242 | 61 | 1261058 | 218129 | Yes | 16 | D.O. | F-MSD | NONE | NONE | |
| | | | | | | Light brown dusting on surface & | | | | | |
| | | | | | | trace shell fragments on surface | | | | | |
| | | | | | | some worm tubes - no wood | | | | | |
| | | | | | | Some small (≤2mm) sheen droplets | | | | | |
| | | | | | | in bowl when homogenized. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard E. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy-calm

Station No.: EB 69
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,598 Y= 217,679

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1516 | 34 | 1261597 | 217671 | Yes | 14 | | | | | |
| | | | | | Grey/brown ½cm layer on surface | | | | | | |
| | | | | | D.O. below – many wood chips | | | | | | |
| | | | | | sheeny on H2O + sed (½cm dia) → drops | | | | | | |
| | | | | small droplets appear when homogenized | | | | | | | |
| | | | | No odor | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

WESTON
MANAGERS DESIGNERS CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 70
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,536 Y= 217,793

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1506 | 42M | 126137 | 217795 | Yes | 14cm | D.O. | | | | |
| | | | | | I ~~22~~ cm light D.O on surface - silt | | | | | | |
| | | | | | >1 cm M-FSD | | | | | | |
| | | | | | No odor - no worms/tubes | | | | | | |
| | | | | | no sheen - baby yoldia | | | | | | |
| | | | | | | | 0 | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 71
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,461 Y= 217,926

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1449 | 49 | 1261458 | 217930 | Yes | 12.5 | | | | | |
| | | | | | Lite flocky layer (≈1cm) on surface | | | | | | |
| | | | | | M-F SDY-silt (D.O) - shell frag | | | | | | |
| | | | | | (small/baby clams) - lots of | | | | | | |
| | | | | | globules/sheening when homog | | | | | | |
| | | | | | ~~Moderate~~ slight creosote odor | | | | | | |
| | | | | | wood debris in broken-up | | | | | | |
| | | | | | ~~g~~ | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 72
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,377 Y= 218,043

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1446 | 55 | 1261371 | 218045 | Yes | 16.5 | → | a few cm layer | | | |
| | | | | | | of | sandy silt on top - M-F SD below | | | | |
| | | | | | | 1 kg. Shell in grab | | | | - NO odor | |
| | | | | | | several small sheen droplet | | | | | |
| | | | | | | when homogenized | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Mostly cloudy - calM

Station No.: EB 73
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,292 Y= 218,177

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1000 | 58.5 | 1261296 | 218176 | Yes | 16 | D.O. | F-M SD | SLH2S | 3 | |
| | | | | | Slight sheen on overlying water | | | | | | |
| | | | | | Small (<1-2 cm dia) droplets (sheen) | | | | | | |
| | | | | | on surface - Trace shell frag. | | | | | | |
| | | | | | on surface - some polychaetes | | | | | | |
| | | | | | present | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** include presence of biota, debris, or redox layer

Sampler Signature: Richard E. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly Sunny - 69°F

Station No.: EB 74
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,194 Y= 218,329

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1255 | 65 | 1261193 | 218327 | Yes | 16CM | D.O. | M-SD | NONE | NONE | |
| | | | | | | Trace shell fragment - worm tubes | | | | | |
| | | | | | | Lt. brown dusting on surface | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 75
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,825 Y= 217,759

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1558 | 32M | 1261820 | 217758 | Yes | 8CM | D.O. | M-FSD | NONE | NONE | |
| | | | | | Some clams shells on surface | | | | | | |
| | | | | | Wood debris present | | | | | | |
| | | | | | Lite brown matting in surface | | | | | | |
| | | | | | Worm tubes | | | | | | |
| | | | | | Strong (<3mm) sheen droplet when sediment | | | | | | |
| | | | | | is homogenized - not many <10. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 76
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,741 Y= 217,909

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1546 | 42M | 1261736 | 217903 | Yes | 8.75M | D.O. | F-MSD | NONE | NONE | |
| | | | | | Light | brown | dusting | on | surface | | |
| | | | | | barnacles | shells | on | surface | | | |
| | | | | | worms/tubes | present | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9/6/96
Weather: Cloudy - calm

Station No.: EB 77
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,667 Y= 218,043

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1536 | 38M | 1261667 | 218041 | Yes | 11cm | | | | | |
| | | | | | Worm tubes / trace shell fragments | | | | | | |
| | | | | | 1-2 cm of D.O - silt on surface - | | | | | | |
| | | | | | dark grey M-F sand below | | | | | | |
| | | | | | No odor - no sheen | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 78
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,596 Y= 218,212

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1527 | 57 | 1261588 | 218215 | Yes | 13cm | | | | | |
| | | | | | Fine silty layer (~1-2cm) on surface | | | | | | |
| | | | | | D.O. 11-FSD below → no odor | | | | | | |
| | | | | | no sheening | | | | | | |
| | | | | | Trace shell fragments - some worm | | | | | | |
| | | | | | some tubes | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Robert Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 7-6-96
Weather: Mostly Cloudy - calm

Station No.: EB 79
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,466 Y= 218,271

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 0932 | 58 M | 1261466 | 218270 | NO | — | worm out | (debris in jaws) | | | |
| 2 | 0938 | 58 M | 12614 | 218270 | Yes | 16 | D.O | M-FSD | SL H2S | Yes 3 | |
| | | | | | Sheen droplets present on surface | | | | | | |
| | | | | | (≈ 2cm dia) | | | | | | |
| | | | | | Trace shell fragments on surface | | | | | | |
| | | | | | Some worm tube - some worms | | | | | | |
| | | | | | present. Free product present | | | | | | |
| | | | | | when grab is opened - Full | | | | | | |
| | | | | | solvent sheens on van Veen | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | Grain size = 52% Fines | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rebecca Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly cloudy - upper 60s

Station No.: EB 80
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,386 Y= 218,424

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1307 | 64 | 1261388 | 218 423 | Yes | 16 | D.O. | M-SD | none | none | |
| | | | | | Trace shell fragments on surface | | | | | | |
| | | | | | Some worm tubes - lt. brown dusting | | | | | | |
| | | | | | on surface. | | | | | | |
| | | | | | ~~Small~~ (PS) | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - no wind

Station No.: EB 81
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,577 Y= 218,400

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 9:18 | 61 | 1261574 | 218397 | Yes | 16cm | D.O. | MFSD | NONE | NONE | |
| | | | | | Some shell fragments on surface | | | | | | |
| | | | | | some worms present - some | | | | | | |
| | | | | | worm tubes | | | | | | |
| | | | | | Small sheen droplets (<1cm dia | | | | | | |
| | | | | | in bowl when depressurized. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly cloudy - some rain

Station No.: EB 82
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,261,538 Y= 218,586

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1427 | 67M | 1261546 | 218580 | Yes | 16cm | D.O. | M-SD | NONE | NONE | SOME TUBES |
| | | | | | | Light brown layering on surface | | | | | |
| | | | | | | trace shell fragments | | | | | |
| | | | | | | WORM tubes - NO SHEEN | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Stu

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 83
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,262,025 Y= 217,973

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1608 | 37M | 1262024 | 217968 | Yes | | | | | | |
| | | | | | Light brown (≈1-2 cm) SITH on surface | | | | | | |
| | | | | | dark-grey M-F Sand below | | | | | | |
| | | | | | Small sheen droplets presently on bad | | | | | | |
| | | | | | (1 or 2) - when homogenized. | | | | | | |
| | | | | | No odor - no worm tubes - trace | | | | | | |
| | | | | | shell fragments | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly Sunny - high 60s

Station No.: EB 85
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,866 Y= 218,265

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1056 | 53 | 1261~~796~~ 869 (RL) | 218271 | Yes | 10.5 | D.O | M-C SD | None | None | |
| | | | | | | | Some worm tubes | | | | |
| | | | | | | | Light Growth on surface | | | | |
| | | | | | | | (<1mm) - trace shell fragments | | | | |
| | | | | | | | on surface | | | | |
| | | | | | | | Medium-to-coarse sand | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Partly cloudy - some RAIN

Station No.: EB 86
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,261,782 Y= 218,430

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1439 | 59 | 1261796 | 218433 | 16CM | Yes | D.O. | FM-SD | NONE | NONE | |
| | | | | | Shell fragments on surface - some pebbles | | | | | | |
| | | | | | Worm tubes present | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Stur

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy -

Station No.: EB 87
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,255 Y= 217,751

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1616 | 17M | 1262256 | 217751 | Yes | 10CM | | | | | |
| | | | | | Lots of wood debris | | | | | | |
| | | | | | D.O. (≈1-2 cm) layer - dark grey M-F SD | | | | | | |
| | | | | | below - many worm tubes | | | | | | |
| | | | | | ~~No sheening~~ | | Sheening (≈1-2 mm dia) | | | | |
| | | | | | no odor | | | | | | |
| | | | | | | | | ↳ when homogenized. | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly Sunny - 15 Knot SW

Station No.: EB 88
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,259 Y= 218,059

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1612 | 36 | 1262266 | 218054 | Yes | 16 | D.O. | F-SD | none | none | |
| | | | | | light brown dusting on surface | | | | | | |
| | | | | | trace shell fragments | | | | | | |
| | | | | | Worm tubes present | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly cloudy - high 60's

Station No.: EB 89
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,262,171 Y= 218,273

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1510 | 47.5 | 126475 | 218272 | Yes | 8.5 | D.O | F-MSD | none | none | |
| | | | | | | Lite dusting on surface (brown) | | | | | |
| | | | | | | some worm tubes | | | | | |
| | | | | | | No Recovery | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard E. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm

Station No.: EB 90
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunosssay field test)
Proposed Coordinates: X= 1,262,427 Y= 217,678

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1624 | 15M | 1262423 | 217673 | Yes | 11CM | D.O. | F SD Silty | Skunk | 3/4 | |
| | | | | | Many worm tubes - skunk cabbage | | | | | | |
| | | | | | like smell - small sheen droplet (<3mm) | | | | | | |
| | | | | | when homogenized | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-95
Weather: Partly Sunny - 15 Kts S.W.

Station No.: EB 91
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,417 Y= 217,877

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1553 | 19 M | 1262420 | 217881 | Yes | 9CM | D.O. | M-SD | NONE | NONE | |
| | | | | | Worm tubes present / trace shell | | | | | | |
| | | | | | fragments on surface | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | Grain size = 37% Fines | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm - 69°F

Station No.: EB 92
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,1634 Y= 217,544

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 2 | 1639 | 1BM | 1262627 | 217544 | Yes | 14cm | | | | | |
| | | | | | Light / D.O. = 1 cm thick - dark/gray/black | | | | | | |
| | | | | | below fine silty-sand - slight sheening | | | | | | |
| | | | | | in bowl when first removed | | | | | | |
| | | | | | Some worm - trace/no shell | | | | | | |
| | | | | | fragments. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard C. Thom

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-6-96
Weather: Cloudy - calm - 69°F

Station No.: EB 93
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= 1,262,652 Y= 217,753

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1632 | 17M | 1262649 | 217748 | Yes | 11CM | | | | | |
| | | | | | Many worm tubes - | | | | | | |
| | | | | | D.O. (≈1-2cm) layer on surface fine sandy | | | | | | |
| | | | | | silt below F-sand | | | | | | |
| | | | | | (R) ~~no sheening~~ = tiny sheen droplets when | | | | | | |
| | | | | | no odor / homogenized | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Ab[illegible]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly Sunny - High 60's

Station No.: EB 94
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,647 Y= 217,940

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1540 | 18.5 | 1262650 | 217948 | Yes | 7cm | D.O. | M-SD | None | None | |
| | | | | | | Worm tubes - trace | | | | Shell fragments | |
| | | | | | | Uniform | color | (D.O.) | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-5-96
Weather: Partly Sunny - High 60s

Station No.: EB 95
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= 1,262,432 Y= 218,164

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1525 | 38M | 1262439 | 218173 | Yes | 13cm | D.O. | M-FSD | NONE | TRACE | |
| | | | | | Light brown dusting on surface | | | | | | |
| | | | | | Some worm tubes + trace shell | | | | | | |
| | | | | | fragments - one sheen droplet (2½ cm | | | | | | |
| | | | | | diameter). | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-11-96
Weather: Partly sunny

Station No.: EB96
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= Y=

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1257 | 59M | 122°35.245'N | 122°22.289'W | Yes | 16cm | B.O. | F-MSD | NONE | | |
| | | | | | Some worm tubes / fecal shell fragments | | | | | | |
| | | | | | No coal debris | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard D. Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-11-96
Weather: Partly cloudy - calm

Station No.: EB 97
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (Immunoassay field test)
Proposed Coordinates: X= Y=

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1307 | 64m | 47°35'29"N | 122°25'1"W | Yes | 16 cm | D.O. | F-MSD | NONE | NONE | |
| | | | | | Trace worm tubes | | | | -NO | Shells | -NO debris |
| | | | | | *One small | sheen/ | bubble | ≈ | 2 mm | dia | |
| | | | | | when sample | is | homogenized. | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-11-96
Weather: Partly cloudy - calm

Station No.: EB 98
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: cPAHs/PAHs (immunoassay field test)
Proposed Coordinates: X= Y=

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1320 | 68 | 47°35'23"N | 122°22'20"W | Yes | 16cm | D.O | F-M SD | NONE | 3 | |
| | | | | | Tan | shell | fragments | - some | worm | tubes | |
| | | | | | Sheening | is | good | when | sample | is | |
| | | | | | homogenized | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Richard Ott

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-11-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy - calm

Sample No.: EB99
Sample Location: Elliott Bay
Prop. Coordinates: X= Y=
Sampling Method: 0.1 m² van Veen Grab
Analysis: ~~(circle) TOC / grain size / PAHs / PCBs / Dios /Furans / metals / biology~~ Immunoassay field test (cPAH)

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1334 | 71m | 4735.559N | 122,22.215W | Y/N | 15 | Grayish on surface - below | | | | |
| | | | | | | | D.O | F-MSD | NO | NO | |
| | | | | | | | Trace shell fragments, some worm tubes, debris | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust
Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse
Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong
Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little
Other: Include presence of biota, debris, or redox layer

Sampler Signature: Robert Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-11-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy / calm

Sample No.: EB 103
Sample Location: Elliott Bay
Prop. Coordinates: X= Y=

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: ~~circle TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology~~
cPAHs - Immunoassay Field Test

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1424 | 54m | 1235,310 | 122,22006 | Yes | 15cm | D.O. | F-C MSD | NORE | NONE | |
| | | | | | Light brown dusting at surface | | | | | | |
| | | | | | Fore worm tubes & worms - Yoldia sp. | | | | | | |
| | | | | | present | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: RLH

# PHASE 2 LABORATORY TESTING STATIONS

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-18-96
Weather: Partly cloudy - calm

Sample No.: EB 47 + ~~[illegible]~~ RA 2524 ~~2025~~
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology
Prop. Coordinates: X= 1,260,620 Y= 216743

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0906 | 8m | | | NO - wash out - rocks in jaws | | | | | | |
| 2 | 0909 | 7.5m | | | NO - | " | " | " | | " | " |
| 3 | 0912 | 8.5m | | | NO - | " | " | " | | " | " |
| 4 | 0917 | 8.5m | | | NO | " - station is moved NE 20 ft. | | | | | |
| 5 | 0920 | 9.0m | 1260643 | 216738 | Yes | 6cm | Very rocky & cobble throughout | | | | |
| | | | | | | | grab - two sheen droplets (≈1cm dia) | | | | |
| | | | | | on surface Coarse - medium sand - many | | | | | | |
| | | | | | shell fragments - worm tubes - Kelp in | | | | | | |
| | | | | | grab - no odor - more sheen droplets | | | | | | |
| | | | | | when sample is homogenized | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9/18/96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Light Rain

Sample No.: EB 49 -2526
Sample Location: Elliott Bay
Prop. Coordinates: X= 1260811 Y= 216875
Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1336 | 15.5' | 1260782 | 216867 | Yes | 15cm | D.O. | M-FSD | NONE | 3 | Rep A |
| | | | | | Trace | shell | fragment | - many | worm | tubes | |
| | | | | | Small | sheen | droplet | appear | (≈ 1cm | dia) | |
| 2 | 1343 | 15' | 1260786 | 216871 | | 16cm | D.O | | NONE | 3 | REP B |
| | | | | | Light | brown | dusting | on | surface | trace | shell frag. |
| | | | | | many | worm | tubes | | | | |
| 3 | 1350 | 15 | 1260785 | 216869 | NO - | old | cut | in | grab | | |
| 4 | 1354 | 15.5 | 1260776 | 216865 | Yes | 16cm | D.O. | M-FSD | NONE | | Rep C |
| | | | | | Shell | fragment | - some | wood | sticks | | |
| | | | | | worm | tubes | - some | sheen | droplets | | |
| 5 | 1400 | 15.5 | 1260784 | 216878 | Yes | 15cm | D.O. | M-FSD | NONE | | Rep D |
| | | | | | SAA | (same | as | above) | | | |
| 6 | 1406 | 15M | 1260776 | 216873 | Yes | 16cm | D.O | M-FSD | NONE | | Rep E |
| | | | | | SAA | (same | as | above) | | | |
| 7 | 1422 | 15M | 1260782 | 216871 | Yes | 16cm | D.O. | S-FSD | NONE | 3 | Grab 1 of Duplicate |
| | | | | | SAA | | | | | | |
| 8 | 1441 | 15.5 | 1260782 | 216865 | Yes | 15cm | SAME | as | above | | GRAB 2 of Duplicate |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:** Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy / Light rain

Sample No.: EB49-2526 (page 2)
Sample Location: Elliott Bay
Prop. Coordinates: X= 1260811 Y= 216875

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Dlox / furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 9 | 1455 | 15½ | 1260785 | 216871 | Yes | 15cm | Same as GRAB 8 | | | | Chem/Bio Rep3 |
| 10 | 1510 | 15 | 1260783 | 216869 | Yes | 14cm | SAA | | | | Chem/Bio Rep4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly sunny - calm

Sample No.: EB 54 -2527 + Dup 2525
Sample Location: Elliott Bay
Prop. Coordinates: X= 1260918 Y= 217,149

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 0933 | 23.5 | 1260921 | 217150 | Yes | 10cm | D.O. | SFSD | none | none | |
| | | | | | some worm tubes - trace shell fragments | | | | | | |
| | | | | | no wood debris | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy - calm

Sample No.: EB 57 -2528
Sample Location: Elliott Bay
Prop. Coordinates: X=1260703 y= 217537

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 0944 | 47m | 1260702 | 217532 | Yes | 15cm | D.O. | M-FSD | SLH2S | NONE | |
| | | | | | Large polychaete in grab | | | | | | |
| | | | | | Trace shell fragments in grab | | | | | | |
| | | | | | Light brown coating on surface (<1cm) | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 7-19-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Overcast - calm

Sample No.: EB60 - 2529
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,260,018 Y= 217442
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Dlox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0855 | 41M | 1261024 | 217440 | Yes | 12CM | D.O | M-FSD | NONE | NONE | Rep (A) |
| ? | | Some | wood | debris | Some | worm | tubes | - trace | shell | fragments | |
| 2 | 0903 | 41M | 1261024 | 217446 | No | | | | | | |
| 3 | 0907 | 41M | 1261026 | 217435 | Yes | 13cm | D.O | M-FSD | NONE | NONE | Rep (B) |
| 4 | 0918 | 41M | 1261022 | 217443 | Yes | 11CM | SAA | Some | trace | sheen | Rep (C) |
| 5 | 0924 | 41M | 1261023 | 217444 | Yes | 12CM | SAA | | | | Rep (D) |
| 6 | 0930 | 41M | 1261030 | 217443 | Yes | 12CM | SAA | | | | Rep (E) |
| 7 | 0954 | 41M | 1261030 | 217439 | Yes | 13CM | SAA | - Small | sheen | droplets | Chem/Bio Rep 1 |
| 8 | 1005 | 41M | 1261021 | 217442 | Yes | 8 CM | D.O | F-MSD | NONE | | Chem/Bio Rep 2 |
| | | | | | Light | brown | dusting | on | surface | (1cm) | some worms |
| | | | | | and | worm | tube | + trace | shell | fragments. | |
| 9 | 1015 | 41M | 1261027 | 217441 | NO | - old | grab | Encountered | | | |
| 10 | 1024 | 41M | 1261023 | 217458 | Yes | 12CM | SAME | as | Rep 1 | | Chem/Bio Rep 3 |
| 11 | 1033 | 41M | 12610 | 217437 | Yes | 8cm | SAME | as | Rep 2 | | Chem/Bio Rep 4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly Cloudy - calm

Sample No.: EB 63 -2530
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,260,872 Y= 217,856
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 0957 | 56 m | 1260874 | 47857 | Yes | 16cm | D.O | MFSD | NONE | NONE | |
| | | | | | Light brown dusting of silt on the surface | | | | | | |
| | | | | | (<1cm) | | | | | | |
| | | | | | Trace shell fragment / worm tubes | | | | | | |
| | | | | | No debris - NO sheen | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

WESTON
MANAGERS DESIGNERS CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-19-96
Weather: Cloudy - calm

Sample No.: EB 67 - 2531
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology
Prop. Coordinates: X= 1,261,080 Y= 217,938

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1125 | 55.5 | 1261077 | 217933 | NO | Reject | | | | | |
| 2 | 1134 | 55.5 | 1261075 | 217928 | Yes | 12cm | D.O. light brown worm tubes/wood | dusting on surface debris SLT PH | | | Rep (A) |
| 3 | 1139 | 55.5 | 1261075 | 217932 | Yes | 11cm | D.O. | M+SD | NONE | NONE | Rep (B) |
| | some wood debris - shells - worm tubes | | | | | | | | | | |
| 4 | 1146 | 55 | 1261078 | 217929 | Yes | 11cm SAA | STRONG POOR - SOME SHEEN ON OVER LIGHT | | | | Rep (C) Bio |
| 5 | 1151 | 55 | 1261077 | 217939 | Yes | 10cm | same as Rep (B) | | | | Rep (D) |
| 6 | 1157 | 55 | 1261077 | 217935 | Yes | 12cm | SAA | | | | Rep (E) |
| 7 | 1218 | 55½ | 1261082 | 217938 | Yes | 14cm | SAA | | | | chem/Bio Rep 1 |
| 8 | 1229 | 55½ | 1261082 | 217937 | Yes | 9cm | ON ONE side of the grab | | | | chem/Bio Rep 2 |
| | | | | | | Appearance SAA Diesel - and none wood debris. | | | | | |
| 9 | 1239 | 55 | 1261079 | 217936 | Yes | 14cm | same as rep 1 - | | | | same |
| | | | | | small | sheen droplets | on grab | | | | chem Bio Rep 3 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date:
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather:

Sample No.: EB 72 - 2532
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261377 Y= 218043
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1010 | 54m | 1261374 | 218040 | Yes | 19cm | D.O. | M-FSD | TPH-ST | 2 | |
| | | | | | Grab is saturated with petroleum | | | | | | |
| | | | | | Naphthenic-like product | | | | | | |
| | | | | | Trace shell fragments - trace worm tube | | | | | | |
| | | | | | & wood debris in grab | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature:

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-19-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather:

Sample No.: EB 77 - 2533
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,261,667 Y= 218,043

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1400 | 48m | 1261665 | 218045 | Yes | 14cm | D.O | F-MSD | NONE | 3 | Rep (A) |
| 2 | 1405 | 48m | 1261669 | 218041 | Yes | 9cm | D.O | F-MSD | NONE | ~~4~~ 3 | Rep (B) |
| 3 | 1410 | 48m | 1261668 | 218042 | NO → reject | | | | | | |
| | | → Both Grabs 1 & 2 had sheening (small) wood debris - | | | | | | | | | |
| | | wood tubes/worms - and some shell fragment | | | | | | | | | light brown dusting on surface |
| 4 | 1415 | 48m | 1261669 | 218042 | Yes | 13cm | SAA (Grab 1 & 2) | | | | Rep (C) |
| 5 | 1422 | 48m | 1261665 | 218042 | Yes | 13cm | SAA | | | | Rep (D) |
| 6 | 1430 | 48m | 1261660 | 218041 | Yes | 10cm | SAA | | | | Rep (e) |
| 7 | 1449 | 48m | 1261668 | 218048 | Yes | 13cm | SAA | | | | Chem/Bio Rep 1 |
| 8 | 1501 | 48m | 1261666 | 218036 | Yes | 9cm | SAA | | | | Chem/Bio Rep 2 |
| 9 | 1512 | 48m | 1261670 | 218041 | Yes | 9cm | SAA - only one side of the van Veen | | | | |
| | | | | | accepted - other washed out | | | | | | Chem/Bio Rep. 3 |
| 10 | 1522 | 48m | | | NO - disturbed surface | | | | | | |
| 11 | 1531 | 48m | 1261667 | 218043 | Yes | 10cm | SAA | | | | Rep 4 |
| 12 | 1539 | 48 | 1261666 | 218051 | Yes | 9cm | SAA - some sheen droplets | | | | Rep 5 |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-1996

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - calm

Sample No.: EB 80 - 2534
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261386 Y= 218,424

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1617 | 63M | 1261390 | 218428 | Yes | 17.5 | DO. | F-M SD | NONE | NONE | Rep (A) |
| | | | | | Light | brown | dusting on | surface (2 | cm) | | shells |
| | | | | | and | wood | debris | present (moderate) | | | |
| 2 | 1624 | 63M | 1261387 | 218433 | NO | 14cm | ~~SAA~~ (same as odor) | | | | ~~Rep B~~ |
| ~~4~~ | 1636 | 63M | | | NO → cut out of a corner | | | | | | |
| 3 | 1629 | 63M | 1261386 | 218433 | Yes | 14cm | same | Rep A | | | Rep (B) |
| 5 | 1642 | 63M | 1261392 | 218422 | Yes | 16cm | SAA | | | | Rep (C) |
| 6 | 1648 | 63M | 1261383 | 218422 | Yes | 17.5 | SAA | | | | Rep (D) |
| 7 | 1653 | 63M | 1261385 | 218430 | Yes | 16cm | SAA | | | | Rep (E) |
| 8 | 1710 | 63.5 | 1261390 | 218414 | Yes | 16cm | SAA | | | | chem/Bio Rep 1 |
| 9 | 1721 | 63M | 1261383 | 218431 | Yes | 17.5cm | SAA | | | | chem/Bio rep 2 |
| 10 | 1732 | 63M | 1261389 | 218424 | Yes | 17.5cm | SAA | | | | chem/Bio Rep 3 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rob Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-20-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - 60°F - calm

Sample No.: EB 85 - 2535
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,261,866 Y= 218,265

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0929 | 53M | | | NO - | disturbed | surface | layer | | | |
| 2 | 0936 | 52½M | 1261878 | 218270 | Yes | 10cm | D.O. | M-SD | NONE | NONE | Rep (A) |
| Light brown dusting on surface, NO ~~trace~~ sheens when sieved. - some pea gravel, some wood debris (~~[illegible]~~) some shells worm tubes | | | | | | | | | | | |
| 3 | 0943 | 53M | 1261866 | 218276 | Yes | 10cm | SAA | (Large wood debris - some pea gravel ... same as above) | | | Rep (B) |
| 4 | 0950 | 53M | 1261874 | 218275 | Yes | 9cm | SAA | (some sheen in H2O when sieved) | | | Rep (C) |
| 5 | 0956 | 53M | 1261868 | 218271 | Yes | 12cm | SAA | (~~some~~ lots of wood) | | | Rep (D) |
| 6 | 1003 | 53M | 1261869 | 218268 | NO - | disturbed | surface | layer | | | |
| 7 | 1010 | 53M | 1261865 | 218269 | Yes | 12cm | SAA | (lots of wood debris) | | | Rep (E) |
| | | | | | | | | | | | |
| 8 | 1027 | 53M | 1261874 | 218268 | Yes | 10cm | D.O | M-SD | NONE | NONE | Chem/Bio Rep (1) |
| Light brown dusting (≤ 1cm) on surface, some shell, pea gravel & wood debris, worms/tubes | | | | | | | | | | | |
| 9 | 1038 | 53M | 1261872 | 218269 | Yes | 9cm | (SAA) | | | | Chem/Bio Rep (2) |
| 10 | 1047 | 53M | 1261869 | 218272 | Yes | 9cm | (SAA) | | | | Chem/BIO (3) |
| 11 | 1056 | 52½ | 1261872 | 218272 | Yes | 11cm | (SAA) | | | | Chem/Bio Rep (4) |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly cloudy

Sample No.: EB 86 - 2536
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,261,782 Y= 218,430
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1034 | 60M | 1261778 | 218422 | Yes | 16cm | D.O | F-MSD | NONE | NONE | |
| | | | | | Light | Brown dusting on surface | | | | | |
| | | | | | trace shell fragments / worm tubes | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: ~~9-19-~~ 9-20-96
Weather: Cloudy - 60°F - calm

Sample No.: EB 87 - 2537
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology
Prop. Coordinates: X=1,262,255 Y= 217,751

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1131 | 18M | 1262256 | 217752 | Yes | 9cm | D.O Lots | a few sticks/wood F-M SD | NONE | 4 | Rep (A) 2 bag |
| 2 | 1136 | 18M | | | ND | | | | | | |
| 3 | 1140 | 18M | 1262251 | 217748 | Yes | 10cm | Lots DO | of sticks/wood F-M-SD | NONE | 4 | Rep (B) 2 bag |
| 4 | 1147 | 17½M | | | ND | | | | | | |
| 5 | 1152 | 19M | 1262253 | 217756 | Yes | 9cm | Same | some sheen as Rep B | when sieved | 4 | Rep (C) |
| 6 | 1204 | 19M | 1262262 | 217754 | Yes | 9cm | (SAA) | | | | Rep (D) |
| 7 | 1208 | 18M | 1262253 | 217748 | NO | water grab | | | | | |
| 8 | 1213 | 19M | 1262265 | 217760 | Yes | 12cm | (SAA) | Some Shells | Slight sheen when sieved | | Rep (E) |
| 9 | 1233 | 18.5M | 1262254 | 217745 | Yes | 10cm | (SAA) | | | | chem/Bio Rep 1 |
| 10 | 1243 | 18.5M | 1262258 | 217749 | Yes | 10cm | (SAA) | | | | chem/Bio Rep 2 |
| 11 | 1252 | 18M | 1262260 | 217749 | Yes | 10cm | (SAA) | van Veen cut ½ grab | | | chem/Bio Rep 3 |
| 12 | 1302 | 18M | 1262262 | 217755 | Yes | 10cm | (SAA) | Shells present | | | chem/Bio Rep 4 |
| | | | | | | | | when horizontal | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9/18/96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy 65°F 5 Knots from SW

Sample No.: EB ~~[illegible]~~ 91-2538
Sample Location: Elliott Bay
Prop. Coordinates: X= 1,262,417 Y= 217,877

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1046 | 19m | 1262421 | 217972 | Yes | 9cm | D.O. | F-MSD | none | none | |
| | | | | | Many | worm tubes - some | | worms | | | |
| | | | | | Trace | shell fragments | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy

Sample No.: EB 97
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261026 Y= 218335

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1056 | 66 ft | 1261028 | 218343 | Yes | 16cm | D.O. | n-FSD | none | none | |
| | | | | | light brown dusting on surface (<1cm) | | | | | | |
| | | | | | trace shell fragments | | | | | | |
| | | | | | Moderate worm tubes - pebbles on | | | | | | |
| | | | | | surface | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: _____

WESTON
MANAGERS DESIGNERS CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - 5kts (SW) 65°F

Sample No.: EB 100
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261512 Y= 218800

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1108 | 72 | 1261517 | 218801 | Yes | 13 cm | D.O. | S-F SD | none | none | |
| | | | | | Brown/olive mottling on surface | | | | | | |
| | | | | | worm tubes present | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Robert Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-21-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly Sunny

Sample No.: EB 104
Sample Location: Elliott Bay
Prop. Coordinates: X= 1262007 Y= 217885

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1010 | 33m | | | NO | | | | | | |
| 2 | 1014 | 33½ | 1262007 | 217887 | Yes | 10cm | D.O | F-MSD | NONE | NONE | Rep (A) |
| 3 | 1021 | 33m | 1262010 | 217888 | Yes | Worm tubes (some shells | | | | | Rep. (B) |
| | Rep B = 11cm penetration. | | | | | lots of little pieces of wood | | | | | |
| 4 | 1027 | 33m | 1262007 | 217890 | Yes | (SAA) | | | | | Rep (C) |
| 5 | 1035 | 33m | 1262003 | 217881 | ~~Yes~~ NO | — pipe in grab | | | | | ~~Rep (D)~~ |
| 6 | 1038 | 32½m | 1262010 | 217878 | ~~Yes~~ NO | — rock in grab | | | | | |
| 7 | 1042 | 33m | 1262010 | 217882 | Yes | 10cm | (Same as Rep (C)) | | | Strong creo sheen + sheens | Rep (D) |
| 8 | 1047 | 33m | 1262004 | 217885 | Yes | 10cm | (SAA) | | | | Rep (E) |
| 9 | 1106 | 34m | 1262007 | 217891 | Yes | 11cm | (SAA) | | | | Chem/Bio Rep. 7 |
| 10 | 1116 | 33m | 1262005 | 217879 | Yes | 11cm | (SAA) | | | | Chem/Bio Rep (2) |
| 11 | 1123 | 33m | 1262010 | 217891 | Yes | 10cm | (SAA) | — some sheens when sieved | | | Chem Bio Rep (3) |
| 12 | 1132 | 33m | 1262006 | 217881 | Yes | 9cm | (SAA) | — lots of sheen on | | | Chem/Bio (4) |
| | | | | | | Surface | | | | | |
| 13 | 1141 | 33m | 1262010 | 217884 | Yes | 11cm | (SAA | | | | Rep (5) |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-18-96
Weather: Cloudy - calm / mid 60's

Sample No.: EB 105
Sampling Method: 0.1 $m^2$ van Veen Grab
Sample Location: Elliott Bay
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology
Prop. Coordinates: X= 1262105 Y= 218172

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1120 | 44M | 1262104 | 218172 | Yes | 13cm | D.O | F-M SD | NONE | NONE | |
| | | | | | Some worm tubes - worms | | | | | | |
| | | | | | Trace shell fragments | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-20-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Calm - cloudy - 60°F

Sample No.: EB 106 - 2543
Sample Location: Elliott Bay
Prop. Coordinates: X= 1261313 Y= 217013

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Biox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1421 | 7m | 1261317 | 217011 | NO - | poor | penetration | - sand | | | |
| 2 | 1424 | 7m | 1216316 | 217004 | NO - | " | " | | " | " | |
| 3 | 1428 | 7m | 1261313 | 217010 | NO - | " | | " | " | " | |
| 4 | 1437 | 16m | 1261186 | 217072 | Station | move | NW | about | 100'-150' | | REP |
| | | | | | Yes | 14cm | D.O. | F-MSD | none | 3 - | some wood |
| 5 | 1445 | 15.5m | 1261189 | 217027 | many | wood | tube | - some | shell | fragment - | sheens present |
| | | | | | yes | 11cm | SAA | (some | sheening | | Rep (B) |
| 6 | 1449 | 15.5m | 1261187 | 217070 | yes | 10cm | SAA | | | | rep (C) |
| 7 | 1456 | 15m | 1261200 | 217073 | yes | 10cm | SAA | | | | Rep (D) |
| 8 | 1500 | 15m | 1261195 | 217067 | yes | 11cm | SAA | | | | Rep (E) |
| 9 | 1514 | 15m | 1261198 | 217077 | yes | 10cm | SAA | | | | chem/Bio rep 1 |
| 10 | 1523 | 15.5m | 1261188 | 217068 | yes | 9cm | SAA | some | sheens | | chem/Bio rep 2 |
| 11 | 1532 | 15.5m | 1261197 | 217069 | yes | 10cm | SAA - | some | 3cm sheen droplet | | chem/Bio rep 3 |
| 12 | 1541 | 15m | 1261184 | 217072 | yes | 10cm | SAA | some | sheen droplets | | chem/Bio rep 4 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy

Sample No.: EB 107
Sample Location: Elliott Bay
Prop. Coordinates: X=1260550 Y= 217009
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1132 | 14M | 1260548 | 217007 | Yes | 8cm | D.O. | F-MSD | NONE | 3 | |
| | | | | | Trace shell fragments | | | | | | |
| | | | | | Moderate worm tubes | | | | | | |
| | | | | | No worms - no wood debris | | | | | | |
| | | | | | Sheen droplet appear when | | | | | | |
| | | | | | homogenized. | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Rich Sturim

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - calm

Sample No.: EB 108 - 2547
Sample Location: Elliott Bay
Prop. Coordinates: X= y=

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1144 | 45M | 1260356 | 217646 | Yes | 9cm | D.O. | F-M SD | None | 3 | |
| | | | | | Light brown dusting on surface | | | | | | |
| | | | | | few worm tubes / trace shell / fragment. | | | | | | |
| | | | | | no wood debris | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-18-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - 5 kts (SW)

Sample No.: EB109
Sample Location: Elliott Bay
Prop. Coordinates: X= Y=
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| I | 1156 | 44m | 1260181 | 217977 | Yes | 12 | D.O. | F-MSD | NONE | NONE | |
| | | | | | Shell fragments in grab - brick frags | | | | | | |
| | | | | | on surface - brown layer on | | | | | | |
| | | | | | surface (<1 cm) | | | | | | |

Color Codes: BR = Brown; BK = Black; GY = Gray; GR = Green; RST = Rust

Texture Codes: SC = Silt/Clay; SD = Sand; GR = Granule; PB = Pebble; GV = Gravel; F = Fine; M = Medium; C = Coarse

Odor Codes: H2S = Sulfide; TPH = Petroleum; SL = Slight; M = Moderate; ST = Strong

Petroleum Code: 1=Thoroughly saturated; 2=Large globules; 3=Sheen/small droplets; 4=None/very little

Other: Include presence of biota, debris, or redox layer

Sampler Signature: Rob Sturim

# SEDIMENT FIELD SAMPLE RECORD

ame: Pacific Sound Resources (PSR) Offshore Unit
ocation: Elliott Bay
o.: 04000-031-001-4400-03
9-18-96
Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - calm - low 60's

lo.: EB 110 - 2599
ocation: Elliott Bay
ordinates: X= Y=
Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: circle (TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology
ARCHIVED

| Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| 1208 | 41M | 1259993 | 218320 | Yes | 8cm | D.O. | F-MSD | NONE | NONE | |
| | | | | Trace shell frag | | | | | | worm tubes |
| | | | | no wood debris | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

les
vn
k
y
en
st

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

ota,

Signature:

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-21-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Partly Sunny - 10-15 Kts (N-NW)

Sample No.: EB BK01 -2545
Sample Location: Elliott Bay
Prop. Coordinates: X= Y= re-occupied from Rd 1

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1638 | 63m | 1245381 | 237241 | Yes | 8cm | Grey | M-SM | None | None | Rep (A) |
| some shells (trace) sea cucumbers, some pebbles/worm tubes | | | | | | | | | | | |
| 2 | 1645 | 63m | | | NO — washout | | | | | | |
| 3 | 1649 | 62m | | | NO — | " | " | | | | |
| 4 | 1653 | 63m | 1245388 | 237224 | Yes | 8cm | (SAA) | | | | Rep (B) |
| 5 | 1659 | 63M | 1245389 | 237228 | Yes | 5cm | (SAA) | | | | Rep (C) |
| 6 | 1706 | 62M | | | NO - washout | | | | | | |
| 7 | 1711 | 62m | | | NO | " | " | | | | |
| 8 | 1716 | 62m | | | NO | " | " | | | | |
| 9 | 1723 | 62m | 1245377 | 237239 | Yes | | | | | | Rep (D) |
| 10 | 1733 | 62m | 1245389 | 237236 | NO - poor penetration | | | | | | |
| 11 | 1748 | 62m | 1245395 | 237231 | Yes | (9cm) | (SAA) | | | | Rep (E) |
| 12 | 1757 | 62½m | | | NO | | | | | | |
| 13 | 1802 | 62m | | | NO | | | | | | |
| 14 | 1807 | 62m | 1245395 | 237233 | Yes - ½ accepted | | | (SAA) | | | Chem Bio Rep. (1) |
| 15 | 1815 | | | | NO - washout | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: [signature]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Project Location: Elliott Bay
Project No.: 04000-031-001-4400-03
Date: 9-21-96

Sampling Personnel: D. Hughes / R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): BioMarine Enterprises
Weather: Cloudy - Broken - High current

Sample No.: BK01 - Magnolia (cont)
Sample Location: Elliott Bay
Prop. Coordinates: X= Y=

Sampling Method: 0.1 m² van Veen Grab
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox / Furans / metals / biology

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 16 | 1820 | 61M | 1245400 | 237233 | Yes | 6cm | (SM) | | | | Clean/B.O Rep 2 |
| 17 | 1830 | 62M | 1245390 | 237236 | Yes | 6cm | (SAA) | only ½ | is accepted | | C/B Rep 3. |
| 18 | 1837 | 62M | 1245392 | 237226 | Yes | 5cm | (SM) | | | | C/B Rep 4 |
| 19 | 1847 | 61M | 1245388 | 237229 | Yes | 8cm | (SM) | | | | C/B Rep 5 |
| 20 | 1855 | 61M | 1245396 | 237233 | Yes | 7cm | (SM) | 1/4 | | | C/O Rep 6 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: Richard Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: Pacific Sound Resources (PSR) Offshore Unit
Sampling Personnel: D. Hughes / R. Sturim
Project Location: Elliott Bay
Sampling Vessel: R/V Kittiwake
Project No.: 04000-031-001-4400-03
Subcontractor(s): BioMarine Enterprises
Date: 9-26-96
Weather: Partly cloudy - calm

Sample No.: BK07-ALKI-2546
Sampling Method: 0.1 m² van Veen Grab
Sample Location: Elliott Bay
Analysis: (circle) TOC / grain size / PAHs / PCBs / Diox /Furans / metals / biology
Prop. Coordinates: X= Y=

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | 1306 | 58M | 1259042 | 219805 | Yes | 10CM | D.O | M-SD | NONE | NONE - SO | Rep (A) |
| some pea-gravel and shells - light brown dusting on surface (±1cm) | | | | | | | | | | | |
| wood tubes / SO wood debris | | | | | | | | | | | |
| (2) | 1314 | 58M | 1259049 | 219802 | Yes | 10cm | (SAA) | | | | Rep (B) |
| (3) | 1321 | 58M | 1259048 | 219800 | Yes | 11 cm | (SAA) | | | | Rep (C) |
| (4) | 1329 | 58M | 1259049 | 219806 | Yes | 10cm | (SAA) | | | | Rep (D) |
| (5) | 1335 | 58M | 1259045 | 219802 | Yes | 10cm | (SAA) | | | | Rep (E) |
| (6) | 1355 | 58M | 1259041 | 219799 | Yes | 13cm | (SAA) - only one side accepted | | | | Rep (1) |
| (7) | 1404 | 58M | 1259048 | 219808 | Yes | 9cm | (SAA) | | | | Rep (2) |
| (8) | 1413 | 58M | 1259038 | 219795 | Yes | 9 cm | (SAA) | | | | Rep (3) |
| (9) | 1421 | 58 | 1259042 | 219794 | Yes | 9/13 | (SAA) | | | | Rep (4) |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | 29% = Fines | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: R. Sturim

# PHASE 3 STATIONS

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: OVERCAST / CALM

Sample No.: SD3-EB137-0000/97312372
Sample Location: Elliott Bay
Prop. Coordinates: E= 1260458 N= 218508.8

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1032 | 64 | (SEE CHARLIE) | | | | | | | | WASHOUT - ROCK IN JAWS |
| 2 | 1037 | 60 | | | 1/2 YES | 12 | BR-SURF GY | M-C SD GRAV | NONE | NONE | RED FLECKS/FRAGS-BRICK? |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: BROKEN/ CALM

Sample No.: SD3-EB138-0000/97312373
Sample Location: Elliott Bay
Prop. Coordinates: E = 1262 968 N = 218431.9

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1051 | 36 | (SEE CHARLIE) | | YES | 8 | BR-SURF GY-BK | SL F-M SD | ST $H_2S$ | <½ cm SHEEN DUBB → DISAPPEARED WHEN SAMPLE THOROUGHLY HOMOGENIZED | MOD WORM TUBES DECOMPOSED WOOD - MC |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: BROKEN / SLIGHT CHOP

Sample No.: SD3-EB139-0000 / 97312374
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262888 N= 218786.2

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1105 | 37 | (SEE CHARLIE) | | YES | 12 | DK-BROWN BY | SURF-SL F-M SD | NONE | NONE | MOD WORM TUBES 6" STICK |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: BROKEN / CALM

Sample No.: SD3-EB140-0000/ 97312375
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262614 N= 219033.8

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1114 | 51 | (SEE CHARLIE) | | YES | 12 | BR-SURF GY | SURF SL FM SD | NONE | NONE | TRACE SHELL FRAGS/ WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: PARTIAL CLEAR / CALM

Sample No.: SD3-EB142-0000/97312377
Sample Location: Elliott Bay
Prop. Coordinates: E = 1261782 N = 219675.8

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1135 | 68 | (SEE CHARLIE) | | YES | 11 | BR-SURF GY | SURF SL F-M SD | NONE | NONE | TERRESTRIAL WOOD FRAGS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: PART CLEAR/ ~~CALM~~ SLIGHT CHOP

Sample No.: SD3-EB143-0000/ 97312378
Sample Location: Elliott Bay
Prop. Coordinates: E = 1261222 N = 219645.9

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ~~1146~~ PDT | | | | | | | | | | |
| 1 | ~~1246~~ | 82 | (SEE CHARLIE) | | NO | | | | | | OVERPENETRATION |
| 2 | 1155 | 82 | | | NO | | | | [BOAT WAKE] | | OVERPENETRATION |
| 3 | 1203 | 82 | | | YES | 17 | DK-SURF GY | F SD/SL | NONE | NONE | 1 BLADE EELGRASS HANGING ON VAN VEEN |
| | | | | | | | | | | | 1 MOLPEDIA ~ 4" CAUGHT IN JAWS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: PART CLEAR/ SLIGHT CHOP

Sample No.: SD3-EB144-0000/97312379
Sample Location: Elliott Bay
Prop. Coordinates: E = 1260813 N = 219195.1

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1215 | 80 | (SEE CHARLIE) | | YES | 17 | BR-SURF GY | F-M SD/SL | NONE | NONE | TRACE WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: PART CLEAR/ SLIGHT CHOP

Sample No.: SD3-EB145-0000/97312380
Sample Location: Elliott Bay
Prop. Coordinates: E=1260273 N=218906.4

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1226 | 74 | (SEE CHARLIE) | | YES | 6 | BR-SURF GY | F-M SD | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: DR Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: CLEAR, SLIGHT CHOP

Sample No.: SD3-EB115-0000/97312350
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262307 N= 217269.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ~~X~~ N | ~~X~~ W | | | | | | | |
| 1 | 1014 | 8 | (SEE CHARLIE) | | YES | 9 | VD-GY | <1CM SILT F-SD/SL | SL $H_2O$ | NONE | 8" BARK; SHELL FRAGS |
| | | | 35.119' | 21.934' | | | | | | | 3" IRON CHUNK |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: DR Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: CLEAR, SLIGHT CHOP

Sample No.: SD3-EB116-0000 / 97312351
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262287 N= 217491.9

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1026 | 9.5 | (SEE CHARLIE) | | YES | 13 | GR-GY | F-MSD/SL | SL $H_2S$ | NONE | ABUNDANT WORM TUBES; MUD |
| | | | 35,156' | 21,943' | | | | | | | SHELL FRAGS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: CLEAR, SLIGHT CHOP

Sample No.: SD3-EB117-0000/97312352
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262558 N= 217660.0

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1040 | 11.5 | SEE CHARLIE | | NO | 4 | | | | | |
| 2 | 1045 | 12.5 | | | YES | 7 | GR-GY | F-M SD W/SL TOP | NONE | NONE | MUD WORM TUBES |
| | | | | | | | | | | ② ½ CM DIAMETER SHEEN CIRCLES ON SURF | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S.EATON
Weather: CLEAR, SLIGHT CHOP

Sample No.: SD3-EB118-0000/97312353
Sample Location: Elliott Bay
Prop. Coordinates: E = 1262979 N = 217805.9

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | YW | | | | | | | |
| 1 | 1058 | 11.5 | (SEE CHARLIE) | | NO | | | | | | WASHOUT; SHELL HASH |
| 2 | 1102 | 12 | | | NO | | | | | | WATER GRAB - HOOKED A CABLE OR LINE OTHER DEB. |
| 3 | 1107 | 13.5 | | | YES | 7 | GY | F-M SD RED FLECKS | NONE | ① 2 CM DIA SHEEN BUBBLE | MOD WORM TUBES ON SED SURF |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

MOVED SLIGHTLY — OFFSHORE

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Sil/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: CLEAR, SLIGHT CHOP

Sample No.: SD3-EB119-0000/97312354
Sample Location: Elliott Bay
Prop. Coordinates: E= 1263256 N= 217913.4

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1119 | 16 | (SEE CHARLIE) | | YES 9 DUP | 9 | GY | F-M SD | SL $H_2S$ | NONE | MOD WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHTLY CLOUDY, CHOPPY

Sample No.: SD3-EB120-0000/97312355
Sample Location: Elliott Bay
Prop. Coordinates: E = 1262790 N = 218144.3

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1130 | 38 | (SEE CHARLIE) | | YES | 9 | BR-GY | F-M SD | SL $H_2S$ | NONE | MUDWORM TUBES OCCAS TWIG & SHELL FRAG |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHT OVERCAST; CHOP

Sample No.: SD3-EB121-0000/97312356
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262399 N= 218373.7

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | Y W | | | | | | | |
| 1 | 1143 | 45 | (SEE CHARLIE) | | YES | 14 | BR-SURF GY | F-M SD/SL | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHT OVERCAST ; CHOP

Sample No.: SD3-EB122-0000/97312357
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262272 N= 218552.4 (BARGE MOORAGE AREA)

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1155 | 52 | (SEE CHARLIE) | | YES | 16 | BR-SURF GY | <1CM SILT F-M SAND | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHT OVERCAST / CHOP

Sample No.: SD3-EB123-0000/97312358
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262050 N= 218747.7 (BARGE MOORAGE AREA)
LOCATION MOVED WESTWARD - ORIGINAL COORDINATES BENEATH MOORED BARGE

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1207 | 60 | (SEE CHARLIE) | | YES | 16 | BR-SURF GY | SURF SL F-M SD | NONE | NONE | OCCAS BURROW TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D. Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHT OVERCAST / CHOP

Sample No.: SD3-EB124-0000/97312359
Sample Location: Elliott Bay
Prop. Coordinates: E=1261858 N=219014.0

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1219 | 66 | (SEE CHARLIE) | | 1/2 YES | 17 | BR-SURF GY | F-SD/SL | NONE | NONE | TRACE WORM TUBE |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (GL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R [illegible]

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: SLIGHT OVERCAST/CHOP

Sample No.: SD3-EB125-0000/97312360
Sample Location: Elliott Bay
Prop. Coordinates: E= 1261533 N= 219098.1

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1317 | 73 | (SEE CHARLIE) | | YES | 13 | SURF - BR GY | F. M SD/ SL | NONE | NONE | PLASTIC BAG IN JARS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: DR Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: HIGH CLOUDS / SLIGHT CHOP

Sample No.: SD3-EB126-0000/97312361
Sample Location: Elliott Bay
Prop. Coordinates: E = 1261168 N = 218954.5

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | + N | + W | | | | | | | |
| 1 | 1330 | 76 | (SEE CHARLIE) | | Y2 YES | 17 | GR GY BK-SURF | F-M SD/SL | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S EATON
Weather: HIGH CLOUDS

Sample No.: SD3-EB127-0000/97312362
Sample Location: Elliott Bay
Prop. Coordinates: E = 1260855 N = 218660.8

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | +N | +W | | | | | | | |
| 1 | 1342 | 73.5 | (SEE CHARLIE) | | NO | | | | | | WASHOUT – ROCK IN JAW |
| 2 | 1348 | 73.5 | | | YES | 16 | BR-SURF GY | F. MSD/SL | SL $H_2S$ | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR/ CALM

Sample No.: SD3-EB128-0000/97312363
Sample Location: Elliott Bay
Prop. Coordinates: E= 1260629 N= 218373.5

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1400 | 65 | (SEE CHARLIE) | | NO | | | | | | WASHOUT; ROCK IN JAWS |
| 2 | 1405 | 65 | | | NO | | | | | | WASHOUT; ROCK IN JAWS |
| 3 | 1409 | 62 | | | YES | 11 | BR-SURF GY | F-C SAND SILT | NONE | NONE | TRACE WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

MOVED ASHORE

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR / CALM

Sample No.: SD3-EB129-0000 /97312364
Sample Location: Elliott Bay
Prop. Coordinates: E = 1260687 N = 217945

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1421 | 58 | (SEE CHARLIE) | | YES | 16 | BR-SHEF GY | F-M SD SL | NONE | NONE | TRACE SHELL FRAGS, WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Color Codes
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

Texture Codes
SL: Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

Odor Codes
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

Petroleum Code
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

Other:
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR/CALM

Sample No.: SD3-EB130-0000/97312365
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262555 N= 218494.9

Sampling Method: 0.1 $m^2$ van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | Y W | | | | | | | |
| 1 | 1440 | 46 | (SEE CHARLIE) | | YES | 13 | BR-SURF GY | F-M SD/SL | NONE | | TRACE WORM TUBES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: DR Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR/ CALM

Sample No.: SD3-EB131-0000/97312366
Sample Location: Elliott Bay
Prop. Coordinates: E = 1262470 N = 218667.8

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | Y W | | | | | | | |
| 1 | 1455 | 51 | (SEE CHART) | | YES | 12 | BR-SURF GY | F-MSD SL | NONE | NONE | SHELL FRAGS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR/CALM

Sample No.: SD3-EB132-0000/97312367
Sample Location: Elliott Bay
Prop. Coordinates: E= 1262238 N = 218970.8

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | XN | XW | | | | | | | |
| 1 | 1512 | 57 | (SEE CHARLIE) | | YES | 14 | BR-SURF GY | F M SD SL | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

WESTON
MANAGERS DESIGNERS/CONSULTANTS

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/29/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: MOSTLY CLEAR | CALM

Sample No.: SD3-EB133-0000/97312368
Sample Location: Elliott Bay
Prop. Coordinates: E= 1261947 N= 219274.3

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X N | X W | | | | | | | |
| 1 | 1527 | 65.5 | (SEE CHARLIE) | | YES | 14 | DK-SURF GY | F. MSD/SL | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: OVERCAST, SLIGHT CHOP

Sample No.: SD3-EB134-0000/97312369
Sample Location: Elliott Bay
Prop. Coordinates: E= 1261522 N= 2193427

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 0953 | 73 | (SEE CHARLIE) | | YES | 10 | BR-SURF GY | SURF-SL F-MSD | NONE | NONE | TRACE WORM TUBES SHELL FRAGS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Sturim

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: OVERCAST; SLIGHT CHOP

Sample No.: SD3-EB135-0000/97312370
Sample Location: Elliott Bay
Prop. Coordinates: E= 1261116 N= 219160.5

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates | | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | Y | | | | | | | |
| 1 | 1006 | 76.5 | (SEE CHARLIE) | | 1/2 YES | 17 | BR-SURF GY | SURF SL F-M SD | NONE | NONE | TRACE WORM TUBES; SHELL FRAGS |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes**
SL = Silt
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# SEDIMENT FIELD SAMPLE RECORD

Project Name: PSR Marine Sediments Unit - Phase 3
Project Location: Seattle, Washington
Project No.: 04000-031-001-4500-02
Date: 7/30/97

Sampling Personnel: D. Hughes, R. Sturim
Sampling Vessel: R/V Kittiwake
Subcontractor(s): Biomarine Enterprises (C. Eaton) S. EATON
Weather: OVERCAST / SLIGHT CHOP

Sample No.: SD3-EB136-0000/97312371
Sample Location: Elliott Bay
Prop. Coordinates: E= 1260733 N= 218832.9

Sampling Method: 0.1 m² van Veen Grab
Analysis: PAHs, TOC ARCHIVE

| Grab # | Time | Depth to Sed. (ft/m) | Coordinates X | Coordinates Y | Grab Accpt. ? | Penet. Depth (cm) | Color | Texture | Odor | Petroleum | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1017 | 73 | (SEECHARGE) | | NO | | | | | | WASHOUT. ROCK IN JAWS |
| 2 | 1020 | 71.5 | | | YES | 13 | BR-SURF GY | M SAND GRAVEL | NONE | NONE | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Color Codes**
BR = Brown
BK = Black
GY = Gray
GR = Green
RST = Rust

**Texture Codes** (SL = Silt)
SC = Silt/Clay
SD = Sand
GR = Granule
PB = Pebble
GV = Gravel
F = Fine
M = Medium
C = Coarse

**Odor Codes**
H2S = Sulfide
TPH = Petroleum
SL = Slight
M = Moderate
ST = Strong

**Petroleum Code**
1=Thoroughly saturated
2=Large globules
3=Sheen/small droplets
4=None/very little

**Other:**
Include presence of biota, debris, or redox layer

Sampler Signature: D R Hughes

# APPENDIX C

## SUBSURFACE SEDIMENT CORING LOGS

- C.1 Shallow Core Logs
- C.2 Deep Boring Logs

# APPENDIX C.1

# SHALLOW CORE LOGS

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 11.8 | Date | 9/26/96 | 9/27/96 |
| Depth to Mud 18.6 | S. Time | 1701 | 0925 |
| Mud Line Elev. 6.8 | E. Time | 1710 | 1115 |

| |
|---|
| Core Number EB03 |
| Drive Length, ft. 21 |
| Recover Length, ft. 16.6 |
| Recovery Efficiency 77% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sand (SP), very dark gray, 100% very fine sand, trace silt, trace shell fragments | | **0 - 1.4'**: Silty SAND, dark gray, fine to medium sand, seaweed, some plant (<5 cm) fragments, wood chips, trace sheen (very soft) |
| _2 | | | **1.4 - 3.8'**: SAND, fine to medium, dark gray (loose) few red and white grains, trace silt, trace shell fragments |
| _3 | | | |
| _4 | Sand with silt (SP-SM), very dark gray, 90% fine sand, 10% silt | | **3.8 - 6.9'**: Very fine sandy SILT, olive brown (soft), occasional wood chips |
| _5 | | | |
| _6 | | | **6.9 - 8.1'**: SAND, SAME AS ABOVE, |
| _7 | | | |
| _8 | | | |
| _9 | Sand (SP), very dark gray, 95% fine sand, 5% silt, trace organic fragments | | **8.1 - 16.5'**: Very fine silty SAND and SILT, olive brown to very dark gray, occasional plant fragments (<2 cm), layers 4 - 12" thick, (loose/soft) |
| _10 | | | |
| _11 | | | |
| _12 | | | |
| _13 | Sandy silt (ML), very dark gray, 65% silt, 35% fine sand, slight sulfur odor, trace organic fragments | | |
| _14 | | | |
| _15 | | | |
| _16 | | | |
| _17 16.65 | Sand (SP) very dark gray, 100% sand, fine trace shell and organic fragments | | **16.5 - 19.0'**: SAND, fine to medium, dark gray, (loose), few red and white grains, trace small (<1 cm) shell and woody plant fragments |
| _18 17.7 | | | **19.0 - 21'**: Fine silty SAND, and very fine sandy SILT, olive gray to medium gray, (loose/soft), occasional and thin layers woody plant fragments (<1 - 5cm), trace shell fragments |
| _19 | | | |
| _20 | | | NOTES: 1) No odor from core noted<br>2) Recent/Native break not apparent in core. (Wood chip observed at ~ 6'). |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0 - 4 | 4 | 77 | 0 - 3.1 | 3.1 |
| B | 4 - 8 | 4 | 77 | 3.1 - 6.2 | 3.1 |
| C | 8 - 12 | 4 | 77 | 6.2 - 9.3 | 3.1 |
| D | 12 - 16 | 4 | 77 | 9.3 - 12.4 | 3.1 |
| E | 16 - 20 | 4 | 77 | 12.4 - 15.5 | 3.1 |

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB03-000A | A,B | 0-3.1 | 0-4 |
| SD2-EB03-0040 | A,B | 3.1-6.2 | 4-8 |
| SD2-EB03-0080 | A,B | 6.2-9.3 | 8-12 |
| SD2-EB03-0120 | A,B | 9.3-12.4 | 12-16 |
| SD2-EB03-0160 | A,B | 12.4-15.5 | 16-20 |

**Comments**

Head space = 4.8
Foot space = none
A duplicate sample was collected at this station

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project Location: Elliott Bay, Washington
Project No: 04000-031-001-4400-03
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 6.3 | Date | 10/2/96 | 10/3/96 |
| Depth to Mud 23.4 | S. Time | 1428 | 1400 |
| Mud Line Elev. 23.9 | E. Time | 1436 | 1425 |

| |
|---|
| Core Number EB12 |
| Drive Length, ft. 13.6 |
| Recover Length, ft. 5.9 |
| Recovery Efficiency 44% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), very dark gray brown, 65% silt, 35% fine sand, very strong sulfur odor, abundant wood and shell fragments | | 0 - 8.0': SILT, black and dark gray, 50 - 95% wood debris, wood fragments from coarse sand size to 4" fragments, abundant shell fragments, strong product sheen from 3.9 to 4.6' bgs, very strong sulfide odor, occasional medium gray silt layers 1 - 1.7' |
| _2 | | | |
| _3 | | | |
| _4 | Silt (ML), grayish brown, 95% silt, 5% sand, abundant wood fragments (50%) to 1.5", very strong sulfur odor | | |
| _5 | | | |
| 5.85 | | | |
| _6 | Sandy silt (ML), very dark gray brown, 65% silt, 35% sand, trace organic fragments, chemical odor | | |
| _7 | | | |
| _8 | | | 8.0 - 8.5': Grades to 50% silt layers |
| _9 | | | 8.5 -13.6': SILT, to silty very fine SAND, dark gray brown to dark gray, (soft), massive, no sheen, very faint product odor |
| _10 | | | |
| _11 | | | |
| _12 | | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | | | NOTES: "Recent" sediment appears to extend to 8.5' bgs |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 44 | 0-1.8 | 1.8 |
| B | 4-8 | 4 | 44 | 1.8-3.6 | 1.8 |
| C | 8-13.6 | 5.6 | 44 | 3.6-5.9 | 2.3 |
| | | | | | |
| | | | | | |

**Comments**

Head space = 15.6"
Foot space = none
Might have driven core through log

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB12-0000A | A,B | 0-1.8 | 0-4 |
| SD2-EB12-0040 | A,B,G,H | 1.8-3.6 | 4-8 |
| SD2-EB12-0080 | A,B,G,H | 3.6-5-9 | 8-12 |
| | | | |
| | | | |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

Field Log by: SC-EL Lab Log by: KP/RJ

| | Field | Lab |
|---|---|---|
| Tide Level (MLLW) 9.1 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 40.5 | S. Time | 1022 | 1540 |
| Mud Line Elev. 31.4 | E. Time | 1030 | 1615 |

| |
|---|
| Core Number EB13 |
| Drive Length, ft. 21 |
| Recover Length, ft. 14.7 |
| Recovery Efficiency 70% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silty sand (SM), black, 60% fine sand, 40% silt, very strong creosote odor and sheen, abundant organic fragments | | **0 - 1.1':** Fine sandy SILT, dark gray, very soft, light gray clayey silt layer at 0.3', product saturated, strong sheen, strong product odor |
| _2 | | | **1.1 - 2.8':** Fibrous wood debris with sand SILT, black, saturated with product, medium gray clayey silt layer at 2.8', very strong product odor |
| _3 | | | **2.8 - 6.0':** Silty very fine SAND, dark gray, (very loose), sheen throughout, product odor |
| _4 | Sand with silt (SP-SM) dark gray, 85% fine sand, 15% silt, no organics, strong creosote and heavy staining | | |
| _5 | | | |
| _6 | | | **6.0 - 9.8':** SAND, dark gray, very fine to fine, (loose), large areas (2-3") of sheen, thin <1" layers of silty sand, moderate product odor |
| _7 | | | |
| _8 | | | |
| _9 | Silty sand (SM), dark gray, 55% fine sand, 45% silt dark gray, strong creosote odor, visible staining | | |
| _10 | | | **9.8 - 21':** Silty very fine SAND, dark gray, (loose), massive, common areas of product sheen in small bedding parallel structures to 21', moderate product odor |
| _11 | | | |
| _12 | | | |
| _13 | Sand with silt (SP-SM), very dark gray, 90% fine sand 10% silt, moderate creosote odor, visible sheen | | |
| _14 | | | |
| 14.65 _15 | Silty sand (SM), very dark gray, 85% fine sand 15% silt, moderate creosote odor, no stain | | |
| _16 | | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | | | |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 70 | 0-2.8 | 2.8 |
| B | 4-8 | 4 | 70 | 2.8-5.6 | 2.8 |
| C | 8-12 | 4 | 70 | 5.6-8.4 | 2.8 |
| D | 12-16 | 4 | 70 | 8.4-11.2 | 2.8 |
| E | 16-20 | 4 | 70 | 11.2-14 | 2.8 |

**Comments**

Some sheening on water during recovery
Head space = 6.9
Foot space = none.

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB13-0000A | B,C,D,E,F | 0-2.8 | 0-4 |
| SD2-EB13-0040 | B,C,D,E,F,G,H | 2.8-5.6 | 4-8 |
| SD2-EB13-0080 | B,C,D,E,F,G,H | 5.6-8.4 | 8-12 |
| SD2-EB13-0120 | B,C,D,E,F | 8.4-11.2 | 12-16 |
| SD2-EB13-0160 | B,C,D,E,F(Archived) | 11.2-14 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 1.1 | Date | 9/26/96 | 9/27/96 |
| Depth to Mud 35.0 | S. Time | 1043 | 1145 |
| Mud Line Elev. 33.9 | E. Time | 1050 | 1300 |

| |
|---|
| Core Number EB15 |
| Drive Length, ft. 21 |
| Recover Length, ft. 16.4 |
| Recovery Efficiency 92% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silty sand (SM), 30% silt, 70% sand, dark gray, trace organic debris | | 0 - 6.2': SILT, olive gray to black (0 - 4'), layers of sandy SILT, 6 - 12", sandy and trace fine gravel in top 1.5', plastic, (very soft), fine woody plant fragments, strong sulfide odor |
| _2 | | | |
| _3 | | | |
| _4 | Silt with sand (ML), dark gray, 65% silt, 35% fine sand, no organics, slightly plastic | | 4.0 - 6.2': Increasing very fine sand becomes (soft) less plastic, some bark fragments. |
| _5 | | | |
| _6 | | | |
| _7 | | | 6.2 - 21': Silty very fine SAND, dark brown gray to dark gray (loose), layers very fine sandy SILT (<1" - 9"), 5 cm bivalve shells at 10 - 12'. Occasional woody plant fragments |
| _8 | Sand with silt (SP-SM), very dark gray, 90% fine sand, 10% silt, no organics | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Sand (SP), very dark gray, 95% fine sand, 5% silt, occasional rootlets, strong sulfide odor | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | Silty sand (SP-SM), very dark gray, 60 % fine sand, 40 % silt, no organics, soft | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | SAME AS ABOVE. | | NOTES: Possible "native/recent" contact at ~ 4.0'. |

FIELD SAMPLING PLAN:

| Tube Segments | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0 - 4 | 4 | 92 | 0 - 3.7 | 3.7 |
| B | 4 - 8 | 4 | 92 | 3.7 - 7.4 | 3.7 |
| C | 8 - 12 | 4 | 92 | 7.4 - 11.1 | 3.7 |
| D | 12 - 16 | 4 | 92 | 11.1 - 14.8 | 3.7 |
| E | 16 - 20 | 4 | 92 | 14.8 - 18.5 | 3.7 |

**Comments**
Head space = 2.6
Foot space = none

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB15-0000A | A,B | 0-3.7 | 0-4 |
| SD2-EB15-0040 | A,B,G,H | 3.7-7.4 | 4-8 |
| SD2-EB15-0080 | A,B(Archived),G,H | 7.4-11.1 | 8-12 |
| SD2-EB15-0120 | A,B(Archived) | 11.1-14.8 | 12-16 |
| SD2-EB15-0160 | A,B(Archived) | 14.8-18.5 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 6.6 | Date | 9/26/96 | 9/27/96 |
| Depth to Mud 47.1 | S. Time | 1400 | 1550 |
| Mud Line Elev. 40.5 | E. Time | 1410 | 1645 |

| |
|---|
| Core Number EB27 |
| Drive Length, ft. 21 |
| Recover Length, ft. 17.7 |
| Recovery Efficiency 84% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), black 70% silt 30% fine sand, very strong creosote odor, visible sheen | | **0 - 1.2'**: SILT, olive gray, (very soft), massive, grades to sandy at base, (plastic) visible sheen in areas near top.<br>**1.2 - 4.7'**: Fine sandy SILT, olive gray to dark gray, thin (<1-2") layers silt, (very soft), layer of fine organic fragments, occasional product stain and sheen with odor.<br>**4.7 - 9.1'**: Very fine sandy SILT, dark gray to black, (soft-m. stiff) crudely layered, fractured, brown product stain and sheen on fractures, strong product odor, occasional woody plant fragments. Becomes sandier at base (soft-m. stiff).<br>**9.1 - 14.0'**: Very fine. sandy SILT, olive gray, (soft), Occasional woody plant fragments, trace disseminated fine plant fragments, moderate to strong product stain and sheen, product odor<br>**14.0 - 21'**: Silty very fine SAND, olive gray, (loose) and very fine sandy SILT in places, crude layers, (6-12 inches), occasional trace woody plant fragments, occasional. Areas of sheen, moderate product odor.<br>NOTES: Product appears to be localized in fractures and bedding planes from 1.2 to 14' bgs. |
| _2 | | | |
| _3 | | | |
| _4 | Silt (ML), very dark gray, 100% silt, very strong creosote odor, staining, very plastic | | |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | SAME AS ABOVE, black staining on exterior of sample, free product visible, very strong creosote odor | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Silt (ML), very dark gray 90% silt, 10% fine sand, moderate odor, some black staining, no free product | | |
| _13 | | | |
| _14 | | | |
| _15 | Silty sand (SM), very dark gray, 75 % sand, 25 % silt, visible staining, moderate creosote odor | | |
| _16 | | | |
| _17 | | | |
| _18 17.7 | Sandy silt (ML), very dark gray, 70% silt, 30% fine sand, moist, light creosote odor | | |
| _19 | | | |
| _20 | | | |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0 - 4 | 4 | 84 | 0 - 3.4 | 3.4 |
| B | 4 - 8 | 4 | 84 | 3.4 - 6.8 | 3.4 |
| C | 8 - 12 | 4 | 84 | 6.8 - 10.2 | 3.4 |
| D | 12 - 16 | 4 | 84 | 10.2 - 13.6 | 3.4 |
| E | 16 - 20 | 4 | 84 | 13.6 - 17.0 | 3.4 |

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB27-000A | A,B | 0-3.4 | 0-4 |
| SD2-EB27-0040 | A,B,G,H | 3.4-6.8 | 4-8 |
| SD2-EB27-0080 | A,B,G,H | 6.8-10.2 | 8-12 |
| SD2-EB27-0120 | A,B | 10.2-13.6 | 12-16 |
| SD2-EB27-0160 | A,B | 13.6-17 | 16-20 |

**Comments**

Sheen on water when core retrieved, lots of gas (i.e., bubbles on surface of water), strong odor, headspace = 3.9, foot space = none, core catcher (bottom) had sheening when rinsed.

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project Location: Elliott Bay, Washington
Project No: 04000-031-001-4400-03
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP/RJ | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 5.0 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 73.0 | S. Time | 1242 | 1015 |
| Mud Line Elev. 68.0 | E. Time | 1249 | 1100 |

| |
|---|
| Core Number EB31 |
| Drive Length, ft. 21 |
| Recover Length, ft. 15.8 |
| Recovery Efficiency 75% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silty w/sand (ML), very dark gray, 65% silt, 35% fine sand, trace organic fragments | | 0 - 1.5': Fine sandy SILT, olive gray, (very soft), abundant wood chips and woody plant fragments, moderate sulfide odor, no sheen |
| _2 | | | 1.5 - 4.2': SILT, dark gray to medium gray, fine sandy layers, (very soft to soft), occasional trace brown product bubbles and sheen, mild product odor |
| _3 | | | |
| _4 | Sand w/silt (SP-SM) very dark gray, 90% fine sand, 10% silt, trace of visible staining, mild petroleum odor | | 4.2 - 16.0': Silty very fine SAND, dark gray, (loose), 0.7' layers of fine SAND, occasional trace fine plant fragments, no sheen, possible very mild product odor, abundant 1-2mm round holes in sediment at 13-16' |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | Sandy silt (ML) very dark gray, 60% silt, 40% fine sand, slight sulfur odor | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Sand w/silt (SB-SM), very dark gray, 90% fine sand, 10% silt, gas bubbles, no odor, trace rootlets | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | Sand (SP), very dark gray, 100% fine-medium sand, trace silt | | 16.0 - 21.0': SAND, dark gray, fine-medium, (loose), silty layers (< 1" - 5"), no sheen, no odor |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | | | |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 75 | 0-3 | 3 |
| B | 4-8 | 4 | 75 | 3-6 | 3 |
| C | 8-12 | 4 | 75 | 6-9 | 3 |
| D | 12-16 | 4 | 75 | 9-12 | 3 |
| E | 16-20 | 4 | 75 | 12-15 | 3 |

**Comments**

Head space = 5.2
Foot space = none

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB31-0000A | A,B | 0-3 | 0-4 |
| SD2-EB31-0040 | A,B,G,H | 3-6 | 4-8 |
| SD2-EB31-0080 | A,B,G,H | 6-9 | 8-12 |
| SD2-EB31-0120 | A,B | 9-12 | 12-16 |
| SD2-EB31-0160 | A,B (Archived) | 12-15 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 7.0 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 71.0 | S. Time | 1128 | 1100 |
| Mud Line Elev. 64.0 | E. Time | 1136 | 1150 |

| |
|---|
| Core Number EB32 |
| Drive Length, ft. 21 |
| Recover Length, ft. 18.1 |
| Recovery Efficiency 86% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silt w/sand (SP-SM), very dark gray, 70% silt, 30% fine sand | | 0 - 0.7': Fine sandy SILT, olive brown, (very soft), no odor, no sheen, sand fraction increases with depth |
| _2 | | | 0.7 - 3.8': SILT, medium gray to black, very fine sandy layers (< 3"), 2-4" layers with product and abundant coarse woody debris, (very soft to soft), fractures in silt layers have brown product stain, moderate sheen, moderate product odor, distinct light gray clayey silt layer at 2.0' (same seen in EB31 at similar depth) |
| _3 | | | |
| _4 | Sand w/silt (SP-SM) very dark gray, 90% very fine sand, 10% silt, moderate odor, visible staining | | 3.8 - 14.0': Layered silty very fine SAND, dark gray, (loose), and SAND, fine, dark gray, (loose), (layers < 1" - 1'), moderate sheen to 5.5', occasional trace sheen to 6.5', moderate product odor to 6.5', abundant 1-2mm round holes 12-14' |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | Silty sand (SM), black, 85% fine sand, 15% silt, no staining or odor | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Silty sand (SM), very dark gray, 65% fine sand, 35% silt, trace rootlets, grades to moist | | 14.0 - 21.0': Silty very fine SAND, dark gray, massive to crude layers, (loose), no sheen, no product odor, occasional trace fine plant fragments |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | Silt w/sand (ML), very dark gray, 65% silt, 35% fine sand, slight sulfur odor | | |
| _17 | | | |
| _18 | | | |
| _19 18.7 | Sand w/silt (SP-SM), 90% fine sand, 10% silt, creosote odor | | |
| _20 | | | Note: Occasional sheen on core 0.7 - 5.5' |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 86 | 0-3.4 | 3.4 |
| B | 4-8 | 4 | 86 | 3.6-6.8 | 3.4 |
| C | 8-12 | 4 | 86 | 6.8-10.2 | 3.4 |
| D | 12-16 | 4 | 86 | 10.2-13.6 | 3.4 |
| E | 16-20 | 4 | 86 | 13.6-17 | 3.4 |

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB32-0000A | A,B | 0-3.4 | 0-4 |
| SD2-EB32-0040 | A,B,G,H | 3.4-6.8 | 4-8 |
| SD2-EB32-0080 | A,B,G,H | 6.8-10.2 | 8-12 |
| SD2-EB32-0120 | A,B | 10.2-13.6 | 12-16 |
| SD2-EB32-0160 | A,B | 13.6-17 | 16-20 |

**Comments**

Sheen on deck of boat from core
Head space = 2.9
Foot space = none

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 4.4 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 82.0 | S. Time | 1341 | 1400 |
| Mud Line Elev. 77.6 | E. Time | 1351 | 1440 |

| |
|---|
| Core Number EB34 |
| Drive Length, ft. 21 |
| Recover Length, ft. 18.6 |
| Recovery Efficiency 89% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silt (ML), very dark grayish brown, 90% silt, 10% very fine sand, moderate sulfur odor, wood fragments to 1/2" | | **0 - 3.5'**: Very fine sandy SILT, dark gray to brownish gray, (very soft), abundant fibrous wood fragments to 2", glass fragments @ 3.5', strong sulfur odor, no sheen, trace small shell fragments, sharp contact w/sand |
| _2 | | | |
| _3 | | | |
| _4 | Sand (SP), very dark gray, 90% medium sand, 10% silt, very strong sulfur odor | | **3.5 - 9.7'**: layered silty very fine - fine SAND, dark gray, (loose), and very fine sandy SILT, dark medium gray, (soft), occasional layers fine SAND, layers < 1" - 1'±, no sheen, moderate strong sulfide odor, trace small plant fragments |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | Silty sand (SP-SM), very dark gray, 85% fine sand, 15% silt, mild sulfur odor | | |
| _9 | | | |
| _10 | | | **9.7 - 21.0'**: Silty very fine SAND, dark gray, massive to crude layers, (loose), no sheen, no odor, occasional trace fine plant fragments |
| _11 | | | |
| _12 | Silty w/sand (ML), very dark gray, 80% silt, 20% fine sand, very mild sulfur odor | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | Silty sand (SM), very dark gray, 55% fine sand, 45% silt, no ordor | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 19.2 | Silt Fraction increases, 60% very fine sand, 40% silt, | | |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 89 | 0-3.6 | 3.6 |
| B | 4-8 | 4 | 89 | 3.6-7.2 | 3.6 |
| C | 8-12 | 4 | 89 | 7.2-10.8 | 3.6 |
| D | 12-16 | 4 | 89 | 10.8-14.4 | 3.6 |
| E | 16-20 | 4 | 89 | 14.4-18 | 3.6 |

**Comments**
Head space = 2.4
Foot space = none

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB34-0000A | A,B | 0-3.6 | 0-4 |
| SD2-EB34-0040 | A,B,G,H | 3.6-7.2 | 4-8 |
| SD2-EB34-0080 | A,B,G,H | 7.2-10.8 | 8-12 |
| SD2-EB34-0120 | A,B (Archived) | 10.8-14.4 | 12-16 |
| SD2-EB34-0160 | A,B (Archived) | 14.4-18 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

Field Log by: SC-EL Lab Log by: KP

| | | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 9.5 | Date | 10/1/96 | 10/3/96 |
| Depth to Mud 120.0 | S. Time | 1054 | 1530 |
| Mud Line Elev. 110.5 | E. Time | 1108 | 1615 |

| |
|---|
| Core Number EB41 |
| Drive Length, ft. 21 |
| Recover Length, ft. 17.2 |
| Recovery Efficiency 82% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silt w/sand (ML), very dark gray/brown, 70% silt, 30% fine sand, very strong creosote odor, visible staining, sheen on water, abundant organic fragments | | 0 - 4.6': SILT with very fine sand, dark gray, (very soft to medium stiff), layered, 0.4' layer of silty fine wood debris @ 1.1', sand layers 1/2" to 1.5", have sheen but no product, abundant brown product in bed planes and subvertical fractures in medium stiff silt from 2.5' to 4.0' bgs, (bed planes defined by fine woody debris and sand), product also associated with wood debris @ 1.1' bgs |
| _2 | | | |
| _3 | | | |
| _4 | | | |
| _5 | Sand (SP), very dark gray, 100% fine to medium sand, trace silt, very strong creosote odor, visible stain with sheen | | 4.6 - 13.5': SAND, dark gray, fine to medium, massive, (medium dense), red and white grains, mussel shell fragments at 7.8', mild product odor to 9.5', sheen in small bubbles on core side to 9.2' |
| _6 | | | |
| _7 | | | |
| _8 | | | |
| _9 | Sand (SP), very dark gray, 100% fine to medium sand, mild creosote odor, no visible stains or sheen, shell fragments | | |
| _10 | | | |
| _11 | | | |
| _12 | | | |
| _13 | Silt w/sand (ML), very dark gray, 65% silt, 35% very fine sand, no odor | | 13.5 - 21.0': SILT, some very fine sand, dark gray, massive, (soft), occasional subvertical fractures, occasional shell fragments and plant fragments, no sheen, no odor, thin sand layers @ 20.0' (~ 1/2" - 1") |
| _14 | | | |
| _15 | | | |
| _16 | | | |
| _17 17.25 | Silt (ML), very dark gray, 80% silt, 20% fine sand, mild chemical odor | | |
| _18 | Silty sand (SM), very dark gray, 55% fine sand, 45% silt, mild odor | | |
| _19 | | | |
| _20 | | | |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 82 | 0-3.3 | 3.3 |
| B | 4-8 | 4 | 82 | 3.3-6.6 | 3.3 |
| C | 8-12 | 4 | 82 | 6.6-9.9 | 3.3 |
| D | 12-16 | 4 | 82 | 9.9-13.2 | 3.3 |
| E | 16-20 | 4 | 82 | 13.2-16.5 | 3.3 |

**Comments**

Head space = 4.3
Strong sheen on deck when core pulled up

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB41-0000A | B,C,D,E,F | 0-3.3 | 0-4 |
| SD2-EB41-0040 | B,C,D,E,F,G,H | 3.3-6.6 | 4-8 |
| SD2-EB41-0080 | B,C,D,E,F,G,H | 6.6-9.9 | 8-12 |
| SD2-EB41-0120 | B,C,D,E,F | 9.9-13.2 | 12-16 |
| SD2-EB41-0160 | B,C,D,E,F | 13.2-16.5 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

Field Log by: SC-EL  Lab Log by: KP

| | | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) | Date | 10/1/96 | 10/3/96 |
| Depth to Mud 120.0 | S. Time | 1321 | 0930 |
| Mud Line Elev. | E. Time | 1342 | 0945 |

| |
|---|
| Core Number EB42 |
| Drive Length, ft. 21 |
| Recover Length, ft. 6.7 |
| Recovery Efficiency 32% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silty sand (SM), very dark gray, 80% fine sand, 20% silt, very mild sulfur odor, moderate organic fragments | | **0 - 1.9':** Silty very fine to fine SAND, dark gray, (very loose), occasional trace small woody plant fragments and shell fragments, no odor, no sheen, clayey silt layer 1.5" thick at 1.0', light to medium gray |
| _2 | | | |
| _3 | | | **1.9 - 6.7':** Silty very fine SAND, dark gray, (loose), massive to crude thin layers, no odor, no sheen |
| _4 | Silty sand (SM) very dark gray, 60% fine sand, 40% silt, mild sulfur odor | | |
| _5 | | | |
| _6 | | | |
| _7 6.8 | Sand (SP), very dark gray, 100% fine to medium sand, no odor | | **6.7 - 8.4':** SAND, dark gray, very fine to fine, (loose), crude thin layers, red and white grains, faint sulfide odor, no sheen |
| _8 | | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | | | NOTES: Bottom of recovered core is 8.4'. |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0 - 4 | 4 | 20 | 0 - 3.2 | 3.2 |
| B | 4 - 8.4 | 4.4 | 20 | 3.2 - 6.7 | 3.5 |
| | | | | | |
| | | | | | |
| | | | | | |

**Comments**

Head space = 14.8'
Foot space = 4", wash out
Second attempt at this site
Assuming 20% compaction and loss of 12.6 feet of sand from bottom of core

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB42-0000A | A,B | 0-3.2 | 0-4 |
| SD2-EB42-0040 | A,B,G,H | 3.2-6.7 | 4-8 |
| | | | |
| | | | |
| | | | |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project Location: Elliott Bay, Washington
Project No: 04000-031-001-4400-03
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 2.8 | Date | 9/26/96 | 9/27/96 |
| Depth to Mud 46.8 | S. Time | 1225 | 1415 |
| Mud Line Elev. 44 | E. Time | 1232 | 1530 |

| |
|---|
| Core Number EB49 |
| Drive Length, ft. 21 |
| Recover Length, ft. 19.1 |
| Recovery Efficiency 91% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silt (ML), dark gray, 100% silt, trace fine sand, occasional shell & fine wood fragments. Heavy sheen, strong diesel odor. | | 0 - 1.9': SILT, olive gray, (very soft, plastic) occasional trace sheen, massive (no layering) |
| _2 | | | |
| _3 | | | 1.9 - 5.1': Very fine SILT, dark gray, soft, massive, fractured, abundant product (brown) staining on vertical and horizontal faces. Strong product odor. Sheening (soft) |
| _4 | Silt (ML) dark gray, 100% silt w/ trace of fine sand, very strong creosote odor, sheen on water ponded at end of sample, staining. | | |
| _5 | | | |
| _6 | | | 5.1 - 8.0': Grades to silty very fine SAND, olive brown, (very loose), occasional *product staining and sheen* |
| _7 | | | |
| _8 | Silty sand (SM), very dark gray, 60% fine sand, 40% silt, very mild creosote odor, no stain or sheen. | | |
| _9 | | | 8.0 - 13.6': Layered fine SAND, dark gray, (loose) and very fine sandy SILT, olive brown, (soft), layers <1" - 5", occasional <1" - 2" layers plant fragments, occasional product sheen to 9.6'. Abundant 1 - 2 mm holes in sandy silt layers |
| _10 | | | |
| _11 | | | |
| _12 | Sand with silt (SP-SM), dark gray, 90% very fine sand, 10% silt, trace shell fragments, trace organic fragments, no odor, no sheen. | | |
| _13 | | | |
| _14 | | | |
| _15 | | | 13.6 - 21': Very fine sandy SILT, olive gray, massive, (med stiff), no product sheen or odor. |
| _16 | Sandy silt (ML), very dark gray, 65% silt, 35% fine sand, slightly plastic, less saturated to moist | | |
| _17 | | | |
| _18 | Silty sand (SM), 80% fine sand, 20% silt, very dark gray, saturated to moist. | | |
| _19 18.7 | | | |
| _20 | | | |

FIELD SAMPLING PLAN:

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0 - 4 | 4 | 91 | 0 - 3.6 | 3.6 |
| B | 4 - 8 | 4 | 91 | 3.6 - 7.3 | 3.6 |
| C | 8 - 12 | 4 | 91 | 7.3 - 10.9 | 3.6 |
| D | 12 - 16 | 4 | 91 | 10.9 - 14.5 | 3.6 |
| E | 16 - 20 | 4 | 91 | 14.9 - 18.7 | 3.8 |

**Comments**

Sheening on water surface when core was retrieved.
Head space = 2.9, foot space = none.
Partial samples from 8 -12' and 12 - 16' core intervals included in MET & DRET analyses.
Strong creosote odor on outside of tube.

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB49-00004 | A,B | 0-3.6 | 0-4 |
| SD2-EB49-0040 | A,B,G,H | 3.6-7.3 | 4-8 |
| SD2-EB49-0080 | A,B,G,H | 7.3-10.9 | 8-12 |
| SD2-EB49-0120 | A,B(Archived) | 10.9-14.5 | 12-16 |
| SD2-EB49-0160 | A,B(Archived) | 14.5-18.7 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 10.4 | Date | 10/2/96 | 10/3/96 |
| Depth to Mud 165.0 | S. Time | 1017 | 1430 |
| Mud Line Elev. 154.6 | E. Time | 1032 | 1515 |

| |
|---|
| Core Number EB66 |
| Drive Length, ft. 20 |
| Recover Length, ft. 16.8 |
| Recovery Efficiency 84% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), black 70% silt, 80% fine sand, very strong creosote odor, visible sheen | | 0 - 5.5': Very fine SAND, dark brown gray, (very soft to soft), layered, occasional brown product in bedding planes (and possibly in animal burrows), sheen from 1.1' to base of unit, in patches, layers of very soft clayey silt at 2.0 and 3.2', 0.1' and 0.5' thick, medium gray |
| _2 | | | |
| _3 | | | |
| _4 | Sandy silt (ML), black, 70% silt, 30% fine sand, trace shell fragments, very strong creosote odor | | |
| _5 | | | |
| _6 | | | 5.5 - 5.6': Silty GRAVEL, fine, angular, brown product, at bottom contact, wood fragments |
| _7 | | | 5.6 - 7.8': Very fine sandy SILT, dark gray, (soft), massive, abundant product staining and sheen in bedding planes from 6.2 to 7.8', occasional large woody plant fragments, moderate to strong creosote odor |
| _8 | | | |
| _9 | Sand (SP), very dark gray, 100% fine to medium sand, trace silt, moderate creosote odor, visible sheen | | 7.8 - 20.0': SAND, fine to medium, dark gray, (medium dense), occasional silt layers ~ 1/4" to 1" thick, sheen on core side associated with silt layers, mild product odor to 14.3', possible very slight product odor to 20' |
| _10 | | | |
| _11 | Sand (SP), very dark gray, 100% fine to medium sand, very mild creosote odor | | |
| _12 | | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | SAME AS ABOVE, no odor | | |
| _17 | | | |
| _18 | | | |
| _19 | | | |
| _20 | | | |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 84 | 0-3.4 | 3.4 |
| B | 4-8 | 4 | 84 | 3.4-6.8 | 3.4 |
| C | 8-12 | 4 | 84 | 6.8-10.2 | 3.4 |
| D | 12-16 | 4 | 84 | 10.2-13.6 | 3.4 |
| E | 16-20 | 4 | 84 | 13.6-17 | 3.4 |

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB72-0000A | A,B | 0-3.4 | 0-4 |
| SD2-EB72-0040 | A,B,G,H | 3.4-6.8 | 4-8 |
| SD2-EB72-0080 | A,B,G,H | 6.8-10.2 | 8-12 |
| SD2-EB72-0120 | A,B | 10.2-13.6 | 12-16 |
| SD2-EB72-0160 | A,B | 13.6-17 | 16-20 |

**Comments**

Sheen noted on outside of core
Head space = 4.7'
Foot space = 10"
Sheen on surface of water during retrieval, lots of sheen on water running from core, strong creosote odor before core opened

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

Field Log by: SC-EL Lab Log by: KP

| | | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 9.7 | Date | 10/2/96 | 10/3/96 |
| Depth to Mud 170.0 | S. Time | 1139 | 1100 |
| Mud Line Elev. 160.3 | E. Time | 1150 | 1130 |

| |
|---|
| Core Number EB72 |
| Drive Length, ft. 18.7 |
| Recover Length, ft. 13.2 |
| Recovery Efficiency 71% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), very dark grayish brown, 60% silt, 40% fine sand, moderate creosote odor, visible sheen, trace organic fragments | | 0 - 6.1': Silty very fine to fine SAND, olive brown to dark gray, (very loose to loose), occasional coarse woody plant fragments, 3" sand layer at 1.4', light gray clayey silt layer at 3.5', brown product in sand stringer (also has abundant fine wood debris) and in clam shell layer at 3.2 to 3.4', strong sheen in spots from 1.7 to 4.5', moderate creosote odor |
| _2 | | | |
| _3 | | | |
| _4 | | | |
| _5 | Sand (SP), very dark gray, 100% fine to medium sand, very mild creosote odor, trace sheening | | 6.1 -12.0': SAND, dark gray, fine to medium, (medium dense), red and white grains, occasional trace small shell fragments, occasional thin 1/4" silt layers, mild product odor, no sheen. Grades (interlayers) to: |
| _6 | | | |
| _7 | | | |
| _8 | Sand (SP), very dark gray, 100% medium sand, silt lense, trace shell fragments, pebbles, mild chemical odor | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Sandy silt (ML), very dark gray, 60% silt, 40% fine sand | | 12.0 -16.6': SILT, some very fine sand, dark gray, (soft), occasional layers 2" sand, crude layered to massive (i.e., indistinct to no layering), occasional trace fine plant fragments, mild sulfide odor, no sheen |
| _13 | | | |
| _14 13.4 | Sand (SP), very dark gray, 100% fine to medium sand | | |
| _15 | | | |
| _16 | | | |
| _17 | | | 16.6 -18.7': SAND, same as 5.1 - 12.0' |
| _18 | | | |
| _19 | | | |
| _20 | | | NOTES: BOC 18.7' |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 71 | 0-2.8 | 2.8 |
| B | 4-8 | 4 | 71 | 2.8-5.6 | 2.8 |
| C | 8-12 | 4 | 71 | 5.6-8.4 | 2.8 |
| D | 12-16 | 4 | 71 | 8.4-11.2 | 2.8 |
| E | 16-20 | 4 | 71 | 11.2-14.0 | 2.8 |

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB72-0000A | A,B | 0-2.8 | 0-4 |
| SD2-EB72-0040 | A,B,G,H | 2.8-5.6 | 4-8 |
| SD2-EB72-0080 | A,B(Archived),G,H | 5.6-8.4 | 8-12 |
| SD2-EB72-0120 | A,B(Archived) | 8.4-11.2 | 12-16 |
| SD2-EB72-0160 | A,B(Archived) | 11.2-14 | 16-20 |

**Comments**

Head space = 7.2'
Foot space = 1.6'
Sheen on water pouring out of core tube
Sheened bubbles on water surface during core recovery

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project Location: Elliott Bay, Washington
Project No: 04000-031-001-4400-03
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| **Tide Level (MLLW)** 8.3 | **Date** | 10/2/96 | 10/3/96 |
| **Depth to Mud** 178.0 | **S. Time** | 1251 | 0950 |
| **Mud Line Elev.** 169.7 | **E. Time** | 1303 | 1030 |

| |
|---|
| Core Number EB78 |
| Drive Length, ft. 21 |
| Recover Length, ft. 18.9 |
| Recovery Efficiency 90% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), very dark gray brown, 70% silt, 30% fine sand, no odor, trace organic fragments | | **0 - 1.6'**: Silty fine SAND, olive gray, (very loose), layered, occasional woody plant fragments, mild sulfide odor, no sheen, clayey silt layer 2" thick at 1.4', medium gray (very soft) |
| _2 | | | **1.6 - 3.0'**: Grades to dark gray, (loose) |
| _3 | | | |
| _4 | Sand (SP), very dark gray, 100% fine sand, trace silt, moderate to strong sulfur odor | | **3.0 - 6.5'**: SAND, dark gray, fine to medium, red and white grains, layered, common silt layers 1/4" - 3" thick, mild sulfide odor, no sheen |
| _5 | | | |
| _6 | | | |
| _7 | | | **6.5 - 11.5'**: SILT, some very fine sand, dark gray, thin layers, occasional trace fine and coarse woody plant fragments, few layers sand, no odor, no sheen |
| _8 | Silt (ML), very dark gray, 75% silt, 25% fine sand | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Sand (SP), very dark gray, 100% fine sand, trace silt, mild sulfur odor | | **11.5 - 13.9'**: SAND, same as 3.0 - 6.5' |
| _13 | | | |
| _14 | | | |
| _15 | Sandy silt (ML), very dark gray, 65% silt, 35% sand, trace shell fragments | | **13.9 - 21.0'**: Very fine sandy SILT to silty very fine SAND, dark olive green, (soft), thin layers (< 1") fine to coarse black plant fragments, occasional trace small shell fragments, no odor, no sheen |
| _16 | | | |
| _17 | | | |
| _18 | Silty sand (SM), very dark gray, 65% fine sand, 35% silt, mild sulfur, odor, trace shell fragments | | |
| _19 | | | |
| _20 19.0 | | | NOTES: "Recent" sediment appears to extend to 1.6' bgs |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 90 | 0-3.6 | 3.6 |
| B | 4-8 | 4 | 90 | 3.6-7.2 | 3.6 |
| C | 8-12 | 4 | 90 | 7.2-10.8 | 3.6 |
| D | 12-16 | 4 | 90 | 10.8-14.4 | 3.6 |
| E | 16-20 | 4 | 90 | 14.4-18 | 3.6 |

**Comments**

Driving easier this time. Bottom surface softer.
Head space = 2.6
Foot space = none

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB78-0000A | A,B | 0-3.6 | 0-4 |
| SD2-EB78-0040 | A,B,G,H | 3.6-7.2 | 4-8 |
| SD2-EB78-0080 | A,B(Archived),G,H | 7.2-10.8 | 18-12 |
| SD2-EB78-0120 | A,B(Archived) | 10.8-14.4 | 12-16 |
| SD2-EB78-0160 | A,B(Archived) | 14.4-18.0 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project Location: Elliott Bay, Washington
Project No: 04000-031-001-4400-03
Core Method Vibracoring

Field Log by: SC-EL Lab Log by: KP

| | Field | Lab |
|---|---|---|
| Tide Level (MLLW) 5.0 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 46.0 | S. Time | 1450 | 0930 |
| Mud Line Elev. 41.0 | E. Time | 1457 | 1010 |

| |
|---|
| Core Number EB87 |
| Drive Length, ft. 21 |
| Recover Length, ft. 15.4 |
| Recovery Efficiency 73% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy silt (ML), very dark gray/brown, 65% silt, 35% very fine sand, trace organic and shell fragments | | 0 - 1.4': Very fine sandy SILT, olive gray, (very soft), shell fragments, strong sulfide odor, abundant wood debris (< 3") |
| _2 | | | 1.4 - 13.4': Very fine sandy SILT, dark gray, (soft to medium stiff), crude layering, occasional sand layers (< 1"), trace small woody plant fragments, no odor |
| _3 | | | |
| _4 | Sandy silt (ML), very dark gray, 70% silt, 30% very fine sand, moderate sulfur odor | | |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | Silt (ML), very dark grayish brown, 85% silt, 15% fine sand, mild sulfur odor | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | Sand (SP), very dark gray, 100% fine to medium sand | | |
| _13 | | | |
| _14 | | | 13.4 - 17.9': SAND, fine, trace silt, (loose to medium dense), crude thin layering, no odor |
| _15 | | | |
| _16 | | | |
| _17 16.0 | SAME AS ABOVE | | |
| _18 | | | 17.9 - 21.0': Layered SILT, dark gray, some very fine sand, (soft), occasional woody plant debris, trace shell fragments, and SAND, fine, dark gray, (loose), trace shell fragments (layers < 1" - 6") |
| _19 | | | |
| _20 | | | |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | In Situ Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 73 | 0-2.9 | 2.9 |
| B | 4-8 | 4 | 73 | 5.8-8.7 | 2.9 |
| C | 8-12 | 4 | 73 | 8.7-11.6 | 2.9 |
| D | 12-16 | 4 | 73 | 14.5-17.4 | 2.9 |
| E | 16-20 | 4 | 73 | 17.4-20.3 | 2.9 |

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB87-0000A | A,B | 0-2.9 | 0-4 |
| SD2-EB87-0040 | A,B,G,H | 5.8-8.7 | 4-8 |
| SD2-EB87-0080 | A,B,G,H | 8.7-14.5 | 8-12 |
| SD2-EB87-0120 | A,B | 14.5-17.4 | 12-16 |
| SD2-EB87-0160 | A,B (Archived) | 17.4-20.3 | 16-20 |

**Comments**

Head space = 5.6
Foot space = none

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP/RJ | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 6.8 | Date | 9/30/96 | 10/1/96 |
| Depth to Mud 98.0 | S. Time | 1547 | 1450 |
| Mud Line Elev. 91.2 | E. Time | 1600 | 1520 |

| |
|---|
| Core Number EB104 |
| Drive Length, ft. 21 |
| Recover Length, ft. 15.8 |
| Recovery Efficiency 75% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln. ft. | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Silt w/sand (ML), very dark grayish brown, 5% silt, 35% fine sand, abundant wood fragments, slight sulfur odor | | **0 - 3.5':** Very fine to fine sandy SILT, dark gray, (soft), occasional wood fragments and woody plant fragments to 4", clam shells at 1.5', medium gray clayey silt layer 4" thick at 2.2', Moderate sulfide odor, no sheen. |
| _2 | | | |
| _3 | | | |
| _4 | SAME AS ABOVE,. No wood fragments, no odor | | **3.5 - 10.0':** Very fine silty SAND, dark gray, (soft), massive, occasional trace small shell and fine plant fragments, slight sulfide odor, no sheen. |
| _5 | | | |
| _6 | | | |
| _7 | | | |
| _8 | Sand (SP), very dark gray, 100% fine to medium sand | | |
| _9 | | | |
| _10 | | | |
| _11 | | | **10.0 - 17.0':** SAND, fine to medium, (loose to medium dense), dark gray, red and white grains, occasional thin (< 1") silt layers, no sheen, no odor. |
| _12 | SAME AS ABOVE | | |
| _13 | | | |
| _14 | | | |
| _15 | Silt w/sand (ML), very dark gray, 70% silt, 30% fine sand | | |
| _16 | | | |
| _17 | | | **17.0 - 21.0':** Silty very fine SAND, dark gray, (medium dense), massive, faint vertical fractures, occasional trace small shell and plant fragments, no sheen, no odor. |
| _18 | | | |
| _19 | | | |
| _20 | | | |

## FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 75 | 0-3 | 3 |
| B | 4-8 | 4 | 75 | 3-6 | 3 |
| C | 8-12 | 4 | 75 | 6-9 | 3 |
| D | 12-16 | 4 | 75 | 9-12 | 3 |
| E | 16-20 | 4 | 75 | 121-15 | 3 |

**Comments**
Head space = 6.7
Foot space = none

## LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB104-0000A | A,B | 0-3 | 0-4 |
| SD2-EB104-0040 | A,B,G,H | 3-6 | 4-8 |
| SD2-EB104-0080 | A,B(Archived),G,H | 6-9 | 8-12 |
| SD2-EB104-0120 | A,B(Archived),G,H | 9-12 | 12-16 |
| SD2-EB104-0160 | A,B(Archived),G,H | 12-15 | 16-20 |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# SHALLOW CORE DESCRIPTION

Project Name: PSR Offshore Investigation
Project No: 04000-031-001-4400-03
Project Location: Elliott Bay, Washington
Core Method Vibracoring

| Field Log by: SC-EL | Lab Log by: KP | Field | Lab |
|---|---|---|---|
| Tide Level (MLLW) 6.0 | Date | 10/2/96 | 10/3/96 |
| Depth to Mud 19.0 | S. Time | 1615 | 1150 |
| Mud Line Elev. | E. Time | 1620 | 1205 |

| |
|---|
| Core Number EB113 |
| Drive Length, ft. 7 |
| Recover Length, ft. 4.9 |
| Recovery Efficiency 70% |

DESCRIPTION OF CORE TUBES & TESTS (based on core tube lengths, feet)

| Tube No. Ln, ft | FIELD End Description | Spl No. & Test | LABORATORY Sample Description |
|---|---|---|---|
| _1 | Sandy w/silt (SM), very dark grayish brown, 65% fine sand, 35% silt, strong creosote odor, visible sheening, abundant organic fragments, (30% wood) | | 0 - 7.0': WOOD DEBRIS, dark gray brown, (loose), upper 0.4' silty, wood debris ranges from coarse sand size to 2 - 3" fragments, wood looks fresh, moderate sheen to 3', strong sheen 0 - 0.4', very strong sulfide odor, medium creosote product odor |
| _2 | | | |
| _3 | | | |
| _4 | | | |
| _5 | Sand w/silt (SM), very dark gray, 55% fine sand, 45% silt, very strong sulfur odor, visible sheening, abundant organic fragments, (60% wood fragments up to 4") | | |
| _6 (6.15) | | | |
| _7 | SAME AS ABOVE. | | |
| _8 | | | |
| _9 | | | |
| _10 | | | |
| _11 | | | |
| _12 | | | |
| _13 | | | |
| _14 | | | |
| _15 | | | |
| _16 | | | |
| _17 | | | |
| _18 | | | NOTES: BOC = 7.0' |
| _19 | | | |
| _20 | | | |

FIELD SAMPLING PLAN

| Tube Segment | | | Actual Recovery | | |
|---|---|---|---|---|---|
| No. | *In Situ* Depth | Ln. | Total % R | Core Tube Depth | Length |
| A | 0-4 | 4 | 70 | 0-2.8 | 2.8 |
| B | 4-7 | 3 | 70 | 2.8-4.9 | 2.1 |
| | | | | | |
| | | | | | |
| | | | | | |

**Comments**

Head space = 16.6
Foot space = none
Core tube and boat deck stained by fluid from core.

LAB: SAMPLES SELECTED FOR TESTING

| SAMPLE | | Sample Depth | |
|---|---|---|---|
| Number | Test | Tube | In-Situ |
| SD2-EB113-0000A | A,B | 0-2.8 | 0-4 |
| SD2-EB113-0040 | A,B,G,H | 2.8-4.9 | 4-8 |
| | | | |
| | | | |
| | | | |

**Tests**

| | |
|---|---|
| A PAHs | E PCBs |
| B TOC | F Grain size |
| C Phenols/Dibenzofurans | G DRET |
| D Metals | H MET |

# APPENDIX C.2

# DEEP BORING LOGS

*(This page intentionally left blank)*

## SEDIMENT BORING LOG FOR EB16



WESTON MANAGERS DESIGNERS CONSULTANTS

Project Name: PSR Offshore Investigation
Site Location: Elliott Bay, Washington
EB16
Date Started/Finished: 11-14-96
Drilling Company: Cascade Drilling
Driller's Name: Scott Krueger
Geoligist's Name: Erik Lottsfeldt
Rig Type(s): CME 75
Drilling Method(s): HSA
Bit Size(s): 10" Auger Size(s): 4"
Auger/Split Spoon Refusal:
Total Depth of Borehole is: 85'
Mudline Elevation:

| BARGE DECK TO MUDLINE | | |
|---|---|---|
| Date | Time | Measurement |
| 11-14-96 | 0752 | 38' |
| | | |
| | | |
| | | |
| | | |

Notes:

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0'-2' | EB16-0000 SHELBY | | | | | | | | | ML | | | | SHELBY TUBE 0-3' |
| 2'-4' | | | | | | | | | | | | | | |
| 3' | EB16-0030-SHELBY | | | | | | | | | SM | | | | SHELBY TUBE 3-6' |
| 4'-6' | | | | | | | | | | | | | | |
| 6'-8' | | 2 | 2 | 2 | 3 | | | | | | | 0 | | |
| 8'-10' | | 2 | 2 | 3 | 3 | 90 | | 10 | | ML | | 2 | | TRACE ODOR/SHEEN |
| 10-'12' | | 2 | 3 | 4 | 4 | TR | | 100 | | SP | | 2 | | |
| 12'-14' | EB16-0120 GS/TOC PAH(A) | 3 | 4 | 6 | 7 | TR | | 100 | | SP | | 2 | | TRACE ODOR/SHEEN |
| 14'-16' | | 5 | 6 | 6 | 7 | 5 | | 95 | | SP | | 2 | | |

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 0'-2' | Trace odor, black silt at 0' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 2'-4' | | ○ | ○ | ● |
| 3 | Wood and organic debris in Shelby. | ○ | ○ | ○ |
| 4'-6' | | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 6'-8' | No recovery-silty sand with abundant organic material in sample shoe. | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 8'-10' | Silt(ML), very dark gray (5Y3/1), 90% silt, 10% fine sand, loose, wet, | ○ | ○ | ● |
| | abundant organic fragments, trace sheen/odor | ○ | ○ | ○ |
| 10-'12' | Sand(SP), very dark gray (5Y/3/1), 100% fine to medium sand, trace | ○ | ○ | ● |
| | silt, medium dense, silty sand at 10', 2-1", wood interbeds at 12.5' and13' | ○ | ○ | ○ |
| 12'-14' | SAA, sandy silt at 12-12.5', trace sheen/odor | ○ | ○ | ○ |
| | | ○ | ○ | ○ |
| 14'-16' | SAA, grades to 95% fine sand, 5% silt, trace organic fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB16



WESTON
MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16'-18' | | 7 | 7 | 8 | 8 | 10 | | 90 | | SP/SM | | 2 | | |
| 18'-20' | | 7 | 8 | 8 | 8 | 10 | | 90 | | SP/SM | | 2 | | |
| 20'-22' | EB16-0200 PAH(A) | 7 | 7 | 7 | 7 | 5 | | 95 | | SP | | 2 | | |
| 22'-24' | EB16-0220 PAH(A) | 7 | 8 | 8 | 8 | 5 | | 95 | | SP | | 2 | | |
| 24'-26' | EB16-0240 PAH(A) | 6 | 6 | 7 | 7 | | | 100 | | SP | | 2 | | |
| 26'-28' | EB16-0260 PAH(A) | 6 | 7 | 7 | 7 | TR | | 100 | | SP | | 2 | | |
| 28'-30' | EB16-0280 PAH(A) GS/TOC | 5 | 5 | 6 | 7 | 20 | | 80 | | SM | | 2 | | TRACE SULFIDE ODOR |
| 30'-32' | | 5 | 5 | 6 | 7 | 45 | | 55 | | SM | | 2 | | |
| 32'-34' | EB16-0320 GS/TOC | 7 | 7 | 8 | 9 | 60 | | 40 | | ML | | 2 | | TRACE SULFIDE ODOR |
| 34'-36' | | 7 | 7 | 7 | 7 | 60 | | 40 | | ML | | 2 | | |
| 36'-38' | | 6 | 7 | 7 | 7 | 60 | | 40 | | ML | | 2 | | |
| 38'-40' | | 7 | 7 | 8 | 9 | 5 | | 95 | | SP | | 0.75 | | |
| 40'-42' | | 5 | 6 | 7 | 8 | 5 | | 95 | | SP | | 2 | | |
| 42'-44' | | 7 | 8 | 8 | 8 | 15 | | 85 | | SM | | 2 | | |

WESTON

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 16'-18' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, medium | ○ | ○ | ● |
| | dense, wet, wood fragments at 16.5' | ○ | ○ | ○ |
| 18'-20' | SAA, grades to medium sand at 19.7' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 20'-22' | Sand (SP), very dark gray (5Y3/1), 95% fine to medium sand, 5% silt, medium | ○ | ○ | ● |
| | dense, wet | ○ | ○ | ○ |
| 22'-24' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 24'-26' | SAA, grades to 100% fine to medium sand, trace organic fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 26'-28' | SAA, grades to trace silt, silt fraction increases at 27.5' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 28'-30' | Silty sand (SM), very dark gray (5Y3/1), 80% fine sand, 20% silt, medium | ○ | ● | ○ |
| | dense, trace sulfide odor, trace organics | ○ | ○ | ○ |
| 30'-32' | SAA, grades to 45% silt, 55% fine sand | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 32'-34' | Silt (ML) very dark gray (5Y3/1), 60% silt, 40% fine sand, medium | ○ | ● | ○ |
| | dense, moist, trace sulfide odor | ○ | ○ | ○ |
| 34'-36' | SAA, occasional organic fragments | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 36'-38' | SAA, fine sand interbeds | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 38'-40' | Sand (SP), very dark gray (5Y3/1), 95% sand, 5% silt, medium dense, wet | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 40'-42' | SAA occasional silty sand interbed | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 42'-44' | Silty sand (SM), very dark gray (5Y3/1), 85% fine sand, 15% silt, | ○ | ○ | ● |
| | medium dense, wet | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB16



WESTON
MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44'-46' | | 4 | 5 | 5 | 5 | 5 | | 95 | | SP | | 2 | | SLIGHT SULFIDE ODOR |
| 46'-48' | | 7 | 8 | 8 | 8 | 10 | | 90 | | SP/SM | | 2 | | |
| 48'-50' | | 4 | 5 | 5 | 5 | 15 | | 85 | | SM | | 2 | | |
| 50'-52' | | 5 | 5 | 5 | 6 | 15 | | 85 | | SM | | 2 | | |
| 52'-54' | EB16-0520 GS/TOC | 5 | 5 | 6 | 6 | 20 | | 80 | | SM | | 2 | | |
| 54'-56' | | 5 | 6 | 7 | 8 | 20 | | 80 | | SM | | 2 | | |
| 56'-58' | | 5 | 6 | 7 | 7 | 20 | | 80 | | SM | | 2 | | |
| 58'-60' | | 6 | 7 | 8 | 8 | 10 | | 90 | | SP/SM | | 2 | | TRACE FREE PRODUCT |
| 60'-62' | EB16-0600 PAH(A) | 5 | 6 | 6 | 6 | TR | | 100 | | SP | | 2 | | STRONG CREOSOTE ODOR AND STAINING |
| 62'-64' | EB16-0620 PAH(A) GS/TOC | 6 | 6 | 6 | 6 | 5 | | 95 | | SP | | 2 | | STRONG CREOSOTE ODOR AND STAINING |
| 64'-66' | EB16-0640 PAH(A) | 5 | 6 | 6 | 6 | 5 | | 95 | | SP | | 2 | | STRONG CREOSOTE ODOR AND STAINING |
| 66'-68' | EB16-0660 PAH(A) | 7 | 8 | 9 | 9 | 10 | | 90 | | SP/SM | | 2 | | MOD. CREOSOTE ODOR |
| 68'-70' | EB16-0680 PAH(A) | 4 | 4 | 4 | 4 | TR | | 100 | | SP | | 2 | | MOD. CREOSOTE ODOR AND STAINING |
| 70'-72' | EB16-0700 PAH(A) | 5 | 5 | 5 | 6 | | | 100 | | SP | | 2 | | MILD ODOR |

WESTON
MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 44'-46' | Sand (SP), very dark gray (5Y3/1), 95% fine sand, 5% silt, medium dense, wet | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 46'-48' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, | ○ | ○ | ● |
| | medium dense, wet | ○ | ○ | ○ |
| 48'-50' | Silty sand (SM), very dark gray (5Y3/1) 85% sand, 15% silt, medium dense | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 50'-52' | SAA | ○ | ○ | ○ |
| | | ○ | ○ | ○ |
| 52'-54' | SAA, grades to 80% fine sand, 20% silt | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 54'-56' | SAA | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 56'-58' | SAA, medium sand interbeds | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 58'-60' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, medium dense, | ○ | ○ | ● |
| | trace organic fragments, 3" medium sand interbed at 59', trace free product in medium sand | ○ | ○ | ○ |
| 60'-62' | Sand (SP), black (5Y2.5/1), 100% medium sand, trace silt, medium dense, | ○ | ○ | ● |
| | wet, strong creosote odor with staining | ○ | ○ | ○ |
| 62'-64' | SAA grades to 95% fine sand, 5% silt, very dark gray (5Y3/1), strong | ○ | ○ | ● |
| | creosote odor with staining | ○ | ○ | ○ |
| 64'-66' | SAA, strong creosote odor with staining | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 66'-68' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, | ○ | ○ | ● |
| | medium dense, wet, moderate creosote odor with staining | ○ | ○ | ○ |
| 68'-70' | Sand (SP), very dark gray (5Y3/1), 100% fine sand, to silt, loose, | ○ | ○ | ● |
| | wet, moderate creosote odor | ○ | ○ | ○ |
| 70'-72' | SAA, grades to 100% medium sand, mild creosote odor | ○ | ○ | ○ |
| | | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB16



| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72'-74' | EB16-0720 PAH(A) GS/TOC | 6 | 7 | 7 | 7 | | | 100 | | SP | | 2 | | MILD CREOSOTE ODOR |
| 74'-76' | EB16-0740 PAH(A) | 6 | 6 | 8 | 9 | | | 100 | | SP | | 2 | | VERY MILD CREOSOTE ODOR |
| 76'-78' | EB16-0760 PAH(A) | 8 | 8 | 8 | 9 | | | 100 | | SP | | 1.5 | | MILD CREOSOTE ODOR |
| 78'-80' | EB16-0780 PAH(A) | 8 | 8 | 9 | 9 | | | 100 | | SP | | 1.75 | | VERY MILD CREOSOTE ODOR |
| 80'-82' | EB16-0800 PAH(A) | 7 | 8 | 8 | 8 | | | 100 | | SP | | 2 | | MODERATE CREOSOTE ODOR |
| 82'-84' | EB16-0820 PAH(A) | 10 | 10 | 10 | 10 | | | 100 | | SP | | 2 | | MILD CREOSOTE ODOR |
| 84'-85' | EB16-0840 PAH(A) | 10 | 10 | 10 | 11 | | | 100 | | SP | | 2 | | MILD CREOSOTE ODOR |

## SEDIMENT BORING LOG FOR EB16



| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content: Dry | Moist | Wet |
|---|---|---|---|---|
| 72'-74' | SAA, 100% medium sand, mild creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 74'-76' | SAA, trace shell fragments (mussel), fine to medium sand, very mild odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 76'-78' | SAA, trace shell fragments, mild creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 78'-80' | SAA, very mild creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 80'-82' | SAA, 8" silty sand interbed at 81.5 feet, moderate creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 82'-84' | SAA, 6" silt interbed at 83 feet, mild creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 84'-85' | SAA, moderate shell fragments, mild creosote odor | ○ | ○ | ● |

*(This page intentionally left blank)*

*(This page intentionally left blank)*

## SEDIMENT BORING LOG FOR EB114



WESTON MANAGERS DESIGNERS/CONSULTANTS

Project Name: PSR Offshore Investigation
Site Location: Elliott Bay, Washington
EB114
Date Started/Finished: 11-13-96
Drilling Company: Cascade Drilling
Driller's Name: Scott Krueger
Geoligist's Name: Erik Lottsfeldt
Rig Type(s): CME 75
Drilling Method(s): HSA
Bit Size(s): 10" Auger Size(s): 4"
Auger/Split Spoon Refusal:
Total Depth of Borehole is: 96'
Mudline Elevation:

| BARGE DECK TO MUDLINE | | |
|---|---|---|
| Date | Time | Measurement |
| 11-13-96 | 0813 | 54' |
| 11-13-96 | 1042 | 50' |
| 11-13-96 | 1358 | 51' |
| | | |
| | | |

Notes:

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0'-2' | EB14-0000 SHELBY | | | | | | | | | ML | | | | SHELBY TUBE 0-3' |
| 2'-4' | | | | | | | | | | | | | | |
| 3' | EB14-0030 SHELBY | | | | | | | | | SM | | | | SHELBY TUBE 3-6' |
| 4'-6' | | | | | | | | | | | | | | |
| 6'-8' | | 3 | 3 | 3 | 3 | 10 | | 90 | | SP/SM | | <.5 | | SULFIDE ODOR |
| 8'-10' | EB14-0080 GS/TOC | 3 | 3 | 3 | 3 | 5 | | 95 | | SP | | 2 | | STRONG SULFIDE ODOR, MILD PETROLEUM ODOR |
| 10-'12' | | 15 | 16 | 16 | 16 | TR | | 100 | | SP | | 2 | | MODERATE SULFIDE ODOR, TRACE PETROLEUM ODOR |
| 12'-14' | EB14-0120 GS/TOC | 7 | 8 | 10 | 10 | TR | | 100 | | SP | | 2 | | MILD PETROLEUM ODOR TRACE SHEEN |
| 14'-16' | | 8 | 9 | 10 | 10 | 5 | | 95 | | SP | | 2 | | MILD CHEMICAL ODOR |

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 0'-2' | Sandy silt in end of Shelby tube, strong petroleum odor 0-3' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 2'-4' | | ○ | ○ | ○ |
| 3' | Silty sand in end of Shelby tube, strong petroleum odor, 3-6" foot space | ○ | ○ | ● |
| 4'-6' | in tube | ○ | ○ | ○ |
| | | ○ | ○ | ○ |
| 6'-8' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, | ○ | ○ | ● |
| | loose, wet, slight sulfide odor | ○ | ○ | ○ |
| 8'-10' | Sand (SP), very dark gray (5Y3/1), 95% fine to medium sand, 5% silt, loose | ○ | ○ | ● |
| | wet, strong sulfide odor, mild petroleum odor | ○ | ○ | ○ |
| 10-'12' | SAA, grades to 100% fine to medium sand, trace silt, mild petroleum odor | ○ | ○ | ● |
| | moderate sulfide odor | ○ | ○ | ○ |
| 12'-14' | SAA, mild petroleum odor, trace sheen on standing water in sampler, | ○ | ○ | ● |
| | grades to medium dense | ○ | ○ | ○ |
| 14'-16' | SAA, grades to 95% fine sand, 5% silt, mild chemical odor, trace organic | ○ | ○ | ● |
| | fragments | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB114



WESTON. MANAGERS ENGINEERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16'-18' | | 8 | 10 | 10 | 10 | | 5 | 95 | | SP | | 2 | | |
| 18'-20' | | 10 | 10 | 10 | 10 | | 5 | 95 | | SP | | 2 | | |
| 20'-22' | EB114-0200 PAH(A) | 8 | 10 | 10 | 10 | | 5 | 95 | | SP | | 2 | | |
| 22'-24' | EB114-0220 PAH(A) | 8 | 9 | 9 | 9 | | TR | 100 | | SP | | 2 | | |
| 24'-26' | EB114-0240 PAH(A) | 8 | 9 | 10 | 10 | | TR | 100 | | SP | | 2 | | |
| 26'-28' | EB114-0260 PAH(A) | 7 | 8 | 8 | 8 | | 10 | 90 | | SP/SM | | 2 | | |
| 28'-30' | EB14-0280 PAH(A) | 7 | 8 | 8 | 11 | | 15 | 85 | | SM | | 2 | | |
| 30'-32' | EB114-0300 PAH(A) GS/TOC | 8 | 8 | 9 | 9 | | 15 | 85 | | SM | | 2 | | |
| 32'-34' | | 8 | 8 | 8 | 9 | | 15 | 85 | | SM | | 1 | | |
| 34'-36' | EB114-0340 PAH(A) | 7 | 7 | 7 | 8 | | 5 | 95 | | SP | | 2 | | CREOSOTE ODOR, VISIBLE SHEEN |
| 36'-38' | | 8 | 9 | 9 | 10 | | TR | 100 | | SP | | 2 | | TRACE CREOSOTE ODOR, SHEEN |
| 38'-40' | EB114-0380 GS/TOC | 7 | 7 | 7 | 8 | | | 100 | | SP | | 2 | | TRACE CREOSOTE ODOR |
| 40'-42' | | 8 | 8 | 8 | 9 | | | 100 | | SP | | 2 | | VERY MILD CREOSOTE ODOR |
| 42'-44' | | 7 | 7 | 8 | 10 | | 15 | 85 | | SM | | 2 | | |

WESTON
MANAGERS DESIGN/REMEDIATION/CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 16'-18' | SAA, grades to sand with silt at 17.9', trace organic fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 18'-20' | SAA, 2-2" sandy silt interbeds at 19' and 19.7' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 20'-22' | SAA, 2" silt interbed at 21' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 22'-24' | SAA, grades to 100%, fine to medium sand, trace silt | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 24'-26' | SAA, 3-1" sandy silt interbeds at 25', 25.5', and 26' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 26'-28' | Sand with silt (SP-SM), very dark gray (5Y3/1), 90% fine sand, 10% silt, | ○ | ○ | ● |
| | medium, dense, wet, medium sand interbeds | ○ | ○ | ○ |
| 28'-30' | Silty sand (SM), very dark gray (5Y3/1), 85% fine sand, 15% silt, | ○ | ○ | ● |
| | medium dense, wet | ○ | ○ | ○ |
| 30'-32' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 32'-34' | SAA, Grades to sand with silt at 33.7' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 34'-36' | Sand (SP), very dark gray (5Y3/1), 95% medium sand, 5% silt, | ○ | ○ | ● |
| | medium dense, wet, trace creosote odor and sheen | ○ | ○ | ○ |
| 36'-38' | SAA, grades to 100% medium sand, trace silt, mild creosote odor, | ○ | ○ | ● |
| | staining at 37' and 38' | ○ | ○ | ○ |
| 38'-40' | SAA, grades to 100% medium sand, trace creosote odor and sheen | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 40'-42' | SAA, very mild creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 42'-44' | Silty sand (SM), very dark gray (5Y3/1), 85% fine sand, 15% silt, | ○ | ○ | ● |
| | medium dense, wet, trace shell fragments | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB114



WESTON
MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44'-46' | | 7 | 8 | 10 | 10 | 5 | | 95 | | SP | | 1 | | |
| 46'-48' | | 7 | 8 | 9 | 9 | 70 | | 30 | | ML | | 2 | | |
| | | | | | | 5 | | 95 | | SP | | | | |
| 48'-50' | | 8 | 9 | 10 | 10 | | | 100 | | SP | | 1 | | MILD SULFIDE ODOR |
| 50'-52' | | 6 | 7 | 7 | 9 | | | 100 | | SP | | 1.5 | | |
| 52'-54' | | 6 | 7 | 8 | 9 | | | 100 | | SP | | 2 | | |
| 54'-56' | | 7 | 7 | 8 | 9 | 40 | | 60 | | SM | | 2 | | |
| 56'-58' | EB114-0056 GS/TOC | 7 | 7 | 8 | 9 | 40 | | 60 | | SM | | 2 | | |
| 58'-60' | | 7 | 8 | 10 | 12 | 40 | | 60 | | SM | | 2 | | |
| 60'-62' | EB114-0600 PAH(A) | 8 | 8 | 10 | 11 | 40 | | 70 | | SM | | 2 | | |
| 62'-64' | EB114-0620 PAH(A) | 7 | 7 | 7 | 8 | 30 | | 100 | | SP | | 1.7 | | MODERATE CREOSOTE ODOR/SHEEN |
| 64'-66' | EB114-0640 PAH(A) GS/TOC | 7 | 8 | 9 | 10 | | | 100 | | SP | | 2 | | MILD CREOSOTE ODOR |
| 66'-68' | EB114-0660 PAH(A) | 7 | 7 | 9 | 10 | | | 100 | | SP | | 2 | | SHEEN/CREOSOTE ODOR |
| 68'-70' | EB114-0680 PAH(A) | 6 | 9 | 11 | 11 | | | 100 | | SP | | 2 | | SHEEN/CREOSOTE ODOR |
| 70'-72' | EB114-0700 PAH(A) | 6 | 7 | 9 | 9 | | | 100 | | SP | | 2 | | SHEEN/CREOSOTE ODOR |

WESTON
MANAGERS ENGINEERS CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 44'-46' | Sand (SP), very dark gray (5Y3/1), 95% fine sand, 5% silt, medium dense, | ○ | ○ | ● |
| | wet, trace shell fragments | ○ | ○ | ○ |
| 46'-48' | Silt (ML), very dark gray (5Y3/1), 70% silt, 30% fine sand, medium dense, wet | ○ | ○ | ● |
| | grades to SP at 47' | ○ | ○ | ○ |
| 48'-50' | Sand (SP), very dark gray (5Y3/1), 100% medium sand, medium, dense, | ○ | ○ | ● |
| | wet, mild sulfide odor | ○ | ○ | ○ |
| 50'-52' | SAA, 100% medium sand, 1" silty sand interbed at 51.8' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 52'-54' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 54'-56' | Silty sand (SM), very dark gray (5Y3/1), 60% very fine sand, 40% silt, medium | ○ | ○ | ● |
| | dense, wet | ○ | ○ | ○ |
| 56'-58' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 58'-60' | SAA, 1" fine sand interbed at 59' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 60'-62' | SAA, grades to 70% fine sand, 30% silt, 2-1" medium sand interbeds | ○ | ○ | ● |
| | at 61.7' and 61' | ○ | ○ | ○ |
| 62'-64' | Sand (SP), very dark gray (5Y3/1), 100% medium sand, medium dense, wet, | ○ | ○ | ● |
| | moderate creosote odor, staining | ○ | ○ | ○ |
| 64'-66' | SAA, mild creosote odor at 64.5' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 66'-68' | SAA, 100% medium sand, staining and creosote odor at 67.7' to 68' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 68'-70' | SAA, sheen and creosote odor at 69'-70', trace shell fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 70'-72' | SAA, sheen and creosote odor at 71.5'-72', moderate shell fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB114



WESTON
MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72'-74' | EB114-0720 PAH(A) | 8 | 8 | 8 | 8 | | | 100 | | SP | | 2 | | STAIN/CREOSOTE ODOR AT 74.5' |
| 73' | | | | | | | 40 | 60 | | SM | | | | |
| 74'-76' | EB114-0740 PAH(A) | 16 | 16 | 17 | 16 | | 40 | 60 | | SM | | 2 | | FREE PRODUCT, CREOSOTE ODOR, SHEEN |
| 76'-78' | EB114-0760 PAH(A) GS/TOC | 13 | 14 | 16 | 16 | | 40 | 60 | | SM | | 2 | | FREE PRODUCT AT 76.5' AND 77.5' |
| 78'-80' | | 10 | 10 | 10 | 12 | | 30 | 70 | | SM | | 2 | | HEAVILY STAINED, STONG CREOSOTE ODOR |
| 80'-82' | EB114-0800 PAH(A) | 9 | 9 | 10 | 11 | | 15 | 85 | | SM | | 2 | | HEAVILY STAINED, STRONG CREOSOTE ODOR |
| 82'-84' | EB114-0820 PAH(A) | 6 | 6 | 7 | 8 | | 20 | 80 | | SM | | 2 | | MODERATE STAIN, STRONG CREOSOTE ODOR |
| 84'-86' | EB114-0840 PAH(A) | 8 | 10 | 12 | 15 | | 20 | 80 | | SM | | 2 | | MODERATE STAIN, MOD-ERATE CREOSOTE ODOR |
| 86'-88' | EB114-0860 PAH(A) | 7 | 7 | 7 | 8 | | 20 | 80 | | SM | | 2 | | MODERATE CREOSOTE ODOR |
| 88'-90' | EB114-0880 PAH(A) | 7 | 7 | 8 | 9 | | 15 | 85 | | SM | | 2 | | MODERATE CREOSOTE ODOR |
| 90'-92' | EB114-0900 PAH(A) | 8 | 10 | 12 | 14 | | 25 | 75 | | SM | | 2 | | MIODERATE CREOSOTE ODOR |
| 92'-94' | EB114-0920 PAH(A) GS/TOC | 8 | 10 | 12 | 16 | | TR | 100 | | SP | | 1.8 | | MILD CREOSOTE ODOR |
| 94'-96' | EB114-0940 PAH(A) | 8 | 8 | 10 | 12 | | TR | 100 | | SP | | 2 | | TRACE CREOSOTE ODOR |

WESTON MANAGERS ENGINEERS/CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 72'-74' | SAA, sheen/creosote odor | ○ | ○ | ● |
| 73' | Silty sand, (SM), very dark gray (5Y3/1), 60% very fine sand, 40 % silt, dense, wet | ○ | ○ | ○ |
| 74'-76' | SAA, free product in 2" mediums and interbed at 74.5' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 76'-78' | SAA, free product in medium sand interbeds (2-3" at 76.5', 77.5'), | ○ | ● | ○ |
| | trace shell/wood fragments | ○ | ○ | ○ |
| 78'-80' | SAA, grades to 70% fine sand, 30% silt, heavily stained, strong creosote | ○ | ● | ○ |
| | odor | ○ | ○ | ○ |
| 80'-82' | SAA, grades to 85% fine sand, 15% silt, trace shell fragments, heavily | ○ | ● | ○ |
| | stained, strong creosote odor | ○ | ○ | ○ |
| 82'-84' | SAA, grades to 80% fine sand, 20% silt, moderate staining, strong | ○ | ● | ○ |
| | creosote odor | ○ | ○ | ○ |
| 84'-86' | SAA, moderate staining, moderate creosote odor | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 86'-88' | Silty sand (SM), very dark gray (5Y3/1), 80% fine sand, 20% silt, medium dense, | ○ | ● | ○ |
| | moist, moderate creosote odor, no sheen | ○ | ○ | ○ |
| 88'-90' | SAA, grades to 85% fine sand, 15% silt, moderate creosote odor | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 90'-92' | SAA, grades to 75% fine sand, 35% silt, moderate creosote odor, | ○ | ● | ○ |
| | trace organic fragments | ○ | ○ | ○ |
| 92'-94' | Sand (SP), very dark gray (5Y3/1), 100% fine to medium sand, trace silt, | ○ | ○ | ● |
| | medium dense, wet, mild creosote odor, trace shell fragments | ○ | ○ | ○ |
| 94'-96' | SAA, 2-1" silty sand interbeds, trace creosote odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |

*(This page intentionally left blank)*

*(This page intentionally left blank)*

## SEDIMENT BORING LOG FOR EB14



WESTON MANAGERS DESIGNERS CONSULTANTS

Project Name: PSR Offshore Investigation
Site Location: Elliott Bay, Washington
EB14
Date Started/Finished: 11-12-96
Drilling Company: Cascade Drilling
Driller's Name: Scott Krueger
Geoligist's Name: Erik Lottsfeldt
Rig Type(s): CME 75
Drilling Method(s): HSA
Bit Size(s): 10" Auger Size(s): 4"
Auger/Split Spoon Refusal:
Total Depth of Borehole is: 85'
Mudline Elevation:

| BARGE DECK TO MUDLINE | | |
|---|---|---|
| Date | Time | Measurement |
| 11-12-96 | 0752 | 37' |
| 11-12-96 | 937 | 35' |
| 11-12-96 | 1115 | 33' |
| 11-12-96 | 1310 | 34' |
| | | |

Notes:

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0'-2' | EB14-0000 SHELBY | | | | | 30 | | 70 | | ML | | | | SHELBY TUBE 0-3' |
| 2'-4' | | | | | | | | | | | | | | |
| 3' | EB14-0030 SHELBY | | | | | | | | | SM | | | | SHELBY TUBE 3-6' |
| 4'-6' | | | | | | | | | | | | | | |
| 6'-8' | | 5 | 5 | 6 | 7 | 10 | | 90 | | SP/SM | | 2 | | VISIBLE SHEEN, STAIN, ODOR |
| 8'-10' | EB14-0080 GS/TOC | 5 | 5 | 7 | 7 | 10 | | 90 | | SP/SM | | 1 | | VISIBLE SHEEN, STAIN, ODOR |
| 10-'12' | | 10 | 10 | 10 | 10 | 20 | | 80 | | SM | | 2 | | SLIGHT ODOR, NO STAIN |
| 12'-14' | EB14-0120 GS/TOC | 10 | 10 | 10 | 10 | 20 | | 80 | | SM | | 2 | | SLIGHT ODOR |
| 14'-16' | o medium sand trace | 10 | 10 | 10 | 10 | 20 | | 80 | | SM | | 2 | | SLIGHT ODOR |

WESTON
MANAGERS ENGINEERS CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 0'-2' | Sandy silt at top of Shelby tube | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 2'-4' | Silty sand at bottom of Shelby tube (3') | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 4'-6' | Silty sand at top and bottom of Shelby tube | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 6'-8' | Sand with silt (SP-SM), very dark gray (10YR4/1), 90% sand, 10% silt | ○ | ○ | ● |
| | medium dense, wet, staining, visible sheen, moderate creosote odor | ○ | ○ | ○ |
| 8'-10' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 10-'12' | Silty sand (SM), very dark gray (10YR4/1), 80% fine sand, 20% silt, medium | ○ | ○ | ● |
| | dense, wet, slight odor. | ○ | ○ | ○ |
| 12'-14' | SAA, slight odor | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 14'-16' | SAA, faint odor, 3" interbeded medium sand at 15 feet | ○ | ○ | ● |
| | | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB14



WESTON. MANAGERS DESIGNERS/CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16'-18' | | 8 | 9 | 10 | 10 | 25 | | 75 | | SM | | 2 | | SLIGHT CREOSOTE ODOR |
| 18'-20' | | 11 | 8 | 8 | 8 | 25 | | 75 | | SM | | 2 | | |
| 20'-22' | EB14-0200 PAH(A) | 9 | 10 | 10 | 11 | 30 | | 70 | | SM | | 2 | | |
| 22'-24' | EB14-0220 PAH(A) | 8 | 8 | 8 | 9 | 35 | | 65 | | SM | | 2 | | |
| 24'-26' | EB14-0240 PAH(A) | 8 | 9 | 10 | 10 | 35 | | 65 | | SM | | 2 | | |
| 26'-28' | EB14-0260 PAH(A) TOC/GS | 8 | 8 | 8 | 9 | 10 | | 90 | | SP/SM | | 2 | | |
| 28'-30' | EB14-0280 PAH(A) | 7 | 8 | 9 | 9 | 10 | | 90 | | SP/SM | | 2 | | |
| 30'-32' | EB14-0300 PAH(A) | 7 | 8 | 8 | 9 | 10 | | 90 | | SP/SM | | 2 | | SLIGHT SHEEN ON WATER |
| 32'-34' | EB14-0320 PAH(A) GS/TOC | 7 | 8 | 9 | 10 | 5 | | 95 | | SP | | 2 | | |
| 34'-36' | | 7 | 8 | 9 | 11 | 10 | | 90 | | SP/SM | | 2 | | |
| 36'-38' | | 8 | 8 | 8 | 9 | 15 | | 85 | | SM | | 2 | | SULFIDE ODOR |
| 38'-40' | | 7 | 7 | 7 | 8 | 5 | | 95 | | SP | | 2 | | |
| 40'-42' | | 7 | 7 | 7 | 8 | 70 | | 30 | | ML | | 2 | | |
| 42'-44' | o medium sand trace | 7 | 7 | 8 | 9 | 65 | | 35 | | ML | | 2 | | |

WESTON MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 16'-18' | Silty sand (SM), very dark gray (10YR4/1), 75% fine sand, 25% silty, medium | ○ | ○ | ● |
| | dense, wet, slight creosote odor, medium sand interbeds to 1" at 16' and 17' | ○ | ○ | ○ |
| 18'-20' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 20'-22' | SAA, grades to 30% silt, medium sand interbeds to 1" at 20.5' and 21' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 22'-24' | SAA, Grades to 35% silt | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 24'-26' | SAA, medium sand interbeds to 2" at 24.5' and 26.5' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 26'-28' | Sand with silt (SP-SM), very dark gray (10YR3/1) to black (10YR2/1), 90% | ○ | ○ | ● |
| | fine sand, 10% silt, medium dense, wet | ○ | ○ | ○ |
| 28'-30' | SAA, silt interbeds to 2" at 29' and 29.5', trace organic fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 30'-32' | SAA, silt interbeds to 3" at 30.5' and 31' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 32'-34' | Sand (SP), very dark gray (10YR3/1), 95% fine sand, 5% silt, medium dense, | ○ | ○ | ● |
| | wet | ○ | ○ | ○ |
| 34'-36' | Sand with silt (SP-SM), very dark gray (10YR3/1), 90% fine sand, 10% silt, | ○ | ○ | ● |
| | medium, dense, wet | ○ | ○ | ○ |
| 36'-38' | Silty sand (SM), very dark gray (10YR3/1), 85% fine sand, 15% silt, | ○ | ○ | ● |
| | medium dense, slight sulfide odor | ○ | ○ | ○ |
| 38'-40' | Sand (SP), very dark gray (10YR3/1), 95% fine to medium sand, 5% silt, | ○ | ○ | ● |
| | medium, dense, trace shell fragments | ○ | ○ | ○ |
| 40'-42' | Silt (ML), very dark gray (10YR3/1), 70% silt, 30% fine sand, medium | ○ | ○ | ● |
| | dense, coarse sand interbed at 41' with wood fragments | ○ | ○ | ○ |
| 42'-44' | SAA, grades to 65% silt | ○ | ○ | ● |
| | | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB14



WESTON MANAGERS DESIGNERS CONSULTANTS

| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44'-46' | | 7 | 8 | 9 | 10 | 60 | | 40 | | | | 2 | | SLIGHT SULFIDE ODOR |
| 46'-48' | EB14-0460 SHELBY | | | | | | | | | | | | | SHELBY TUBE 46-49' |
| 48'-50' | | | | | | | | | | | | | | |
| 50'-52' | | 8 | 9 | 10 | 10 | 45 | | 55 | | SM | | 2 | | |
| 52'-54' | | 10 | 12 | 13 | 15 | 40 | | 60 | | SM | | 2 | | |
| 54'-56' | | 15 | 16 | 18 | 20 | 35 | | 65 | | SM | | 2 | | |
| 56'-58' | | 15 | 15 | 16 | 18 | 10 | | 90 | | SP/SM | | 2 | | |
| 58'-60' | | 12 | 13 | 15 | 18 | 10 | | 90 | | SP/SM | | 2 | | |
| 60'-62' | EB14-0600 PAH(A) | 9 | 9 | 9 | 10 | 10 | | 90 | | SP/SM | | 2 | | |
| 62'-64' | EB14-0620 PAH(A) | 7 | 8 | 10 | 11 | 15 | | 85 | | SM | | 2 | | |
| 64'-66' | EB14-0640 PAH(A) | 15 | 16 | 18 | 20 | 10 | | 90 | | SP/SM | | 2 | | |
| 66'-68' | EB14-0660 GS/TOC | 15 | 15 | 16 | 18 | 10 | | 90 | | SP/SM | | 2 | | |
| 68'-70' | EB14-0680 PAH(A) | 12 | 15 | 16 | 17 | 5 | | 95 | | SP | | 2 | | |
| 70'-72' | o medium sand trace PAH(A) | 15 | 15 | 18 | 20 | TR | | 100 | | SP | | 2 | | |

WESTON MANAGERS DESIGNERS-CONSULTANTS

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 44'-46' | SAA | ○ | ○ | ○ |
| | | ○ | ○ | ○ |
| 46'-48' | Shelby Tube 46-49' | ○ | ○ | ○ |
| | | ○ | ○ | ○ |
| 48'-50' | | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 50'-52' | Silty sand (SM), very dark gray (10YR3/1), 55% fine sand, 45% silt, medium | ○ | ● | ○ |
| | dense, coarse and sand interbeded at 51' | ○ | ○ | ○ |
| 52'-54' | SAA, grades to 40% silt, 60% fine sand | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 54'-56' | SAA, grades to 35% silt, 65% fine sand, dense | ○ | ● | ○ |
| | | ○ | ○ | ○ |
| 56'-58' | Sand with silt (SP-SM), very dark gray (10YR3/1), 90% fine sand, 10% silt | ○ | ● | ○ |
| | dense, moist | ○ | ○ | ○ |
| 58'-60' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 60'-62' | SAA | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 62'-64' | Silty sand (SM), very dark gray (10YR3/1), 85% fine sand, 15% silt, | ○ | ○ | ● |
| | dense, wet | ○ | ○ | ○ |
| 64'-66' | Sand with silt (SP-SM), very dark gray (10YR3/1), 90% fine sand, 10% silt | ○ | ○ | ● |
| | dense, wet | ○ | ○ | ○ |
| 66'-68' | SAA, 2" medium sand interbed at 67' | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 68'-70' | Sand (SP), very dark gray (10YR3/1), 95% fine to medium sand, 5% silt, | ○ | ○ | ● |
| | dense, wet | ○ | ○ | ○ |
| 70'-72' | SAA, grades to 100% fine to medium sand trace silt, 1" wood fragment layer | ○ | ○ | ● |
| | at 71' | ○ | ○ | ○ |

## SEDIMENT BORING LOG FOR EB14



| Depth Below Surface/Sample Interval | Sample Number | Standard Penetration Test Results 6"-6"-6"-6" (N) | | | | Soil Components CL | SL | S | GR | USCS Classi. | Time | Sample Recovery (feet) | HNu/OVA (ppm) | Comments (odor, sheen, drilling rate, drilling fluid loss, reasons for standby) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72'-74' | EB14-0720 PAH(A) | 12 | 13 | 15 | 15 | | | 100 | | SP | | 1.5 | | |
| 74'-76' | EB14-0740 GS/TOC | 10 | 13 | 15 | 16 | | | 100 | | SP | | 1.5 | | |
| 76'-78' | EB14-0760 PAH(A) | 10 | 12 | 15 | 16 | | | 100 | | SP | | 1.5 | | |
| 78'-80' | EB14-0780 PAH(A) | 13 | 15 | 16 | 17 | | | 100 | | SP | | 2 | | |
| 80'-82' | EB14-0800 PAH(A) | 16 | 18 | 18 | 22 | | | 100 | | SP | | 2 | | |
| 82'-84' | EB14-0820 PAH(A) | 15 | 16 | 19 | 19 | | | 100 | | SP | | 2 | | |
| 84'-85' | EB14-0840 PAH(A) | 13 | 15 | 16 | 20 | | | 100 | | SP | | 1.5 | | |

WESTON

| Depth Below Surface/Sample Interval | Soil Description (soil name, color, moisture content, relative density or consistency, soil structure, mineralogy | Moisture Content Dry | Moist | Wet |
|---|---|---|---|---|
| 72'-74' | SAA, Grades to 100% medium sand with red "lithic" fragments | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 74'-76' | SAA, 1" wood (cedar) fragment interbeded at 76 feet | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 76'-78' | SAA, 2" wood fragment with shell interbeded at 78 feet, occasional silt | ○ | ○ | ● |
| | interbed to 1/2" | ○ | ○ | ○ |
| 78'-80' | SAA, grades to coarse sand with shell fragments, grades to silty sand at | ○ | ○ | ● |
| | 79', and to fine sand at 80 feet (separated by 1" wood fragment interbed) | ○ | ○ | ○ |
| 80'-82' | SAA, grades to medium sand , 6" silty sand layer at 81 feet, trace | ○ | ○ | ● |
| | organic fragments | ○ | ○ | ○ |
| 82'-84' | SAA, 2" silt interbed at 81.5 feet | ○ | ○ | ● |
| | | ○ | ○ | ○ |
| 84'-85' | SAA, 100% fine to medium sand | ○ | ○ | ● |

## APPENDIX D

## SEDIMENT ANALYTICAL AND CHEMICAL SCREENING RESULTS

- Table D-1 PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances
- Table D-2 PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios
- Table D-3 PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment 2LAET Exceedance Ratios
- Table D-4 PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios
- Table D-5 PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment LAET Exceedance Ratios
- Table D-6 PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations
- Table D-7 PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background
- Table D-8 PSR Marine Sediments Unit Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results
- Table D-9 PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances
- Table D-10 PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios
- Table D-11 PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment 2LAET Exceedance Ratios
- Table D-12 PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios
- Table D-13 PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment LAET Exceedance Ratios
- Table D-14 PSR Marine Sediments Unit Deep Subsurface Sediment Analytical Results

# APPENDIX D

# DATA TABLE KEY AND INTERPRETATION NOTES

## CODING KEY FOR DATA TABLES

### Notes Applicable to All Sediment Chemical Tables

Chemical concentrations are presented in units of dry-weight, unless otherwise indicated by "TOCN," which indicates that the data were normalized to total organic carbon (TOC) content for comparison with SMS screening criteria or similarly normalized average Elliott Bay background concentrations.

Blank cells indicate laboratory analysis was not performed (i.e., was not required in accordance with the sampling and analysis plans) or TOC normalization was not conducted because the sample-specific TOC content was outside of the range for normalization (i.e., the TOC content was less than 0.5 or greater than 4 percent).

Tables presenting comparisons with LAET and 2LAET screening values present only those samples for which comparisons with SMS criteria were not applicable (for nonionic/nonpolar organic compounds) based on sample-specific TOC content outside of the range determined appropriate for normalization.

### Table-Specific Notes

Surface and Shallow Subsurface Sediment Results and SMS/AET Exceedances

Boxed values exceed SQS or LAET chemical criteria

("Boxed Cell Standard: SQS LAET")

Shaded values exceed CSL or 2LAET chemical criteria

("Shaded Cell Standard: CSL 2LAET")

Surface and Shallow Subsurface Sediment CSL Exceedance Ratios

Boxed values exceed CSL screening criterion by a factor greater than 1.0

("Boxed Cell Value > 1")

Shaded values exceed CSL screening criterion by a factor greater than 2.0

("Shaded Cell Value > 2")

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Surface and Shallow Subsurface Sediment 2LAET Exceedance Ratios

Boxed values exceed 2LAET screening criterion by a factor greater than 1.0

("Boxed Cell Value > 1")

Shaded values exceed 2LAET screening criterion by a factor greater than 2.0

("Shaded Cell Value > 2")

Surface and Shallow Subsurface Sediment SQS Exceedance Ratios

Boxed values exceed SQS screening criterion by a factor greater than 1.0

("Boxed Cell Value > 1")

Shaded values exceed SQS screening criterion by a factor greater than 2.0

("Shaded Cell Value > 2")

Surface and Shallow Subsurface Sediment LAET Exceedance Ratios

Boxed values exceed LAET screening criterion by a factor greater than 1.0

("Boxed Cell Value > 1")

Shaded values exceed LAET screening criterion by a factor greater than 2.0

("Shaded Cell Value > 2")

Surface Sediment 2,3,7,8-TCDD Results Compared with Average Elliott Bay Background Concentration

Boxed values exceed average Elliott Bay background concentrations for 2,3,7,8-TCDD

("Boxed Cell Standard: PSRBGSED")

Surface Sediment 2,3,7,8-TCDD Elliott Bay Background Exceedance Ratios

Boxed values exceed average Elliott Bay background screening value by a factor greater than 1.0

("Boxed Cell Value > 1")

Shaded values exceed average Elliott Bay background screening value by a factor greater than 5.0

("Shaded Cell Value > 5")

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

UI - The analyte was not detected due to matrix interference.

UE - The analyte was not detected due to polychlorinated chlorinated diphenyl ethers interferences.

UJ - The analyte was not detected at the estimated quantitation limit shown.

P - The analyte was detected above the instrument detection limit (IDL), but not quantified within expected limits of precision. The laboratory has established minimum quantitation limits having a relative standard deviation of no more than 10 percent.

T - This qualifier was added to the data to indicate that the total was calculated by WESTON data management.

UT - This qualifier was added to the data to indicate that the total calculated by WESTON data management is based on the maximum detection limit of the individual compounds (all of which were undetected) used in the summing procedure.

er - This qualifier was added to the data to indicate that the value represents an exceedance ratio (ER) calculated by WESTON data management.

Ter - This qualifier was added to the data to indicate that the value represents an exceedance ratio for a compound total calculated by WESTON data management.

Uer - This qualifier was added to the data to indicate that the exceedance ratio calculated by WESTON data management is based on a detection limit.

UTer - This qualifier was added to the data to indicate that the exceedance ratio for the compound total calculated by WESTON data management is based on the maximum detection limit of the individual compounds (all of which were undetected) used in the summing procedure.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | 1.30 UE | 2.60 | 2.70 | 8.90 | 1.50 | 1.90 |
| Total HxCDF | | 550.00 | 92.00 | 72.00 | 270.00 | 70.00 | 63.00 |
| 123478-HxCDD | | 6.60 | 2.30 | 2.30 | 9.00 | 1.30 U | 2.00 |
| 123678-HxCDD | | 54.00 | 18.00 | 14.00 | 67.00 | 9.50 | 15.00 |
| 123789-HxCDD | | 15.00 | 4.40 | 3.70 | 19.00 | 2.50 | 5.30 |
| Total HxCDD | | 830.00 | 260.00 | 210.00 | 680.00 | 120.00 | 170.00 |
| 1234678-HpCDF | | 330.00 | 86.00 | 47.00 | 550.00 | 31.00 | 63.00 |
| 1234789-HpCDF | | 19.00 | 7.20 | 4.50 | 36.00 | 2.10 | 5.20 |
| Total HpCDF | | 1100.00 | 290.00 | 240.00 | 590.00 | 130.00 | 68.00 |
| 1234678-HpCDD | | 1300.00 | 530.00 | 410.00 | 2100.00 | 260.00 | 350.00 |
| Total HpCDD | | 4400.00 | 1800.00 | 1600.00 | 5800.00 | 920.00 | 1200.00 |
| OCDF | | 1000.00 | 300.00 | 190.00 | 2200.00 | 91.00 | 230.00 |
| OCDD | | 12000.00 | 4600.00 | 3700.00 | 19000.00 J | 2400.00 | 3200.00 |
| Total 2,3,7,8-TCDD(Equiv) | | 52.65 T | 19.41 T | 16.58 T | 72.55 T | 8.88 T | 13.02 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 2507.14 T | 1213.25 T | 1275.76 T | | 1168.68 T | 394.60 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 13100.00 | 10900.00 | 8040.00 | 12200.00 | 8310.00 | 10600.00 |
| Arsenic | | 18.00 P | 8.40 P | 7.00 P | 21.20 | 6.70 P | 6.70 P |
| Cadmium | | 0.93 P | 0.64 P | 0.30 U | 1.26 | 0.30 U | 0.56 P |
| Chromium | | 34.90 | 23.90 | 19.20 | 38.60 | 17.70 | 42.80 |
| Copper | | 81.60 | 52.00 | 51.00 | 112.00 | 32.00 | 64.80 |
| Iron | | 20000.00 | 16800.00 | 12400.00 | 21400.00 | 12600.00 | 15700.00 |
| Lead | | 83.10 | 49.80 | 41.70 | 99.50 | 31.80 | 94.70 |
| Mercury | | 0.51 | 0.26 | 0.18 | 0.75 | 0.19 | 0.56 |
| Nickel | | 23.80 | 19.30 | 15.10 | 22.90 | 15.80 | 18.10 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 180.00 | 129.00 | 86.20 | 205.00 | 74.70 | 273.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 2.10 | 1.60 | 1.30 | 4.20 | 0.76 | 3.30 |
| Percent Moisture (%) | | 82.00 | 61.00 | 50.00 | 130.00 | 45.00 | 80.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | 4.00 | | 4.00 |
| 4750-2000 microns-Fractional | | 2.00 | 1.00 | | 4.00 | | 3.00 |
| 2000-1000 microns-Fractional | | 1.00 | 1.00 | 1.00 | 4.00 | | 2.00 |
| 1000-500 microns-Fractional | | 1.00 | 1.00 | 1.00 | 4.00 | 2.00 | 4.00 |
| 500-250 microns-Fractional % | | 3.00 | 15.00 | 4.00 | 5.00 | 14.00 | 14.00 |
| 250-125 microns-Fractional % | | 8.00 | 21.00 | 27.00 | 7.00 | 21.00 | 18.00 |
| 125-62.4 microns-Fractional | | 23.00 | 14.00 | 35.00 | 17.00 | 28.00 | 18.00 |
| Total Percent Sand | | 36.00 T | 52.00 T | 68.00 T | 37.00 T | 65.00 T | 56.00 T |
| 62.5-31.2 microns-Fractional | | 18.00 | 9.00 | 14.00 | 15.00 | 15.00 | 12.00 |
| 31.2-15.6 microns-Fractional | | 12.00 | 10.00 | 5.00 | 11.00 | 6.00 | 7.00 |
| 15.6-7.8 microns-Fractional | | 9.00 | 8.00 | 3.00 | 8.00 | 3.00 | 4.00 |
| 7.8-3.9 microns-Fractional % | | 6.00 | 7.00 | 2.00 | 6.00 | 2.00 | 4.00 |
| 3.9-1.9 microns-Fractional % | | 5.00 | 4.00 | 2.00 | 4.00 | 2.00 | 3.00 |
| 1.9-0.9 microns-Fractional % | | 3.00 | 3.00 | 1.00 | 4.00 | 1.00 | 2.00 |
| < 0.9 microns-Fractional % | | 6.00 | 5.00 | 3.00 | 4.00 | 3.00 | 3.00 |
| Balance-Fractional % | | 3.00 | 1.00 | 2.00 | 3.00 | 3.00 | 2.00 |
| Total Percent Fines | | 62.00 T | 47.00 T | 32.00 T | 55.00 T | 35.00 T | 37.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 85.30 | 123.00 | 35.10 U | 34.00 U | 220.00 | 39.70 U |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 1540.00 | 3100.00 | 95.90 | 422.00 | 4980.00 | 353.00 |
| 2-Methylphenol | | 33.20 J | 38.00 J | 35.10 U | 7.20 J | 78.90 | 10.60 J |
| 4-Methylphenol | | 141.00 | 6770.00 | 1480.00 | 36.20 | 334.00 | 112.00 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 2930.00 | 8360.00 | 220.00 J | 601.00 | 5780.00 | 601.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 178.00 U | 527.00 U | 176.00 U | 261.00 J | 194.00 U | 237.00 J |
| Phenol | | 79.20 | 3980.00 | 551.00 | 445.00 | 130.00 | 60.30 U |
| Retene | | | | | | | |
| Naphthalene | | 7010.00 U | 5550.00 | 380.00 J | 690.00 | 21700.00 | 1160.00 |
| Acenaphthylene | | 676.00 | 2040.00 | 68.00 | 131.00 | 398.00 | 324.00 |
| Acenaphthene | | 2990.00 | 12600.00 | 195.00 J | 266.00 | 5900.00 | 508.00 |
| Fluorene | | 3260.00 | 21600.00 | 273.00 J | 1360.00 | 5690.00 | 723.00 |
| Phenanthrene | | 8100.00 | 111000.00 | 730.00 J | 2950.00 | 16300.00 | 2550.00 |
| Anthracene | | 5040.00 | 60800.00 | 655.00 | 6730.00 | 3820.00 | 2010.00 |
| Total LPAH | | 20066.00 T | 213590.00 T | 2301.00 T | 12127.00 T | 53608.00 T | 7275.00 T |
| Fluoranthene | | 68500.00 | 124000.00 | 1530.00 | 4520.00 | 11700.00 | 4120.00 |
| Pyrene | | 54100.00 | 79200.00 | 1500.00 | 2560.00 | 18300.00 | 5300.00 |
| Benzo(a)anthracene | | 14300.00 | 26800.00 | 440.00 J | 1260.00 | 1710.00 | 1910.00 |
| Chrysene | | 16400.00 | 44300.00 | 694.00 J | 2620.00 | 2390.00 | 3480.00 |
| Benzo(b)fluoranthene | | 6970.00 | 22300.00 | 485.00 J | 1500.00 | 2560.00 | 4380.00 |
| Benzo(k)fluoranthene | | 2080.00 | 4380.00 | 202.00 | 607.00 | 990.00 | 1270.00 |
| Total Benzofluoranthene | | 9050.00 T | 26680.00 T | 687.00 T | 2107.00 T | 3550.00 T | 5650.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 3630.00 | 12000.00 | 276.00 | 727.00 | 1330.00 | 2290.00 |
| Indeno(1,2,3-cd)pyrene | | 1220.00 | 4450.00 | 101.00 | 363.00 | 400.00 | 1200.00 |
| Dibenz(a,h)anthracene | | 391.00 | 1400.00 | 31.70 J | 116.00 | 129.00 U | 400.00 |
| Benzo(g,h,i)perylene | | 914.00 | 3640.00 | 76.20 | 275.00 | 356.00 | 921.00 |
| Total HPAH | | 168505.00 T | 324270.00 T | 5335.90 T | 14748.00 T | 39736.00 T | 25271.00 T |
| Total B(a)P equivalent | | 6307.20 T | 19023.10 T | 413.01 T | 1164.19 T | 1809.29 T | 3455.18 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 118461.53 | 96875.00 | 11839.50 | | 646753.24 | 18578.94 |
| Dibenzofuran | | 225384.61 | 261250.00 | 27160.49 J | | 750649.35 | 31631.57 |
| Naphthalene | | 7010.00 U | 173437.50 | 46913.58 J | | 2818181.81 | 61052.63 |
| Acenaphthylene | | 52000.00 | 63750.00 | 8395.06 | | 51688.31 | 17052.63 |
| Acenaphthene | | 230000.00 | 393750.00 | 24074.07 J | | 766233.76 | 26736.84 |
| Fluorene | | 250769.23 | 675000.00 | 33703.70 J | | 738961.03 | 38052.63 |
| Phenanthrene | | 623076.92 | 3468750.00 | 90123.45 J | | 2116883.11 | 134210.52 |
| Anthracene | | 387692.30 | 1900000.00 | 80864.19 | | 496103.89 | 105789.47 |
| Total LPAH | | 1543538.46 T | 6674687.50 T | 284074.07 T | | 6958051.94 T | 382894.73 T |
| Fluoranthene | | 5269230.76 | 3875000.00 | 188888.88 | | 1519480.51 | 216842.10 |
| Pyrene | | 4161538.46 | 2475000.00 | 185185.18 | | 2376623.37 | 278947.36 |
| Benzo(a)anthracene | | 1100000.00 | 893750.00 | 54320.98 J | | 222077.92 | 100526.31 |
| Chrysene | | 1261538.46 | 1384375.00 | 85679.01 J | | 310389.61 | 183157.89 |
| Total Benzofluoranthene | | 696153.84 T | 833750.00 T | 84814.81 T | | 461038.96 T | 297368.42 T |
| Benzo(a)pyrene | | 279230.76 | 375000.00 | 34074.07 | | 172727.27 | 120526.31 |
| Indeno(1,2,3-cd)pyrene | | 93846.15 | 139062.50 | 12469.13 | | 51948.05 | 63157.89 |
| Dibenz(a,h)anthracene | | 30076.92 | 43750.00 | 3913.58 J | | 129.00 U | 21052.63 |
| Benzo(g,h,i)perylene | | 70307.69 | 113750.00 | 9407.40 | | 46233.76 | 48473.68 |
| Total HPAH | | 12961923.07 T | 10133437.50 T | 658753.08 T | | 5160519.48 T | 1330052.63 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 485169.23 T | 594471.87 T | 50989.38 T | | 234972.72 T | 181851.57 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | 50.00 U | | | 95.00 U | 790.00 U |
| Aroclor 1221 | | | 50.00 U | | | 95.00 U | 790.00 U |
| Aroclor 1232 | | | 50.00 U | | | 95.00 U | 790.00 U |
| Aroclor 1242 | | | 50.00 U | | | 95.00 J | 790.00 J |
| Aroclor 1248 | | | 50.00 U | | | 95.00 U | 790.00 U |
| Aroclor 1254 | | | 460.00 | | | 88.00 | 380.00 |
| Aroclor 1260 | | | 88.00 | | | 62.00 | 170.00 |
| Total PCB | | | 548.00 T | | | 245.00 T | 1340.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | 17125.00 T | | | 31818.18 T | 70526.31 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | 1.60 | | | 3.30 | |
| Total TCDF | | | 5.40 | | | 12.00 | |
| 2378-TCDD | | | 0.27 UI | | | 1.40 U | |
| Total TCDD | | | 2.90 | | | 1.40 U | |
| 12378-PeCDF | | | 1.30 UE | | | 6.50 U | |
| 23478-PeCDF | | | 1.30 UE | | | 11.00 | |
| Total PeCDF | | | 8.80 | | | 21.00 | |
| 12378-PeCDD | | | 1.30 UI | | | 6.50 UI | |
| Total PeCDD | | | 2.10 | | | 6.80 | |
| 123478-HxCDF | | | 5.90 | | | 6.50 UE | |
| 123678-HxCDF | | | 2.90 | | | 6.50 UE | |
| 234678-HxCDF | | | 4.00 | | | 13.00 | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | 3.40 | | | 9.00 | |
| Total HxCDF | | | 72.00 | | | 210.00 | |
| 123478-HxCDD | | | 2.30 | | | 12.00 | |
| 123678-HxCDD | | | 26.00 | | | 86.00 | |
| 123789-HxCDD | | | 5.10 | | | 25.00 | |
| Total HxCDD | | | 490.00 | | | 980.00 | |
| 1234678-HpCDF | | | 72.00 | | | 290.00 | |
| 1234789-HpCDF | | | 5.90 | | | 28.00 | |
| Total HpCDF | | | 78.00 | | | 1400.00 | |
| 1234678-HpCDD | | | 920.00 | | | 3600.00 | |
| Total HpCDD | | | 5100.00 | | | 13000.00 | |
| OCDF | | | 250.00 | | | 1500.00 | |
| OCDD | | | 11000.00 | | | 30000.00 | |
| Total 2,3,7,8-TCDD(Equiv) | | | 26.34 T | | | 91.01 T | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 823.40 T | | | 11819.48 T | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 13500.00 | 12300.00 | 5500.00 | 6500.00 | 6830.00 | 7360.00 |
| Arsenic | | 20.70 | 14.00 P | 4.00 U | 4.00 U | 4.00 U | 15.00 P |
| Cadmium | | 0.65 P | 0.85 P | 0.30 U | 0.38 P | 0.49 P | 1.25 |
| Chromium | | 206.00 | 151.00 | 9.15 | 12.40 | 19.20 | 64.50 |
| Copper | | 410.00 | 313.00 | 12.20 | 19.40 | 39.30 | 202.00 |
| Iron | | 38300.00 | 27800.00 | 9220.00 | 11100.00 | 12800.00 | 39100.00 |
| Lead | | 84.10 | 149.00 | 6.70 P | 11.00 P | 31.30 | 114.00 |
| Mercury | | 0.29 | 0.28 | 0.02 | 0.03 | 0.06 | 0.66 |
| Nickel | | 51.90 | 39.30 | 8.14 | 11.60 | 16.50 | 52.80 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 240.00 | 292.00 | 35.30 | 57.20 | 113.00 | 308.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.30 | 3.20 | 0.81 | 0.47 | 0.77 | 1.90 |
| Percent Moisture (%) | | 46.00 | 104.00 | 38.00 | 35.00 | 51.00 | 58.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | 12.00 | | 4.00 | | |
| 4750-2000 microns-Fractional | | 1.00 | 5.00 | 1.00 | 1.00 | 1.00 | 5.00 |
| 2000-1000 microns-Fractional | | 2.00 | 4.00 | 1.00 | 1.00 | | 3.00 |
| 1000-500 microns-Fractional | | 5.00 | 4.00 | 12.00 | 5.00 | 2.00 | 4.00 |
| 500-250 microns-Fractional % | | 27.00 | 17.00 | 41.00 | 36.00 | 9.00 | 14.00 |
| 250-125 microns-Fractional % | | 28.00 | 32.00 | 23.00 | 30.00 | 22.00 | 25.00 |
| 125-62.4 microns-Fractional | | 23.00 | 9.00 | 11.00 | 16.00 | 40.00 | 18.00 |
| Total Percent Sand | | 85.00 T | 66.00 T | 88.00 T | 88.00 T | 73.00 T | 64.00 T |
| 62.5-31.2 microns-Fractional | | 5.00 | 2.00 | 4.00 | 3.00 | 14.00 | 9.00 |
| 31.2-15.6 microns-Fractional | | 2.00 | 4.00 | 2.00 | 1.00 | 3.00 | 8.00 |
| 15.6-7.8 microns-Fractional | | 1.00 | 3.00 | 1.00 | 1.00 | 2.00 | 4.00 |
| 7.8-3.9 microns-Fractional % | | 1.00 | 1.00 | | | 1.00 | 2.00 |
| 3.9-1.9 microns-Fractional % | | 1.00 | 2.00 | 1.00 | 1.00 | 1.00 | 2.00 |
| 1.9-0.9 microns-Fractional % | | 1.00 | 2.00 | | | 1.00 | 2.00 |
| < 0.9 microns-Fractional % | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| Balance-Fractional % | | 2.00 | 3.00 | 2.00 | | 3.00 | 3.00 |
| Total Percent Fines | | 14.00 T | 17.00 T | 11.00 T | 7.00 T | 26.00 T | 31.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB007 | EB008 | EB009 | EB010 | EB011 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB07-0000 | SD1-EB08-0000 | SD1-EB09-0000 | SD1-EB10-0000 | SD1-EB11-0000 | SD1-EB12-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 36.70 U | 34.70 U | 1310.00 J | 35.50 U | 34.30 U | 84.10 |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 64.20 | 119.00 J | 20000.00 | 44.40 U | 122.00 | 1350.00 |
| 2-Methylphenol | | 36.70 U | 34.70 U | 601.00 J | 35.50 U | 34.30 U | 42.50 J |
| 4-Methylphenol | | 27.10 J | 96.60 | 1520.00 J | 244.00 | 16.70 J | 162.00 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 110.00 | 166.00 J | 39200.00 | 99.20 J | 429.00 | 2770.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 158.00 J | 198.00 J | 48900.00 U | 178.00 U | 172.00 U | 293.00 U |
| Phenol | | 38.40 U | 54.40 U | 9770.00 U | 164.00 | 100.00 | 80.30 U |
| Retene | | | | | | | |
| Naphthalene | | 131.00 | 270.00 J | 85700.00 | 154.00 U | 720.00 | 5380.00 |
| Acenaphthylene | | 57.20 | 128.00 J | 4390.00 J | 31.60 J | 76.00 | 1060.00 |
| Acenaphthene | | 99.20 J | 163.00 J | 32700.00 | 83.70 U | 462.00 | 3400.00 |
| Fluorene | | 168.00 | 238.00 J | 49100.00 | 116.00 J | 647.00 | 3060.00 |
| Phenanthrene | | 659.00 | 1020.00 J | 119000.00 | 336.00 J | 1940.00 | 7460.00 |
| Anthracene | | 463.00 | 812.00 J | 451000.00 | 189.00 | 1450.00 | 5010.00 |
| Total LPAH | | 1577.40 T | 2631.00 T | 741890.00 T | 672.60 T | 5295.00 T | 25370.00 T |
| Fluoranthene | | 782.00 | 2030.00 J | 712000.00 | 622.00 J | 2210.00 | 9150.00 |
| Pyrene | | 1060.00 | 2020.00 J | 439000.00 | 575.00 J | 2730.00 | 57000.00 J |
| Benzo(a)anthracene | | 405.00 | 852.00 J | 134000.00 | 210.00 | 1060.00 | 3220.00 |
| Chrysene | | 710.00 | 1440.00 J | 186000.00 | 303.00 | 1420.00 | 7870.00 |
| Benzo(b)fluoranthene | | 688.00 | 1710.00 J | 67600.00 | 302.00 | 1150.00 | 16100.00 |
| Benzo(k)fluoranthene | | 292.00 | 776.00 J | 29000.00 | 102.00 | 521.00 | 6010.00 |
| Total Benzofluoranthene | | 980.00 T | 2486.00 T | 96600.00 T | 404.00 T | 1671.00 T | 22110.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007<br>SD1-EB07-0000<br>0 to 10 cm | EB008<br>SD1-EB08-0000<br>0 to 10 cm | EB009<br>SD1-EB09-0000<br>0 to 10 cm | EB010<br>SD1-EB10-0000<br>0 to 10 cm | EB011<br>SD1-EB11-0000<br>0 to 10 cm | EB012<br>SD1-EB12-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 382.00 | 1000.00 J | 38600.00 | 154.00 | 650.00 | 6490.00 |
| Indeno(1,2,3-cd)pyrene | | 204.00 | 592.00 J | 11800.00 | 69.90 | 238.00 | 2490.00 |
| Dibenz(a,h)anthracene | | 68.80 | 180.00 J | 3840.00 J | 23.40 J | 73.50 | 807.00 |
| Benzo(g,h,i)perylene | | 170.00 J | 516.00 J | 9620.00 J | 50.20 | 178.00 | 2010.00 |
| Total HPAH | | 4761.80 T | 11116.00 T | 1631460.00 T | 2411.50 T | 10230.50 T | 111147.00 T |
| Total B(a)P equivalent | | 584.13 T | 1504.60 T | 64256.00 T | 236.91 T | 974.93 T | 9545.97 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 4280.00 | 10818.18 J | | 44.40 U | 13118.27 | 38571.42 |
| Dibenzofuran | | 7333.33 | 15090.90 J | | 11809.52 J | 46129.03 | 79142.85 |
| Naphthalene | | 8733.33 | 24545.45 J | | 154.00 U | 77419.35 | 153714.28 |
| Acenaphthylene | | 3813.33 | 11636.36 J | | 3761.90 J | 8172.04 | 30285.71 |
| Acenaphthene | | 6613.33 J | 14818.18 J | | 83.70 U | 49677.41 | 97142.85 |
| Fluorene | | 11200.00 | 21636.36 J | | 13809.52 J | 69569.89 | 87428.57 |
| Phenanthrene | | 43933.33 | 92727.27 J | | 40000.00 J | 208602.15 | 213142.85 |
| Anthracene | | 30866.66 | 73818.18 J | | 22500.00 | 155913.97 | 143142.85 |
| Total LPAH | | 105160.00 T | 239181.81 T | | 80071.42 T | 569354.83 T | 724857.14 T |
| Fluoranthene | | 52133.33 | 184545.45 J | | 74047.61 J | 237634.40 | 261428.57 |
| Pyrene | | 70666.66 | 183636.36 J | | 68452.38 J | 293548.38 | 1628571.42 J |
| Benzo(a)anthracene | | 27000.00 | 77454.54 J | | 25000.00 | 113978.49 | 92000.00 |
| Chrysene | | 47333.33 | 130909.09 J | | 36071.42 | 152688.17 | 224857.14 |
| Total Benzofluoranthene | | 65333.33 T | 226000.00 T | | 48095.23 T | 179677.41 T | 631714.28 T |
| Benzo(a)pyrene | | 25466.66 | 90909.09 J | | 18333.33 | 69892.47 | 185428.57 |
| Indeno(1,2,3-cd)pyrene | | 13600.00 | 53818.18 J | | 8321.42 | 25591.39 | 71142.85 |
| Dibenz(a,h)anthracene | | 4586.66 | 16363.63 J | | 2785.71 J | 7903.22 | 23057.14 |
| Benzo(g,h,i)perylene | | 11333.33 J | 46909.09 J | | 5976.19 | 19139.78 | 57428.57 |
| Total HPAH | | 317453.33 T | 1010545.45 T | | 287083.33 T | 1100053.76 T | 3175628.57 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007<br>SD1-EB07-0000<br>0 to 10 cm | EB008<br>SD1-EB08-0000<br>0 to 10 cm | EB009<br>SD1-EB09-0000<br>0 to 10 cm | EB010<br>SD1-EB10-0000<br>0 to 10 cm | EB011<br>SD1-EB11-0000<br>0 to 10 cm | EB012<br>SD1-EB12-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 38942.00 T | 136781.81 T | | 28203.92 T | 104831.18 T | 272742.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 440.00 U | 470.00 U | | 18.00 U | 46.00 U | 73.00 U |
| Aroclor 1221 | | 440.00 U | 470.00 U | | 18.00 U | 46.00 U | 73.00 U |
| Aroclor 1232 | | 440.00 U | 470.00 U | | 18.00 U | 46.00 U | 73.00 U |
| Aroclor 1242 | | 440.00 J | 470.00 J | | 20.00 J | 46.00 J | 73.00 J |
| Aroclor 1248 | | 440.00 U | 470.00 U | | 18.00 U | 46.00 U | 73.00 U |
| Aroclor 1254 | | 270.00 | 270.00 | | 18.00 | 34.00 | 300.00 |
| Aroclor 1260 | | 130.00 | 120.00 | | 7.60 J | 18.00 | 120.00 |
| Total PCB | | 840.00 T | 860.00 T | | 45.60 T | 98.00 T | 493.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 56000.00 T | 78181.81 T | | 5428.57 T | 10537.63 T | 14085.71 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 3.30 | | | 0.90 | | 0.68 UE |
| Total TCDF | | 32.00 | | | 3.00 | | 7.30 |
| 2378-TCDD | | 0.27 U | | | 0.27 U | | 0.68 U |
| Total TCDD | | 1.60 | | | 0.84 | | 9.90 |
| 12378-PeCDF | | 1.30 UE | | | 1.30 U | | 3.20 U |
| 23478-PeCDF | | 1.30 UE | | | 1.30 U | | 6.00 |
| Total PeCDF | | 39.00 | | | 3.00 | | 41.00 |
| 12378-PeCDD | | 1.30 UI | | | 1.30 UI | | 3.20 U |
| Total PeCDD | | 1.30 U | | | 1.30 U | | 8.90 |
| 123478-HxCDF | | 7.40 | | | 1.30 UE | | 3.20 UE |
| 123678-HxCDF | | 3.50 | | | 1.30 U | | 7.90 |
| 234678-HxCDF | | 6.80 | | | 1.30 U | | 9.20 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007 SD1-EB07-0000 0 to 10 cm | EB008 SD1-EB08-0000 0 to 10 cm | EB009 SD1-EB09-0000 0 to 10 cm | EB010 SD1-EB10-0000 0 to 10 cm | EB011 SD1-EB11-0000 0 to 10 cm | EB012 SD1-EB12-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | 3.30 | | | 1.30 UI | | 7.40 |
| Total HxCDF | | 100.00 | | | 17.00 | | 140.00 |
| 123478-HxCDD | | 2.90 | | | 1.30 U | | 5.60 |
| 123678-HxCDD | | 25.00 | | | 6.90 | | 41.00 |
| 123789-HxCDD | | 7.60 | | | 2.30 | | 13.00 |
| Total HxCDD | | 160.00 | | | 66.00 | | 680.00 |
| 1234678-HpCDF | | 100.00 | | | 16.00 | | 160.00 |
| 1234789-HpCDF | | 8.30 | | | 1.70 | | 15.00 |
| Total HpCDF | | 110.00 | | | 69.00 | | 690.00 |
| 1234678-HpCDD | | 640.00 | | | 170.00 | | 1400.00 |
| Total HpCDD | | 1900.00 | | | 550.00 | | 5200.00 |
| OCDF | | 330.00 | | | 65.00 | | 580.00 |
| OCDD | | 6500.00 | | | 1700.00 | | 12000.00 |
| Total 2,3,7,8-TCDD(Equiv) | | 20.29 T | | | 4.65 T | | 39.74 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 1352.86 T | | | 553.80 T | | 1135.42 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 7180.00 | 7560.00 | 13200.00 | 6110.00 | 5670.00 | 9940.00 |
| Arsenic | | 7.60 P | 13.00 P | 23.30 | 4.70 P | 6.00 P | 17.00 P |
| Cadmium | | 1.63 | 2.74 | 1.22 | 0.30 U | 0.30 U | 1.47 |
| Chromium | | 31.00 | 62.20 | 251.00 | 10.80 | 10.80 | 60.70 |
| Copper | | 77.00 | 118.00 | 351.00 | 17.80 | 18.30 | 147.00 |
| Iron | | 20700.00 | 30900.00 | 34300.00 | 10200.00 | 10500.00 | 35800.00 |
| Lead | | 72.50 | 91.30 | 192.00 | 11.00 P | 15.00 P | 105.00 |
| Mercury | | 0.09 | 0.10 | 1.32 | 0.02 P | 0.03 P | 4.24 |
| Nickel | | 31.20 | 40.10 | 52.60 | 9.72 | 9.71 | 38.90 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007 SD1-EB07-0000 0 to 10 cm | EB008 SD1-EB08-0000 0 to 10 cm | EB009 SD1-EB09-0000 0 to 10 cm | EB010 SD1-EB10-0000 0 to 10 cm | EB011 SD1-EB11-0000 0 to 10 cm | EB012 SD1-EB12-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 183.00 | 263.00 | 466.00 | 41.00 | 55.90 | 303.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.50 | 1.10 | 6.00 | 0.84 | 0.93 | 3.50 |
| Percent Moisture (%) | | 36.00 | 42.00 | 155.00 | 40.00 | 31.00 | 118.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | 3.00 | 2.00 | 2.00 | | | 4.00 |
| 4750-2000 microns-Fractional | | 6.00 | 2.00 | 11.00 | 1.00 | 1.00 | 7.00 |
| 2000-1000 microns-Fractional | | 2.00 | 2.00 | 10.00 | | 1.00 | 5.00 |
| 1000-500 microns-Fractional | | 8.00 | 4.00 | 7.00 | 9.00 | 14.00 | 4.00 |
| 500-250 microns-Fractional % | | 26.00 | 17.00 | 6.00 | 39.00 | 49.00 | 6.00 |
| 250-125 microns-Fractional % | | 30.00 | 31.00 | 11.00 | 27.00 | 19.00 | 9.00 |
| 125-62.4 microns-Fractional | | 12.00 | 22.00 | 18.00 | 12.00 | 6.00 | 17.00 |
| Total Percent Sand | | 78.00 T | 76.00 T | 52.00 T | 87.00 T | 89.00 T | 41.00 T |
| 62.5-31.2 microns-Fractional | | 4.00 | 8.00 | 11.00 | 4.00 | 2.00 | 12.00 |
| 31.2-15.6 microns-Fractional | | 3.00 | 3.00 | 9.00 | 2.00 | 2.00 | 9.00 |
| 15.6-7.8 microns-Fractional | | 1.00 | 2.00 | 4.00 | 1.00 | 1.00 | 8.00 |
| 7.8-3.9 microns-Fractional % | | 1.00 | 2.00 | 3.00 | 1.00 | 1.00 | 5.00 |
| 3.9-1.9 microns-Fractional % | | 1.00 | 1.00 | 2.00 | 1.00 | 1.00 | 4.00 |
| 1.9-0.9 microns-Fractional % | | 1.00 | 1.00 | 1.00 | | 1.00 | 3.00 |
| < 0.9 microns-Fractional % | | | 1.00 | 3.00 | 1.00 | 1.00 | 4.00 |
| Balance-Fractional % | | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 3.00 |
| Total Percent Fines | | 13.00 T | 20.00 T | 35.00 T | 12.00 T | 10.00 T | 48.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013 SD1-EB13-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm | EB015 SD1-EB15-0000 0 to 10 cm | EB016 SD1-EB16-0000 0 to 10 cm | EB017 SD1-EB17-0000 0 to 10 cm | EB018 SD1-EB18-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 8900.00 U | 44.90 U | 37.10 U | 317.00 | 38.20 U | 309.00 |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 26000.00 | 193.00 | 115.00 | 7240.00 | 640.00 | 5460.00 |
| 2-Methylphenol | | 8900.00 U | 12.00 J | 37.10 U | 132.00 | 18.70 J | 258.00 |
| 4-Methylphenol | | 8900.00 U | 38.30 J | 32.10 J | 374.00 | 65.10 | 664.00 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 62800.00 | 362.00 | 280.00 | 8740.00 | 1070.00 | 13400.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 44500.00 U | 224.00 U | 185.00 U | 318.00 | 191.00 U | 323.00 U |
| Phenol | | 8900.00 U | 44.90 U | 37.10 U | 172.00 | 45.40 U | 318.00 |
| Retene | | | | | | | |
| Naphthalene | | 25700.00 | 572.00 | 378.00 | 37400.00 | 2330.00 | 42100.00 |
| Acenaphthylene | | 8380.00 J | 239.00 | 159.00 | 1150.00 | 330.00 | 1590.00 |
| Acenaphthene | | 397000.00 | 338.00 | 366.00 J | 13500.00 | 933.00 | 11300.00 |
| Fluorene | | 218000.00 | 511.00 | 468.00 | 8270.00 | 1180.00 | 12600.00 |
| Phenanthrene | | 549000.00 | 1630.00 | 1180.00 | 25900.00 | 2800.00 | 35900.00 |
| Anthracene | | 1750000.00 | 1630.00 | 971.00 | 7320.00 | 2060.00 | 10900.00 |
| Total LPAH | | 2948080.00 T | 4920.00 T | 3522.00 T | 93540.00 T | 9633.00 T | 114390.00 T |
| Fluoranthene | | 2060000.00 | 2590.00 | 3170.00 | 25600.00 | 4690.00 | 37700.00 |
| Pyrene | | 1140000.00 | 5640.00 | 8740.00 | 22700.00 | 6100.00 | 82000.00 |
| Benzo(a)anthracene | | 382000.00 | 1570.00 | 1300.00 | 4900.00 | 2220.00 | 10500.00 |
| Chrysene | | 526000.00 | 2770.00 | 1880.00 | 7490.00 | 4260.00 | 14400.00 |
| Benzo(b)fluoranthene | | 215000.00 | 3320.00 | 2380.00 | 8720.00 | 3850.00 | 13600.00 |
| Benzo(k)fluoranthene | | 87900.00 | 1340.00 | 867.00 | 2820.00 | 1410.00 | 4850.00 |
| Total Benzofluoranthene | | 302900.00 T | 4660.00 T | 3247.00 T | 11540.00 T | 5260.00 T | 18450.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013 SD1-EB13-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm | EB015 SD1-EB15-0000 0 to 10 cm | EB016 SD1-EB16-0000 0 to 10 cm | EB017 SD1-EB17-0000 0 to 10 cm | EB018 SD1-EB18-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 114000.00 | 1690.00 | 1300.00 | 4300.00 | 1870.00 | 7570.00 |
| Indeno(1,2,3-cd)pyrene | | 34400.00 | 702.00 | 456.00 | 1800.00 | 780.00 | 2850.00 |
| Dibenz(a,h)anthracene | | 10700.00 | 243.00 | 139.00 | 611.00 | 251.00 | 932.00 |
| Benzo(g,h,i)perylene | | 26600.00 | 551.00 | 340.00 | 1540.00 | 579.00 | 2220.00 |
| Total HPAH | | 4596600.00 T | 20416.00 T | 20572.00 T | 80461.00 T | 26010.00 T | 176422.00 T |
| Total B(a)P equivalent | | 189245.00 T | 2508.37 T | 1863.15 T | 6488.69 T | 2824.36 T | 11239.90 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | 11352.94 | 7666.66 | 190526.31 | 42666.66 | 156000.00 |
| Dibenzofuran | | | 21294.11 | 18666.66 | 230000.00 | 71333.33 | 382857.14 |
| Naphthalene | | | 33647.05 | 25200.00 | 984210.52 | 155333.33 | 1202857.14 |
| Acenaphthylene | | | 14058.82 | 10600.00 | 30263.15 | 22000.00 | 45428.57 |
| Acenaphthene | | | 19882.35 | 24400.00 J | 355263.15 | 62200.00 | 322857.14 |
| Fluorene | | | 30058.82 | 31200.00 | 217631.57 | 78666.66 | 360000.00 |
| Phenanthrene | | | 95882.35 | 78666.66 | 681578.94 | 186666.66 | 1025714.28 |
| Anthracene | | | 95882.35 | 64733.33 | 192631.57 | 137333.33 | 311428.57 |
| Total LPAH | | | 289411.76 T | 234800.00 T | 2461578.94 T | 642200.00 T | 3268265.71 T |
| Fluoranthene | | | 152352.94 | 211333.33 | 673684.21 | 312666.66 | 1077142.85 |
| Pyrene | | | 331764.70 | 582666.66 | 597368.42 | 406666.66 | 2342857.14 |
| Benzo(a)anthracene | | | 92352.94 | 86666.66 | 128947.36 | 148000.00 | 300000.00 |
| Chrysene | | | 162941.17 | 125333.33 | 197105.26 | 284000.00 | 411428.57 |
| Total Benzofluoranthene | | | 274117.64 T | 216466.66 T | 303684.21 T | 350666.66 T | 527142.85 T |
| Benzo(a)pyrene | | | 99411.76 | 86666.66 | 113157.89 | 124666.66 | 216285.71 |
| Indeno(1,2,3-cd)pyrene | | | 41294.11 | 30400.00 | 47368.42 | 52000.00 | 75714.28 |
| Dibenz(a,h)anthracene | | | 14294.11 | 9266.66 | 16078.94 | 16733.33 | 26628.57 |
| Benzo(g,h,i)perylene | | | 32411.76 | 22666.66 | 40526.31 | 38600.00 | 63428.57 |
| Total HPAH | | | 1200941.17 T | 1371466.66 T | 2117921.05 T | 1734000.00 T | 5040628.57 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013<br>SD1-EB13-0000<br>0 to 10 cm | EB014<br>SD1-EB14-0000<br>0 to 10 cm | EB015<br>SD1-EB15-0000<br>0 to 10 cm | EB016<br>SD1-EB16-0000<br>0 to 10 cm | EB017<br>SD1-EB17-0000<br>0 to 10 cm | EB018<br>SD1-EB18-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | | 147551.17 T | 124210.00 T | 170755.00 T | 188290.66 T | 321140.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | 250.00 U | 210.00 U | 66.00 U | 78.00 U | |
| Aroclor 1221 | | | 250.00 U | 210.00 U | 66.00 U | 78.00 U | |
| Aroclor 1232 | | | 250.00 U | 210.00 U | 66.00 U | 78.00 U | |
| Aroclor 1242 | | | 250.00 J | 210.00 J | 66.00 J | 78.00 J | |
| Aroclor 1248 | | | 250.00 U | 210.00 U | 66.00 U | 78.00 U | |
| Aroclor 1254 | | | 220.00 | 170.00 | 230.00 | 110.00 | |
| Aroclor 1260 | | | 120.00 | 110.00 | 120.00 | 55.00 | |
| Total PCB | | | 590.00 T | 490.00 T | 416.00 T | 243.00 T | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | 34705.88 T | 32666.66 T | 10947.36 T | 16200.00 T | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | 0.27 UE | 0.27 UE | 0.27 UE | 5.00 | |
| Total TCDF | | | 2.00 | 37.00 | 13.00 | 28.00 | |
| 2378-TCDD | | | 0.27 U | 0.27 UI | 0.27 U | 0.38 U | |
| Total TCDD | | | 0.45 | 11.00 | 8.30 | 9.30 | |
| 12378-PeCDF | | | 1.30 UE | 1.30 U | 1.30 UE | 1.90 U | |
| 23478-PeCDF | | | 1.30 UE | 1.30 UE | 3.10 | 6.20 | |
| Total PeCDF | | | 9.60 | 89.00 | 19.00 | 40.00 | |
| 12378-PeCDD | | | 1.30 UI | 1.30 UI | 1.30 UI | 1.90 U | |
| Total PeCDD | | | 1.30 U | 7.00 | 3.90 | 1.90 U | |
| 123478-HxCDF | | | 2.30 | 16.00 | 1.30 UE | 1.90 UE | |
| 123678-HxCDF | | | 1.30 UI | 1.30 UE | 3.00 | 1.90 UE | |
| 234678-HxCDF | | | 1.60 | 12.00 | 3.90 | 5.20 | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013 SD1-EB13-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm | EB015 SD1-EB15-0000 0 to 10 cm | EB016 SD1-EB16-0000 0 to 10 cm | EB017 SD1-EB17-0000 0 to 10 cm | EB018 SD1-EB18-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | 1.30 | 8.70 | 3.10 | 3.80 | |
| Total HxCDF | | | 31.00 | 250.00 | 150.00 | 92.00 | |
| 123478-HxCDD | | | 1.30 U | 4.80 | 2.00 | 2.30 | |
| 123678-HxCDD | | | 8.80 | 59.00 | 19.00 | 29.00 | |
| 123789-HxCDD | | | 1.90 | 11.00 | 4.30 | 7.20 | |
| Total HxCDD | | | 110.00 | 870.00 | 280.00 | 310.00 | |
| 1234678-HpCDF | | | 23.00 | 110.00 | 77.00 | 84.00 | |
| 1234789-HpCDF | | | 1.90 | 7.90 | 1.30 U | 7.80 | |
| Total HpCDF | | | 82.00 | 660.00 | 320.00 | 400.00 | |
| 1234678-HpCDD | | | 250.00 | 1600.00 | 580.00 | 820.00 | |
| Total HpCDD | | | 880.00 | 5600.00 | 2500.00 | 3000.00 | |
| OCDF | | | 65.00 | 240.00 | 200.00 | 340.00 | |
| OCDD | | | 2500.00 | 12000.00 | 5300.00 | 8400.00 | |
| Total 2,3,7,8-TCDD(Equiv) | | | 6.90 T | 40.56 T | 17.15 T | 26.20 T | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 406.11 T | 2704.60 T | 451.31 T | 1747.20 T | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 12500.00 | 9750.00 | 9900.00 | 13400.00 | 8710.00 | 13100.00 |
| Arsenic | | 23.90 | 13.00 P | 9.90 P | 17.00 P | 8.30 P | 22.70 |
| Cadmium | | 2.56 | 1.23 | 1.29 | 0.93 P | 0.64 P | 1.52 |
| Chromium | | 70.50 | 56.80 | 28.20 | 65.20 | 24.60 | 66.80 |
| Copper | | 122.00 | 152.00 | 77.60 | 153.00 | 55.70 | 148.00 |
| Iron | | 26600.00 | 36200.00 | 20400.00 | 27100.00 | 16600.00 | 27500.00 |
| Lead | | 181.00 | 96.60 | 87.40 | 98.20 | 62.10 | 135.00 |
| Mercury | | 0.98 | 0.21 | 0.21 | 0.49 | 0.17 | 1.39 |
| Nickel | | 30.10 | 44.50 | 23.10 | 28.70 | 18.80 | 28.10 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013 SD1-EB13-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm | EB015 SD1-EB15-0000 0 to 10 cm | EB016 SD1-EB16-0000 0 to 10 cm | EB017 SD1-EB17-0000 0 to 10 cm | EB018 SD1-EB18-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 584.00 | 290.00 | 323.00 | 212.00 | 173.00 | 333.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 7.50 | 1.70 | 1.50 | 3.80 | 1.50 | 3.50 |
| Percent Moisture (%) | | 179.00 | 69.00 | 51.00 | 124.00 | 53.00 | 147.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | 2.00 | | | 7.00 | 1.00 | 1.00 |
| 4750-2000 microns-Fractional | | 5.00 | 1.00 | 1.00 | 4.00 | 1.00 | 2.00 |
| 2000-1000 microns-Fractional | | 5.00 | 1.00 | 1.00 | 4.00 | | 3.00 |
| 1000-500 microns-Fractional | | 4.00 | 2.00 | 3.00 | 3.00 | 3.00 | 4.00 |
| 500-250 microns-Fractional % | | 5.00 | 10.00 | 14.00 | 5.00 | 20.00 | 4.00 |
| 250-125 microns-Fractional % | | 6.00 | 18.00 | 19.00 | 7.00 | 26.00 | 7.00 |
| 125-62.4 microns-Fractional | | 6.00 | 18.00 | 14.00 | 16.00 | 15.00 | 13.00 |
| Total Percent Sand | | 26.00 T | 49.00 T | 51.00 T | 35.00 T | 64.00 T | 31.00 T |
| 62.5-31.2 microns-Fractional | | 11.00 | 14.00 | 14.00 | 14.00 | 9.00 | 14.00 |
| 31.2-15.6 microns-Fractional | | 17.00 | 12.00 | 11.00 | 11.00 | 7.00 | 13.00 |
| 15.6-7.8 microns-Fractional | | 12.00 | 7.00 | 7.00 | 6.00 | 4.00 | 9.00 |
| 7.8-3.9 microns-Fractional % | | 8.00 | 4.00 | 4.00 | 7.00 | 3.00 | 8.00 |
| 3.9-1.9 microns-Fractional % | | 5.00 | 3.00 | 3.00 | 5.00 | 3.00 | 6.00 |
| 1.9-0.9 microns-Fractional % | | 4.00 | 3.00 | 3.00 | 4.00 | 2.00 | 4.00 |
| < 0.9 microns-Fractional % | | 4.00 | 4.00 | 4.00 | 5.00 | 4.00 | 7.00 |
| Balance-Fractional % | | 6.00 | 3.00 | 2.00 | 2.00 | 2.00 | 5.00 |
| Total Percent Fines | | 67.00 T | 50.00 T | 48.00 T | 54.00 T | 34.00 T | 66.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019 SD1-EB19-0000 0 to 10 cm | EB020 SD1-EB20-0000-CC 0 to 10 cm | EB021 SD1-EB21-0000 0 to 10 cm | EB022 SD1-EB22-0000 0 to 10 cm | EB023 SD1-EB23-0000 0 to 10 cm | EB024 SD1-EB24-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 680.00 | 116.00 | 83.10 | 37.50 J | 30.80 U | 22.20 J |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 8220.00 | 3560.00 | 1220.00 | 582.00 | 129.00 | 566.00 |
| 2-Methylphenol | | 391.00 | 46.30 J | 25.80 J | 15.50 J | 30.80 U | 58.20 U |
| 4-Methylphenol | | 829.00 | 535.00 | 146.00 | 113.00 | 21.80 J | 101.00 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 20000.00 | 5100.00 | 2290.00 | 1060.00 | 281.00 | 1300.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 268.00 U | 278.00 U | 216.00 U | 205.00 J | 154.00 U | 380.00 J |
| Phenol | | 370.00 | 250.00 | 59.40 U | 62.40 | 21.70 J | 316.00 |
| Retene | | | | | | | |
| Naphthalene | | 55500.00 | 21400.00 | 4260.00 | 2360.00 J | 358.00 | 1380.00 |
| Acenaphthylene | | 1240.00 | 977.00 | 526.00 | 425.00 | 32.80 | 467.00 |
| Acenaphthene | | 17900.00 | 7470.00 | 2460.00 | 948.00 | 261.00 | 1770.00 |
| Fluorene | | 19000.00 | 4840.00 | 2190.00 | 1060.00 | 270.00 | 1940.00 |
| Phenanthrene | | 46800.00 | 13000.00 | 5250.00 | 3330.00 J | 866.00 | 7530.00 |
| Anthracene | | 13000.00 | 6400.00 | 2820.00 | 2490.00 | 263.00 | 4350.00 |
| Total LPAH | | 153440.00 T | 54087.00 T | 17506.00 T | 10613.00 T | 2050.80 T | 17437.00 T |
| Fluoranthene | | 49600.00 | 18600.00 | 5080.00 | 5630.00 J | 1360.00 | 17900.00 |
| Pyrene | | 57700.00 | 22100.00 | 8480.00 | 5880.00 J | 924.00 | 13700.00 |
| Benzo(a)anthracene | | 8640.00 | 4370.00 | 2290.00 | 2810.00 | 302.00 | 4430.00 |
| Chrysene | | 10000.00 | 5980.00 | 3920.00 | 6290.00 | 446.00 | 7840.00 |
| Benzo(b)fluoranthene | | 6940.00 | 8780.00 | 4900.00 | 5370.00 | 410.00 | 5510.00 |
| Benzo(k)fluoranthene | | 2420.00 | 2400.00 | 1740.00 | 1940.00 | 141.00 | 2150.00 |
| Total Benzofluoranthene | | 9360.00 T | 11180.00 T | 6640.00 T | 7310.00 T | 551.00 T | 7660.00 T |

*See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.*

*Boxed Cell Standard: SQS* *LAET*

*Sheded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019<br>SD1-EB19-0000<br>0 to 10 cm | EB020<br>SD1-EB20-0000-CC<br>0 to 10 cm | EB021<br>SD1-EB21-0000<br>0 to 10 cm | EB022<br>SD1-EB22-0000<br>0 to 10 cm | EB023<br>SD1-EB23-0000<br>0 to 10 cm | EB024<br>SD1-EB24-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 3140.00 | 4040.00 | 2440.00 | 3060.00 | 234.00 | 3080.00 |
| Indeno(1,2,3-cd)pyrene | | 877.00 | 1690.00 | 1010.00 | 1410.00 | 99.50 | 1410.00 |
| Dibenz(a,h)anthracene | | 260.00 U | 566.00 U | 366.00 | 423.00 | 30.80 U | 426.00 |
| Benzo(g,h,i)perylene | | 787.00 | 1350.00 | 758.00 | 1150.00 | 78.40 | 1080.00 |
| Total HPAH | | 140304.00 T | 69310.00 T | 30984.00 T | 33963.00 T | 3994.90 T | 57526.00 T |
| Total B(a)P equivalent | | 4839.90 T | 5553.98 T | 3647.32 T | 4467.69 T | 317.00 T | 4670.34 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 328800.00 | 91282.05 | 76250.00 | 38800.00 | 9923.07 | 14512.82 |
| Dibenzofuran | | 800000.00 | 130769.23 | 143125.00 | 70666.66 | 21615.38 | 33333.33 |
| Naphthalene | | 2220000.00 | 548717.94 | 266250.00 | 157333.33 J | 27538.46 | 35384.61 |
| Acenaphthylene | | 49600.00 | 25051.28 | 32875.00 | 28333.33 | 2523.07 | 11974.35 |
| Acenaphthene | | 716000.00 | 191538.46 | 153750.00 | 63200.00 | 20076.92 | 45384.61 |
| Fluorene | | 760000.00 | 124102.56 | 136875.00 | 70666.66 | 20769.23 | 49743.58 |
| Phenanthrene | | 1672000.00 | 333333.33 | 328125.00 | 222000.00 J | 66615.38 | 193076.92 |
| Anthracene | | 520000.00 | 164102.56 | 176250.00 | 166000.00 | 20230.76 | 111538.46 |
| Total LPAH | | 6137600.00 T | 1386846.15 T | 1094125.00 T | 707533.33 T | 157753.84 T | 447102.56 T |
| Fluoranthene | | 1984000.00 | 476923.07 | 317500.00 | 375333.33 J | 104615.38 | 458974.35 |
| Pyrene | | 2308000.00 | 566666.66 | 530000.00 | 392000.00 J | 71076.92 | 351282.05 |
| Benzo(a)anthracene | | 353600.00 | 112051.28 | 143125.00 | 187333.33 | 23230.76 | 113589.74 |
| Chrysene | | 400000.00 | 153333.33 | 245000.00 | 419333.33 | 34307.69 | 201025.64 |
| Total Benzofluoranthene | | 374400.00 T | 286666.66 T | 415000.00 T | 487333.33 T | 42384.61 T | 196410.25 T |
| Benzo(a)pyrene | | 125600.00 | 103589.74 | 152500.00 | 204000.00 | 18000.00 | 78974.35 |
| Indeno(1,2,3-cd)pyrene | | 35080.00 | 43333.33 | 63125.00 | 94000.00 | 7653.84 | 36153.84 |
| Dibenz(a,h)anthracene | | 260.00 U | 566.00 U | 22875.00 | 28200.00 | 30.80 U | 10923.07 |
| Benzo(g,h,i)perylene | | 31480.00 | 34615.38 | 47375.00 | 76666.66 | 6030.76 | 27692.30 |
| Total HPAH | | 5612160.00 T | 1777179.48 T | 1936500.00 T | 2264200.00 T | 307300.00 T | 1475025.64 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019 SD1-EB19-0000 0 to 10 cm | EB020 SD1-EB20-0000-CC 0 to 10 cm | EB021 SD1-EB21-0000 0 to 10 cm | EB022 SD1-EB22-0000 0 to 10 cm | EB023 SD1-EB23-0000 0 to 10 cm | EB024 SD1-EB24-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 193596.00 T | 142409.74 T | 227957.50 T | 297846.00 T | 24385.07 T | 119752.30 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | 22.00 U | 58.00 U |
| Aroclor 1221 | | | | | | 22.00 U | 58.00 U |
| Aroclor 1232 | | | | | | 22.00 U | 58.00 U |
| Aroclor 1242 | | | | | | 22.00 J | 58.00 J |
| Aroclor 1248 | | | | | | 22.00 U | 58.00 U |
| Aroclor 1254 | | | | | | 19.00 | 300.00 |
| Aroclor 1260 | | | | | | 10.00 J | 120.00 |
| Total PCB | | | | | | 51.00 T | 478.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | 3923.07 T | 12256.41 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | 0.62 J | 6.90 |
| Total TCDF | | | | | | 3.40 | 69.00 |
| 2378-TCDD | | | | | | 0.27 U | 0.27 UI |
| Total TCDD | | | | | | 0.27 U | 79.00 |
| 12378-PeCDF | | | | | | 1.30 U | 1.30 UE |
| 23478-PeCDF | | | | | | 1.30 U | 9.40 |
| Total PeCDF | | | | | | 4.50 | 39.00 |
| 12378-PeCDD | | | | | | 1.30 U | 1.30 UI |
| Total PeCDD | | | | | | 1.30 U | 36.00 |
| 123478-HxCDF | | | | | | 1.30 UE | 18.00 |
| 123678-HxCDF | | | | | | 1.30 U | 5.30 |
| 234678-HxCDF | | | | | | 1.30 U | 8.00 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019 SD1-EB19-0000 0 to 10 cm | EB020 SD1-EB20-0000-CC 0 to 10 cm | EB021 SD1-EB21-0000 0 to 10 cm | EB022 SD1-EB22-0000 0 to 10 cm | EB023 SD1-EB23-0000 0 to 10 cm | EB024 SD1-EB24-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | | | 1.30 U | 4.90 |
| Total HxCDF | | | | | | 17.00 | 320.00 |
| 123478-HxCDD | | | | | | 1.30 U | 3.60 |
| 123678-HxCDD | | | | | | 5.60 | 34.00 |
| 123789-HxCDD | | | | | | 1.30 U | 10.00 |
| Total HxCDD | | | | | | 69.00 | 550.00 |
| 1234678-HpCDF | | | | | | 14.00 | 160.00 |
| 1234789-HpCDF | | | | | | 1.30 U | 10.00 |
| Total HpCDF | | | | | | 57.00 | 170.00 |
| 1234678-HpCDD | | | | | | 180.00 | 1200.00 |
| Total HpCDD | | | | | | 640.00 | 4500.00 |
| OCDF | | | | | | 41.00 | 450.00 |
| OCDD | | | | | | 1800.00 | 10000.00 |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | 4.40 T | 37.92 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | 338.69 T | 972.30 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 11200.00 | 12800.00 | 12000.00 | 10600.00 | 5580.00 | 11400.00 |
| Arsenic | | 10.00 P | 22.60 | 10.00 P | 9.70 P | 4.00 U | 21.20 |
| Cadmium | | 0.48 P | 1.57 | 1.18 | 0.75 P | 0.30 U | 0.78 P |
| Chromium | | 27.50 | 45.80 | 35.00 | 33.00 | 10.10 | 51.60 |
| Copper | | 62.60 | 117.00 | 83.10 | 76.70 | 17.50 | 116.00 |
| Iron | | 20800.00 | 22900.00 | 20100.00 | 19300.00 | 10100.00 | 22300.00 |
| Lead | | 39.30 | 181.00 | 89.60 | 67.30 | 16.70 | 114.00 |
| Mercury | | 0.22 | 0.73 | 0.38 | 0.27 | 0.03 | 0.40 |
| Nickel | | 18.30 | 25.20 | 23.20 | 21.40 | 8.84 | 23.30 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019 SD1-EB19-0000 0 to 10 cm | EB020 SD1-EB20-0000-CC 0 to 10 cm | EB021 SD1-EB21-0000 0 to 10 cm | EB022 SD1-EB22-0000 0 to 10 cm | EB023 SD1-EB23-0000 0 to 10 cm | EB024 SD1-EB24-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 94.10 | 287.00 | 233.00 | 173.00 | 50.10 | 254.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 2.50 | 3.90 | 1.60 | 1.50 | 1.30 | 3.90 |
| Percent Moisture (%) | | 117.00 | 121.00 | 63.00 | 59.00 | 40.00 | 126.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | 1.00 | 3.00 | 3.00 | 1.00 | | 2.00 |
| 4750-2000 microns-Fractional | | 2.00 | 3.00 | | 4.00 | 1.00 | 2.00 |
| 2000-1000 microns-Fractional | | 3.00 | 4.00 | 1.00 | 2.00 | 1.00 | 3.00 |
| 1000-500 microns-Fractional | | 3.00 | 4.00 | 1.00 | 2.00 | 11.00 | 5.00 |
| 500-250 microns-Fractional % | | 3.00 | 4.00 | 4.00 | 7.00 | 45.00 | 7.00 |
| 250-125 microns-Fractional % | | 7.00 | 7.00 | 17.00 | 21.00 | 23.00 | 13.00 |
| 125-62.4 microns-Fractional | | 19.00 | 17.00 | 19.00 | 19.00 | 10.00 | 20.00 |
| Total Percent Sand | | 35.00 T | 36.00 T | 42.00 T | 51.00 T | 90.00 T | 48.00 T |
| 62.5-31.2 microns-Fractional | | 17.00 | 15.00 | 13.00 | 13.00 | 3.00 | 12.00 |
| 31.2-15.6 microns-Fractional | | 14.00 | 12.00 | 11.00 | 9.00 | 2.00 | 9.00 |
| 15.6-7.8 microns-Fractional | | 8.00 | 8.00 | 9.00 | 5.00 | 1.00 | 6.00 |
| 7.8-3.9 microns-Fractional % | | 6.00 | 8.00 | 7.00 | 4.00 | 1.00 | 5.00 |
| 3.9-1.9 microns-Fractional % | | 5.00 | 6.00 | 5.00 | 4.00 | 1.00 | 6.00 |
| 1.9-0.9 microns-Fractional % | | 3.00 | 5.00 | 3.00 | 3.00 | 1.00 | 3.00 |
| < 0.9 microns-Fractional % | | 5.00 | 5.00 | 7.00 | 4.00 | | 5.00 |
| Balance-Fractional % | | 4.00 | 4.00 | | 2.00 | | 2.00 |
| Total Percent Fines | | 62.00 T | 63.00 T | 55.00 T | 44.00 T | 9.00 T | 48.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025 SD1-EB25-0000 0 to 10 cm | EB026 SD1-EB26-0000 0 to 10 cm | EB027 SD1-EB27-0000 0 to 10 cm | EB028 SD1-EB28-0000 0 to 10 cm | EB029 SD1-EB29-0000 0 to 10 cm | EB030 SD1-EB30-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 111.00 | 34.20 J | 49.50 | 40.40 U | 124.00 | 29.40 J |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 2850.00 | 330.00 | 584.00 | 37.80 J | 2570.00 | 1240.00 |
| 2-Methylphenol | | 62.70 | 17.90 J | 19.80 J | 40.40 U | 46.30 J | 16.40 J |
| 4-Methylphenol | | 202.00 | 60.00 | 124.00 | 25.80 J | 223.00 | 142.00 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 4840.00 | 4800.00 | 4950.00 | 64.30 | 3210.00 | 1770.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 258.00 U | 282.00 U | 245.00 U | 202.00 U | 262.00 U | 245.00 U |
| Phenol | | 203.00 | 31.40 J | 60.30 | 40.40 U | 125.00 | 119.00 |
| Retene | | | | | | | |
| Naphthalene | | 11200.00 | 945.00 | 1770.00 | 130.00 | 12100.00 | 6700.00 |
| Acenaphthylene | | 974.00 | 1050.00 | 1890.00 | 24.60 J | 320.00 | 332.00 |
| Acenaphthene | | 7330.00 | 14800.00 | 15500.00 | 62.30 | 3730.00 | 2530.00 |
| Fluorene | | 4620.00 | 7980.00 | 11600.00 | 63.30 | 3170.00 | 1650.00 |
| Phenanthrene | | 9480.00 | 36100.00 | 25100.00 | 210.00 | 6590.00 | 3750.00 |
| Anthracene | | 5900.00 | 7600.00 | 16100.00 | 137.00 | 2540.00 | 1830.00 |
| Total LPAH | | 39504.00 T | 68475.00 T | 71960.00 T | 627.20 T | 28450.00 T | 16792.00 T |
| Fluoranthene | | 14700.00 | 58100.00 | 200000.00 | 368.00 | 5150.00 | 4080.00 |
| Pyrene | | 41900.00 | 45500.00 | 160000.00 | 544.00 | 13900.00 | 7120.00 |
| Benzo(a)anthracene | | 7320.00 | 14700.00 | 43500.00 | 183.00 | 1500.00 | 1140.00 |
| Chrysene | | 10600.00 | 16100.00 | 42800.00 | 282.00 | 2640.00 | 1970.00 |
| Benzo(b)fluoranthene | | 13300.00 | 13900.00 | 27500.00 | 280.00 | 2420.00 | 3120.00 |
| Benzo(k)fluoranthene | | 4300.00 | 4490.00 | 12600.00 | 127.00 | 969.00 | 1110.00 |
| Total Benzofluoranthene | | 17600.00 T | 18390.00 T | 40100.00 T | 407.00 T | 3389.00 T | 4230.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025<br>SD1-EB25-0000<br>0 to 10 cm | EB026<br>SD1-EB26-0000<br>0 to 10 cm | EB027<br>SD1-EB27-0000<br>0 to 10 cm | EB028<br>SD1-EB28-0000<br>0 to 10 cm | EB029<br>SD1-EB29-0000<br>0 to 10 cm | EB030<br>SD1-EB30-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 8190.00 | 7290.00 | 16700.00 | 160.00 | 1320.00 | 1760.00 |
| Indeno(1,2,3-cd)pyrene | | 3730.00 | 2930.00 | 4960.00 | 76.40 J | 495.00 | 749.00 |
| Dibenz(a,h)anthracene | | 1170.00 | 1090.00 | 1820.00 | 21.00 J | 170.00 U | 204.00 |
| Benzo(g,h,i)perylene | | 3670.00 | 2390.00 | 4090.00 | 61.30 | 425.00 | 615.00 |
| Total HPAH | | 108680.00 T | 166490.00 T | 513970.00 T | 2102.70 T | 28819.00 T | 21868.00 T |
| Total B(a)P equivalent | | 11848.60 T | 11594.00 T | 26284.80 T | 236.49 T | 1773.83 T | 2477.97 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 89062.50 | 12222.22 | 25391.30 | | 80312.50 | 82666.66 |
| Dibenzofuran | | 151250.00 | 177777.77 | 215217.39 | | 100312.50 | 118000.00 |
| Naphthalene | | 350000.00 | 35000.00 | 76956.52 | | 378125.00 | 446666.66 |
| Acenaphthylene | | 30437.50 | 38888.88 | 82173.91 | | 10000.00 | 22133.33 |
| Acenaphthene | | 229062.50 | 548148.14 | 673913.04 | | 116562.50 | 168666.66 |
| Fluorene | | 144375.00 | 295555.55 | 504347.82 | | 99062.50 | 110000.00 |
| Phenanthrene | | 296250.00 | 1337037.03 | 1091304.34 | | 205937.50 | 250000.00 |
| Anthracene | | 184375.00 | 281481.48 | 700000.00 | | 79375.00 | 122000.00 |
| Total LPAH | | 1234500.00 T | 2536111.11 T | 3128695.65 T | | 889062.50 T | 1119466.66 T |
| Fluoranthene | | 459375.00 | 2151851.85 | 8695652.17 | | 160937.50 | 272000.00 |
| Pyrene | | 1309375.00 | 1685185.18 | 6956521.73 | | 434375.00 | 474666.66 |
| Benzo(a)anthracene | | 228750.00 | 544444.44 | 1891304.34 | | 46875.00 | 76000.00 |
| Chrysene | | 331250.00 | 596296.29 | 1860869.56 | | 82500.00 | 131333.33 |
| Total Benzofluoranthene | | 550000.00 T | 681111.11 T | 1743478.26 T | | 105906.25 T | 282000.00 T |
| Benzo(a)pyrene | | 255937.50 | 270000.00 | 726086.95 | | 41250.00 | 117333.33 |
| Indeno(1,2,3-cd)pyrene | | 116562.50 | 108518.51 | 215652.17 | | 15468.75 | 49933.33 |
| Dibenz(a,h)anthracene | | 36562.50 | 40370.37 | 79130.43 | | 170.00 U | 13600.00 |
| Benzo(g,h,i)perylene | | 114687.50 | 88518.51 | 177826.08 | | 13281.25 | 41000.00 |
| Total HPAH | | 3402500.00 T | 6166296.29 T | 22346521.73 T | | 900593.75 T | 1457866.66 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025<br>SD1-EB25-0000<br>0 to 10 cm | EB026<br>SD1-EB26-0000<br>0 to 10 cm | EB027<br>SD1-EB27-0000<br>0 to 10 cm | EB028<br>SD1-EB28-0000<br>0 to 10 cm | EB029<br>SD1-EB29-0000<br>0 to 10 cm | EB030<br>SD1-EB30-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 370268.75 T | 429407.40 T | 1142817.39 T | | 55432.18 T | 165198.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | 130.00 U | 620.00 U | 7.00 U | 32.00 U | 25.00 U |
| Aroclor 1221 | | | 130.00 U | 620.00 U | 7.00 U | 32.00 U | 25.00 U |
| Aroclor 1232 | | | 130.00 U | 620.00 U | 7.00 U | 32.00 U | 25.00 U |
| Aroclor 1242 | | | 130.00 J | 620.00 | 7.00 J | 32.00 J | 26.00 J |
| Aroclor 1248 | | | 130.00 U | 620.00 U | 7.00 U | 32.00 U | 25.00 U |
| Aroclor 1254 | | | 170.00 | 380.00 | 9.90 | 140.00 | 91.00 |
| Aroclor 1260 | | | 100.00 | 230.00 | 7.10 | 100.00 | 56.00 |
| Total PCB | | | 400.00 T | 1230.00 T | 24.00 T | 272.00 T | 173.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | 14814.81 T | 53478.26 T | | 8500.00 T | 11533.33 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | 11.00 | | 0.48 | 7.50 | 8.10 |
| Total TCDF | | | 42.00 | | 1.40 | 88.00 | 50.00 |
| 2378-TCDD | | | 0.32 UI | | 0.27 U | 1.90 | 0.99 |
| Total TCDD | | | 9.80 | | 1.60 | 190.00 | 82.00 |
| 12378-PeCDF | | | 1.60 UE | | 1.30 U | 1.30 UE | 1.30 U |
| 23478-PeCDF | | | 36.00 | | 1.30 U | 10.00 | 13.00 |
| Total PeCDF | | | 77.00 | | 1.30 U | 87.00 | 73.00 |
| 12378-PeCDD | | | 1.60 UI | | 1.30 U | 1.30 UI | 1.30 UI |
| Total PeCDD | | | 43.00 | | 1.30 U | 46.00 | 28.00 |
| 123478-HxCDF | | | 42.00 | | 1.30 UE | 12.00 | 1.30 UE |
| 123678-HxCDF | | | 8.30 | | 1.30 U | 8.20 | 1.30 UE |
| 234678-HxCDF | | | 18.00 | | 1.30 U | 8.60 | 9.10 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB025 | EB026 | EB027 | EB028 | EB029 | EB030 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB25-0000 | SD1-EB26-0000 | SD1-EB27-0000 | SD1-EB28-0000 | SD1-EB29-0000 | SD1-EB30-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| 123789-HxCDF | | | 26.00 | | 1.30 U | 5.40 | 5.40 |
| Total HxCDF | | | 1300.00 | | 19.00 | 110.00 | 150.00 |
| 123478-HxCDD | | | 7.50 | | 1.30 U | 3.70 | 4.60 |
| 123678-HxCDD | | | 170.00 | | 2.90 | 20.00 | 37.00 |
| 123789-HxCDD | | | 31.00 | | 1.30 U | 7.30 | 9.90 |
| Total HxCDD | | | 2600.00 | | 16.00 | 290.00 | 340.00 |
| 1234678-HpCDF | | | 400.00 | | 10.00 | 100.00 | 160.00 |
| 1234789-HpCDF | | | 20.00 | | 1.30 U | 21.00 | 12.00 |
| Total HpCDF | | | 1400.00 | | 40.00 | 400.00 | 350.00 |
| 1234678-HpCDD | | | 5700.00 | | 75.00 | 570.00 | 900.00 |
| Total HpCDD | | | 19000.00 | | 260.00 | 2200.00 | 3000.00 |
| OCDF | | | 610.00 | | 35.00 | 320.00 | 620.00 |
| OCDD | | | 45000.00 D | | 750.00 | 5100.00 | 8800.00 |
| Total 2,3,7,8-TCDD(Equiv) | | | 156.19 T | | 1.97 T | 26.50 T | 35.04 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 5784.81 T | | | 828.12 T | 2336.00 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 11500.00 | 11500.00 | 14100.00 | 8710.00 | 12300.00 | 10500.00 |
| Arsenic | | 13.00 P | 13.00 P | 15.00 P | 4.00 U | 17.00 P | 15.00 P |
| Cadmium | | 1.47 | 0.84 P | 2.43 | 0.30 U | 0.54 P | 0.66 P |
| Chromium | | 36.30 | 39.90 | 32.80 | 13.70 | 48.40 | 26.50 |
| Copper | | 79.20 | 105.00 | 83.10 | 19.30 | 159.00 | 64.10 |
| Iron | | 19700.00 | 23900.00 | 25800.00 | 11800.00 | 20200.00 | 17300.00 |
| Lead | | 71.40 | 71.60 | 150.00 | 11.00 P | 68.50 | 45.50 |
| Mercury | | 0.82 | 0.25 | 0.44 | 0.07 | 0.37 | 0.36 |
| Nickel | | 23.50 | 29.10 | 23.60 | 12.80 | 23.40 | 19.20 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025 SD1-EB25-0000 0 to 10 cm | EB026 SD1-EB26-0000 0 to 10 cm | EB027 SD1-EB27-0000 0 to 10 cm | EB028 SD1-EB28-0000 0 to 10 cm | EB029 SD1-EB29-0000 0 to 10 cm | EB030 SD1-EB30-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 162.00 | 190.00 | 639.00 | 40.70 | 157.00 | 113.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 3.20 | 2.70 | 2.30 | 0.35 | 3.20 | 1.50 |
| Percent Moisture (%) | | 120.00 | 112.00 | 75.00 | 46.00 | 105.00 | 89.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | 3.00 | 1.00 | 3.00 | | 2.00 | |
| 4750-2000 microns-Fractional | | 5.00 | 1.00 | | | 4.00 | 2.00 |
| 2000-1000 microns-Fractional | | 3.00 | 1.00 | | | 3.00 | 1.00 |
| 1000-500 microns-Fractional | | 3.00 | 3.00 | 1.00 | 1.00 | 4.00 | 2.00 |
| 500-250 microns-Fractional % | | 4.00 | 9.00 | 2.00 | 3.00 | 6.00 | 3.00 |
| 250-125 microns-Fractional % | | 7.00 | 13.00 | 5.00 | 15.00 | 14.00 | 5.00 |
| 125-62.4 microns-Fractional | | 15.00 | 15.00 | 10.00 | 40.00 | 22.00 | 22.00 |
| Total Percent Sand | | 32.00 T | 41.00 T | 18.00 T | 59.00 T | 49.00 T | 33.00 T |
| 62.5-31.2 microns-Fractional | | 14.00 | 15.00 | 20.00 | 21.00 | 13.00 | 22.00 |
| 31.2-15.6 microns-Fractional | | 12.00 | 14.00 | 18.00 | 8.00 | 7.00 | 14.00 |
| 15.6-7.8 microns-Fractional | | 9.00 | 8.00 | 13.00 | 3.00 | 5.00 | 8.00 |
| 7.8-3.9 microns-Fractional % | | 6.00 | 5.00 | 9.00 | 2.00 | 5.00 | 6.00 |
| 3.9-1.9 microns-Fractional % | | 5.00 | 4.00 | 5.00 | 1.00 | 4.00 | 4.00 |
| 1.9-0.9 microns-Fractional % | | 4.00 | 3.00 | 4.00 | 2.00 | 3.00 | 4.00 |
| < 0.9 microns-Fractional % | | 6.00 | 4.00 | 7.00 | 2.00 | 5.00 | 5.00 |
| Balance-Fractional % | | 4.00 | 4.00 | 3.00 | 2.00 | 3.00 | 2.00 |
| Total Percent Fines | | 60.00 T | 57.00 T | 79.00 T | 41.00 T | 45.00 T | 65.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 68.90 | 45.10 U | 29.50 J | 100.00 U | 36.30 U | 40.30 J |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 2060.00 | 656.00 | 1020.00 | 1800.00 | 96.00 | 1190.00 |
| 2-Methylphenol | | 31.60 J | 15.60 J | 14.10 J | 34.10 J | 36.30 U | 15.50 J |
| 4-Methylphenol | | 218.00 | 144.00 | 81.40 | 451.00 | 18.40 J | 79.70 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 2980.00 | 987.00 | 1540.00 | 2200.00 | 147.00 | 1590.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 245.00 U | 268.00 | 198.00 U | 320.00 U | 182.00 U | 227.00 U |
| Phenol | | 156.00 | 115.00 | 56.40 U | 257.00 | 47.20 | 80.20 U |
| Retene | | | | | | | |
| Naphthalene | | 10600.00 | 2960.00 | 4790.00 | 11800.00 | 350.00 J | 5030.00 |
| Acenaphthylene | | 670.00 | 363.00 | 326.00 | 456.00 | 52.40 | 200.00 |
| Acenaphthene | | 3280.00 | 1180.00 | 1700.00 | 3290.00 | 148.00 | 1860.00 |
| Fluorene | | 2500.00 | 938.00 | 1350.00 | 2000.00 | 152.00 | 1570.00 |
| Phenanthrene | | 6060.00 | 2440.00 | 3160.00 | 4260.00 | 454.00 | 3500.00 |
| Anthracene | | 2810.00 | 1550.00 | 1540.00 | 2430.00 | 240.00 | 1250.00 |
| Total LPAH | | 25920.00 T | 9431.00 T | 12866.00 T | 24236.00 T | 1396.40 T | 13410.00 T |
| Fluoranthene | | 5680.00 | 6830.00 | 2680.00 | 4900.00 | 554.00 | 2810.00 |
| Pyrene | | 14600.00 | 9600.00 | 5550.00 | 9660.00 | 739.00 J | 4680.00 |
| Benzo(a)anthracene | | 1640.00 | 2650.00 | 966.00 | 1220.00 | 307.00 | 740.00 |
| Chrysene | | 2770.00 | 3996.00 | 1700.00 | 1940.00 | 356.00 | 1190.00 |
| Benzo(b)fluoranthene | | 4070.00 | 3520.00 | 2370.00 | 2850.00 | 464.00 | 1250.00 |
| Benzo(k)fluoranthene | | 1390.00 | 1170.00 | 938.00 | 1030.00 | 189.00 | 440.00 |
| Total Benzofluoranthene | | 5460.00 T | 4690.00 T | 3308.00 T | 3880.00 T | 653.00 T | 1690.00 T |

*See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.*

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 2040.00 | 1820.00 | 1340.00 | 1470.00 | 281.00 | 670.00 |
| Indeno(1,2,3-cd)pyrene | | 610.00 | 690.00 | 531.00 | 587.00 | 136.00 | 277.00 |
| Dibenz(a,h)anthracene | | 264.00 | 253.00 | 178.00 | 206.00 | 35.30 J | 98.20 U |
| Benzo(g,h,i)perylene | | 659.00 | 528.00 | 458.00 | 528.00 | 116.00 | 232.00 |
| Total HPAH | | 33923.00 T | 31057.00 T | 16711.00 T | 24391.00 T | 3177.30 T | 12289.00 T |
| Total B(a)P equivalent | | 2972.67 T | 2774.69 T | 1915.78 T | 2153.94 T | 409.24 T | 902.29 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 98095.23 | 41000.00 | 78461.53 | | 12631.57 | 36060.60 |
| Dibenzofuran | | 141904.76 | 61667.50 | 118461.53 | | 19342.10 | 48181.81 |
| Naphthalene | | 504761.90 | 185000.00 | 368461.53 | | 46052.63 J | 152424.24 |
| Acenaphthylene | | 31904.76 | 22687.50 | 25076.92 | | 6894.73 | 6060.60 |
| Acenaphthene | | 156190.47 | 73750.00 | 130769.23 | | 19473.68 | 56363.63 |
| Fluorene | | 119047.61 | 58625.00 | 103846.15 | | 20000.00 | 47575.75 |
| Phenanthrene | | 288571.42 | 152500.00 | 243076.92 | | 59736.84 | 106060.60 |
| Anthracene | | 133809.52 | 96875.00 | 118461.53 | | 31578.94 | 37878.78 |
| Total LPAH | | 1234265.71 T | 589437.50 T | 989692.30 T | | 183736.84 T | 406363.63 T |
| Fluoranthene | | 270476.19 | 426875.00 | 206153.84 | | 72894.73 | 85151.51 |
| Pyrene | | 695238.09 | 600000.00 | 426923.07 | | 97236.84 J | 141818.18 |
| Benzo(a)anthracene | | 78095.23 | 165625.00 | 74307.69 | | 40394.73 | 22424.24 |
| Chrysene | | 131904.76 | 249750.00 | 130769.23 | | 46842.10 | 36060.60 |
| Total Benzofluoranthene | | 260000.00 T | 293125.00 T | 254461.53 T | | 85921.05 T | 51212.12 T |
| Benzo(a)pyrene | | 97142.85 | 113750.00 | 103076.92 | | 36973.68 | 20303.03 |
| Indeno(1,2,3-cd)pyrene | | 38571.42 | 43125.00 | 40846.15 | | 17894.73 | 8393.93 |
| Dibenz(a,h)anthracene | | 12571.42 | 15812.50 | 13692.30 | | 4644.73 J | 98.20 U |
| Benzo(g,h,i)perylene | | 31380.95 | 33000.00 | 35230.76 | | 15263.15 | 7030.30 |
| Total HPAH | | 1615380.95 T | 1941062.50 T | 1285461.53 T | | 418065.78 T | 372393.93 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS LAET*

*Shaded Cell Standard: CSL 2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 141555.71 T | 173418.50 T | 147367.69 T | | 53848.15 T | 27342.12 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 79.00 U | 51.00 U | 32.00 U | 46.00 U | 20.00 U | 23.00 U |
| Aroclor 1221 | | 79.00 U | 51.00 U | 32.00 U | 46.00 U | 20.00 U | 23.00 U |
| Aroclor 1232 | | 79.00 U | 51.00 U | 32.00 U | 46.00 U | 20.00 U | 23.00 U |
| Aroclor 1242 | | 79.00 J | 51.00 J | 32.00 J | 46.00 J | 20.00 J | 24.00 J |
| Aroclor 1248 | | 79.00 U | 51.00 U | 32.00 U | 46.00 U | 20.00 U | 23.00 U |
| Aroclor 1254 | | 250.00 | 110.00 | 94.00 | 230.00 | 61.00 | 120.00 |
| Aroclor 1260 | | 130.00 | 64.00 | 52.00 | 150.00 | 28.00 | 71.00 |
| Total PCB | | 459.00 T | 225.00 T | 178.00 T | 426.00 T | 109.00 T | 215.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 21857.14 T | 14062.50 T | 13692.30 T | | 14342.10 T | 6515.15 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 12.00 | 2.20 | 3.00 | 11.00 | 3.10 | 4.80 |
| Total TCDF | | 91.00 | 9.50 | 24.00 | 100.00 | 21.00 | 94.00 |
| 2378-TCDD | | 2.10 | 0.27 UI | 0.56 | 0.27 UI | 0.27 UI | 1.00 |
| Total TCDD | | 260.00 | 12.00 | 91.00 | 200.00 | 11.00 | 51.00 |
| 12378-PeCDF | | 1.30 UE | 1.30 UE | 1.30 U | 1.30 UE | 1.30 U | 1.30 UE |
| 23478-PeCDF | | 17.00 | 6.80 | 7.20 | 20.00 | 3.10 | 1.30 UE |
| Total PeCDF | | 78.00 | 24.00 | 42.00 | 80.00 | 20.00 | 38.00 |
| 12378-PeCDD | | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI |
| Total PeCDD | | 130.00 | 4.10 | 20.00 | 95.00 | 4.30 | 26.00 |
| 123478-HxCDF | | 24.00 | 9.90 | 5.70 | 1.30 UE | 1.30 UE | 7.10 |
| 123678-HxCDF | | 1.30 UE | 4.10 | 3.40 | 10.00 | 1.30 UE | 3.50 |
| 234678-HxCDF | | 14.00 | 5.30 | 4.40 | 20.00 | 2.50 | 4.50 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB037 | EB038 | EB039 | EB040 | EB041 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB37-0000 | SD1-EB38-0000 | SD1-EB39-0000-CC | SD1-EB40-0000 | SD1-EB41-0000 | SD1-EB42-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 148.00 | 44.60 U | 113.00 | 21.00 J | 122.00 | 28.30 J |
| 2-Chloronaphthalene | | | | | | | |
| 2-Methylnaphthalene | | 3490.00 | 596.00 | 2570.00 | 892.00 | 2520.00 | 945.00 |
| 2-Methylphenol | | 80.70 | 44.60 U | 31.90 J | 10.10 J | 40.00 J | 16.80 J |
| 4-Methylphenol | | 282.00 | 38.70 J | 168.00 | 54.10 | 209.00 | 99.30 |
| Carbazole | | | | | | | |
| Dibenzofuran | | 4690.00 | 996.00 | 3210.00 | 1040.00 | 5630.00 | 1460.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | 298.00 U | 223.00 U | 216.00 U | 169.00 U | 243.00 U | 220.00 U |
| Phenol | | 140.00 | 44.60 U | 75.20 | 36.20 | 116.00 | 72.80 |
| Retene | | | | | | | |
| Naphthalene | | 14400.00 | 2610.00 | 10900.00 | 3720.00 | 14000.00 | 4880.00 |
| Acenaphthylene | | 785.00 | 265.00 | 291.00 | 187.00 | 1630.00 | 368.00 |
| Acenaphthene | | 6770.00 | 1030.00 | 3610.00 | 1010.00 | 6360.00 | 1350.00 |
| Fluorene | | 4860.00 | 948.00 | 3250.00 | 877.00 | 4780.00 | 1220.00 |
| Phenanthrene | | 14400.00 | 2820.00 | 7350.00 | 2430.00 | 12800.00 | 3190.00 |
| Anthracene | | 4670.00 | 1190.00 | 2210.00 | 881.00 | 6450.00 | 1500.00 |
| Total LPAH | | 45885.00 T | 8863.00 T | 27611.00 T | 9105.00 T | 46020.00 T | 12308.00 T |
| Fluoranthene | | 14800.00 | 2740.00 | 5460.00 J | 2040.00 | 30400.00 | 3290.00 |
| Pyrene | | 24500.00 | 4360.00 | 13800.00 J | 2810.00 | 49500.00 | 4510.00 |
| Benzo(a)anthracene | | 2310.00 | 1070.00 | 1490.00 | 466.00 | 10700.00 | 830.00 |
| Chrysene | | 3540.00 | 1860.00 | 2120.00 | 702.00 | 17400.00 | 1520.00 |
| Benzo(b)fluoranthene | | 4080.00 | 2150.00 | 2160.00 | 987.00 | 17000.00 | 2120.00 |
| Benzo(k)fluoranthene | | 1670.00 | 768.00 | 921.00 | 366.00 | 3910.00 | 935.00 |
| Total Benzofluoranthene | | 5750.00 T | 2918.00 T | 3081.00 T | 1353.00 T | 20910.00 T | 3055.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037<br>SD1-EB37-0000<br>0 to 10 cm | EB038<br>SD1-EB38-0000<br>0 to 10 cm | EB039<br>SD1-EB39-0000-CC<br>0 to 10 cm | EB040<br>SD1-EB40-0000<br>0 to 10 cm | EB041<br>SD1-EB41-0000<br>0 to 10 cm | EB042<br>SD1-EB42-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 2000.00 | 1190.00 | 1310.00 | 543.00 | 10000.00 | 1270.00 |
| Indeno(1,2,3-cd)pyrene | | 659.00 | 525.00 | 642.00 | 250.00 | 3430.00 | 593.00 |
| Dibenz(a,h)anthracene | | 251.00 | 170.00 | 222.00 | 71.10 U | 1040.00 | 170.00 |
| Benzo(g,h,i)perylene | | 650.00 | 450.00 | 569.00 | 231.00 | 2950.00 | 502.00 |
| Total HPAH | | 54260.00 T | 15283.00 T | 28694.00 T | 8395.00 T | 146330.00 T | 15650.00 T |
| Total B(a)P equivalent | | 2976.14 T | 1744.04 T | 1972.53 T | 717.66 T | 14209.50 T | 1805.17 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | 37250.00 | 88620.68 | 46947.36 | 114545.45 | 72692.30 |
| Dibenzofuran | | | 62250.00 | 110689.65 | 54736.84 | 255909.09 | 112307.69 |
| Naphthalene | | | 163125.00 | 375862.06 | 195789.47 | 636363.63 | 360000.00 |
| Acenaphthylene | | | 16562.50 | 10034.48 | 9842.10 | 74090.90 | 28307.69 |
| Acenaphthene | | | 64375.00 | 124482.75 | 53157.89 | 269090.90 | 103846.15 |
| Fluorene | | | 59250.00 | 112068.96 | 46157.89 | 217272.72 | 93846.15 |
| Phenanthrene | | | 176250.00 | 253448.27 | 127894.73 | 581818.18 | 245384.61 |
| Anthracene | | | 74375.00 | 76206.89 | 46368.42 | 293181.81 | 115384.61 |
| Total LPAH | | | 553937.50 T | 952103.44 T | 479210.52 T | 2091818.18 T | 946769.23 T |
| Fluoranthene | | | 171250.00 | 188275.86 J | 107368.42 | 1381818.18 | 246153.84 |
| Pyrene | | | 272500.00 | 475862.06 J | 147894.73 | 2250000.00 | 346923.07 |
| Benzo(a)anthracene | | | 66875.00 | 51379.31 | 24526.31 | 468363.63 | 63846.15 |
| Chrysene | | | 116250.00 | 73103.44 | 36947.36 | 790909.09 | 116923.07 |
| Total Benzofluoranthene | | | 182375.00 T | 106241.37 T | 71210.52 T | 950454.54 T | 235000.00 T |
| Benzo(a)pyrene | | | 74375.00 | 45172.41 | 28578.94 | 454545.45 | 97692.30 |
| Indeno(1,2,3-cd)pyrene | | | 32812.50 | 22137.93 | 13157.89 | 155909.09 | 45615.38 |
| Dibenz(a,h)anthracene | | | 10625.00 | 7655.17 | 71.10 U | 47272.72 | 13076.92 |
| Benzo(g,h,i)perylene | | | 28125.00 | 19620.68 | 12157.89 | 134090.90 | 38615.38 |
| Total HPAH | | | 955187.50 T | 989448.27 T | 441842.10 T | 6651363.63 T | 1203846.15 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037 SD1-EB37-0000 0 to 10 cm | EB038 SD1-EB38-0000 0 to 10 cm | EB039 SD1-EB39-0000-CC 0 to 10 cm | EB040 SD1-EB40-0000 0 to 10 cm | EB041 SD1-EB41-0000 0 to 10 cm | EB042 SD1-EB42-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | | 109002.50 T | 68018.27 T | 37771.68 T | 645886.36 T | 138859.23 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 30.00 U | 41.00 U | 46.00 U | 17.00 U | 40.00 U | 30.00 U |
| Aroclor 1221 | | 30.00 U | 41.00 U | 46.00 U | 17.00 U | 40.00 U | 30.00 U |
| Aroclor 1232 | | 30.00 U | 41.00 U | 46.00 U | 17.00 U | 40.00 U | 30.00 U |
| Aroclor 1242 | | 30.00 U | 41.00 J | 46.00 J | 17.00 U | 40.00 J | 30.00 J |
| Aroclor 1248 | | 30.00 U | 41.00 U | 46.00 U | 17.00 U | 40.00 U | 30.00 U |
| Aroclor 1254 | | 57.00 | 170.00 | 150.00 | 80.00 | 240.00 | 130.00 |
| Aroclor 1260 | | 41.00 | 92.00 | 91.00 | 58.00 | 150.00 | 76.00 |
| Total PCB | | 98.00 T | 303.00 T | 287.00 T | 138.00 T | 430.00 T | 236.00 T |
| ***Pesticides/PCBs - TOCN (ug/kg)*** | | | | | | | |
| Total PCB | | | 18937.50 T | 9896.55 T | 7263.15 T | 19545.45 T | 18153.84 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 22.00 | 2.50 | 4.60 | 4.90 | 6.00 | 4.10 |
| Total TCDF | | 250.00 | 2.50 | 54.00 | 97.00 | 89.00 | 75.00 |
| 2378-TCDD | | 3.70 | 0.27 UI | 0.87 | 1.40 | 1.70 | 0.76 |
| Total TCDD | | 520.00 | 35.00 | 68.00 | 170.00 | 120.00 | 96.00 |
| 12378-PeCDF | | 1.30 UE | 1.30 UE | 1.30 UE | 1.30 UI | 9.90 | 1.30 UE |
| 23478-PeCDF | | 13.00 | 1.30 UE | 6.70 | 1.30 UE | 18.00 | 5.60 |
| Total PeCDF | | 94.00 | 18.00 | 45.00 | 61.00 | 100.00 | 51.00 |
| 12378-PeCDD | | 9.60 | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI |
| Total PeCDD | | 370.00 | 17.00 | 25.00 | 75.00 | 79.00 | 26.00 |
| 123478-HxCDF | | 1.30 UE | 6.20 | 9.10 | 8.20 | 33.00 | 7.30 |
| 123678-HxCDF | | 1.30 UE | 2.60 | 4.60 | 4.30 | 6.60 | 3.70 |
| 234678-HxCDF | | 7.30 | 5.40 | 6.50 | 5.40 | 19.00 | 5.10 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB037 | EB038 | EB039 | EB040 | EB041 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB37-0000 | SD1-EB38-0000 | SD1-EB39-0000-CC | SD1-EB40-0000 | SD1-EB41-0000 | SD1-EB42-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| 123789-HxCDF | | 1.30 UE | 2.90 | 3.70 | 2.40 | 16.00 | 2.70 |
| Total HxCDF | | 170.00 | 180.00 | 98.00 | 76.00 | 670.00 | 77.00 |
| 123478-HxCDD | | 7.40 | 2.60 | 2.80 | 3.60 | 6.70 | 2.50 |
| 123678-HxCDD | | 22.00 | 18.00 | 23.00 | 16.00 | 68.00 | 16.00 |
| 123789-HxCDD | | 10.00 | 5.30 | 7.10 | 6.20 | 18.00 | 5.00 |
| Total HxCDD | | 530.00 | 160.00 | 290.00 | 170.00 | 1500.00 | 200.00 |
| 1234678-HpCDF | | 84.00 | 70.00 | 92.00 | 64.00 | 270.00 | 59.00 |
| 1234789-HpCDF | | 4.40 | 6.60 | 7.20 | 4.70 | 22.00 | 5.40 |
| Total HpCDF | | 290.00 | 77.00 | 240.00 | 69.00 | 940.00 | 210.00 |
| 1234678-HpCDD | | 410.00 | 550.00 | 660.00 | 330.00 | 2500.00 | 400.00 |
| Total HpCDD | | 1400.00 | 1800.00 | 2300.00 | 950.00 | 12000.00 | 1300.00 |
| OCDF | | 290.00 | 290.00 | 330.00 | 210.00 | 800.00 | 270.00 |
| OCDD | | 3400.00 | 4500.00 | 5800.00 | 2700.00 | 17000.00 | 2900.00 |
| Total 2,3,7,8-TCDD(Equiv) | | 30.54 T | 15.60 T | 24.08 T | 13.39 T | 74.24 T | 16.01 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 975.37 T | 830.41 T | 705.10 T | 3374.77 T | 1231.84 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 13600.00 | 11600.00 | 11500.00 | 12600.00 | 11400.00 | 10900.00 |
| Arsenic | | 11.00 P | 13.00 P | 11.00 P | 15.00 P | 16.00 P | 13.00 P |
| Cadmium | | 0.72 P | 0.56 P | 0.55 P | 0.46 P | 0.61 P | 0.55 P |
| Chromium | | 31.80 | 27.70 | 26.10 | 33.10 | 30.30 | 28.50 |
| Copper | | 65.50 | 68.70 | 67.70 | 66.10 | 82.10 | 62.30 |
| Iron | | 21300.00 | 17200.00 | 16600.00 | 17200.00 | 18000.00 | 16600.00 |
| Lead | | 49.80 | 56.10 | 54.30 | 54.50 | 65.50 | 55.40 |
| Mercury | | 0.57 | 0.35 | 0.39 | 0.63 | 0.51 | 0.63 |
| Nickel | | 30.20 | 20.70 | 20.00 | 20.10 | 20.40 | 22.30 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037 SD1-EB37-0000 0 to 10 cm | EB038 SD1-EB38-0000 0 to 10 cm | EB039 SD1-EB39-0000-CC 0 to 10 cm | EB040 SD1-EB40-0000 0 to 10 cm | EB041 SD1-EB41-0000 0 to 10 cm | EB042 SD1-EB42-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 102.00 | 147.00 | 147.00 | 115.00 | 144.00 | 120.00 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 4.90 | 1.60 | 2.90 | 1.90 | 2.20 | 1.30 |
| Percent Moisture (%) | | 117.00 | 60.00 | 85.00 | 71.00 | 90.00 | 67.00 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | 1.00 | | | |
| 4750-2000 microns-Fractional | | 3.00 | | 1.00 | 2.00 | 1.00 | |
| 2000-1000 microns-Fractional | | 2.00 | 1.00 | 3.00 | 1.00 | 1.00 | 1.00 |
| 1000-500 microns-Fractional | | 4.00 | 1.00 | 4.00 | 3.00 | 4.00 | 1.00 |
| 500-250 microns-Fractional % | | 6.00 | 9.00 | 11.00 | 9.00 | 11.00 | 6.00 |
| 250-125 microns-Fractional % | | 6.00 | 16.00 | 15.00 | 17.00 | 8.00 | 16.00 |
| 125-62.4 microns-Fractional | | 12.00 | 19.00 | 21.00 | 23.00 | 19.00 | 24.00 |
| Total Percent Sand | | 30.00 T | 46.00 T | 54.00 T | 53.00 T | 43.00 T | 48.00 T |
| 62.5-31.2 microns-Fractional | | 13.00 | 16.00 | 17.00 | 15.00 | 19.00 | 17.00 |
| 31.2-15.6 microns-Fractional | | 13.00 | 12.00 | 13.00 | 9.00 | 10.00 | 10.00 |
| 15.6-7.8 microns-Fractional | | 10.00 | 7.00 | 6.00 | 5.00 | 6.00 | 6.00 |
| 7.8-3.9 microns-Fractional % | | 8.00 | 6.00 | 6.00 | 4.00 | 5.00 | 4.00 |
| 3.9-1.9 microns-Fractional % | | 6.00 | 3.00 | 4.00 | 3.00 | 4.00 | 4.00 |
| 1.9-0.9 microns-Fractional % | | 4.00 | 3.00 | 3.00 | 3.00 | 4.00 | 3.00 |
| < 0.9 microns-Fractional % | | 6.00 | 5.00 | 5.00 | 4.00 | 5.00 | 5.00 |
| Balance-Fractional % | | 7.00 | 2.00 | 2.00 | 2.00 | 3.00 | 3.00 |
| Total Percent Fines | | 67.00 T | 54.00 T | 56.00 T | 45.00 T | 56.00 T | 52.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Sheded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043 SD1-EB43-0000 0 to 10 cm | EB045 SD1-EB45-0000 0 to 10 cm | EB047 SD2-EB47-0000 0 to 10 cm | EB049 SD2-EB49-0000 0 to 10 cm | EB052 SD2-EB52-0000 0 to 10 cm | EB054 SD2-EB54-0000-CC 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 51.70 U | 33.80 J | | | | |
| 2-Chloronaphthalene | | | | 7.40 U | 19.50 U | | 8.60 U |
| 2-Methylnaphthalene | | 99.20 | 1470.00 | 47.50 | 118.00 | 148.00 | 322.00 |
| 2-Methylphenol | | 51.70 U | 13.80 J | | | | |
| 4-Methylphenol | | 86.10 | 70.20 | | | | |
| Carbazole | | | | 21.20 | 58.90 | | 65.50 |
| Dibenzofuran | | 167.00 | 2190.00 | | | | |
| Naphthalene, 1-methyl | | | | 31.10 | 73.80 | | 204.00 |
| Pentachlorophenol | | 258.00 U | 193.00 U | | | | |
| Phenol | | 120.00 | 55.60 | | | | |
| Retene | | | | 145.00 | 148.00 | | 160.00 |
| Naphthalene | | 374.00 J | 5820.00 | 120.00 | 314.00 | 539.00 | 1060.00 |
| Acenaphthylene | | 94.70 | 328.00 | 24.90 | 102.00 | 80.80 | 120.00 |
| Acenaphthene | | 153.00 | 2180.00 | 64.10 | 153.00 | 177.00 | 355.00 |
| Fluorene | | 160.00 | 2290.00 | 98.10 | 212.00 | 188.00 | 325.00 |
| Phenanthrene | | 496.00 J | 5210.00 | 368.00 | 1000.00 | 675.00 | 977.00 |
| Anthracene | | 316.00 | 2380.00 | 234.00 | 586.00 | 331.00 | 550.00 |
| Total LPAH | | 1593.70 T | 18208.00 T | 909.10 T | 2367.00 T | 1990.80 T | 3387.00 T |
| Fluoranthene | | 541.00 J | 5370.00 | 834.00 | 2290.00 | 1040.00 | 1290.00 |
| Pyrene | | 1550.00 J | 7250.00 | 665.00 | 4590.00 | 1450.00 | 1820.00 |
| Benzo(a)anthracene | | 349.00 J | 2560.00 | 411.00 | 1400.00 | 454.00 | 572.00 |
| Chrysene | | 620.00 J | 3680.00 | 599.00 | 2130.00 | 723.00 | 938.00 |
| Benzo(b)fluoranthene | | 1000.00 J | 4000.00 | 528.00 | 2840.00 | 1000.00 | 1100.00 |
| Benzo(k)fluoranthene | | 458.00 | 1650.00 | 188.00 | 1250.00 | 379.00 | 450.00 |
| Total Benzofluoranthene | | 1458.00 T | 5650.00 T | 716.00 T | 4090.00 T | 1379.00 T | 1550.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043 SD1-EB43-0000 0 to 10 cm | EB045 SD1-EB45-0000 0 to 10 cm | EB047 SD2-EB47-0000 0 to 10 cm | EB049 SD2-EB49-0000 0 to 10 cm | EB052 SD2-EB52-0000 0 to 10 cm | EB054 SD2-EB54-0000-CC 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 610.00 J | 2090.00 | 304.00 | 2000.00 | 710.00 | 705.00 |
| Indeno(1,2,3-cd)pyrene | | 298.00 | 778.00 | 157.00 | 1100.00 | 380.00 | 356.00 |
| Dibenz(a,h)anthracene | | 111.00 | 292.00 | 51.10 | 360.00 | 28.30 J | 105.00 |
| Benzo(g,h,i)perylene | | 247.00 | 612.00 | 135.00 | 972.00 | 362.00 | 324.00 |
| Total HPAH | | 5784.00 T | 26282.00 T | 3872.10 T | 18932.00 T | 6526.30 T | 7660.00 T |
| Total B(a)P equivalent | | 890.90 T | 3135.98 T | 467.17 T | 2908.63 T | 926.21 T | 1018.23 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 5221.05 | 86470.58 | 3166.66 | 5363.63 | 12333.33 | 32200.00 |
| Dibenzofuran | | 8789.47 | 128523.52 | | | | |
| Naphthalene | | 19684.21 J | 342352.94 | 8000.00 | 14272.72 | 44916.66 | 106000.00 |
| Acenaphthylene | | 4984.21 | 19294.11 | 1660.00 | 4636.36 | 6733.33 | 12000.00 |
| Acenaphthene | | 8052.63 | 128235.29 | 4273.33 | 6954.54 | 14750.00 | 35500.00 |
| Fluorene | | 8421.05 | 134705.88 | 6540.00 | 9636.36 | 15666.66 | 32500.00 |
| Phenanthrene | | 26105.26 J | 306470.58 | 24533.33 | 45454.54 | 56250.00 | 97700.00 |
| Anthracene | | 16631.57 | 140000.00 | 15600.00 | 26636.36 | 27583.33 | 55000.00 |
| Total LPAH | | 83878.94 T | 1071058.82 T | 60606.66 T | 107590.90 T | 165900.00 T | 338700.00 T |
| Fluoranthene | | 28473.68 J | 315882.35 | 55600.00 | 104090.90 | 86666.66 | 129000.00 |
| Pyrene | | 81578.94 J | 426470.58 | 44333.33 | 208636.36 | 120833.33 | 182000.00 |
| Benzo(a)anthracene | | 18368.42 J | 150588.23 | 27400.00 | 63636.36 | 37833.33 | 57200.00 |
| Chrysene | | 32631.57 J | 216470.58 | 39933.33 | 96818.18 | 60250.00 | 93800.00 |
| Total Benzofluoranthene | | 76736.84 T | 332352.94 T | 47733.33 T | 185909.09 T | 114916.66 T | 155000.00 T |
| Benzo(a)pyrene | | 32105.26 J | 122941.17 | 20266.66 | 90909.09 | 59166.66 | 70500.00 |
| Indeno(1,2,3-cd)pyrene | | 15684.21 | 45764.70 | 10466.66 | 50000.00 | 31666.66 | 35600.00 |
| Dibenz(a,h)anthracene | | 5842.10 | 17176.47 | 3406.66 | 16363.63 | 2358.33 J | 10500.00 |
| Benzo(g,h,i)perylene | | 13000.00 | 36000.00 | 9000.00 | 44181.81 | 30166.66 | 32400.00 |
| Total HPAH | | 304421.05 T | 1663647.05 T | 258140.00 T | 860545.45 T | 543858.33 T | 766000.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043<br>SD1-EB43-0000<br>0 to 10 cm | EB045<br>SD1-EB45-0000<br>0 to 10 cm | EB047<br>SD2-EB47-0000<br>0 to 10 cm | EB049<br>SD2-EB49-0000<br>0 to 10 cm | EB052<br>SD2-EB52-0000<br>0 to 10 cm | EB054<br>SD2-EB54-0000-CC<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 46889.47 T | 184469.41 T | 31145.26 T | 132210.45 T | 77184.41 T | 101823.80 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 66.00 U | 19.00 U | | 9.30 UJ | | |
| Aroclor 1221 | | 66.00 U | 19.00 U | | 9.30 UJ | | |
| Aroclor 1232 | | 66.00 U | 19.00 U | | 9.30 UJ | | |
| Aroclor 1242 | | 66.00 J | 19.00 U | | 53.00 J | | |
| Aroclor 1248 | | 66.00 U | 19.00 U | | 9.30 UJ | | |
| Aroclor 1254 | | 110.00 | 80.00 | | 220.00 J | | |
| Aroclor 1260 | | 89.00 | 50.00 | | 90.00 | | |
| Total PCB | | 265.00 T | 130.00 T | | 363.00 T | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 13947.36 T | 7647.05 T | | 16500.00 T | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 4.00 | 14.00 | | 3.70 | | |
| Total TCDF | | 34.00 | 78.00 | | 34.00 | | |
| 2378-TCDD | | 0.35 | 0.91 | | 0.40 U | | |
| Total TCDD | | 14.00 | 79.00 | | 16.00 | | |
| 12378-PeCDF | | 1.30 UE | 1.30 U | | 1.90 UI | | |
| 23478-PeCDF | | 11.00 | 1.30 UI | | 6.00 | | |
| Total PeCDF | | 36.00 | 35.00 | | 97.00 | | |
| 12378-PeCDD | | 1.30 UI | 1.30 UI | | 1.90 UI | | |
| Total PeCDD | | 14.00 | 13.00 | | 7.90 | | |
| 123478-HxCDF | | 1.30 UE | 2.80 | | 9.50 | | |
| 123678-HxCDF | | 4.60 | 4.40 | | 4.20 | | |
| 234678-HxCDF | | 8.70 | 5.20 | | 6.80 | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043<br>SD1-EB43-0000<br>0 to 10 cm | EB045<br>SD1-EB45-0000<br>0 to 10 cm | EB047<br>SD2-EB47-0000<br>0 to 10 cm | EB049<br>SD2-EB49-0000<br>0 to 10 cm | EB052<br>SD2-EB52-0000<br>0 to 10 cm | EB054<br>SD2-EB54-0000-CC<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | 4.30 | 2.60 | | 6.80 | | |
| Total HxCDF | | 230.00 | 75.00 | | 240.00 | | |
| 123478-HxCDD | | 1.70 | 1.30 UI | | 1.90 U | | |
| 123678-HxCDD | | 17.00 | 17.00 | | 29.00 | | |
| 123789-HxCDD | | 4.50 | 5.90 | | 1.90 UI | | |
| Total HxCDD | | 130.00 | 280.00 | | 360.00 | | |
| 1234678-HpCDF | | 85.00 | 77.00 | | 64.00 | | |
| 1234789-HpCDF | | 12.00 | 5.50 | | 10.00 | | |
| Total HpCDF | | 470.00 | 330.00 | | 460.00 | | |
| 1234678-HpCDD | | 390.00 | 580.00 | | 610.00 | | |
| Total HpCDD | | 1100.00 | 2200.00 | | 2000.00 | | |
| OCDF | | 360.00 | 240.00 | | 340.00 | | |
| OCDD | | 2700.00 | 4800.00 | | 5000.00 | | |
| Total 2,3,7,8-TCDD(Equiv) | | 18.26 T | 17.76 T | | 21.18 T | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 961.05 T | 1045.00 T | | 962.72 T | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 17200.00 | 8980.00 | | | | |
| Arsenic | | 20.00 P | 12.00 P | | | | |
| Cadmium | | 1.22 | 0.41 P | | | | |
| Chromium | | 34.80 | 23.00 | | | | |
| Copper | | 81.40 | 190.00 | | | | |
| Iron | | 28700.00 | 13800.00 | | | | |
| Lead | | 73.20 | 45.90 | | | | |
| Mercury | | 0.56 | 0.31 | | 0.35 | | |
| Nickel | | 29.20 | 20.00 | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043 SD1-EB43-0000 0 to 10 cm | EB045 SD1-EB45-0000 0 to 10 cm | EB047 SD2-EB47-0000 0 to 10 cm | EB049 SD2-EB49-0000 0 to 10 cm | EB052 SD2-EB52-0000 0 to 10 cm | EB054 SD2-EB54-0000-CC 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 209.00 | 106.00 | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.90 | 1.70 | 1.50 | 2.20 | 1.20 | 1.00 |
| Percent Moisture (%) | | 88.00 | 49.00 | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | 1.00 | 10.00 | 2.00 | | |
| 4750-2000 microns-Fractional | | | 2.00 | 4.00 | 1.00 | | |
| 2000-1000 microns-Fractional | | 1.00 | 3.00 | 2.00 | | | 1.00 |
| 1000-500 microns-Fractional | | 1.00 | 9.00 | 10.00 | 1.00 | | |
| 500-250 microns-Fractional % | | 1.00 | 24.00 | 38.00 | 5.00 | | 2.00 |
| 250-125 microns-Fractional % | | 2.00 | 16.00 | 17.00 | 8.00 | | 9.00 |
| 125-62.4 microns-Fractional | | 5.00 | 14.00 | 9.00 | 10.00 | | 33.00 |
| Total Percent Sand | | 10.00 T | 66.00 T | 76.00 T | 24.00 T | | 45.00 T |
| 62.5-31.2 microns-Fractional | | 11.00 | 9.00 | 5.00 | 6.00 | | 22.00 |
| 31.2-15.6 microns-Fractional | | 24.00 | 6.00 | 2.00 | 18.00 | | 14.00 |
| 15.6-7.8 microns-Fractional | | 20.00 | 3.00 | 1.00 | 15.00 | | 7.00 |
| 7.8-3.9 microns-Fractional % | | 10.00 | 3.00 | 1.00 | 9.00 | | 3.00 |
| 3.9-1.9 microns-Fractional % | | 8.00 | 2.00 | 1.00 | 6.00 | | 3.00 |
| 1.9-0.9 microns-Fractional % | | 5.00 | 2.00 | | 4.00 | | 3.00 |
| < 0.9 microns-Fractional % | | 9.00 | 3.00 | | 9.00 | | 4.00 |
| Balance-Fractional % | | 3.00 | 3.00 | | 6.00 | | 3.00 |
| Total Percent Fines | | 90.00 T | 31.00 T | 10.00 T | 73.00 T | | 59.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB056 | EB057 | EB060 | EB061 | EB062 | EB063 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB56-0000 | SD2-EB57-0000 | SD2-EB60-0000 | SD2-EB61-0000 | SD2-EB62-0000 | SD2-EB63-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 12.50 U | 8.80 U | 14.60 U | | 125.00 U | 9.40 U |
| 2-Methylnaphthalene | | 312.00 | 210.00 | 235.00 | 252.00 | 792.00 | 348.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 55.30 | 39.10 | 71.90 | | 57.20 J | 65.40 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 175.00 | 124.00 | 182.00 | | 655.00 | 270.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 284.00 | 247.00 | 143.00 | | 202.00 | 239.00 |
| Naphthalene | | 1060.00 | 796.00 | 946.00 | 1090.00 | 3940.00 | 1500.00 |
| Acenaphthylene | | 158.00 | 102.00 | 95.50 | 88.90 | 223.00 | 158.00 |
| Acenaphthene | | 282.00 | 191.00 | 366.00 | 421.00 | 1050.00 | 498.00 |
| Fluorene | | 309.00 | 195.00 | 372.00 | 349.00 | 985.00 | 445.00 |
| Phenanthrene | | 1170.00 | 698.00 | 1080.00 | 1090.00 | 2910.00 | 1330.00 |
| Anthracene | | 581.00 | 346.00 | 696.00 | 433.00 | 1040.00 | 560.00 |
| Total LPAH | | 3560.00 T | 2328.00 T | 3555.50 T | 3471.90 T | 10148.00 T | 4491.00 T |
| Fluoranthene | | 1640.00 | 882.00 | 1590.00 | 1140.00 | 3400.00 | 1480.00 |
| Pyrene | | 2050.00 | 1280.00 | 1990.00 | 2250.00 | 5850.00 | 2690.00 |
| Benzo(a)anthracene | | 592.00 | 302.00 | 672.00 | 455.00 | 1020.00 | 496.00 |
| Chrysene | | 907.00 | 459.00 | 1290.00 | 763.00 | 1600.00 | 780.00 |
| Benzo(b)fluoranthene | | 1180.00 | 668.00 | 1380.00 | 1100.00 | 2140.00 | 1150.00 |
| Benzo(k)fluoranthene | | 461.00 | 213.00 | 556.00 | 332.00 | 725.00 | 416.00 |
| Total Benzofluoranthene | | 1641.00 T | 881.00 T | 1936.00 T | 1432.00 T | 2865.00 T | 1566.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056 SD2-EB56-0000 0 to 10 cm | EB057 SD2-EB57-0000 0 to 10 cm | EB060 SD2-EB60-0000 0 to 10 cm | EB061 SD2-EB61-0000 0 to 10 cm | EB062 SD2-EB62-0000 0 to 10 cm | EB063 SD2-EB63-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 721.00 | 380.00 | 860.00 | 631.00 | 1200.00 | 658.00 |
| Indeno(1,2,3-cd)pyrene | | 363.00 | 222.00 | 401.00 | 322.00 | 461.00 | 348.00 |
| Dibenz(a,h)anthracene | | 105.00 | 70.20 | 118.00 | 22.60 J | 145.00 | 101.00 |
| Benzo(g,h,i)perylene | | 342.00 | 211.00 | 348.00 | 306.00 | 473.00 | 336.00 |
| Total HPAH | | 8361.00 T | 4687.20 T | 9205.00 T | 7321.60 T | 17014.00 T | 8455.00 T |
| Total B(a)P equivalent | | 1045.01 T | 571.98 T | 1230.15 T | 845.38 T | 1715.95 T | 963.34 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 31200.00 | 19090.90 | 19583.33 | 19384.61 | 60923.07 | 26769.23 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 106000.00 | 72363.63 | 78833.33 | 83846.15 | 303076.92 | 115384.61 |
| Acenaphthylene | | 15800.00 | 9272.72 | 7958.33 | 6838.46 | 17153.84 | 12153.84 |
| Acenaphthene | | 28200.00 | 17363.63 | 30500.00 | 32384.61 | 80769.23 | 38307.69 |
| Fluorene | | 30900.00 | 17727.27 | 31000.00 | 26846.15 | 75769.23 | 34230.76 |
| Phenanthrene | | 117000.00 | 63454.54 | 90000.00 | 83846.15 | 223846.15 | 102307.69 |
| Anthracene | | 58100.00 | 31454.54 | 58000.00 | 33307.69 | 80000.00 | 43076.92 |
| Total LPAH | | 356000.00 T | 211636.36 T | 296291.66 T | 267069.23 T | 780615.38 T | 345461.53 T |
| Fluoranthene | | 164000.00 | 80181.81 | 132500.00 | 87692.30 | 261538.46 | 113846.15 |
| Pyrene | | 205000.00 | 116363.63 | 165833.33 | 173076.92 | 450000.00 | 206923.07 |
| Benzo(a)anthracene | | 59200.00 | 27454.54 | 56000.00 | 35000.00 | 78461.53 | 38153.84 |
| Chrysene | | 90700.00 | 41727.27 | 107500.00 | 58692.30 | 123076.92 | 60000.00 |
| Total Benzofluoranthene | | 164100.00 T | 80090.90 T | 161333.33 T | 110153.84 T | 220384.61 T | 120461.53 T |
| Benzo(a)pyrene | | 72100.00 | 34545.45 | 71666.66 | 48538.46 | 92307.69 | 50615.38 |
| Indeno(1,2,3-cd)pyrene | | 36300.00 | 20181.81 | 33416.66 | 24769.23 | 35461.53 | 26769.23 |
| Dibenz(a,h)anthracene | | 10500.00 | 6381.81 | 9833.33 | 1738.46 J | 11153.84 | 7769.23 |
| Benzo(g,h,i)perylene | | 34200.00 | 19181.81 | 29000.00 | 23538.46 | 36384.61 | 25846.15 |
| Total HPAH | | 836100.00 T | 426109.09 T | 767083.33 T | 563200.00 T | 1308769.23 T | 650384.61 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056 SD2-EB56-0000 0 to 10 cm | EB057 SD2-EB57-0000 0 to 10 cm | EB060 SD2-EB60-0000 0 to 10 cm | EB061 SD2-EB61-0000 0 to 10 cm | EB062 SD2-EB62-0000 0 to 10 cm | EB063 SD2-EB63-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 104501.70 T | 51999.00 T | 102512.50 T | 65029.46 T | 131996.15 T | 74103.07 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | 8.10 UJ | | | |
| Aroclor 1221 | | | | 8.10 UJ | | | |
| Aroclor 1232 | | | | 8.10 UJ | | | |
| Aroclor 1242 | | | | 30.00 J | | | |
| Aroclor 1248 | | | | 8.10 UJ | | | |
| Aroclor 1254 | | | | 64.00 J | | | |
| Aroclor 1260 | | | | 40.00 | | | |
| Total PCB | | | | 134.00 T | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | 11166.66 T | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | 0.40 U | | | |
| Total TCDF | | | | 0.40 U | | | |
| 2378-TCDD | | | | 0.40 U | | | |
| Total TCDD | | | | 3.50 | | | |
| 12378-PeCDF | | | | 1.90 U | | | |
| 23478-PeCDF | | | | 1.90 U | | | |
| Total PeCDF | | | | 34.00 | | | |
| 12378-PeCDD | | | | 1.90 U | | | |
| Total PeCDD | | | | 1.90 U | | | |
| 123478-HxCDF | | | | 1.90 UE | | | |
| 123678-HxCDF | | | | 1.90 UE | | | |
| 234678-HxCDF | | | | 4.00 | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056 SD2-EB56-0000 0 to 10 cm | EB057 SD2-EB57-0000 0 to 10 cm | EB060 SD2-EB60-0000 0 to 10 cm | EB061 SD2-EB61-0000 0 to 10 cm | EB062 SD2-EB62-0000 0 to 10 cm | EB063 SD2-EB63-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | 3.60 | | | |
| Total HxCDF | | | | 58.00 | | | |
| 123478-HxCDD | | | | 2.80 | | | |
| 123678-HxCDD | | | | 15.00 | | | |
| 123789-HxCDD | | | | 5.50 | | | |
| Total HxCDD | | | | 290.00 | | | |
| 1234678-HpCDF | | | | 58.00 | | | |
| 1234789-HpCDF | | | | 1.90 UI | | | |
| Total HpCDF | | | | 240.00 | | | |
| 1234678-HpCDD | | | | 580.00 | | | |
| Total HpCDD | | | | 1900.00 | | | |
| OCDF | | | | 170.00 | | | |
| OCDD | | | | 6200.00 | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | 15.84 T | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | 1320.00 T | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | 0.17 | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056 SD2-EB56-0000 0 to 10 cm | EB057 SD2-EB57-0000 0 to 10 cm | EB060 SD2-EB60-0000 0 to 10 cm | EB061 SD2-EB61-0000 0 to 10 cm | EB062 SD2-EB62-0000 0 to 10 cm | EB063 SD2-EB63-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.00 | 1.10 | 1.20 | 1.30 | 1.30 | 1.30 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | 2.00 | | | | |
| 4750-2000 microns-Fractional | | | 6.00 | | | | 1.00 |
| 2000-1000 microns-Fractional | | | 3.00 | 1.00 | | | 1.00 |
| 1000-500 microns-Fractional | | | 3.00 | 1.00 | | | 2.00 |
| 500-250 microns-Fractional % | | | 4.00 | 9.00 | | | 8.00 |
| 250-125 microns-Fractional % | | | 9.00 | 16.00 | | | 10.00 |
| 125-62.4 microns-Fractional | | | 25.00 | 27.00 | | | 22.00 |
| Total Percent Sand | | | 44.00 T | 54.00 T | | | 43.00 T |
| 62.5-31.2 microns-Fractional | | | 22.00 | 20.00 | | | 26.00 |
| 31.2-15.6 microns-Fractional | | | 9.00 | 8.00 | | | 10.00 |
| 15.6-7.8 microns-Fractional | | | 4.00 | 4.00 | | | 5.00 |
| 7.8-3.9 microns-Fractional % | | | 3.00 | 2.00 | | | 3.00 |
| 3.9-1.9 microns-Fractional % | | | 2.00 | 3.00 | | | 4.00 |
| 1.9-0.9 microns-Fractional % | | | 3.00 | 2.00 | | | 2.00 |
| < 0.9 microns-Fractional % | | | 3.00 | 3.00 | | | 5.00 |
| Balance-Fractional % | | | 2.00 | 4.00 | | | 1.00 |
| Total Percent Fines | | | 48.00 T | 46.00 T | | | 56.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 15.00 U | 9.30 U | 131.00 U | 16.00 U | 18.00 U | 298.00 U |
| 2-Methylnaphthalene | | 723.00 | 1430.00 | 1220.00 | 699.00 | 2720.00 | 1440.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 134.00 | 1050.00 | 82.80 J | 72.50 | 258.00 | 234.00 J |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 544.00 | 1720.00 | 916.00 | 587.00 | 2170.00 | 1110.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 226.00 | 263.00 J | 261.00 | 169.00 | 343.00 | 298.00 J |
| Naphthalene | | 3190.00 | 9070.00 | 5340.00 | 2530.00 | 11400.00 | 6360.00 |
| Acenaphthylene | | 240.00 | 554.00 | 265.00 | 115.00 | 380.00 | 339.00 |
| Acenaphthene | | 1150.00 | 4500.00 | 1800.00 | 955.00 | 4260.00 | 2470.00 |
| Fluorene | | 1080.00 | 4440.00 | 1670.00 | 804.00 | 3510.00 | 2470.00 |
| Phenanthrene | | 2870.00 | 13100.00 | 4760.00 | 2110.00 | 9670.00 | 5930.00 |
| Anthracene | | 1610.00 | 6410.00 | 1760.00 | 765.00 | 2730.00 | 2760.00 |
| Total LPAH | | 10140.00 T | 38074.00 T | 15595.00 T | 7279.00 T | 32150.00 T | 20329.00 T |
| Fluoranthene | | 6670.00 | 58700.00 | 4590.00 | 2080.00 | 7690.00 | 6250.00 |
| Pyrene | | 7320.00 | 57000.00 | 7270.00 | 2910.00 | 11300.00 | 10400.00 |
| Benzo(a)anthracene | | 1580.00 | 12400.00 | 1200.00 | 494.00 | 1360.00 | 3550.00 |
| Chrysene | | 2390.00 | 14200.00 | 2190.00 | 847.00 | 1980.00 | 5610.00 |
| Benzo(b)fluoranthene | | 2300.00 | 8150.00 | 2240.00 | 1010.00 | 2250.00 | 5000.00 |
| Benzo(k)fluoranthene | | 922.00 | 3570.00 | 1020.00 | 359.00 | 882.00 | 1870.00 |
| Total Benzofluoranthene | | 3222.00 T | 11720.00 T | 3260.00 T | 1369.00 T | 3132.00 T | 6870.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 1310.00 | 4400.00 | 1340.00 | 577.00 | 1280.00 | 2590.00 |
| Indeno(1,2,3-cd)pyrene | | 578.00 | 1420.00 | 477.00 | 256.00 | 542.00 | 891.00 |
| Dibenz(a,h)anthracene | | 196.00 | 425.00 | 161.00 | 74.60 | 168.00 | 252.00 J |
| Benzo(g,h,i)perylene | | 542.00 | 1020.00 | 475.00 | 223.00 | 519.00 | 783.00 |
| Total HPAH | | 23808.00 T | 161285.00 T | 20963.00 T | 8830.60 T | 27971.00 T | 37196.00 T |
| Total B(a)P equivalent | | 1963.41 T | 7071.90 T | 1905.09 T | 832.03 T | 1874.00 T | 3810.41 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 42529.41 | 75263.15 | 76250.00 | 46600.00 | 123636.36 | 72000.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 187647.05 | 477368.42 | 333750.00 | 168666.66 | 518181.81 | 318000.00 |
| Acenaphthylene | | 14117.64 | 29157.89 | 16562.50 | 7666.66 | 17272.72 | 16950.00 |
| Acenaphthene | | 67647.05 | 236842.10 | 112500.00 | 63666.66 | 193636.36 | 123500.00 |
| Fluorene | | 63529.41 | 233684.21 | 104375.00 | 53600.00 | 159545.45 | 123500.00 |
| Phenanthrene | | 168823.52 | 689473.68 | 297500.00 | 140666.66 | 448636.36 | 296500.00 |
| Anthracene | | 94705.88 | 337368.42 | 110000.00 | 51000.00 | 124090.90 | 138000.00 |
| Total LPAH | | 596470.58 T | 2003894.73 T | 974687.50 T | 485266.66 T | 1461363.63 T | 1016450.00 T |
| Fluoranthene | | 392352.94 | 3089473.68 | 286875.00 | 138666.66 | 349545.45 | 312500.00 |
| Pyrene | | 430588.23 | 3000000.00 | 454375.00 | 194000.00 | 513636.36 | 520000.00 |
| Benzo(a)anthracene | | 92941.17 | 652631.57 | 75000.00 | 32933.33 | 61818.18 | 177500.00 |
| Chrysene | | 140588.23 | 747368.42 | 136875.00 | 56466.66 | 90000.00 | 280500.00 |
| Total Benzofluoranthene | | 189529.41 T | 616842.10 T | 203750.00 T | 91266.66 T | 142363.63 T | 343500.00 T |
| Benzo(a)pyrene | | 77058.82 | 231578.94 | 83750.00 | 38466.66 | 58181.81 | 129500.00 |
| Indeno(1,2,3-cd)pyrene | | 34000.00 | 74736.84 | 29812.50 | 17066.66 | 24636.36 | 44550.00 |
| Dibenz(a,h)anthracene | | 11529.41 | 22368.42 | 10062.50 | 4973.33 | 7636.36 | 12600.00 J |
| Benzo(g,h,i)perylene | | 31882.35 | 53684.21 | 29687.50 | 14866.66 | 23590.90 | 39150.00 |
| Total HPAH | | 1400470.58 T | 8488684.21 T | 1310187.50 T | 588706.66 T | 1271409.09 T | 1859800.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 115494.70 T | 372205.26 T | 119068.12 T | 55469.13 T | 85181.81 T | 190520.50 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 14.00 UJ | | | 14.00 UJ | 8.30 UJ | |
| Aroclor 1221 | | 14.00 UJ | | | 14.00 UJ | 8.30 UJ | |
| Aroclor 1232 | | 14.00 UJ | | | 14.00 UJ | 8.30 UJ | |
| Aroclor 1242 | | 28.00 J | | | 18.00 J | 8.30 UJ | |
| Aroclor 1248 | | 14.00 UJ | | | 14.00 UJ | 8.30 UJ | |
| Aroclor 1254 | | 30.00 J | | | 48.00 | 64.00 | |
| Aroclor 1260 | | 51.00 | | | 38.00 | 100.00 | |
| Total PCB | | 109.00 T | | | 104.00 T | 164.00 T | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 6411.76 T | | | 6933.33 T | 7454.54 T | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 0.40 U | | | 0.40 U | 0.40 U | |
| Total TCDF | | 6.70 | | | 2.50 | 1.50 | |
| 2378-TCDD | | 0.40 U | | | 0.40 U | 0.40 U | |
| Total TCDD | | 21.00 | | | 12.00 | 5.80 | |
| 12378-PeCDF | | 2.00 U | | | 2.00 U | 1.90 U | |
| 23478-PeCDF | | 2.00 U | | | 2.00 U | 1.90 U | |
| Total PeCDF | | 4.50 | | | 20.00 | 5.90 | |
| 12378-PeCDD | | 2.00 U | | | 2.00 U | 1.90 U | |
| Total PeCDD | | 9.30 | | | 2.00 U | 1.90 U | |
| 123478-HxCDF | | 2.00 UE | | | 2.00 UE | 1.90 UE | |
| 123678-HxCDF | | 2.00 U | | | 2.00 U | 1.90 U | |
| 234678-HxCDF | | 2.00 U | | | 2.00 U | 1.90 U | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | 2.00 U | | | 2.00 U | 1.90 U | |
| Total HxCDF | | 21.00 | | | 28.00 | 4.80 | |
| 123478-HxCDD | | 2.00 U | | | 2.00 UI | 1.90 U | |
| 123678-HxCDD | | 8.10 | | | 2.00 UI | 3.40 | |
| 123789-HxCDD | | 2.00 U | | | 2.00 U | 1.90 U | |
| Total HxCDD | | 86.00 | | | 110.00 | 43.00 | |
| 1234678-HpCDF | | 38.00 | | | 77.00 | 11.00 | |
| 1234789-HpCDF | | 2.00 U | | | 2.00 UI | 1.90 U | |
| Total HpCDF | | 160.00 | | | 270.00 | 47.00 | |
| 1234678-HpCDD | | 220.00 | | | 220.00 | 89.00 | |
| Total HpCDD | | 660.00 | | | 690.00 | 370.00 | |
| OCDF | | 170.00 | | | 260.00 | 43.00 | |
| OCDD | | 2400.00 | | | 2100.00 | 850.00 | |
| Total 2,3,7,8-TCDD(Equiv) | | 5.96 T | | | 5.33 T | 2.23 T | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 350.58 T | | | 355.33 T | 101.50 T | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | 0.36 | | | 0.26 | 0.72 | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.70 | 1.90 | 1.60 | 1.50 | 2.20 | 2.00 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | 1.00 | | | | |
| 4750-2000 microns-Fractional | | 1.00 | | | 1.00 | 1.00 | |
| 2000-1000 microns-Fractional | | | 1.00 | | 1.00 | 3.00 | |
| 1000-500 microns-Fractional | | 5.00 | 3.00 | | 5.00 | 3.00 | |
| 500-250 microns-Fractional % | | 21.00 | 13.00 | | 22.00 | 11.00 | |
| 250-125 microns-Fractional % | | 13.00 | 18.00 | | 26.00 | 18.00 | |
| 125-62.4 microns-Fractional | | 17.00 | 18.00 | | 17.00 | 18.00 | |
| Total Percent Sand | | 56.00 T | 53.00 T | | 71.00 T | 53.00 T | |
| 62.5-31.2 microns-Fractional | | 16.00 | 16.00 | | 8.00 | 14.00 | |
| 31.2-15.6 microns-Fractional | | 9.00 | 10.00 | | 6.00 | 8.00 | |
| 15.6-7.8 microns-Fractional | | 4.00 | 4.00 | | 3.00 | 5.00 | |
| 7.8-3.9 microns-Fractional % | | 3.00 | 4.00 | | 2.00 | 5.00 | |
| 3.9-1.9 microns-Fractional % | | 3.00 | 3.00 | | 3.00 | 3.00 | |
| 1.9-0.9 microns-Fractional % | | 3.00 | 3.00 | | 1.00 | 3.00 | |
| < 0.9 microns-Fractional % | | 4.00 | 4.00 | | 4.00 | 5.00 | |
| Balance-Fractional % | | 1.00 | 2.00 | | 1.00 | 3.00 | |
| Total Percent Fines | | 43.00 T | 46.00 T | | 28.00 T | 46.00 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 11.00 U | 15.10 U | 8.40 U | 19.40 U | 13.20 U | |
| 2-Methylnaphthalene | | 1940.00 | 2240.00 | 1110.00 | 7910.00 | 591.00 | 560.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 229.00 | 82.20 | 109.00 | 3090.00 | 111.00 | |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 1260.00 | 1470.00 | 765.00 | 4570.00 | 458.00 | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 325.00 | 297.00 | 248.00 | 635.00 | 252.00 | |
| Naphthalene | | 7680.00 | 7260.00 | 4160.00 | 29600.00 | 2360.00 | 1610.00 |
| Acenaphthylene | | 249.00 | 145.00 | 158.00 | 411.00 | 169.00 | 93.30 |
| Acenaphthene | | 1970.00 | 2720.00 | 1670.00 | 7990.00 | 915.00 | 899.00 |
| Fluorene | | 1860.00 | 2680.00 | 1690.00 | 9410.00 | 751.00 | 744.00 |
| Phenanthrene | | 5300.00 | 7610.00 | 4550.00 | 24400.00 | 2060.00 | 1950.00 |
| Anthracene | | 1470.00 | 1920.00 | 1120.00 | 20200.00 | 849.00 | 602.00 |
| Total LPAH | | 18529.00 T | 22335.00 T | 13348.00 T | 92011.00 T | 7104.00 T | 5898.30 T |
| Fluoranthene | | 3940.00 | 5820.00 | 3950.00 | 21800.00 | 2120.00 | 1670.00 |
| Pyrene | | 4320.00 | 6320.00 | 4800.00 | 25600.00 | 2400.00 | 3000.00 |
| Benzo(a)anthracene | | 664.00 | 902.00 | 636.00 | 4730.00 | 598.00 | 389.00 |
| Chrysene | | 871.00 | 1060.00 | 869.00 | 6130.00 | 853.00 | 527.00 |
| Benzo(b)fluoranthene | | 1250.00 | 1400.00 | 1100.00 | 6480.00 | 1040.00 | 772.00 |
| Benzo(k)fluoranthene | | 398.00 | 436.00 | 369.00 | 2110.00 | 371.00 | 262.00 |
| Total Benzofluoranthene | | 1648.00 T | 1836.00 T | 1469.00 T | 8590.00 T | 1411.00 T | 1034.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 669.00 | 709.00 | 596.00 | 3460.00 | 613.00 | 439.00 |
| Indeno(1,2,3-cd)pyrene | | 275.00 | 293.00 | 291.00 | 1240.00 | 278.00 | 208.00 |
| Dibenz(a,h)anthracene | | 84.70 | 84.70 | 87.50 | 398.00 | 78.00 | 20.20 J |
| Benzo(g,h,i)perylene | | 264.00 | 282.00 | 269.00 | 1030.00 | 263.00 | 223.00 |
| Total HPAH | | 12735.70 T | 17306.70 T | 12967.50 T | 72978.00 T | 8614.00 T | 7510.20 T |
| Total B(a)P equivalent | | 977.45 T | 1058.62 T | 890.75 T | 5130.23 T | 887.16 T | 599.24 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 138571.42 | 124444.44 | 69375.00 | 359545.45 | 42214.28 | 37333.33 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 548571.42 | 403333.33 | 260000.00 | 1345454.54 | 168571.42 | 107333.33 |
| Acenaphthylene | | 17785.71 | 8055.55 | 9875.00 | 18681.81 | 12071.42 | 6220.00 |
| Acenaphthene | | 140714.28 | 151111.11 | 104375.00 | 363181.81 | 65357.14 | 59933.33 |
| Fluorene | | 132857.14 | 148888.88 | 105625.00 | 427727.27 | 53642.85 | 49600.00 |
| Phenanthrene | | 378571.42 | 422777.77 | 284375.00 | 1109090.90 | 147142.85 | 130000.00 |
| Anthracene | | 105000.00 | 106666.66 | 70000.00 | 918181.81 | 60642.85 | 40133.33 |
| Total LPAH | | 1323500.00 T | 1240833.33 T | 834250.00 T | 4162318.18 T | 507428.57 T | 393220.00 T |
| Fluoranthene | | 281428.57 | 323333.33 | 246875.00 | 990909.09 | 151428.57 | 111333.33 |
| Pyrene | | 308571.42 | 351111.11 | 300000.00 | 1163636.36 | 171428.57 | 200000.00 |
| Benzo(a)anthracene | | 47428.57 | 50111.11 | 39750.00 | 215000.00 | 42714.28 | 25933.33 |
| Chrysene | | 62214.28 | 58888.88 | 54312.50 | 278636.36 | 60928.57 | 35133.33 |
| Total Benzofluoranthene | | 117714.28 T | 102000.00 T | 91812.50 T | 390454.54 T | 100785.71 T | 68933.33 T |
| Benzo(a)pyrene | | 47785.71 | 39388.88 | 37250.00 | 157272.72 | 43785.71 | 29266.66 |
| Indeno(1,2,3-cd)pyrene | | 19642.85 | 16277.77 | 18187.50 | 56363.63 | 19857.14 | 13866.66 |
| Dibenz(a,h)anthracene | | 6050.00 | 4705.55 | 5468.75 | 18090.90 | 5571.42 | 1346.66 J |
| Benzo(g,h,i)perylene | | 18857.14 | 15666.66 | 16812.50 | 46818.18 | 18785.71 | 14866.66 |
| Total HPAH | | 909692.85 T | 961483.33 T | 810468.75 T | 3317181.81 T | 615285.71 T | 500680.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 69817.92 T | 58812.22 T | 55672.43 T | 233192.27 T | 63368.78 T | 39949.80 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | 14.00 UJ | | 8.80 UJ | | |
| Aroclor 1221 | | | 14.00 UJ | | 8.80 UJ | | |
| Aroclor 1232 | | | 14.00 UJ | | 8.80 UJ | | |
| Aroclor 1242 | | | 29.00 J | | 29.00 J | | |
| Aroclor 1248 | | | 14.00 UJ | | 8.80 UJ | | |
| Aroclor 1254 | | | 66.00 | | 250.00 J | | |
| Aroclor 1260 | | | 41.00 | | 130.00 | | |
| Total PCB | | | 136.00 T | | 409.00 T | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | 7555.55 T | | 18590.90 T | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | 3.20 | | 7.60 | | |
| Total TCDF | | | 15.00 | | 100.00 | | |
| 2378-TCDD | | | 0.40 U | | 0.40 U | | |
| Total TCDD | | | 51.00 | | 79.00 | | |
| 12378-PeCDF | | | 2.00 U | | 3.30 | | |
| 23478-PeCDF | | | 2.00 U | | 6.30 | | |
| Total PeCDF | | | 19.00 | | 73.00 | | |
| 12378-PeCDD | | | 2.00 U | | 1.90 UI | | |
| Total PeCDD | | | 25.00 | | 48.00 | | |
| 123478-HxCDF | | | 2.00 UE | | 1.90 UE | | |
| 123678-HxCDF | | | 2.00 U | | 4.10 | | |
| 234678-HxCDF | | | 2.00 U | | 5.40 | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | 2.00 U | | 4.00 | | |
| Total HxCDF | | | 16.00 | | 68.00 | | |
| 123478-HxCDD | | | 2.00 U | | 1.90 UI | | |
| 123678-HxCDD | | | 9.10 | | 25.00 | | |
| 123789-HxCDD | | | 4.10 | | 14.00 | | |
| Total HxCDD | | | 150.00 | | 330.00 | | |
| 1234678-HpCDF | | | 40.00 | | 140.00 | | |
| 1234789-HpCDF | | | 3.90 | | 9.80 | | |
| Total HpCDF | | | 190.00 | | 560.00 | | |
| 1234678-HpCDD | | | 290.00 | | 740.00 | | |
| Total HpCDD | | | 950.00 | | 2500.00 | | |
| OCDF | | | 200.00 | | 430.00 | | |
| OCDD | | | 3400.00 | | 7500.00 | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 8.57 T | | 26.15 T | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 476.61 T | | 1188.77 T | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.24 | | 0.44 | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.40 | 1.80 | 1.60 | 2.20 | 1.40 | 1.50 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | 4.00 | 3.00 | | |
| 4750-2000 microns-Fractional | | | 4.00 | 7.00 | 4.00 | | |
| 2000-1000 microns-Fractional | | | 2.00 | 3.00 | 2.00 | | |
| 1000-500 microns-Fractional | | | 7.00 | 6.00 | 3.00 | | |
| 500-250 microns-Fractional % | | | 28.00 | 12.00 | 6.00 | | |
| 250-125 microns-Fractional % | | | 18.00 | 12.00 | 13.00 | | |
| 125-62.4 microns-Fractional | | | 14.00 | 15.00 | 24.00 | | |
| Total Percent Sand | | | 69.00 T | 48.00 T | 48.00 T | | |
| 62.5-31.2 microns-Fractional | | | 8.00 | 14.00 | 14.00 | | |
| 31.2-15.6 microns-Fractional | | | 5.00 | 9.00 | 8.00 | | |
| 15.6-7.8 microns-Fractional | | | 3.00 | 3.00 | 5.00 | | |
| 7.8-3.9 microns-Fractional % | | | 2.00 | 5.00 | 4.00 | | |
| 3.9-1.9 microns-Fractional % | | | 2.00 | 3.00 | 4.00 | | |
| 1.9-0.9 microns-Fractional % | | | 2.00 | 3.00 | 3.00 | | |
| < 0.9 microns-Fractional % | | | 4.00 | 4.00 | 4.00 | | |
| Balance-Fractional % | | | 1.00 | | 3.00 | | |
| Total Percent Fines | | | 27.00 T | 41.00 T | 45.00 T | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB091 SD2-EB91-0000 0 to 10 cm | EB094 SD2-EB94-0000 0 to 10 cm | EB095 SD2-EB95-0000 0 to 10 cm | EB096 SD2-EB96-0000 0 to 10 cm | EB097 SD2-EB97-0000 0 to 10 cm | EB098 SD2-EB98-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 7.00 U | | | | 9.80 U | |
| 2-Methylnaphthalene | | 140.00 | 15.60 | 150.00 | 404.00 | 812.00 | 362.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 21.70 | | | | 152.00 | |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 79.90 | | | | 636.00 | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 123.00 | | | | 313.00 | |
| Naphthalene | | 504.00 | 59.80 | 610.00 | 1630.00 | 3920.00 | 1340.00 |
| Acenaphthylene | | 62.60 | 10.20 J | 108.00 | 109.00 | 178.00 | 92.50 |
| Acenaphthene | | 135.00 | 19.60 | 237.00 | 654.00 | 1100.00 | 541.00 |
| Fluorene | | 143.00 | 21.00 | 253.00 | 526.00 | 971.00 | 472.00 |
| Phenanthrene | | 541.00 | 95.70 | 736.00 | 1580.00 | 3130.00 | 1740.00 |
| Anthracene | | 221.00 | 41.70 | 293.00 | 518.00 | 967.00 | 818.00 |
| Total LPAH | | 1606.60 T | 248.00 T | 2237.00 T | 5017.00 T | 10266.00 T | 5003.50 T |
| Fluoranthene | | 630.00 | 164.00 | 957.00 | 1520.00 | 2630.00 | 1520.00 |
| Pyrene | | 876.00 | 187.00 | 1150.00 | 3970.00 | 4670.00 | 3630.00 |
| Benzo(a)anthracene | | 219.00 | 61.10 | 276.00 | 498.00 | 617.00 | 1170.00 |
| Chrysene | | 326.00 | 100.00 | 346.00 | 722.00 | 980.00 | 2930.00 |
| Benzo(b)fluoranthene | | 475.00 | 129.00 | 609.00 | 1130.00 | 1340.00 | 1620.00 |
| Benzo(k)fluoranthene | | 182.00 | 48.10 | 238.00 | 346.00 | 507.00 | 635.00 |
| Total Benzofluoranthene | | 657.00 T | 177.10 T | 847.00 T | 1476.00 T | 1847.00 T | 2255.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB091 SD2-EB91-0000 0 to 10 cm | EB094 SD2-EB94-0000 0 to 10 cm | EB095 SD2-EB95-0000 0 to 10 cm | EB096 SD2-EB96-0000 0 to 10 cm | EB097 SD2-EB97-0000 0 to 10 cm | EB098 SD2-EB98-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 300.00 | 84.20 | 389.00 | 712.00 | 806.00 | 1070.00 |
| Indeno(1,2,3-cd)pyrene | | 175.00 | 45.30 | 218.00 | 306.00 | 409.00 | 491.00 |
| Dibenz(a,h)anthracene | | 45.30 | 4.20 J | 15.80 J | 27.00 J | 116.00 | 41.90 |
| Benzo(g,h,i)perylene | | 161.00 | 46.40 | 218.00 | 310.00 | 392.00 | 481.00 |
| Total HPAH | | 3389.30 T | 869.30 T | 4416.80 T | 9541.00 T | 12467.00 T | 13588.90 T |
| Total B(a)P equivalent | | 434.34 T | 112.52 T | 517.82 T | 936.58 T | 1164.65 T | 1449.28 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 25000.00 | | 13636.36 | 31076.92 | 50750.00 | 30166.66 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 90000.00 | | 55454.54 | 125384.61 | 245000.00 | 111666.66 |
| Acenaphthylene | | 11178.57 | | 9818.18 | 8384.61 | 11125.00 | 7708.33 |
| Acenaphthene | | 24107.14 | | 21545.45 | 50307.69 | 68750.00 | 45083.33 |
| Fluorene | | 25535.71 | | 23000.00 | 40461.53 | 60687.50 | 39333.33 |
| Phenanthrene | | 96607.14 | | 66909.09 | 121538.46 | 195625.00 | 145000.00 |
| Anthracene | | 39464.28 | | 26636.36 | 39846.15 | 60437.50 | 68166.66 |
| Total LPAH | | 286892.85 T | | 203363.63 T | 385923.07 T | 641625.00 T | 416958.33 T |
| Fluoranthene | | 112500.00 | | 87000.00 | 116923.07 | 164375.00 | 126666.66 |
| Pyrene | | 156428.57 | | 104545.45 | 305384.61 | 291875.00 | 302500.00 |
| Benzo(a)anthracene | | 39107.14 | | 25090.90 | 38307.69 | 38562.50 | 97500.00 |
| Chrysene | | 58214.28 | | 31454.54 | 55538.46 | 61250.00 | 244166.66 |
| Total Benzofluoranthene | | 117321.42 T | | 77000.00 T | 113538.46 T | 115437.50 T | 187916.66 T |
| Benzo(a)pyrene | | 53571.42 | | 35363.63 | 54769.23 | 50375.00 | 89166.66 |
| Indeno(1,2,3-cd)pyrene | | 31250.00 | | 19818.18 | 23538.46 | 25562.50 | 40916.66 |
| Dibenz(a,h)anthracene | | 8089.28 | | 1436.36 J | 2076.92 J | 7250.00 | 3491.66 |
| Benzo(g,h,i)perylene | | 28750.00 | | 19818.18 | 23846.15 | 24500.00 | 40083.33 |
| Total HPAH | | 605232.14 T | | 401527.27 T | 733923.07 T | 779187.50 T | 1132408.33 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB091 | EB094 | EB095 | EB096 | EB097 | EB098 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB91-0000 | SD2-EB94-0000 | SD2-EB95-0000 | SD2-EB96-0000 | SD2-EB97-0000 | SD2-EB98-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| Total B(a)P equivalent | | 77561.78 T | | 47075.09 T | 72044.76 T | 72790.62 T | 120773.33 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | |
| Total TCDF | | | | | | | |
| 2378-TCDD | | | | | | | |
| Total TCDD | | | | | | | |
| 12378-PeCDF | | | | | | | |
| 23478-PeCDF | | | | | | | |
| Total PeCDF | | | | | | | |
| 12378-PeCDD | | | | | | | |
| Total PeCDD | | | | | | | |
| 123478-HxCDF | | | | | | | |
| 123678-HxCDF | | | | | | | |
| 234678-HxCDF | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB091 / SD2-EB91-0000 / 0 to 10 cm | EB094 / SD2-EB94-0000 / 0 to 10 cm | EB095 / SD2-EB95-0000 / 0 to 10 cm | EB096 / SD2-EB96-0000 / 0 to 10 cm | EB097 / SD2-EB97-0000 / 0 to 10 cm | EB098 / SD2-EB98-0000 / 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | | | | |
| Total HxCDF | | | | | | | |
| 123478-HxCDD | | | | | | | |
| 123678-HxCDD | | | | | | | |
| 123789-HxCDD | | | | | | | |
| Total HxCDD | | | | | | | |
| 1234678-HpCDF | | | | | | | |
| 1234789-HpCDF | | | | | | | |
| Total HpCDF | | | | | | | |
| 1234678-HpCDD | | | | | | | |
| Total HpCDD | | | | | | | |
| OCDF | | | | | | | |
| OCDD | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB091 SD2-EB91-0000 0 to 10 cm | EB094 SD2-EB94-0000 0 to 10 cm | EB095 SD2-EB95-0000 0 to 10 cm | EB096 SD2-EB96-0000 0 to 10 cm | EB097 SD2-EB97-0000 0 to 10 cm | EB098 SD2-EB98-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.56 | 0.33 | 1.10 | 1.30 | 1.60 | 1.20 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | 3.00 | |
| 4750-2000 microns-Fractional | | 1.00 | | | | 4.00 | |
| 2000-1000 microns-Fractional | | | | | | 2.00 | |
| 1000-500 microns-Fractional | | | | | | 5.00 | |
| 500-250 microns-Fractional % | | 3.00 | | | | 12.00 | |
| 250-125 microns-Fractional % | | 18.00 | | | | 14.00 | |
| 125-62.4 microns-Fractional | | 43.00 | | | | 17.00 | |
| Total Percent Sand | | 64.00 T | | | | 50.00 T | |
| 62.5-31.2 microns-Fractional | | 16.00 | | | | 12.00 | |
| 31.2-15.6 microns-Fractional | | 6.00 | | | | 8.00 | |
| 15.6-7.8 microns-Fractional | | 3.00 | | | | 4.00 | |
| 7.8-3.9 microns-Fractional % | | 2.00 | | | | 5.00 | |
| 3.9-1.9 microns-Fractional % | | 1.00 | | | | 4.00 | |
| 1.9-0.9 microns-Fractional % | | 2.00 | | | | 4.00 | |
| < 0.9 microns-Fractional % | | 2.00 | | | | 4.00 | |
| Balance-Fractional % | | 3.00 | | | | 2.00 | |
| Total Percent Fines | | 35.00 T | | | | 43.00 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB099 | EB100 | EB101 | EB102 | EB103 | EB104 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB99-0000 | SD2-EB100-0000 | SD2-EB101-0000 | SD2-EB102-0000 | SD2-EB103-0000 | SD2-EB104-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | | 8.60 U | | | | 19.20 U |
| 2-Methylnaphthalene | | 296.00 | 537.00 | 187.00 | 321.00 | 698.00 | 5770.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | | 96.80 | | | | 1450.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | | 417.00 | | | | 4270.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | 156.00 | | | | 401.00 |
| Naphthalene | | 1280.00 | 2290.00 | 626.00 | 1120.00 | 4420.00 | 24100.00 |
| Acenaphthylene | | 57.40 | 98.40 | 40.60 | 48.00 | 107.00 | 238.00 |
| Acenaphthene | | 401.00 | 900.00 | 306.00 | 473.00 | 932.00 | 8740.00 |
| Fluorene | | 352.00 | 723.00 | 277.00 | 411.00 | 823.00 | 8880.00 |
| Phenanthrene | | 1070.00 | 1810.00 | 867.00 | 1200.00 | 3830.00 | 21200.00 |
| Anthracene | | 412.00 | 699.00 | 292.00 | 362.00 | 644.00 | 9130.00 |
| Total LPAH | | 3572.40 T | 6520.40 T | 2408.60 T | 3614.00 T | 10756.00 T | 72288.00 T |
| Fluoranthene | | 1020.00 | 1920.00 | 905.00 | 1020.00 | 1870.00 | 19600.00 |
| Pyrene | | 1800.00 | 3110.00 | 1320.00 | 1380.00 | 3500.00 | 28200.00 |
| Benzo(a)anthracene | | 375.00 | 427.00 | 259.00 | 290.00 | 396.00 | 2790.00 |
| Chrysene | | 568.00 | 642.00 | 358.00 | 375.00 | 486.00 | 3740.00 |
| Benzo(b)fluoranthene | | 1080.00 | 910.00 | 614.00 | 678.00 | 664.00 | 3140.00 |
| Benzo(k)fluoranthene | | 350.00 | 368.00 | 204.00 | 229.00 | 259.00 | 925.00 |
| Total Benzofluoranthene | | 1430.00 T | 1278.00 T | 818.00 T | 907.00 T | 923.00 T | 4065.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Sheded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099 SD2-EB99-0000 0 to 10 cm | EB100 SD2-EB100-0000 0 to 10 cm | EB101 SD2-EB101-0000 0 to 10 cm | EB102 SD2-EB102-0000 0 to 10 cm | EB103 SD2-EB103-0000 0 to 10 cm | EB104 SD2-EB104-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 723.00 | 534.00 | 400.00 | 353.00 | 408.00 | 1550.00 |
| Indeno(1,2,3-cd)pyrene | | 334.00 | 269.00 | 181.00 | 181.00 | 187.00 | 514.00 |
| Dibenz(a,h)anthracene | | 29.60 J | 88.30 | 14.40 J | 54.40 | 56.40 | 174.00 |
| Benzo(g,h,i)perylene | | 307.00 | 255.00 | 180.00 | 188.00 | 200.00 | 471.00 |
| Total HPAH | | 6586.60 T | 8523.30 T | 4435.40 T | 4748.40 T | 8026.40 T | 61014.00 T |
| Total B(a)P equivalent | | 935.56 T | 787.22 T | 522.19 T | 524.96 T | 592.17 T | 2372.39 T |
| ***Semi-Volatile Organic Compounds - TOCN (ug/kg)*** | | | | | | | |
| 2-Methylnaphthalene | | 24666.66 | 31588.23 | 13357.14 | 32755.10 | 63454.54 | 262272.72 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 106666.66 | 134705.88 | 44714.28 | 114285.71 | 401818.18 | 1095454.54 |
| Acenaphthylene | | 4783.33 | 5788.23 | 2900.00 | 4897.95 | 9727.27 | 10818.18 |
| Acenaphthene | | 33416.66 | 52941.17 | 21857.14 | 48265.30 | 84727.27 | 397272.72 |
| Fluorene | | 29333.33 | 42529.41 | 19785.71 | 41938.77 | 74818.18 | 403636.36 |
| Phenanthrene | | 89166.66 | 106470.58 | 61928.57 | 122448.97 | 348181.81 | 963636.36 |
| Anthracene | | 34333.33 | 41117.64 | 20857.14 | 36938.77 | 58545.45 | 415000.00 |
| *Total LPAH* | | *297700.00* T | 383552.94 T | *172042.85* T | 368775.51 T | 977818.18 T | 3285818.18 T |
| Fluoranthene | | 85000.00 | 112941.17 | 64642.85 | 104081.63 | 170000.00 | 890909.09 |
| Pyrene | | 150000.00 | 182941.17 | 94285.71 | 140816.32 | 318181.81 | 1281818.18 |
| Benzo(a)anthracene | | 31250.00 | 25117.64 | 18500.00 | 29591.83 | 36000.00 | 122727.27 |
| Chrysene | | 47333.33 | 37764.70 | 25571.42 | 38265.30 | 44181.81 | 170000.00 |
| Total Benzofluoranthene | | 119166.66 T | 75176.47 T | 58428.57 T | 92551.02 T | 83909.09 T | 184772.72 T |
| Benzo(a)pyrene | | 60250.00 | 31411.76 | 28571.42 | 36020.40 | 37090.90 | 70454.54 |
| Indeno(1,2,3-cd)pyrene | | 27833.33 | 15823.52 | 12928.57 | 18469.38 | 17000.00 | 23363.63 |
| Dibenz(a,h)anthracene | | 2466.66 J | 5194.11 | 1028.57 J | 5551.02 | 5127.27 | 7909.09 |
| Benzo(g,h,i)perylene | | 25583.33 | 15000.00 | 12857.14 | 19183.67 | 18181.81 | 21409.09 |
| Total HPAH | | 548883.33 T | 501370.58 T | 316814.28 T | 484530.61 T | 729672.72 T | 2773363.63 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099 SD2-EB99-0000 0 to 10 cm | EB100 SD2-EB100-0000 0 to 10 cm | EB101 SD2-EB101-0000 0 to 10 cm | EB102 SD2-EB102-0000 0 to 10 cm | EB103 SD2-EB103-0000 0 to 10 cm | EB104 SD2-EB104-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 77964.00 T | 46307.17 T | 37299.85 T | 53567.85 T | 53834.18 T | 107835.90 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | 8.90 UJ |
| Aroclor 1221 | | | | | | | 8.90 UJ |
| Aroclor 1232 | | | | | | | 8.90 UJ |
| Aroclor 1242 | | | | | | | 16.00 J |
| Aroclor 1248 | | | | | | | 8.90 UJ |
| Aroclor 1254 | | | | | | | 79.00 |
| Aroclor 1260 | | | | | | | 62.00 |
| Total PCB | | | | | | | 157.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | 7136.36 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | 2.60 |
| Total TCDF | | | | | | | 19.00 |
| 2378-TCDD | | | | | | | 0.40 U |
| Total TCDD | | | | | | | 22.00 |
| 12378-PeCDF | | | | | | | 2.00 U |
| 23478-PeCDF | | | | | | | 2.00 U |
| Total PeCDF | | | | | | | 20.00 |
| 12378-PeCDD | | | | | | | 2.00 U |
| Total PeCDD | | | | | | | 8.40 |
| 123478-HxCDF | | | | | | | 2.00 UE |
| 123678-HxCDF | | | | | | | 2.00 U |
| 234678-HxCDF | | | | | | | 2.00 U |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB099 | EB100 | EB101 | EB102 | EB103 | EB104 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB99-0000 | SD2-EB100-0000 | SD2-EB101-0000 | SD2-EB102-0000 | SD2-EB103-0000 | SD2-EB104-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| 123789-HxCDF | | | | | | | 2.00 U |
| Total HxCDF | | | | | | | 19.00 |
| 123478-HxCDD | | | | | | | 2.00 UI |
| 123678-HxCDD | | | | | | | 10.00 |
| 123789-HxCDD | | | | | | | 2.00 UI |
| Total HxCDD | | | | | | | 170.00 |
| 1234678-HpCDF | | | | | | | 60.00 |
| 1234789-HpCDF | | | | | | | 2.00 UI |
| Total HpCDF | | | | | | | 260.00 |
| 1234678-HpCDD | | | | | | | 380.00 |
| Total HpCDD | | | | | | | 1300.00 |
| OCDF | | | | | | | 240.00 |
| OCDD | | | | | | | 4000.00 |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | 9.90 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | 450.00 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | 0.27 |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099 SD2-EB99-0000 0 to 10 cm | EB100 SD2-EB100-0000 0 to 10 cm | EB101 SD2-EB101-0000 0 to 10 cm | EB102 SD2-EB102-0000 0 to 10 cm | EB103 SD2-EB103-0000 0 to 10 cm | EB104 SD2-EB104-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.20 | 1.70 | 1.40 | 0.98 | 1.10 | 2.20 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | 2.00 | | | | 2.00 |
| 4750-2000 microns-Fractional | | | 1.00 | | | | 5.00 |
| 2000-1000 microns-Fractional | | | 2.00 | | | | 3.00 |
| 1000-500 microns-Fractional | | | 4.00 | | | | 4.00 |
| 500-250 microns-Fractional % | | | 10.00 | | | | 8.00 |
| 250-125 microns-Fractional % | | | 11.00 | | | | 17.00 |
| 125-62.4 microns-Fractional | | | 15.00 | | | | 22.00 |
| Total Percent Sand | | | 42.00 T | | | | 54.00 T |
| 62.5-31.2 microns-Fractional | | | 13.00 | | | | 14.00 |
| 31.2-15.6 microns-Fractional | | | 11.00 | | | | 5.00 |
| 15.6-7.8 microns-Fractional | | | 6.00 | | | | 5.00 |
| 7.8-3.9 microns-Fractional % | | | 7.00 | | | | 4.00 |
| 3.9-1.9 microns-Fractional % | | | 4.00 | | | | 2.00 |
| 1.9-0.9 microns-Fractional % | | | 5.00 | | | | 3.00 |
| < 0.9 microns-Fractional % | | | 8.00 | | | | 3.00 |
| Balance-Fractional % | | | 1.00 | | | | 3.00 |
| Total Percent Fines | | | 55.00 T | | | | 39.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105 SD2-EB105-0000 0 to 10 cm | EB106 SD2-EB106-0000 0 to 10 cm | EB107 SD2-EB107-0000 0 to 10 cm | EB108 SD2-EB108-0000 0 to 10 cm | EB109 SD2-EB109-0000 0 to 10 cm | EB110 SD2-EB110-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 7.00 U | 16.30 U | 7.60 U | 8.90 U | 39.00 U | |
| 2-Methylnaphthalene | | 2560.00 | 148.00 | 109.00 | 98.60 | 128.00 | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 326.00 | 108.00 | 31.50 | 23.40 | 31.10 J | |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 1820.00 | 167.00 | 66.80 | 60.10 | 78.50 | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 325.00 | 115.00 | 221.00 | 254.00 | 153.00 | |
| Naphthalene | | 6700.00 | 525.00 | 340.00 | 361.00 | 665.00 | |
| Acenaphthylene | | 171.00 | 108.00 | 50.50 | 82.30 | 79.50 | |
| Acenaphthene | | 3560.00 | 405.00 | 147.00 | 81.00 | 106.00 | |
| Fluorene | | 3260.00 | 460.00 | 163.00 | 109.00 | 111.00 | |
| Phenanthrene | | 7570.00 | 1460.00 | 626.00 | 541.00 | 563.00 | |
| Anthracene | | 2080.00 | 747.00 | 300.00 | 381.00 | 259.00 | |
| Total LPAH | | 25341.00 T | 3705.00 T | 1626.50 T | 1555.30 T | 1783.50 T | |
| Fluoranthene | | 6120.00 | 1910.00 | 901.00 | 813.00 | 664.00 | |
| Pyrene | | 6680.00 | 2280.00 | 1430.00 | 1020.00 | 853.00 | |
| Benzo(a)anthracene | | 804.00 | 1010.00 | 344.00 | 533.00 | 212.00 | |
| Chrysene | | 1010.00 | 1590.00 | 460.00 | 853.00 | 345.00 | |
| Benzo(b)fluoranthene | | 1560.00 | 1960.00 | 763.00 | 1330.00 | 401.00 | |
| Benzo(k)fluoranthene | | 410.00 | 690.00 | 282.00 | 416.00 | 169.00 | |
| Total Benzofluoranthene | | 1970.00 T | 2650.00 T | 1045.00 T | 1746.00 T | 570.00 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105<br>SD2-EB105-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm | EB107<br>SD2-EB107-0000<br>0 to 10 cm | EB108<br>SD2-EB108-0000<br>0 to 10 cm | EB109<br>SD2-EB109-0000<br>0 to 10 cm | EB110<br>SD2-EB110-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 754.00 | 1200.00 | 479.00 | 905.00 | 252.00 | |
| Indeno(1,2,3-cd)pyrene | | 323.00 | 524.00 | 250.00 | 539.00 | 140.00 | |
| Dibenz(a,h)anthracene | | 100.00 | 155.00 | 77.10 | 155.00 | 38.90 J | |
| Benzo(g,h,i)perylene | | 299.00 | 446.00 | 230.00 | 538.00 | 151.00 | |
| Total HPAH | | 18060.00 T | 11765.00 T | 5216.10 T | 7102.00 T | 3225.90 T | |
| Total B(a)P equivalent | | 1127.81 T | 1712.89 T | 695.08 T | 1305.21 T | 368.23 T | |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 170666.66 | 11384.61 | 9083.33 | 4108.33 | 11636.36 | |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 580000.00 | 40384.61 | 28333.33 | 15041.66 | 60454.54 | |
| Acenaphthylene | | 11400.00 | 8307.69 | 4208.33 | 3429.16 | 7227.27 | |
| Acenaphthene | | 237333.33 | 31153.84 | 12250.00 | 3375.00 | 9636.36 | |
| Fluorene | | 217333.33 | 35384.61 | 13583.33 | 4541.66 | 10090.90 | |
| Phenanthrene | | 504666.66 | 112307.69 | 52166.66 | 22541.66 | 51181.81 | |
| Anthracene | | 138666.66 | 57461.53 | 25000.00 | 15875.00 | 23545.45 | |
| Total LPAH | | 1689400.00 T | 285000.00 T | 135541.66 T | 64804.16 T | 162136.36 T | |
| Fluoranthene | | 408000.00 | 146923.07 | 75083.33 | 33875.00 | 60363.63 | |
| Pyrene | | 445333.33 | 175384.61 | 119166.66 | 42500.00 | 77545.45 | |
| Benzo(a)anthracene | | 53600.00 | 77692.30 | 28666.66 | 22208.33 | 19272.72 | |
| Chrysene | | 67333.33 | 122307.69 | 38333.33 | 35541.66 | 31363.63 | |
| Total Benzofluoranthene | | 131333.33 T | 203846.15 T | 87083.33 T | 72750.00 T | 51818.18 T | |
| Benzo(a)pyrene | | 50266.66 | 92307.69 | 39916.66 | 37708.33 | 22909.09 | |
| Indeno(1,2,3-cd)pyrene | | 21533.33 | 40307.69 | 20833.33 | 22458.33 | 12727.27 | |
| Dibenz(a,h)anthracene | | 6666.66 | 11923.07 | 6425.00 | 6458.33 | 3536.36 J | |
| Benzo(g,h,i)perylene | | 19933.33 | 34307.69 | 19166.66 | 22416.66 | 13727.27 | |
| Total HPAH | | 1204000.00 T | 905000.00 T | 434675.00 T | 295916.66 T | 293263.63 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105<br>SD2-EB105-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm | EB107<br>SD2-EB107-0000<br>0 to 10 cm | EB108<br>SD2-EB108-0000<br>0 to 10 cm | EB109<br>SD2-EB109-0000<br>0 to 10 cm | EB110<br>SD2-EB110-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 75187.33 T | 131760.76 T | 57923.33 T | 54383.87 T | 33475.90 T | |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | 7.30 UJ | | | | |
| Aroclor 1221 | | | 7.30 UJ | | | | |
| Aroclor 1232 | | | 7.30 UJ | | | | |
| Aroclor 1242 | | | 60.00 J | | | | |
| Aroclor 1248 | | | 7.30 UJ | | | | |
| Aroclor 1254 | | | 170.00 J | | | | |
| Aroclor 1260 | | | 56.00 | | | | |
| Total PCB | | | 286.00 T | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | 22000.00 T | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | 0.40 U | | | | |
| Total TCDF | | | 1.30 | | | | |
| 2378-TCDD | | | 0.40 U | | | | |
| Total TCDD | | | 1.40 | | | | |
| 12378-PeCDF | | | 2.00 U | | | | |
| 23478-PeCDF | | | 2.00 U | | | | |
| Total PeCDF | | | 30.00 | | | | |
| 12378-PeCDD | | | 2.00 U | | | | |
| Total PeCDD | | | 2.00 U | | | | |
| 123478-HxCDF | | | 2.00 UE | | | | |
| 123678-HxCDF | | | 2.00 UE | | | | |
| 234678-HxCDF | | | 3.40 | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105<br>SD2-EB105-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm | EB107<br>SD2-EB107-0000<br>0 to 10 cm | EB108<br>SD2-EB108-0000<br>0 to 10 cm | EB109<br>SD2-EB109-0000<br>0 to 10 cm | EB110<br>SD2-EB110-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | 3.30 | | | | |
| Total HxCDF | | | 41.00 | | | | |
| 123478-HxCDD | | | 2.00 U | | | | |
| 123678-HxCDD | | | 14.00 | | | | |
| 123789-HxCDD | | | 5.10 | | | | |
| Total HxCDD | | | 240.00 | | | | |
| 1234678-HpCDF | | | 64.00 | | | | |
| 1234789-HpCDF | | | 2.00 UI | | | | |
| Total HpCDF | | | 280.00 | | | | |
| 1234678-HpCDD | | | 560.00 | | | | |
| Total HpCDD | | | 1800.00 | | | | |
| OCDF | | | 230.00 | | | | |
| OCDD | | | 6000.00 | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 15.05 T | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 1157.69 T | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.21 | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105 SD2-EB105-0000 0 to 10 cm | EB106 SD2-EB106-0000 0 to 10 cm | EB107 SD2-EB107-0000 0 to 10 cm | EB108 SD2-EB108-0000 0 to 10 cm | EB109 SD2-EB109-0000 0 to 10 cm | EB110 SD2-EB110-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.50 | 1.30 | 1.20 | 2.40 | 1.10 | 1.10 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | 1.00 | 2.00 | 1.00 | |
| 4750-2000 microns-Fractional | | 1.00 | | 2.00 | 3.00 | 2.00 | |
| 2000-1000 microns-Fractional | | 1.00 | 1.00 | 1.00 | 3.00 | 3.00 | |
| 1000-500 microns-Fractional | | 4.00 | 2.00 | 3.00 | 13.00 | 3.00 | |
| 500-250 microns-Fractional % | | 18.00 | 12.00 | 11.00 | 28.00 | 8.00 | |
| 250-125 microns-Fractional % | | 16.00 | 13.00 | 16.00 | 11.00 | 9.00 | |
| 125-62.4 microns-Fractional | | 19.00 | 9.00 | 31.00 | 9.00 | 24.00 | |
| Total Percent Sand | | 58.00 T | 37.00 T | 62.00 T | 64.00 T | 47.00 T | |
| 62.5-31.2 microns-Fractional | | 14.00 | 17.00 | 16.00 | 10.00 | 22.00 | |
| 31.2-15.6 microns-Fractional | | 7.00 | 18.00 | 6.00 | 6.00 | 9.00 | |
| 15.6-7.8 microns-Fractional | | 4.00 | 9.00 | 3.00 | 3.00 | 4.00 | |
| 7.8-3.9 microns-Fractional % | | 4.00 | 6.00 | 2.00 | 4.00 | 2.00 | |
| 3.9-1.9 microns-Fractional % | | 3.00 | 3.00 | 2.00 | 2.00 | 2.00 | |
| 1.9-0.9 microns-Fractional % | | 2.00 | 3.00 | 1.00 | 3.00 | 1.00 | |
| < 0.9 microns-Fractional % | | 4.00 | 5.00 | 2.00 | 3.00 | 6.00 | |
| Balance-Fractional % | | 3.00 | 2.00 | 3.00 | | 4.00 | |
| Total Percent Fines | | 41.00 T | 63.00 T | 35.00 T | 31.00 T | 50.00 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB111<br>SD2-EB111-0000<br>0 to 10 cm | EB112<br>SD2-EB112-0000<br>0 to 10 cm | EB115<br>SD3-EB115-0000<br>0.0 to 10 cm | EB116<br>SD3-EB116-0000<br>0.0 to 10 cm | EB117<br>SD3-EB117-0000<br>0.0 to 10 cm | EB118<br>SD3-EB118-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | | | 11.40 U | 10.40 U | 8.00 U | 7.50 U |
| 2-Methylnaphthalene | | | | 590.00 | 777.00 | 66.40 | 62.50 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | | | 851.00 | 261.00 | 54.00 J | 19.50 |
| Dibenzofuran | | | | 1390.00 | 1290.00 | 154.00 | 70.30 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | | | | | |
| Naphthalene | | | | 2650.00 | 4650.00 | 210.00 | 37.80 |
| Acenaphthylene | | | | 260.00 | 222.00 | 61.20 | 12.60 |
| Acenaphthene | | | | 1340.00 | 1260.00 | 111.00 | 30.40 |
| Fluorene | | | | 4030.00 | 1380.00 | 148.00 | 51.40 |
| Phenanthrene | | | | 13600.00 | 7080.00 | 680.00 | 246.00 |
| Anthracene | | | | 12100.00 | 1630.00 | 288.00 | 65.30 |
| Total LPAH | | | | 33980.00 T | 16222.00 T | 1498.20 T | 443.50 T |
| Fluoranthene | | | | 20000.00 | 7710.00 | 5050.00 | 403.00 |
| Pyrene | | | | 17300.00 | 11500.00 | 3490.00 | 373.00 |
| Benzo(a)anthracene | | | | 6630.00 | 2900.00 | 835.00 | 136.00 |
| Chrysene | | | | 9000.00 | 4580.00 | 1920.00 | 262.00 |
| Benzo(b)fluoranthene | | | | 8650.00 | 6960.00 | 1150.00 | 254.00 |
| Benzo(k)fluoranthene | | | | 1270.00 | 912.00 | 350.00 | 96.80 |
| Total Benzofluoranthene | | | | 9920.00 T | 7872.00 T | 1500.00 T | 350.80 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB111 | EB112 | EB115 | EB116 | EB117 | EB118 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB111-0000 | SD2-EB112-0000 | SD3-EB115-0000 | SD3-EB116-0000 | SD3-EB117-0000 | SD3-EB118-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| Benzo(a)pyrene | | | | 5480.00 | 4250.00 | 650.00 | 157.00 |
| Indeno(1,2,3-cd)pyrene | | | | 1360.00 | 1070.00 | 286.00 | 90.80 |
| Dibenz(a,h)anthracene | | | | 325.00 | 276.00 | 93.60 | 42.80 |
| Benzo(g,h,i)perylene | | | | 1360.00 | 1020.00 | 281.00 | 88.20 |
| Total HPAH | | | | 71375.00 T | 41178.00 T | 14105.60 T | 1903.60 T |
| Total B(a)P equivalent | | | | 7490.70 T | 5632.70 T | 976.12 T | 249.11 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | | 28095.23 | 27750.00 | 3320.00 | 7352.94 |
| Dibenzofuran | | | | 66190.47 | 46071.42 | 7700.00 | 8270.58 |
| Naphthalene | | | | 126190.47 | 166071.42 | 10500.00 | 4447.05 |
| Acenaphthylene | | | | 12380.95 | 7928.57 | 3060.00 | 1482.35 |
| Acenaphthene | | | | 63809.52 | 45000.00 | 5550.00 | 3576.47 |
| Fluorene | | | | 191904.76 | 49285.71 | 7400.00 | 6047.05 |
| Phenanthrene | | | | 647619.04 | 252857.14 | 34000.00 | 28941.17 |
| Anthracene | | | | 576190.47 | 58214.28 | 14400.00 | 7682.35 |
| Total LPAH | | | | 1618095.23 T | 579357.14 T | 74910.00 T | 52176.47 T |
| Fluoranthene | | | | 952380.95 | 275357.14 | 252500.00 | 47411.76 |
| Pyrene | | | | 823809.52 | 410714.28 | 174500.00 | 43882.35 |
| Benzo(a)anthracene | | | | 315714.28 | 103571.42 | 41750.00 | 16000.00 |
| Chrysene | | | | 428571.42 | 163571.42 | 96000.00 | 30823.52 |
| Total Benzofluoranthene | | | | 472380.95 T | 281142.85 T | 75000.00 T | 41270.58 T |
| Benzo(a)pyrene | | | | 260952.38 | 151785.71 | 32500.00 | 18470.58 |
| Indeno(1,2,3-cd)pyrene | | | | 64761.90 | 38214.28 | 14300.00 | 10682.35 |
| Dibenz(a,h)anthracene | | | | 15476.19 | 9857.14 | 4680.00 | 5035.29 |
| Benzo(g,h,i)perylene | | | | 64761.90 | 36428.57 | 14050.00 | 10376.47 |
| Total HPAH | | | | 3398809.52 T | 1470642.85 T | 705280.00 T | 223952.94 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB111<br>SD2-EB111-0000<br>0 to 10 cm | EB112<br>SD2-EB112-0000<br>0 to 10 cm | EB115<br>SD3-EB115-0000<br>0.0 to 10 cm | EB116<br>SD3-EB116-0000<br>0.0 to 10 cm | EB117<br>SD3-EB117-0000<br>0.0 to 10 cm | EB118<br>SD3-EB118-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | | | 356700.00 T | 201167.85 T | 48806.00 T | 29307.05 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | |
| Total TCDF | | | | | | | |
| 2378-TCDD | | | | | | | |
| Total TCDD | | | | | | | |
| 12378-PeCDF | | | | | | | |
| 23478-PeCDF | | | | | | | |
| Total PeCDF | | | | | | | |
| 12378-PeCDD | | | | | | | |
| Total PeCDD | | | | | | | |
| 123478-HxCDF | | | | | | | |
| 123678-HxCDF | | | | | | | |
| 234678-HxCDF | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB111 | EB112 | EB115 | EB116 | EB117 | EB118 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB111-0000 | SD2-EB112-0000 | SD3-EB115-0000 | SD3-EB116-0000 | SD3-EB117-0000 | SD3-EB118-0000 |
| **Constituent** | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| 123789-HxCDF | | | | | | | |
| Total HxCDF | | | | | | | |
| 123478-HxCDD | | | | | | | |
| 123678-HxCDD | | | | | | | |
| 123789-HxCDD | | | | | | | |
| Total HxCDD | | | | | | | |
| 1234678-HpCDF | | | | | | | |
| 1234789-HpCDF | | | | | | | |
| Total HpCDF | | | | | | | |
| 1234678-HpCDD | | | | | | | |
| Total HpCDD | | | | | | | |
| OCDF | | | | | | | |
| OCDD | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB111<br>SD2-EB111-0000<br>0 to 10 cm | EB112<br>SD2-EB112-0000<br>0 to 10 cm | EB115<br>SD3-EB115-0000<br>0.0 to 10 cm | EB116<br>SD3-EB116-0000<br>0.0 to 10 cm | EB117<br>SD3-EB117-0000<br>0.0 to 10 cm | EB118<br>SD3-EB118-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.20 | 1.00 | 2.10 | 2.80 | 2.00 | 0.85 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB119 | EB120 | EB121 | EB122 | EB123 | EB124 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB119-0000 | SD3-EB120-0000 | SD3-EB121-0000 | SD3-EB122-0000 | SD3-EB123-0000 | SD3-EB124-0000 |
| Constituent | Depth (cm bgs): | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 8.20 U | 7.40 U | 8.00 U | 8.10 U | 8.00 U | 8.00 U |
| 2-Methylnaphthalene | | 41.00 | 23.50 | 238.00 | 409.00 | 325.00 | 175.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 36.90 | 12.80 | 73.80 | 74.80 | 68.50 | 46.00 J |
| Dibenzofuran | | 72.60 | 39.80 | 316.00 | 554.00 | 494.00 | 294.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | | | | | |
| Naphthalene | | 121.00 | 69.80 | 888.00 | 2250.00 | 902.00 | 586.00 |
| Acenaphthylene | | 33.50 | 14.20 | 112.00 | 82.10 | 57.50 | 42.40 |
| Acenaphthene | | 98.80 | 30.40 | 395.00 | 512.00 | 458.00 | 320.00 |
| Fluorene | | 94.10 | 44.80 | 385.00 | 502.00 | 449.00 | 316.00 |
| Phenanthrene | | 507.00 | 207.00 | 3550.00 | 2360.00 | 2310.00 | 983.00 |
| Anthracene | | 162.00 | 95.60 | 689.00 | 542.00 | 459.00 | 312.00 |
| Total LPAH | | 1016.40 T | 461.80 T | 6019.00 T | 6248.10 T | 4635.50 T | 2559.40 T |
| Fluoranthene | | 766.00 | 401.00 | 3150.00 | 2470.00 | 2280.00 | 1030.00 |
| Pyrene | | 936.00 | 337.00 | 4770.00 | 2770.00 | 2820.00 | 2380.00 |
| Benzo(a)anthracene | | 330.00 | 246.00 | 755.00 | 438.00 | 449.00 | 336.00 |
| Chrysene | | 481.00 | 341.00 | 1020.00 | 674.00 | 605.00 | 410.00 |
| Benzo(b)fluoranthene | | 701.00 | 446.00 | 1200.00 | 840.00 | 833.00 | 696.00 |
| Benzo(k)fluoranthene | | 239.00 | 128.00 | 324.00 | 341.00 | 318.00 | 248.00 |
| Total Benzofluoranthene | | 940.00 T | 574.00 T | 1524.00 T | 1181.00 T | 1151.00 T | 944.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB119 SD3-EB119-0000 0.0 to 10 cm | EB120 SD3-EB120-0000 0.0 to 10 cm | EB121 SD3-EB121-0000 0.0 to 10 cm | EB122 SD3-EB122-0000 0.0 to 10 cm | EB123 SD3-EB123-0000 0.0 to 10 cm | EB124 SD3-EB124-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 536.00 | 270.00 | 912.00 | 597.00 | 599.00 | 486.00 |
| Indeno(1,2,3-cd)pyrene | | 280.00 | 130.00 | 409.00 | 281.00 | 284.00 | 233.00 |
| Dibenz(a,h)anthracene | | 91.30 | 53.40 | 125.00 | 93.10 | 87.00 | 74.90 |
| Benzo(g,h,i)perylene | | 293.00 | 110.00 | 472.00 | 262.00 | 296.00 | 241.00 |
| Total HPAH | | 4653.30 T | 2462.40 T | 13137.00 T | 8766.10 T | 8571.00 T | 6134.90 T |
| Total B(a)P equivalent | | 761.27 T | 407.22 T | 1277.66 T | 850.08 T | 846.38 T | 690.29 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 5394.73 | 1119.04 | 19833.33 | 34083.33 | 23214.28 | 9722.22 |
| Dibenzofuran | | 9552.63 | 1895.23 | 26333.33 | 46166.66 | 35285.71 | 16333.33 |
| Naphthalene | | 15921.05 | 3323.80 | 74000.00 | 187500.00 | 64428.57 | 32555.55 |
| Acenaphthylene | | 4407.89 | 676.19 | 9333.33 | 6841.66 | 4107.14 | 2355.55 |
| Acenaphthene | | 13000.00 | 1447.61 | 32916.66 | 42666.66 | 32714.28 | 17777.77 |
| Fluorene | | 12381.57 | 2133.33 | 32083.33 | 41833.33 | 32071.42 | 17555.55 |
| Phenanthrene | | 66710.52 | 9857.14 | 295833.33 | 196666.66 | 165000.00 | 54611.11 |
| Anthracene | | 21315.78 | 4552.38 | 57416.66 | 45166.66 | 32785.71 | 17333.33 |
| Total LPAH | | 133736.84 T | 21990.47 T | 501583.33 T | 520675.00 T | 331107.14 T | 142188.88 T |
| Fluoranthene | | 100789.47 | 19095.23 | 262500.00 | 205833.33 | 162857.14 | 57222.22 |
| Pyrene | | 123157.89 | 16047.61 | 397500.00 | 230833.33 | 201428.57 | 132222.22 |
| Benzo(a)anthracene | | 43421.05 | 11714.28 | 62916.66 | 36500.00 | 32071.42 | 18666.66 |
| Chrysene | | 63289.47 | 16238.09 | 85000.00 | 56166.66 | 43214.28 | 22777.77 |
| Total Benzofluoranthene | | 123684.21 T | 27333.33 T | 127000.00 T | 98416.66 T | 82214.28 T | 52444.44 T |
| Benzo(a)pyrene | | 70526.31 | 12857.14 | 76000.00 | 49750.00 | 42785.71 | 27000.00 |
| Indeno(1,2,3-cd)pyrene | | 36842.10 | 6190.47 | 34083.33 | 23416.66 | 20285.71 | 12944.44 |
| Dibenz(a,h)anthracene | | 12013.15 | 2542.85 | 10416.66 | 7758.33 | 6214.28 | 4161.11 |
| Benzo(g,h,i)perylene | | 38552.63 | 5238.09 | 39333.33 | 21833.33 | 21142.85 | 13388.88 |
| Total HPAH | | 612276.31 T | 117257.14 T | 1094750.00 T | 730508.33 T | 612214.28 T | 340827.77 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB119 | EB120 | EB121 | EB122 | EB123 | EB124 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB119-0000 | SD3-EB120-0000 | SD3-EB121-0000 | SD3-EB122-0000 | SD3-EB123-0000 | SD3-EB124-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| Total B(a)P equivalent | | 100167.23 T | 19391.47 T | 106471.66 T | 70840.33 T | 60456.07 T | 38349.44 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs** - TOCN (ug/kg) | | | | | | | |
| Total PCB | | | | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | |
| Total TCDF | | | | | | | |
| 2378-TCDD | | | | | | | |
| Total TCDD | | | | | | | |
| 12378-PeCDF | | | | | | | |
| 23478-PeCDF | | | | | | | |
| Total PeCDF | | | | | | | |
| 12378-PeCDD | | | | | | | |
| Total PeCDD | | | | | | | |
| 123478-HxCDF | | | | | | | |
| 123678-HxCDF | | | | | | | |
| 234678-HxCDF | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB119<br>SD3-EB119-0000<br>0.0 to 10 cm | EB120<br>SD3-EB120-0000<br>0.0 to 10 cm | EB121<br>SD3-EB121-0000<br>0.0 to 10 cm | EB122<br>SD3-EB122-0000<br>0.0 to 10 cm | EB123<br>SD3-EB123-0000<br>0.0 to 10 cm | EB124<br>SD3-EB124-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | | | | |
| Total HxCDF | | | | | | | |
| 123478-HxCDD | | | | | | | |
| 123678-HxCDD | | | | | | | |
| 123789-HxCDD | | | | | | | |
| Total HxCDD | | | | | | | |
| 1234678-HpCDF | | | | | | | |
| 1234789-HpCDF | | | | | | | |
| Total HpCDF | | | | | | | |
| 1234678-HpCDD | | | | | | | |
| Total HpCDD | | | | | | | |
| OCDF | | | | | | | |
| OCDD | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB119 | EB120 | EB121 | EB122 | EB123 | EB124 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB119-0000 | SD3-EB120-0000 | SD3-EB121-0000 | SD3-EB122-0000 | SD3-EB123-0000 | SD3-EB124-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.76 | 2.10 | 1.20 | 1.20 | 1.40 | 1.80 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9.microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125 SD3-EB125-0000 0.0 to 10 cm | EB126 SD3-EB126-0000 0.0 to 10 cm | EB127 SD3-EB127-0000 0.0 to 10 cm | EB128 SD3-EB128-0000 0.0 to 10 cm | EB129 SD3-EB129-0000 0.0 to 10 cm | EB130 SD3-EB130-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 8.80 U | 9.10 U | 8.80 U | 7.20 U | 7.70 U | 8.90 U |
| 2-Methylnaphthalene | | 174.00 | 493.00 | 189.00 | 298.00 | 260.00 | 73.10 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 41.00 | 158.00 J | 51.60 J | 53.50 | 49.80 J | 19.00 |
| Dibenzofuran | | 285.00 | 847.00 | 363.00 | 366.00 | 432.00 | 75.50 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | | | | | |
| Naphthalene | | 756.00 | 5650.00 | 1240.00 | 856.00 | 1200.00 | 255.00 |
| Acenaphthylene | | 45.20 | 105.00 | 63.10 | 52.20 | 110.00 | 36.00 |
| Acenaphthene | | 277.00 | 824.00 | 297.00 | 307.00 | 390.00 | 73.70 |
| Fluorene | | 287.00 | 721.00 | 359.00 | 277.00 | 374.00 | 82.40 |
| Phenanthrene | | 771.00 | 3470.00 | 996.00 | 954.00 | 1070.00 | 379.00 |
| Anthracene | | 226.00 | 799.00 | 387.00 | 303.00 | 452.00 | 210.00 |
| Total LPAH | | 2362.20 T | 11569.00 T | 3342.10 T | 2749.20 T | 3596.00 T | 1036.10 T |
| Fluoranthene | | 813.00 | 3350.00 | 1130.00 | 977.00 | 1590.00 | 508.00 |
| Pyrene | | 1340.00 | 6600.00 | 1890.00 | 2030.00 | 2610.00 | 764.00 |
| Benzo(a)anthracene | | 238.00 | 729.00 | 336.00 | 219.00 | 304.00 | 401.00 |
| Chrysene | | 322.00 | 1060.00 | 474.00 | 308.00 | 480.00 | 732.00 |
| Benzo(b)fluoranthene | | 562.00 | 3140.00 | 849.00 | 509.00 | 864.00 | 546.00 |
| Benzo(k)fluoranthene | | 226.00 | 615.00 | 305.00 | 213.00 | 85.20 | 226.00 |
| Total Benzofluoranthene | | 788.00 T | 3755.00 T | 1154.00 T | 722.00 T | 949.20 T | 772.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125 SD3-EB125-0000 0.0 to 10 cm | EB126 SD3-EB126-0000 0.0 to 10 cm | EB127 SD3-EB127-0000 0.0 to 10 cm | EB128 SD3-EB128-0000 0.0 to 10 cm | EB129 SD3-EB129-0000 0.0 to 10 cm | EB130 SD3-EB130-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 377.00 | 1170.00 | 592.00 | 325.00 | 443.00 | 344.00 |
| Indeno(1,2,3-cd)pyrene | | 197.00 | 529.00 | 330.00 | 166.00 | 200.00 | 161.00 |
| Dibenz(a,h)anthracene | | 68.70 | 142.00 | 102.00 | 55.80 | 59.90 | 57.00 |
| Benzo(g,h,i)perylene | | 204.00 | 589.00 | 354.00 | 170.00 | 190.00 | 162.00 |
| Total HPAH | | 4347.70 T | 17924.00 T | 6362.00 T | 4972.80 T | 6826.10 T | 3901.00 T |
| Total B(a)P equivalent | | 547.98 T | 1759.01 T | 849.02 T | 472.63 T | 641.03 T | 514.79 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 9157.89 | 29000.00 | 10500.00 | 16555.55 | 21666.66 | 8306.81 |
| Dibenzofuran | | 15000.00 | 49823.52 | 20166.66 | 20333.33 | 36000.00 | 8579.54 |
| Naphthalene | | 39789.47 | 332352.94 | 68888.88 | 47555.55 | 100000.00 | 28977.27 |
| Acenaphthylene | | 2378.94 | 6176.47 | 3505.55 | 2900.00 | 9166.66 | 4090.90 |
| Acenaphthene | | 14578.94 | 48470.58 | 16500.00 | 17055.55 | 32500.00 | 8375.00 |
| Fluorene | | 15105.26 | 42411.76 | 19944.44 | 15388.88 | 31166.66 | 9363.63 |
| Phenanthrene | | 40578.94 | 204117.64 | 55333.33 | 53000.00 | 89166.66 | 43068.18 |
| Anthracene | | 11894.73 | 47000.00 | 21500.00 | 16833.33 | 37666.66 | 23863.63 |
| Total LPAH | | 124326.31 T | 680529.41 T | 185672.22 T | 152733.33 T | 299666.66 T | 117738.63 T |
| Fluoranthene | | 42789.47 | 197058.82 | 62777.77 | 54277.77 | 132500.00 | 57727.27 |
| Pyrene | | 70526.31 | 388235.29 | 105000.00 | 112777.77 | 217500.00 | 86818.18 |
| Benzo(a)anthracene | | 12526.31 | 42882.35 | 18666.66 | 12166.66 | 25333.33 | 45568.18 |
| Chrysene | | 16947.36 | 62352.94 | 26333.33 | 17111.11 | 40000.00 | 83181.81 |
| Total Benzofluoranthene | | 41473.68 T | 220882.35 T | 64111.11 T | 40111.11 T | 79100.00 T | 87727.27 T |
| Benzo(a)pyrene | | 19842.10 | 68823.52 | 32888.88 | 18055.55 | 36916.66 | 39090.90 |
| Indeno(1,2,3-cd)pyrene | | 10368.42 | 31117.64 | 18333.33 | 9222.22 | 16666.66 | 18295.45 |
| Dibenz(a,h)anthracene | | 3615.78 | 8352.94 | 5666.66 | 3100.00 | 4991.66 | 6477.27 |
| Benzo(g,h,i)perylene | | 10736.84 | 34647.05 | 19666.66 | 9444.44 | 15833.33 | 18409.09 |
| Total HPAH | | 228826.31 T | 1054352.94 T | 353444.44 T | 276266.66 T | 568841.66 T | 443295.45 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB125 | EB126 | EB127 | EB128 | EB129 | EB130 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB125-0000 | SD3-EB126-0000 | SD3-EB127-0000 | SD3-EB128-0000 | SD3-EB129-0000 | SD3-EB130-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| Total B(a)P equivalent | | 28841.15 T | 103471.17 T | 47168.00 T | 26257.66 T | 53419.33 T | 58499.09 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | |
| Total TCDF | | | | | | | |
| 2378-TCDD | | | | | | | |
| Total TCDD | | | | | | | |
| 12378-PeCDF | | | | | | | |
| 23478-PeCDF | | | | | | | |
| Total PeCDF | | | | | | | |
| 12378-PeCDD | | | | | | | |
| Total PeCDD | | | | | | | |
| 123478-HxCDF | | | | | | | |
| 123678-HxCDF | | | | | | | |
| 234678-HxCDF | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125 SD3-EB125-0000 0.0 to 10 cm | EB126 SD3-EB126-0000 0.0 to 10 cm | EB127 SD3-EB127-0000 0.0 to 10 cm | EB128 SD3-EB128-0000 0.0 to 10 cm | EB129 SD3-EB129-0000 0.0 to 10 cm | EB130 SD3-EB130-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | | | | |
| Total HxCDF | | | | | | | |
| 123478-HxCDD | | | | | | | |
| 123678-HxCDD | | | | | | | |
| 123789-HxCDD | | | | | | | |
| Total HxCDD | | | | | | | |
| 1234678-HpCDF | | | | | | | |
| 1234789-HpCDF | | | | | | | |
| Total HpCDF | | | | | | | |
| 1234678-HpCDD | | | | | | | |
| Total HpCDD | | | | | | | |
| OCDF | | | | | | | |
| OCDD | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125<br>SD3-EB125-0000<br>0.0 to 10 cm | EB126<br>SD3-EB126-0000<br>0.0 to 10 cm | EB127<br>SD3-EB127-0000<br>0.0 to 10 cm | EB128<br>SD3-EB128-0000<br>0.0 to 10 cm | EB129<br>SD3-EB129-0000<br>0.0 to 10 cm | EB130<br>SD3-EB130-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.90 | 1.70 | 1.80 | 1.80 | 1.20 | 0.88 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB131 | EB132 | EB133 | EB135 | EB136 | EB137 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB131-0000 | SD3-EB132-0000 | SD3-EB133-0000 | SD3-EB135-0000 | SD3-EB136-0000 | SD3-EB137-0000 |
| **Constituent** | Depth (cm bgs): | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 8.80 U | 9.10 U | 8.40 U | 10.50 U | 8.60 U | 8.90 U |
| 2-Methylnaphthalene | | 58.70 | 67.50 | 54.90 | 160.00 | 194.00 | 315.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 29.20 | 9.10 U | 8.40 U | 10.50 U | 15.30 | 8.90 U |
| Dibenzofuran | | 90.10 | 109.00 | 76.90 | 251.00 | 334.00 | 319.00 |
| Naphthalene, 1-methyl | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | | | | | |
| Naphthalene | | 221.00 | 311.00 | 158.00 | 996.00 | 1350.00 | 1390.00 |
| Acenaphthylene | | 26.00 | 21.30 | 14.40 | 32.40 | 20.70 | 50.70 |
| Acenaphthene | | 87.10 | 98.80 | 66.80 | 172.00 | 259.00 | 305.00 |
| Fluorene | | 80.40 | 90.80 | 72.20 | 212.00 | 351.00 | 245.00 |
| Phenanthrene | | 330.00 | 389.00 | 406.00 | 698.00 | 1240.00 | 865.00 |
| Anthracene | | 129.00 | 129.00 | 96.80 | 220.00 | 588.00 | 234.00 |
| Total LPAH | | 873.50 T | 1039.90 T | 814.20 T | 2330.40 T | 3808.70 T | 3089.70 T |
| Fluoranthene | | 497.00 | 572.00 | 656.00 | 873.00 | 1290.00 | 848.00 |
| Pyrene | | 625.00 | 795.00 | 915.00 | 1490.00 | 1380.00 | 1260.00 |
| Benzo(a)anthracene | | 192.00 | 202.00 | 278.00 | 296.00 | 722.00 | 214.00 |
| Chrysene | | 288.00 | 321.00 | 405.00 | 455.00 | 966.00 | 350.00 |
| Benzo(b)fluoranthene | | 424.00 | 404.00 | 500.00 | 696.00 | 1180.00 | 395.00 |
| Benzo(k)fluoranthene | | 181.00 | 179.00 | 207.00 | 362.00 | 430.00 | 166.00 |
| Total Benzofluoranthene | | 605.00 T | 583.00 T | 707.00 T | 1058.00 T | 1610.00 T | 561.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131 SD3-EB131-0000 0.0 to 10 cm | EB132 SD3-EB132-0000 0.0 to 10 cm | EB133 SD3-EB133-0000 0.0 to 10 cm | EB135 SD3-EB135-0000 0.0 to 10 cm | EB136 SD3-EB136-0000 0.0 to 10 cm | EB137 SD3-EB137-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 296.00 | 270.00 | 363.00 | 511.00 | 840.00 | 273.00 |
| Indeno(1,2,3-cd)pyrene | | 190.00 | 171.00 | 226.00 | 279.00 | 396.00 | 181.00 |
| Dibenz(a,h)anthracene | | 66.40 | 62.70 | 72.00 | 97.90 | 151.00 | 61.30 |
| Benzo(g,h,i)perylene | | 170.00 | 160.00 | 217.00 | 256.00 | 383.00 | 161.00 |
| Total HPAH | | 2929.40 T | 3136.70 T | 3839.00 T | 5315.90 T | 7738.00 T | 3909.30 T |
| Total B(a)P equivalent | | 445.09 T | 412.51 T | 537.87 T | 740.07 T | 1226.06 T | 415.31 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 4192.85 | 4821.42 | 3921.42 | 10000.00 | 12933.33 | 22500.00 |
| Dibenzofuran | | 6435.71 | 7785.71 | 5492.85 | 15687.50 | 22266.66 | 22785.71 |
| Naphthalene | | 15785.71 | 22214.28 | 11285.71 | 62250.00 | 90000.00 | 99285.71 |
| Acenaphthylene | | 1857.14 | 1521.42 | 1028.57 | 2025.00 | 1380.00 | 3621.42 |
| Acenaphthene | | 6221.42 | 7057.14 | 4771.42 | 10750.00 | 17266.66 | 21785.71 |
| Fluorene | | 5742.85 | 6485.71 | 5157.14 | 13250.00 | 23400.00 | 17500.00 |
| Phenanthrene | | 23571.42 | 27785.71 | 29000.00 | 43625.00 | 82666.66 | 61785.71 |
| Anthracene | | 9214.28 | 9214.28 | 6914.28 | 13750.00 | 39200.00 | 16714.28 |
| Total LPAH | | 62392.85 T | 74278.57 T | 58157.14 T | 145650.00 T | 253913.33 T | 220692.85 T |
| Fluoranthene | | 35500.00 | 40857.14 | 46857.14 | 54562.50 | 86000.00 | 60571.42 |
| Pyrene | | 44642.85 | 56785.71 | 65357.14 | 93125.00 | 92000.00 | 90000.00 |
| Benzo(a)anthracene | | 13714.28 | 14428.57 | 19857.14 | 18500.00 | 48133.33 | 15285.71 |
| Chrysene | | 20571.42 | 22928.57 | 28928.57 | 28437.50 | 64400.00 | 25000.00 |
| Total Benzofluoranthene | | 43214.28 T | 41642.85 T | 50500.00 T | 66125.00 T | 107333.33 T | 40071.42 T |
| Benzo(a)pyrene | | 21142.85 | 19285.71 | 25928.57 | 31937.50 | 56000.00 | 19500.00 |
| Indeno(1,2,3-cd)pyrene | | 13571.42 | 12214.28 | 16142.85 | 17437.50 | 26400.00 | 12928.57 |
| Dibenz(a,h)anthracene | | 4742.85 | 4478.57 | 5142.85 | 6118.75 | 10066.66 | 4378.57 |
| Benzo(g,h,i)perylene | | 12142.85 | 11428.57 | 15500.00 | 16000.00 | 25533.33 | 11500.00 |
| Total HPAH | | 209242.85 T | 224050.00 T | 274214.28 T | 332243.75 T | 515866.66 T | 279235.71 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB131 | EB132 | EB133 | EB135 | EB136 | EB137 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB131-0000 | SD3-EB132-0000 | SD3-EB133-0000 | SD3-EB135-0000 | SD3-EB136-0000 | SD3-EB137-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| Total B(a)P equivalent | | 31792.71 T | 29465.07 T | 38419.64 T | 46254.68 T | 81737.73 T | 29665.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | | | | | | |
| Total TCDF | | | | | | | |
| 2378-TCDD | | | | | | | |
| Total TCDD | | | | | | | |
| 12378-PeCDF | | | | | | | |
| 23478-PeCDF | | | | | | | |
| Total PeCDF | | | | | | | |
| 12378-PeCDD | | | | | | | |
| Total PeCDD | | | | | | | |
| 123478-HxCDF | | | | | | | |
| 123678-HxCDF | | | | | | | |
| 234678-HxCDF | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131 SD3-EB131-0000 0.0 to 10 cm | EB132 SD3-EB132-0000 0.0 to 10 cm | EB133 SD3-EB133-0000 0.0 to 10 cm | EB135 SD3-EB135-0000 0.0 to 10 cm | EB136 SD3-EB136-0000 0.0 to 10 cm | EB137 SD3-EB137-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | | | | | | |
| Total HxCDF | | | | | | | |
| 123478-HxCDD | | | | | | | |
| 123678-HxCDD | | | | | | | |
| 123789-HxCDD | | | | | | | |
| Total HxCDD | | | | | | | |
| 1234678-HpCDF | | | | | | | |
| 1234789-HpCDF | | | | | | | |
| Total HpCDF | | | | | | | |
| 1234678-HpCDD | | | | | | | |
| Total HpCDD | | | | | | | |
| OCDF | | | | | | | |
| OCDD | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Iron | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131 SD3-EB131-0000 0.0 to 10 cm | EB132 SD3-EB132-0000 0.0 to 10 cm | EB133 SD3-EB133-0000 0.0 to 10 cm | EB135 SD3-EB135-0000 0.0 to 10 cm | EB136 SD3-EB136-0000 0.0 to 10 cm | EB137 SD3-EB137-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.40 | 1.40 | 1.40 | 1.60 | 1.50 | 1.40 |
| Percent Moisture (%) | | | | | | | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| *Total Percent Fines* | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | |
| 2,4-Dimethylphenol | | |
| 2-Chloronaphthalene | | 10.20 U |
| 2-Methylnaphthalene | | 262.00 |
| 2-Methylphenol | | |
| 4-Methylphenol | | |
| Carbazole | | 10.20 U |
| Dibenzofuran | | 364.00 |
| Naphthalene, 1-methyl | | |
| Pentachlorophenol | | |
| Phenol | | |
| Retene | | |
| Naphthalene | | 1350.00 |
| Acenaphthylene | | 33.60 |
| Acenaphthene | | 309.00 |
| Fluorene | | 320.00 |
| Phenanthrene | | 1040.00 |
| Anthracene | | 480.00 |
| Total LPAH | | 3532.60 T |
| Fluoranthene | | 1230.00 |
| Pyrene | | 2170.00 |
| Benzo(a)anthracene | | 609.00 |
| Chrysene | | 1120.00 |
| Benzo(b)fluoranthene | | 1100.00 |
| Benzo(k)fluoranthene | | 409.00 |
| Total Benzofluoranthene | | 1509.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): |
|---|---|
| | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
| Benzo(a)pyrene | 800.00 |
| Indeno(1,2,3-cd)pyrene | 373.00 |
| Dibenz(a,h)anthracene | 132.00 |
| Benzo(g,h,i)perylene | 347.00 |
| Total HPAH | 8290.00 T |
| Total B(a)P equivalent | 1145.41 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | |
| 2-Methylnaphthalene | 15411.76 |
| Dibenzofuran | 21411.76 |
| Naphthalene | 79411.76 |
| Acenaphthylene | 1976.47 |
| Acenaphthene | 18176.47 |
| Fluorene | 18823.52 |
| Phenanthrene | 61176.47 |
| Anthracene | 28235.29 |
| Total LPAH | 207800.00 T |
| Fluoranthene | 72352.94 |
| Pyrene | 127647.05 |
| Benzo(a)anthracene | 35823.52 |
| Chrysene | 65882.35 |
| Total Benzofluoranthene | 88764.70 T |
| Benzo(a)pyrene | 47058.82 |
| Indeno(1,2,3-cd)pyrene | 21941.17 |
| Dibenz(a,h)anthracene | 7764.70 |
| Benzo(g,h,i)perylene | 20411.76 |
| Total HPAH | 487647.05 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): |
|---|---|
| | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
| Total B(a)P equivalent | 67377.05 T |
| **Pesticides/PCBs (ug/kg)** | |
| Aroclor 1016 | |
| Aroclor 1221 | |
| Aroclor 1232 | |
| Aroclor 1242 | |
| Aroclor 1248 | |
| Aroclor 1254 | |
| Aroclor 1260 | |
| Total PCB | |
| **Pesticides/PCBs - TOCN (ug/kg)** | |
| Total PCB | |
| **Dioxins and Furans (ng/kg)** | |
| 2378-TCDF | |
| Total TCDF | |
| 2378-TCDD | |
| Total TCDD | |
| 12378-PeCDF | |
| 23478-PeCDF | |
| Total PeCDF | |
| 12378-PeCDD | |
| Total PeCDD | |
| 123478-HxCDF | |
| 123678-HxCDF | |
| 234678-HxCDF | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| 123789-HxCDF | | |
| Total HxCDF | | |
| 123478-HxCDD | | |
| 123678-HxCDD | | |
| 123789-HxCDD | | |
| Total HxCDD | | |
| 1234678-HpCDF | | |
| 1234789-HpCDF | | |
| Total HpCDF | | |
| 1234678-HpCDD | | |
| Total HpCDD | | |
| OCDF | | |
| OCDD | | |
| Total 2,3,7,8-TCDD(Equiv) | | |
| **Dioxins and Furans - TOCN (ng/kg)** | | |
| *Total 2,3,7,8-TCDD(Equiv)* | | |
| **Inorganics (Total) (mg/kg)** | | |
| Aluminum | | |
| Arsenic | | |
| Cadmium | | |
| Chromium | | |
| Copper | | |
| Iron | | |
| Lead | | |
| Mercury | | |
| Nickel | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-1: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| Zinc | | |
| **Conventional Parameters** | | |
| Total Organic Carbon (%) | | 1.70 |
| Percent Moisture (%) | | |
| **Grain Size (%)** | | |
| >4750 microns-Fractional % | | |
| 4750-2000 microns-Fractional | | |
| 2000-1000 microns-Fractional | | |
| 1000-500 microns-Fractional | | |
| 500-250 microns-Fractional % | | |
| 250-125 microns-Fractional % | | |
| 125-62.4 microns-Fractional | | |
| Total Percent Sand | | |
| 62.5-31.2 microns-Fractional | | |
| 31.2-15.6 microns-Fractional | | |
| 15.6-7.8 microns-Fractional | | |
| 7.8-3.9 microns-Fractional % | | |
| 3.9-1.9 microns-Fractional % | | |
| 1.9-0.9 microns-Fractional % | | |
| < 0.9 microns-Fractional % | | |
| Balance-Fractional % | | |
| Total Percent Fines | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: SQS* *LAET*

*Shaded Cell Standard: CSL* *2LAET*

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 2.94 er | 4.24 er | 1.21 Uer | 1.17 Uer | 7.58 er | 1.36 Uer |
| 2-Methylphenol | | 0.52 Jer | 0.60 Jer | 0.55 Uer | 0.11 Jer | 1.25 er | 0.16 Jer |
| 4-Methylphenol | | 0.21 er | 10.10 er | 2.20 er | 0.05 er | 0.49 er | 0.16 er |
| Pentachlorophenol | | 0.25 Uer | 0.76 Uer | 0.25 Uer | 0.37 Jer | 0.28 Uer | 0.34 Jer |
| Phenol | | 0.06 er | 3.31 er | 0.45 er | 0.37 er | 0.10 er | 0.05 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 1.85 er | 1.51 er | 0.18 er | | 10.10 er | 0.29 er |
| Dibenzofuran | | 3.88 er | 4.50 er | 0.46 Jer | | 12.94 er | 0.54 er |
| Naphthalene | | 0.04 Uer | 1.02 er | 0.27 Jer | | 16.57 er | 0.35 er |
| Acenaphthylene | | 0.78 er | 0.96 er | 0.12 er | | 0.78 er | 0.25 er |
| Acenaphthene | | 4.03 er | 6.90 er | 0.42 Jer | | 13.44 er | 0.46 er |
| Fluorene | | 3.17 er | 8.54 er | 0.42 Jer | | 9.35 er | 0.48 er |
| Phenanthrene | | 1.29 er | 7.22 er | 0.18 Jer | | 4.41 er | 0.27 er |
| Anthracene | | 0.32 er | 1.58 er | 0.06 er | | 0.41 er | 0.08 er |
| Total LPAH | | 1.97 Ter | 8.55 Ter | 0.36 Ter | | 8.95 Ter | 0.49 Ter |
| Fluoranthene | | 4.39 er | 3.22 er | 0.15 er | | 1.26 er | 0.18 er |
| Pyrene | | 2.97 er | 1.76 er | 0.13 er | | 1.69 er | 0.19 er |
| Benzo(a)anthracene | | 4.07 er | 3.31 er | 0.20 Jer | | 0.82 er | 0.37 er |
| Chrysene | | 2.74 er | 3.00 er | 0.18 Jer | | 0.67 er | 0.39 er |
| Total Benzofluoranthene | | 1.54 Ter | 1.85 Ter | 0.18 Ter | | 1.02 Ter | 0.66 Ter |
| Benzo(a)pyrene | | 1.32 er | 1.78 er | 0.16 er | | 0.82 er | 0.57 er |
| Indeno(1,2,3-cd)pyrene | | 1.06 er | 1.58 er | 0.14 er | | 0.59 er | 0.71 er |
| Dibenz(a,h)anthracene | | 0.91 er | 1.32 er | 0.11 Jer | | 0.00 Uer | 0.63 er |
| Benzo(g,h,i)perylene | | 0.90 er | 1.45 er | 0.12 er | | 0.59 er | 0.62 er |
| Total HPAH | | 2.44 Ter | 1.91 Ter | 0.12 Ter | | 0.97 Ter | 0.25 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001<br>SD1-EB01-0000<br>0 to 10 cm | EB002<br>SD1-EB02-0000<br>0 to 10 cm | EB003<br>SD1-EB03-0000<br>0 to 10 cm | EB004<br>SD1-EB04-0000<br>0 to 10 cm | EB005<br>SD1-EB05-0000<br>0 to 10 cm | EB006<br>SD1-EB06-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.26 Ter | | | 0.48 Ter | 1.08 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.22 er | 0.15 Per | 0.04 Uer | 0.04 Uer | 0.04 Uer | 0.16 Per |
| Cadmium | | 0.09 Per | 0.12 Per | 0.04 Uer | 0.05 Per | 0.07 Per | 0.18 er |
| Chromium | | 0.76 er | 0.55 er | 0.03 er | 0.04 er | 0.07 er | 0.23 er |
| Copper | | 1.05 er | 0.80 er | 0.03 er | 0.04 er | 0.10 er | 0.51 er |
| Lead | | 0.15 er | 0.28 er | 0.01 Per | 0.02 Per | 0.05 er | 0.21 er |
| Mercury | | 0.50 er | 0.48 er | 0.03 er | 0.06 er | 0.10 er | 1.13 er |
| Zinc | | 0.25 er | 0.30 er | 0.03 er | 0.05 er | 0.11 er | 0.32 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007 SD1-EB07-0000 0 to 10 cm | EB008 SD1-EB08-0000 0 to 10 cm | EB009 SD1-EB09-0000 0 to 10 cm | EB010 SD1-EB10-0000 0 to 10 cm | EB011 SD1-EB11-0000 0 to 10 cm | EB012 SD1-EB12-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.26 Uer | 1.19 Uer | 45.17 Jer | 1.22 Uer | 1.18 Uer | 2.90 er |
| 2-Methylphenol | | 0.58 Uer | 0.55 Uer | 9.53 Jer | 0.56 Uer | 0.54 Uer | 0.67 Jer |
| 4-Methylphenol | | 0.04 Jer | 0.14 er | 2.26 Jer | 0.36 er | 0.02 Jer | 0.24 er |
| Pentachlorophenol | | 0.22 Jer | 0.28 Jer | 70.86 Uer | 0.25 Uer | 0.24 Uer | 0.42 Uer |
| Phenol | | 0.03 Uer | 0.04 Uer | 8.14 Uer | 0.13 er | 0.08 er | 0.06 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.06 er | 0.16 Jer | | 0.00 Uer | 0.20 er | 0.60 er |
| Dibenzofuran | | 0.12 er | 0.26 Jer | | 0.20 Jer | 0.79 er | 1.36 er |
| Naphthalene | | 0.05 er | 0.14 Jer | | 0.00 Uer | 0.45 er | 0.90 er |
| Acenaphthylene | | 0.05 er | 0.17 Jer | | 0.05 Jer | 0.12 er | 0.45 er |
| Acenaphthene | | 0.11 Jer | 0.25 Jer | | 0.00 Uer | 0.87 er | 1.70 er |
| Fluorene | | 0.14 er | 0.27 Jer | | 0.17 Jer | 0.88 er | 1.10 er |
| Phenanthrene | | 0.09 er | 0.19 Jer | | 0.08 Jer | 0.43 er | 0.44 er |
| Anthracene | | 0.02 er | 0.06 Jer | | 0.01 er | 0.12 er | 0.11 er |
| Total LPAH | | 0.13 Ter | 0.30 Ter | | 0.10 Ter | 0.72 Ter | 0.92 Ter |
| Fluoranthene | | 0.04 er | 0.15 Jer | | 0.06 Jer | 0.19 er | 0.21 er |
| Pyrene | | 0.05 er | 0.13 Jer | | 0.04 Jer | 0.20 er | 1.16 Jer |
| Benzo(a)anthracene | | 0.10 er | 0.28 Jer | | 0.09 er | 0.42 er | 0.34 er |
| Chrysene | | 0.10 er | 0.28 Jer | | 0.07 er | 0.33 er | 0.48 er |
| Total Benzofluoranthene | | 0.14 Ter | 0.50 Ter | | 0.10 Ter | 0.39 Ter | 1.40 Ter |
| Benzo(a)pyrene | | 0.12 er | 0.43 Jer | | 0.08 er | 0.33 er | 0.88 er |
| Indeno(1,2,3-cd)pyrene | | 0.15 er | 0.61 Jer | | 0.09 er | 0.29 er | 0.80 er |
| Dibenz(a,h)anthracene | | 0.13 er | 0.49 Jer | | 0.08 Jer | 0.23 er | 0.69 er |
| Benzo(g,h,i)perylene | | 0.14 Jer | 0.60 Jer | | 0.07 er | 0.24 er | 0.73 er |
| Total HPAH | | 0.05 Ter | 0.19 Ter | | 0.05 Ter | 0.20 Ter | 0.59 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007<br>SD1-EB07-0000<br>0 to 10 cm | EB008<br>SD1-EB08-0000<br>0 to 10 cm | EB009<br>SD1-EB09-0000<br>0 to 10 cm | EB010<br>SD1-EB10-0000<br>0 to 10 cm | EB011<br>SD1-EB11-0000<br>0 to 10 cm | EB012<br>SD1-EB12-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.86 Ter | 1.20 Ter | | 0.08 Ter | 0.16 Ter | 0.21 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.08 Per | 0.13 Per | 0.25 er | 0.05 Per | 0.06 Per | 0.18 Per |
| Cadmium | | 0.24 er | 0.40 er | 0.18 er | 0.04 Uer | 0.04 Uer | 0.21 er |
| Chromium | | 0.11 er | 0.23 er | 0.92 er | 0.04 er | 0.04 er | 0.22 er |
| Copper | | 0.19 er | 0.30 er | 0.90 er | 0.04 er | 0.04 er | 0.37 er |
| Lead | | 0.13 er | 0.17 er | 0.36 er | 0.02 Per | 0.02 Per | 0.19 er |
| Mercury | | 0.15 er | 0.17 er | 2.23 er | 0.04 Per | 0.06 Per | 7.16 er |
| Zinc | | 0.19 er | 0.27 er | 0.48 er | 0.04 er | 0.05 er | 0.31 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013 SD1-EB13-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm | EB015 SD1-EB15-0000 0 to 10 cm | EB016 SD1-EB16-0000 0 to 10 cm | EB017 SD1-EB17-0000 0 to 10 cm | EB018 SD1-EB18-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 306.89 Uer | 1.54 Uer | 1.27 Uer | 10.93 er | 1.31 Uer | 10.65 er |
| 2-Methylphenol | | 141.26 Uer | 0.19 Jer | 0.58 Uer | 2.09 er | 0.29 Jer | 4.09 er |
| 4-Methylphenol | | 13.28 Uer | 0.05 Jer | 0.04 Jer | 0.55 er | 0.09 er | 0.99 er |
| Pentachlorophenol | | 64.49 Uer | 0.32 Uer | 0.26 Uer | 0.46 er | 0.27 Uer | 0.46 Uer |
| Phenol | | 7.41 Uer | 0.03 Uer | 0.03 Uer | 0.14 er | 0.03 Uer | 0.26 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 0.17 er | 0.11 er | 2.97 er | 0.66 er | 2.43 er |
| Dibenzofuran | | | 0.36 er | 0.32 er | 3.96 er | 1.22 er | 6.60 er |
| Naphthalene | | | 0.19 er | 0.14 er | 5.78 er | 0.91 er | 7.07 er |
| Acenaphthylene | | | 0.21 er | 0.16 er | 0.45 er | 0.33 er | 0.68 er |
| Acenaphthene | | | 0.34 er | 0.42 Jer | 6.23 er | 1.09 er | 5.66 er |
| Fluorene | | | 0.38 er | 0.39 er | 2.75 er | 0.99 er | 4.55 er |
| Phenanthrene | | | 0.19 er | 0.16 er | 1.41 er | 0.38 er | 2.13 er |
| Anthracene | | | 0.07 er | 0.05 er | 0.16 er | 0.11 er | 0.25 er |
| Total LPAH | | | 0.37 Ter | 0.30 Ter | 3.15 Ter | 0.82 Ter | 4.19 Ter |
| Fluoranthene | | | 0.12 er | 0.17 er | 0.56 er | 0.26 er | 0.89 er |
| Pyrene | | | 0.23 er | 0.41 er | 0.42 er | 0.29 er | 1.67 er |
| Benzo(a)anthracene | | | 0.34 er | 0.32 er | 0.47 er | 0.54 er | 1.11 er |
| Chrysene | | | 0.35 er | 0.27 er | 0.42 er | 0.61 er | 0.89 er |
| Total Benzofluoranthene | | | 0.60 Ter | 0.48 Ter | 0.67 Ter | 0.77 Ter | 1.17 Ter |
| Benzo(a)pyrene | | | 0.47 er | 0.41 er | 0.53 er | 0.59 er | 1.02 er |
| Indeno(1,2,3-cd)pyrene | | | 0.46 er | 0.34 er | 0.53 er | 0.59 er | 0.86 er |
| Dibenz(a,h)anthracene | | | 0.43 er | 0.28 er | 0.48 er | 0.50 er | 0.80 er |
| Benzo(g,h,i)perylene | | | 0.41 er | 0.29 er | 0.51 er | 0.49 er | 0.81 er |
| Total HPAH | | | 0.22 Ter | 0.25 Ter | 0.39 Ter | 0.32 Ter | 0.95 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB013 | EB014 | EB015 | EB016 | EB017 | EB018 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB13-0000 | SD1-EB14-0000 | SD1-EB15-0000 | SD1-EB16-0000 | SD1-EB17-0000 | SD1-EB18-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.53 Ter | 0.50 Ter | 0.16 Ter | 0.24 Ter | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.25 er | 0.13 Per | 0.10 Per | 0.18 Per | 0.08 Per | 0.24 er |
| Cadmium | | 0.38 er | 0.18 er | 0.19 er | 0.13 Per | 0.09 Per | 0.22 er |
| Chromium | | 0.26 er | 0.21 er | 0.10 er | 0.24 er | 0.09 er | 0.24 er |
| Copper | | 0.31 er | 0.38 er | 0.19 er | 0.39 er | 0.14 er | 0.37 er |
| Lead | | 0.34 er | 0.18 er | 0.16 er | 0.18 er | 0.11 er | 0.25 er |
| Mercury | | 1.66 er | 0.36 er | 0.37 er | 0.84 er | 0.28 er | 2.35 er |
| Zinc | | 0.60 er | 0.30 er | 0.33 er | 0.22 er | 0.18 er | 0.34 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019<br>SD1-EB19-0000<br>0 to 10 cm | EB020<br>SD1-EB20-0000-CC<br>0 to 10 cm | EB021<br>SD1-EB21-0000<br>0 to 10 cm | EB022<br>SD1-EB22-0000<br>0 to 10 cm | EB023<br>SD1-EB23-0000<br>0 to 10 cm | EB024<br>SD1-EB24-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 23.44 er | 4.00 er | 2.86 er | 1.29 Jer | 1.06 Uer | 0.76 Jer |
| 2-Methylphenol | | 6.20 er | 0.73 Jer | 0.40 Jer | 0.24 Jer | 0.48 Uer | 0.92 Uer |
| 4-Methylphenol | | 1.23 er | 0.79 er | 0.21 er | 0.16 er | 0.03 Jer | 0.15 er |
| Pentachlorophenol | | 0.38 Uer | 0.40 Uer | 0.31 Uer | 0.29 Jer | 0.22 Uer | 0.55 Jer |
| Phenol | | 0.30 er | 0.20 er | 0.04 Uer | 0.05 er | 0.01 Jer | 0.26 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 5.13 er | 1.42 er | 1.19 er | 0.60 er | 0.15 er | 0.22 er |
| Dibenzofuran | | 13.79 er | 2.25 er | 2.46 er | 1.21 er | 0.37 er | 0.57 er |
| Naphthalene | | 13.05 er | 3.22 er | 1.56 er | 0.92 Jer | 0.16 er | 0.20 er |
| Acenaphthylene | | 0.75 er | 0.37 er | 0.49 er | 0.42 er | 0.03 er | 0.18 er |
| Acenaphthene | | 12.56 er | 3.36 er | 2.69 er | 1.10 er | 0.35 er | 0.79 er |
| Fluorene | | 9.62 er | 1.57 er | 1.73 er | 0.89 er | 0.26 er | 0.62 er |
| Phenanthrene | | 3.90 er | 0.69 er | 0.68 er | 0.46 Jer | 0.13 er | 0.40 er |
| Anthracene | | 0.43 er | 0.13 er | 0.14 er | 0.13 er | 0.01 er | 0.09 er |
| Total LPAH | | 7.86 Ter | 1.77 Ter | 1.40 Ter | 0.90 Ter | 0.20 Ter | 0.57 Ter |
| Fluoranthene | | 1.65 er | 0.39 er | 0.26 er | 0.31 Jer | 0.08 er | 0.38 er |
| Pyrene | | 1.64 er | 0.40 er | 0.37 er | 0.28 Jer | 0.05 er | 0.25 er |
| Benzo(a)anthracene | | 1.30 er | 0.41 er | 0.53 er | 0.69 er | 0.08 er | 0.42 er |
| Chrysene | | 0.86 er | 0.33 er | 0.53 er | 0.91 er | 0.07 er | 0.43 er |
| Total Benzofluoranthene | | 0.83 Ter | 0.63 Ter | 0.92 Ter | 1.08 Ter | 0.09 Ter | 0.43 Ter |
| Benzo(a)pyrene | | 0.59 er | 0.49 er | 0.72 er | 0.97 er | 0.08 er | 0.37 er |
| Indeno(1,2,3-cd)pyrene | | 0.39 er | 0.49 er | 0.71 er | 1.06 er | 0.08 er | 0.41 er |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.01 Uer | 0.69 er | 0.85 er | 0.00 Uer | 0.33 er |
| Benzo(g,h,i)perylene | | 0.40 er | 0.44 er | 0.60 er | 0.98 er | 0.07 er | 0.35 er |
| Total HPAH | | 1.05 Ter | 0.33 Ter | 0.36 Ter | 0.42 Ter | 0.05 Ter | 0.27 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB019 | EB020 | EB021 | EB022 | EB023 | EB024 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB19-0000 | SD1-EB20-0000-CC | SD1-EB21-0000 | SD1-EB22-0000 | SD1-EB23-0000 | SD1-EB24-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | 0.06 Ter | 0.18 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.10 Per | 0.24 er | 0.10 Per | 0.10 Per | 0.04 Uer | 0.22 er |
| Cadmium | | 0.07 Per | 0.23 er | 0.17 er | 0.11 Per | 0.04 Uer | 0.11 Per |
| Chromium | | 0.10 er | 0.16 er | 0.12 er | 0.12 er | 0.03 er | 0.19 er |
| Copper | | 0.16 er | 0.30 er | 0.21 er | 0.19 er | 0.04 er | 0.29 er |
| Lead | | 0.07 er | 0.34 er | 0.16 er | 0.12 er | 0.03 er | 0.21 er |
| Mercury | | 0.37 er | 1.24 er | 0.64 er | 0.46 er | 0.06 er | 0.69 er |
| Zinc | | 0.09 er | 0.29 er | 0.24 er | 0.18 er | 0.05 er | 0.26 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB025 | EB026 | EB027 | EB028 | EB029 | EB030 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB25-0000 | SD1-EB26-0000 | SD1-EB27-0000 | SD1-EB28-0000 | SD1-EB29-0000 | SD1-EB30-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 3.82 er | 1.17 Jer | 1.70 er | 1.39 Uer | 4.27 er | 1.01 Jer |
| 2-Methylphenol | | 0.99 er | 0.28 Jer | 0.31 Jer | 0.64 Uer | 0.73 Jer | 0.26 Jer |
| 4-Methylphenol | | 0.30 er | 0.08 er | 0.18 er | 0.03 Jer | 0.33 er | 0.21 er |
| Pentachlorophenol | | 0.37 Uer | 0.40 Uer | 0.35 Uer | 0.29 Uer | 0.37 Uer | 0.35 Uer |
| Phenol | | 0.16 er | 0.02 Jer | 0.05 er | 0.03 Uer | 0.10 er | 0.09 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 1.39 er | 0.19 er | 0.39 er | | 1.25 er | 1.29 er |
| Dibenzofuran | | 2.60 er | 3.06 er | 3.71 er | | 1.72 er | 2.03 er |
| Naphthalene | | 2.05 er | 0.20 er | 0.45 er | | 2.22 er | 2.62 er |
| Acenaphthylene | | 0.46 er | 0.58 er | 1.24 er | | 0.15 er | 0.33 er |
| Acenaphthene | | 4.01 er | 9.61 er | 11.82 er | | 2.04 er | 2.95 er |
| Fluorene | | 1.82 er | 3.74 er | 6.38 er | | 1.25 er | 1.39 er |
| Phenanthrene | | 0.61 er | 2.78 er | 2.27 er | | 0.42 er | 0.52 er |
| Anthracene | | 0.15 er | 0.23 er | 0.58 er | | 0.06 er | 0.10 er |
| Total LPAH | | 1.58 Ter | 3.25 Ter | 4.01 Ter | | 1.13 Ter | 1.43 Ter |
| Fluoranthene | | 0.38 er | 1.79 er | 7.24 er | | 0.13 er | 0.22 er |
| Pyrene | | 0.93 er | 1.20 er | 4.96 er | | 0.31 er | 0.33 er |
| Benzo(a)anthracene | | 0.84 er | 2.01 er | 7.00 er | | 0.17 er | 0.28 er |
| Chrysene | | 0.72 er | 1.29 er | 4.04 er | | 0.17 er | 0.28 er |
| Total Benzofluoranthene | | 1.22 Ter | 1.51 Ter | 3.87 Ter | | 0.23 Ter | 0.62 Ter |
| Benzo(a)pyrene | | 1.21 er | 1.28 er | 3.45 er | | 0.19 er | 0.55 er |
| Indeno(1,2,3-cd)pyrene | | 1.32 er | 1.23 er | 2.45 er | | 0.17 er | 0.56 er |
| Dibenz(a,h)anthracene | | 1.10 er | 1.22 er | 2.39 er | | 0.00 Uer | 0.41 er |
| Benzo(g,h,i)perylene | | 1.47 er | 1.13 er | 2.27 er | | 0.17 er | 0.52 er |
| Total HPAH | | 0.64 Ter | 1.16 Ter | 4.21 Ter | | 0.16 Ter | 0.27 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025<br>SD1-EB25-0000<br>0 to 10 cm | EB026<br>SD1-EB26-0000<br>0 to 10 cm | EB027<br>SD1-EB27-0000<br>0 to 10 cm | EB028<br>SD1-EB28-0000<br>0 to 10 cm | EB029<br>SD1-EB29-0000<br>0 to 10 cm | EB030<br>SD1-EB30-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.22 Ter | 0.82 Ter | | 0.13 Ter | 0.17 Ter |
| ***Inorganics (Total) (er)*** | | | | | | | |
| Arsenic | | 0.13 Per | 0.13 Per | 0.16 Per | 0.04 Uer | 0.18 Per | 0.16 Per |
| Cadmium | | 0.21 er | 0.12 Per | 0.36 er | 0.04 Uer | 0.08 Per | 0.09 Per |
| Chromium | | 0.13 er | 0.14 er | 0.12 er | 0.05 er | 0.17 er | 0.09 er |
| Copper | | 0.20 er | 0.26 er | 0.21 er | 0.04 er | 0.40 er | 0.16 er |
| Lead | | 0.13 er | 0.13 er | 0.28 er | 0.02 Per | 0.12 er | 0.08 er |
| Mercury | | 1.40 er | 0.43 er | 0.75 er | 0.12 er | 0.63 er | 0.62 er |
| Zinc | | 0.16 er | 0.19 er | 0.66 er | 0.04 er | 0.16 er | 0.11 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 / SD1-EB31-0000 / 0 to 10 cm | EB032 / SD1-EB32-0000 / 0 to 10 cm | EB033 / SD1-EB33-0000 / 0 to 10 cm | EB034 / SD1-EB34-0000 / 0 to 10 cm | EB035 / SD1-EB35-0000 / 0 to 10 cm | EB036 / SD1-EB36-0000 / 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 2.37 er | 1.55 Uer | 1.01 Jer | 3.44 Uer | 1.25 Uer | 1.38 Jer |
| 2-Methylphenol | | 0.50 Jer | 0.24 Jer | 0.22 Jer | 0.54 Jer | 0.57 Uer | 0.24 Jer |
| 4-Methylphenol | | 0.32 er | 0.21 er | 0.12 er | 0.67 er | 0.02 Jer | 0.11 er |
| Pentachlorophenol | | 0.35 Uer | 0.38 er | 0.28 Uer | 0.46 Uer | 0.26 Uer | 0.32 Uer |
| Phenol | | 0.13 er | 0.09 er | 0.04 Uer | 0.21 er | 0.03 er | 0.06 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 1.53 er | 0.64 er | 1.22 er | | 0.19 er | 0.56 er |
| Dibenzofuran | | 2.44 er | 1.06 er | 2.04 er | | 0.33 er | 0.83 er |
| Naphthalene | | 2.96 er | 1.08 er | 2.16 er | | 0.27 Jer | 0.89 er |
| Acenaphthylene | | 0.48 er | 0.34 er | 0.37 er | | 0.10 er | 0.09 er |
| Acenaphthene | | 2.74 er | 1.29 er | 2.29 er | | 0.34 er | 0.98 er |
| Fluorene | | 1.50 er | 0.74 er | 1.31 er | | 0.25 er | 0.60 er |
| Phenanthrene | | 0.60 er | 0.31 er | 0.50 er | | 0.12 er | 0.22 er |
| Anthracene | | 0.11 er | 0.08 er | 0.09 er | | 0.02 er | 0.03 er |
| Total LPAH | | 1.58 Ter | 0.75 Ter | 1.26 Ter | | 0.23 Ter | 0.52 Ter |
| Fluoranthene | | 0.22 er | 0.35 er | 0.17 er | | 0.06 er | 0.07 er |
| Pyrene | | 0.49 er | 0.42 er | 0.30 er | | 0.06 Jer | 0.10 er |
| Benzo(a)anthracene | | 0.28 er | 0.61 er | 0.27 er | | 0.14 er | 0.08 er |
| Chrysene | | 0.28 er | 0.54 er | 0.28 er | | 0.10 er | 0.07 er |
| Total Benzofluoranthene | | 0.57 Ter | 0.65 Ter | 0.56 Ter | | 0.19 Ter | 0.11 Ter |
| Benzo(a)pyrene | | 0.46 er | 0.54 er | 0.49 er | | 0.17 er | 0.09 er |
| Indeno(1,2,3-cd)pyrene | | 0.43 er | 0.49 er | 0.46 er | | 0.20 er | 0.09 er |
| Dibenz(a,h)anthracene | | 0.38 er | 0.47 er | 0.41 er | | 0.14 Jer | 0.00 Uer |
| Benzo(g,h,i)perylene | | 0.40 er | 0.42 er | 0.45 er | | 0.19 er | 0.09 er |
| Total HPAH | | 0.30 Ter | 0.36 Ter | 0.24 Ter | | 0.07 Ter | 0.07 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 SD1-EB31-0000 0 to 10 cm | EB032 SD1-EB32-0000 0 to 10 cm | EB033 SD1-EB33-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB035 SD1-EB35-0000 0 to 10 cm | EB036 SD1-EB36-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.33 Ter | 0.21 Ter | 0.21 Ter | | 0.22 Ter | 0.10 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.19 Per | 0.09 Per | 0.07 Per | 0.22 er | 0.07 Per | 0.07 Per |
| Cadmium | | 0.13 Per | 0.09 Per | 0.04 Uer | 0.18 er | 0.04 Uer | 0.08 Per |
| Chromium | | 0.12 er | 0.08 er | 0.07 er | 0.14 er | 0.06 er | 0.15 er |
| Copper | | 0.20 er | 0.13 er | 0.13 er | 0.28 er | 0.08 er | 0.16 er |
| Lead | | 0.15 er | 0.09 er | 0.07 er | 0.18 er | 0.06 er | 0.17 er |
| Mercury | | 0.86 er | 0.44 er | 0.31 er | 1.28 er | 0.32 er | 0.96 er |
| Zinc | | 0.18 er | 0.13 er | 0.08 er | 0.21 er | 0.07 er | 0.28 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037 SD1-EB37-0000 0 to 10 cm | EB038 SD1-EB38-0000 0 to 10 cm | EB039 SD1-EB39-0000-CC 0 to 10 cm | EB040 SD1-EB40-0000 0 to 10 cm | EB041 SD1-EB41-0000 0 to 10 cm | EB042 SD1-EB42-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 5.10 er | 1.53 Uer | 3.89 er | 0.72 Jer | 4.20 er | 0.97 Jer |
| 2-Methylphenol | | 1.28 er | 0.70 Uer | 0.50 Jer | 0.16 Jer | 0.63 Jer | 0.26 Jer |
| 4-Methylphenol | | 0.42 er | 0.05 Jer | 0.25 er | 0.08 er | 0.31 er | 0.14 er |
| Pentachlorophenol | | 0.43 Uer | 0.32 Uer | 0.31 Uer | 0.24 Uer | 0.35 Uer | 0.31 Uer |
| Phenol | | 0.11 er | 0.03 Uer | 0.06 er | 0.03 er | 0.09 er | 0.06 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 0.58 er | 1.38 er | 0.73 er | 1.78 er | 1.13 er |
| Dibenzofuran | | | 1.07 er | 1.90 er | 0.94 er | 4.41 er | 1.93 er |
| Naphthalene | | | 0.95 er | 2.21 er | 1.15 er | 3.74 er | 2.11 er |
| Acenaphthylene | | | 0.25 er | 0.15 er | 0.14 er | 1.12 er | 0.42 er |
| Acenaphthene | | | 1.12 er | 2.18 er | 0.93 er | 5.07 er | 1.82 er |
| Fluorene | | | 0.75 er | 1.41 er | 0.58 er | 2.75 er | 1.18 er |
| Phenanthrene | | | 0.36 er | 0.52 er | 0.26 er | 1.21 er | 0.51 er |
| Anthracene | | | 0.06 er | 0.06 er | 0.03 er | 0.24 er | 0.09 er |
| Total LPAH | | | 0.71 Ter | 1.22 Ter | 0.61 Ter | 2.68 Ter | 1.21 Ter |
| Fluoranthene | | | 0.14 er | 0.15 Jer | 0.08 er | 1.15 er | 0.20 er |
| Pyrene | | | 0.19 er | 0.33 Jer | 0.10 er | 1.60 er | 0.24 er |
| Benzo(a)anthracene | | | 0.24 er | 0.19 er | 0.09 er | 1.80 er | 0.23 er |
| Chrysene | | | 0.25 er | 0.15 er | 0.08 er | 1.71 er | 0.25 er |
| Total Benzofluoranthene | | | 0.40 Ter | 0.23 Ter | 0.15 Ter | 2.11 Ter | 0.52 Ter |
| Benzo(a)pyrene | | | 0.35 er | 0.21 er | 0.13 er | 2.16 er | 0.46 er |
| Indeno(1,2,3-cd)pyrene | | | 0.37 er | 0.25 er | 0.14 er | 1.77 er | 0.51 er |
| Dibenz(a,h)anthracene | | | 0.32 er | 0.23 er | 0.00 Uer | 1.43 er | 0.39 er |
| Benzo(g,h,i)perylene | | | 0.36 er | 0.25 er | 0.15 er | 1.71 er | 0.49 er |
| Total HPAH | | | 0.18 Ter | 0.18 Ter | 0.08 Ter | 1.25 Ter | 0.22 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037 SD1-EB37-0000 0 to 10 cm | EB038 SD1-EB38-0000 0 to 10 cm | EB039 SD1-EB39-0000-CC 0 to 10 cm | EB040 SD1-EB40-0000 0 to 10 cm | EB041 SD1-EB41-0000 0 to 10 cm | EB042 SD1-EB42-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.29 Ter | 0.15 Ter | 0.11 Ter | 0.30 Ter | 0.27 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.11 Per | 0.13 Per | 0.11 Per | 0.16 Per | 0.17 Per | 0.13 Per |
| Cadmium | | 0.10 Per | 0.08 Per | 0.08 Per | 0.06 Per | 0.09 Per | 0.08 Per |
| Chromium | | 0.11 er | 0.10 er | 0.09 er | 0.12 er | 0.11 er | 0.10 er |
| Copper | | 0.16 er | 0.17 er | 0.17 er | 0.16 er | 0.21 er | 0.15 er |
| Lead | | 0.09 er | 0.10 er | 0.10 er | 0.10 er | 0.12 er | 0.10 er |
| Mercury | | 0.96 er | 0.59 er | 0.67 er | 1.06 er | 0.87 er | 1.06 er |
| Zinc | | 0.10 er | 0.15 er | 0.15 er | 0.11 er | 0.15 er | 0.12 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043 SD1-EB43-0000 0 to 10 cm | EB045 SD1-EB45-0000 0 to 10 cm | EB047 SD2-EB47-0000 0 to 10 cm | EB049 SD2-EB49-0000 0 to 10 cm | EB052 SD2-EB52-0000 0 to 10 cm | EB054 SD2-EB54-0000-CC 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.78 Uer | 1.16 Jer | | | | |
| 2-Methylphenol | | 0.82 Uer | 0.21 Jer | | | | |
| 4-Methylphenol | | 0.12 er | 0.10 er | | | | |
| Pentachlorophenol | | 0.37 Uer | 0.27 Uer | | | | |
| Phenol | | 0.10 er | 0.04 er | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.08 er | 1.35 er | 0.04 er | 0.08 er | 0.19 er | 0.50 er |
| Dibenzofuran | | 0.15 er | 2.22 er | | | | |
| Naphthalene | | 0.11 Jer | 2.01 er | 0.04 er | 0.08 er | 0.26 er | 0.62 er |
| Acenaphthylene | | 0.07 er | 0.29 er | 0.02 er | 0.07 er | 0.10 er | 0.18 er |
| Acenaphthene | | 0.14 er | 2.24 er | 0.07 er | 0.12 er | 0.25 er | 0.62 er |
| Fluorene | | 0.10 er | 1.70 er | 0.08 er | 0.12 er | 0.19 er | 0.41 er |
| Phenanthrene | | 0.05 Jer | 0.63 er | 0.05 er | 0.09 er | 0.11 er | 0.20 er |
| Anthracene | | 0.01 er | 0.11 er | 0.01 er | 0.02 er | 0.02 er | 0.04 er |
| Total LPAH | | 0.10 Ter | 1.37 Ter | 0.07 Ter | 0.13 Ter | 0.21 Ter | 0.43 Ter |
| Fluoranthene | | 0.02 Jer | 0.26 er | 0.04 er | 0.08 er | 0.07 er | 0.10 er |
| Pyrene | | 0.05 Jer | 0.30 er | 0.03 er | 0.14 er | 0.08 er | 0.13 er |
| Benzo(a)anthracene | | 0.06 Jer | 0.55 er | 0.10 er | 0.23 er | 0.14 er | 0.21 er |
| Chrysene | | 0.07 Jer | 0.47 er | 0.08 er | 0.21 er | 0.13 er | 0.20 er |
| Total Benzofluoranthene | | 0.17 Ter | 0.73 Ter | 0.10 Ter | 0.41 Ter | 0.25 Ter | 0.34 Ter |
| Benzo(a)pyrene | | 0.15 Jer | 0.58 er | 0.09 er | 0.43 er | 0.28 er | 0.33 er |
| Indeno(1,2,3-cd)pyrene | | 0.17 er | 0.52 er | 0.11 er | 0.56 er | 0.35 er | 0.40 er |
| Dibenz(a,h)anthracene | | 0.17 er | 0.52 er | 0.10 er | 0.49 er | 0.07 Jer | 0.31 er |
| Benzo(g,h,i)perylene | | 0.16 er | 0.46 er | 0.11 er | 0.56 er | 0.38 er | 0.41 er |
| Total HPAH | | 0.05 Ter | 0.31 Ter | 0.04 Ter | 0.16 Ter | 0.10 Ter | 0.14 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB043 | EB045 | EB047 | EB049 | EB052 | EB054 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB43-0000 | SD1-EB45-0000 | SD2-EB47-0000 | SD2-EB49-0000 | SD2-EB52-0000 | SD2-EB54-0000-CC |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.21 Ter | 0.11 Ter | | 0.25 Ter | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.21 Per | 0.12 Per | | | | |
| Cadmium | | 0.18 er | 0.06 Per | | | | |
| Chromium | | 0.12 er | 0.08 er | | | | |
| Copper | | 0.20 er | 0.48 er | | | | |
| Lead | | 0.13 er | 0.08 er | | | | |
| Mercury | | 0.95 er | 0.53 er | | 0.60 er | | |
| Zinc | | 0.21 er | 0.11 er | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056 SD2-EB56-0000 0 to 10 cm | EB057 SD2-EB57-0000 0 to 10 cm | EB060 SD2-EB60-0000 0 to 10 cm | EB061 SD2-EB61-0000 0 to 10 cm | EB062 SD2-EB62-0000 0 to 10 cm | EB063 SD2-EB63-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.48 er | 0.29 er | 0.30 er | 0.30 er | 0.95 er | 0.41 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.62 er | 0.42 er | 0.46 er | 0.49 er | 1.78 er | 0.67 er |
| Acenaphthylene | | 0.23 er | 0.14 er | 0.12 er | 0.10 er | 0.25 er | 0.18 er |
| Acenaphthene | | 0.49 er | 0.30 er | 0.53 er | 0.56 er | 1.41 er | 0.67 er |
| Fluorene | | 0.39 er | 0.22 er | 0.39 er | 0.33 er | 0.95 er | 0.43 er |
| Phenanthrene | | 0.24 er | 0.13 er | 0.18 er | 0.17 er | 0.46 er | 0.21 er |
| Anthracene | | 0.04 er | 0.02 er | 0.04 er | 0.02 er | 0.06 er | 0.03 er |
| Total LPAH | | 0.45 Ter | 0.27 Ter | 0.37 Ter | 0.34 Ter | 1.00 Ter | 0.44 Ter |
| Fluoranthene | | 0.13 er | 0.06 er | 0.11 er | 0.07 er | 0.21 er | 0.09 er |
| Pyrene | | 0.14 er | 0.08 er | 0.11 er | 0.12 er | 0.32 er | 0.14 er |
| Benzo(a)anthracene | | 0.21 er | 0.10 er | 0.20 er | 0.12 er | 0.29 er | 0.14 er |
| Chrysene | | 0.19 er | 0.09 er | 0.23 er | 0.12 er | 0.26 er | 0.13 er |
| Total Benzofluoranthene | | 0.36 Ter | 0.17 Ter | 0.35 Ter | 0.24 Ter | 0.48 Ter | 0.26 Ter |
| Benzo(a)pyrene | | 0.34 er | 0.16 er | 0.34 er | 0.23 er | 0.43 er | 0.24 er |
| Indeno(1,2,3-cd)pyrene | | 0.41 er | 0.22 er | 0.37 er | 0.28 er | 0.40 er | 0.30 er |
| Dibenz(a,h)anthracene | | 0.31 er | 0.19 er | 0.29 er | 0.05 Jer | 0.33 er | 0.23 er |
| Benzo(g,h,i)perylene | | 0.43 er | 0.24 er | 0.37 er | 0.30 er | 0.46 er | 0.33 er |
| Total HPAH | | 0.15 Ter | 0.08 Ter | 0.14 Ter | 0.10 Ter | 0.24 Ter | 0.12 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB056<br>SD2-EB56-0000<br>0 to 10 cm | EB057<br>SD2-EB57-0000<br>0 to 10 cm | EB060<br>SD2-EB60-0000<br>0 to 10 cm | EB061<br>SD2-EB61-0000<br>0 to 10 cm | EB062<br>SD2-EB62-0000<br>0 to 10 cm | EB063<br>SD2-EB63-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | 0.17 Ter | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | 0.29 er | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB067 SD2-EB67-0000 0 to 10 cm | EB072 SD2-EB72-0000 0 to 10 cm | EB073 SD2-EB73-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB082 SD2-EB82-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.66 er | 1.17 er | 1.19 er | 0.72 er | 1.93 er | 1.12 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1.10 er | 2.80 er | 1.96 er | 0.99 er | 3.04 er | 1.87 er |
| Acenaphthylene | | 0.21 er | 0.44 er | 0.25 er | 0.11 er | 0.26 er | 0.25 er |
| Acenaphthene | | 1.18 er | 4.15 er | 1.97 er | 1.11 er | 3.39 er | 2.16 er |
| Fluorene | | 0.80 er | 2.95 er | 1.32 er | 0.67 er | 2.01 er | 1.56 er |
| Phenanthrene | | 0.35 er | 1.43 er | 0.61 er | 0.29 er | 0.93 er | 0.61 er |
| Anthracene | | 0.07 er | 0.28 er | 0.09 er | 0.04 er | 0.10 er | 0.11 er |
| Total LPAH | | 0.76 Ter | 2.56 Ter | 1.24 Ter | 0.62 Ter | 1.87 Ter | 1.30 Ter |
| Fluoranthene | | 0.32 er | 2.57 er | 0.23 er | 0.11 er | 0.29 er | 0.26 er |
| Pyrene | | 0.30 er | 2.14 er | 0.32 er | 0.13 er | 0.36 er | 0.37 er |
| Benzo(a)anthracene | | 0.34 er | 2.41 er | 0.27 er | 0.12 er | 0.22 er | 0.65 er |
| Chrysene | | 0.30 er | 1.62 er | 0.29 er | 0.12 er | 0.19 er | 0.60 er |
| Total Benzofluoranthene | | 0.42 Ter | 1.37 Ter | 0.45 Ter | 0.20 Ter | 0.31 Ter | 0.76 Ter |
| Benzo(a)pyrene | | 0.36 er | 1.10 er | 0.39 er | 0.18 er | 0.27 er | 0.61 er |
| Indeno(1,2,3-cd)pyrene | | 0.38 er | 0.84 er | 0.33 er | 0.19 er | 0.27 er | 0.50 er |
| Dibenz(a,h)anthracene | | 0.34 er | 0.67 er | 0.30 er | 0.15 er | 0.23 er | 0.38 Jer |
| Benzo(g,h,i)perylene | | 0.40 er | 0.68 er | 0.38 er | 0.19 er | 0.30 er | 0.50 er |
| Total HPAH | | 0.26 Ter | 1.60 Ter | 0.24 Ter | 0.11 Ter | 0.23 Ter | 0.35 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB067 | EB072 | EB073 | EB077 | EB080 | EB082 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB67-0000 | SD2-EB72-0000 | SD2-EB73-0000 | SD2-EB77-0000 | SD2-EB80-0000 | SD2-EB82-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.09 Ter | | | 0.10 Ter | 0.11 Ter | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | 0.61 er | | | 0.44 er | 1.22 er | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084 SD2-EB84-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB086 SD2-EB86-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm | EB088 SD2-EB88-0000 0 to 10 cm | EB089 SD2-EB89-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 2.16 er | 1.94 er | 1.08 er | 5.61 er | 0.65 er | 0.58 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 3.22 er | 2.37 er | 1.52 er | 7.91 er | 0.99 er | 0.63 er |
| Acenaphthylene | | 0.26 er | 0.12 er | 0.14 er | 0.28 er | 0.18 er | 0.09 er |
| Acenaphthene | | 2.46 er | 2.65 er | 1.83 er | 6.37 er | 1.14 er | 1.05 er |
| Fluorene | | 1.68 er | 1.88 er | 1.33 er | 5.41 er | 0.67 er | 0.62 er |
| Phenanthrene | | 0.78 er | 0.88 er | 0.59 er | 2.31 er | 0.30 er | 0.27 er |
| Anthracene | | 0.08 er | 0.08 er | 0.05 er | 0.76 er | 0.05 er | 0.03 er |
| Total LPAH | | 1.69 Ter | 1.59 Ter | 1.06 Ter | 5.36 Ter | 0.65 Ter | 0.50 Ter |
| Fluoranthene | | 0.23 er | 0.26 er | 0.20 er | 0.82 er | 0.12 er | 0.09 er |
| Pyrene | | 0.22 er | 0.25 er | 0.21 er | 0.83 er | 0.12 er | 0.14 er |
| Benzo(a)anthracene | | 0.17 er | 0.18 er | 0.14 er | 0.79 er | 0.15 er | 0.09 er |
| Chrysene | | 0.13 er | 0.12 er | 0.11 er | 0.60 er | 0.13 er | 0.07 er |
| Total Benzofluoranthene | | 0.26 Ter | 0.22 Ter | 0.20 Ter | 0.86 Ter | 0.22 Ter | 0.15 Ter |
| Benzo(a)pyrene | | 0.22 er | 0.18 er | 0.17 er | 0.74 er | 0.20 er | 0.13 er |
| Indeno(1,2,3-cd)pyrene | | 0.22 er | 0.18 er | 0.20 er | 0.64 er | 0.22 er | 0.15 er |
| Dibenz(a,h)anthracene | | 0.18 er | 0.14 er | 0.16 er | 0.54 er | 0.16 er | 0.04 Jer |
| Benzo(g,h,i)perylene | | 0.24 er | 0.20 er | 0.21 er | 0.60 er | 0.24 er | 0.19 er |
| Total HPAH | | 0.17 Ter | 0.18 Ter | 0.15 Ter | 0.62 Ter | 0.11 Ter | 0.09 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB084<br>SD2-EB84-0000<br>0 to 10 cm | EB085<br>SD2-EB85-0000<br>0 to 10 cm | EB086<br>SD2-EB86-0000<br>0 to 10 cm | EB087<br>SD2-EB87-0000<br>0 to 10 cm | EB088<br>SD2-EB88-0000<br>0 to 10 cm | EB089<br>SD2-EB89-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.11 Ter | | 0.28 Ter | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.40 er | | 0.75 er | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB091 SD2-EB91-0000 0 to 10 cm | EB094 SD2-EB94-0000 0 to 10 cm | EB095 SD2-EB95-0000 0 to 10 cm | EB096 SD2-EB96-0000 0 to 10 cm | EB097 SD2-EB97-0000 0 to 10 cm | EB098 SD2-EB98-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.39 er | | 0.21 er | 0.48 er | 0.79 er | 0.47 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.52 er | | 0.32 er | 0.73 er | 1.44 er | 0.65 er |
| Acenaphthylene | | 0.16 er | | 0.14 er | 0.12 er | 0.16 er | 0.11 er |
| Acenaphthene | | 0.42 er | | 0.37 er | 0.88 er | 1.20 er | 0.79 er |
| Fluorene | | 0.32 er | | 0.29 er | 0.51 er | 0.76 er | 0.49 er |
| Phenanthrene | | 0.20 er | | 0.13 er | 0.25 er | 0.40 er | 0.30 er |
| Anthracene | | 0.03 er | | 0.02 er | 0.03 er | 0.05 er | 0.05 er |
| Total LPAH | | 0.36 Ter | | 0.26 Ter | 0.49 Ter | 0.82 Ter | 0.53 Ter |
| Fluoranthene | | 0.09 er | | 0.07 er | 0.09 er | 0.13 er | 0.10 er |
| Pyrene | | 0.11 er | | 0.07 er | 0.21 er | 0.20 er | 0.21 er |
| Benzo(a)anthracene | | 0.14 er | | 0.09 er | 0.14 er | 0.14 er | 0.36 er |
| Chrysene | | 0.12 er | | 0.06 er | 0.12 er | 0.13 er | 0.53 er |
| Total Benzofluoranthene | | 0.26 Ter | | 0.17 Ter | 0.25 Ter | 0.25 Ter | 0.41 Ter |
| Benzo(a)pyrene | | 0.25 er | | 0.16 er | 0.26 er | 0.23 er | 0.42 er |
| Indeno(1,2,3-cd)pyrene | | 0.35 er | | 0.22 er | 0.26 er | 0.29 er | 0.46 er |
| Dibenz(a,h)anthracene | | 0.24 er | | 0.04 Jer | 0.06 Jer | 0.21 er | 0.10 er |
| Benzo(g,h,i)perylene | | 0.36 er | | 0.25 er | 0.30 er | 0.31 er | 0.51 er |
| Total HPAH | | 0.11 Ter | | 0.07 Ter | 0.13 Ter | 0.14 Ter | 0.21 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB091 | EB094 | EB095 | EB096 | EB097 | EB098 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB91-0000 | SD2-EB94-0000 | SD2-EB95-0000 | SD2-EB96-0000 | SD2-EB97-0000 | SD2-EB98-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099<br>SD2-EB99-0000<br>0 to 10 cm | EB100<br>SD2-EB100-0000<br>0 to 10 cm | EB101<br>SD2-EB101-0000<br>0 to 10 cm | EB102<br>SD2-EB102-0000<br>0 to 10 cm | EB103<br>SD2-EB103-0000<br>0 to 10 cm | EB104<br>SD2-EB104-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.38 er | 0.49 er | 0.20 er | 0.51 er | 0.99 er | 4.09 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.62 er | 0.79 er | 0.26 er | 0.67 er | 2.36 er | 6.44 er |
| Acenaphthylene | | 0.07 er | 0.08 er | 0.04 er | 0.07 er | 0.14 er | 0.16 er |
| Acenaphthene | | 0.58 er | 0.92 er | 0.38 er | 0.84 er | 1.48 er | 6.96 er |
| Fluorene | | 0.37 er | 0.53 er | 0.25 er | 0.53 er | 0.94 er | 5.10 er |
| Phenanthrene | | 0.18 er | 0.22 er | 0.12 er | 0.25 er | 0.72 er | 2.00 er |
| Anthracene | | 0.02 er | 0.03 er | 0.01 er | 0.03 er | 0.04 er | 0.34 er |
| Total LPAH | | 0.38 Ter | 0.49 Ter | 0.22 Ter | 0.47 Ter | 1.25 Ter | 4.21 Ter |
| Fluoranthene | | 0.07 er | 0.09 er | 0.05 er | 0.08 er | 0.14 er | 0.74 er |
| Pyrene | | 0.10 er | 0.13 er | 0.06 er | 0.10 er | 0.22 er | 0.91 er |
| Benzo(a)anthracene | | 0.11 er | 0.09 er | 0.06 er | 0.10 er | 0.13 er | 0.45 er |
| Chrysene | | 0.10 er | 0.08 er | 0.05 er | 0.08 er | 0.09 er | 0.36 er |
| Total Benzofluoranthene | | 0.26 Ter | 0.16 Ter | 0.12 Ter | 0.20 Ter | 0.18 Ter | 0.41 Ter |
| Benzo(a)pyrene | | 0.28 er | 0.14 er | 0.13 er | 0.17 er | 0.17 er | 0.33 er |
| Indeno(1,2,3-cd)pyrene | | 0.31 er | 0.17 er | 0.14 er | 0.20 er | 0.19 er | 0.26 er |
| Dibenz(a,h)anthracene | | 0.07 Jer | 0.15 er | 0.03 Jer | 0.16 er | 0.15 er | 0.23 er |
| Benzo(g,h,i)perylene | | 0.32 er | 0.19 er | 0.16 er | 0.24 er | 0.23 er | 0.27 er |
| Total HPAH | | 0.10 Ter | 0.09 Ter | 0.05 Ter | 0.09 Ter | 0.13 Ter | 0.52 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099<br>SD2-EB99-0000<br>0 to 10 cm | EB100<br>SD2-EB100-0000<br>0 to 10 cm | EB101<br>SD2-EB101-0000<br>0 to 10 cm | EB102<br>SD2-EB102-0000<br>0 to 10 cm | EB103<br>SD2-EB103-0000<br>0 to 10 cm | EB104<br>SD2-EB104-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | 0.10 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | 0.46 er |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105<br>SD2-EB105-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm | EB107<br>SD2-EB107-0000<br>0 to 10 cm | EB108<br>SD2-EB108-0000<br>0 to 10 cm | EB109<br>SD2-EB109-0000<br>0 to 10 cm | EB110<br>SD2-EB110-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 2.66 er | 0.17 er | 0.14 er | 0.06 er | 0.18 er | |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 3.41 er | 0.23 er | 0.16 er | 0.08 er | 0.35 er | |
| Acenaphthylene | | 0.17 er | 0.12 er | 0.06 er | 0.05 er | 0.10 er | |
| Acenaphthene | | 4.16 er | 0.54 er | 0.21 er | 0.05 er | 0.16 er | |
| Fluorene | | 2.75 er | 0.44 er | 0.17 er | 0.05 er | 0.12 er | |
| Phenanthrene | | 1.05 er | 0.23 er | 0.10 er | 0.04 er | 0.10 er | |
| Anthracene | | 0.11 er | 0.04 er | 0.02 er | 0.01 er | 0.01 er | |
| Total LPAH | | 2.16 Ter | 0.36 Ter | 0.17 Ter | 0.08 Ter | 0.20 Ter | |
| Fluoranthene | | 0.34 er | 0.12 er | 0.06 er | 0.02 er | 0.05 er | |
| Pyrene | | 0.31 er | 0.12 er | 0.08 er | 0.03 er | 0.05 er | |
| Benzo(a)anthracene | | 0.19 er | 0.28 er | 0.10 er | 0.08 er | 0.07 er | |
| Chrysene | | 0.14 er | 0.26 er | 0.08 er | 0.07 er | 0.06 er | |
| Total Benzofluoranthene | | 0.29 Ter | 0.45 Ter | 0.19 Ter | 0.16 Ter | 0.11 Ter | |
| Benzo(a)pyrene | | 0.23 er | 0.43 er | 0.19 er | 0.17 er | 0.10 er | |
| Indeno(1,2,3-cd)pyrene | | 0.24 er | 0.45 er | 0.23 er | 0.25 er | 0.14 er | |
| Dibenz(a,h)anthracene | | 0.20 er | 0.36 er | 0.19 er | 0.19 er | 0.10 Jer | |
| Benzo(g,h,i)perylene | | 0.25 er | 0.43 er | 0.24 er | 0.28 er | 0.17 er | |
| Total HPAH | | 0.22 Ter | 0.17 Ter | 0.08 Ter | 0.05 Ter | 0.05 Ter | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105<br>SD2-EB105-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm | EB107<br>SD2-EB107-0000<br>0 to 10 cm | EB108<br>SD2-EB108-0000<br>0 to 10 cm | EB109<br>SD2-EB109-0000<br>0 to 10 cm | EB110<br>SD2-EB110-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.33 Ter | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.36 er | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB111<br>SD2-EB111-0000<br>0 to 10 cm | EB112<br>SD2-EB112-0000<br>0 to 10 cm | EB115<br>SD3-EB115-0000<br>0.0 to 10 cm | EB116<br>SD3-EB116-0000<br>0.0 to 10 cm | EB117<br>SD3-EB117-0000<br>0.0 to 10 cm | EB118<br>SD3-EB118-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | | 0.43 er | 0.43 er | 0.05 er | 0.11 er |
| Dibenzofuran | | | | 1.14 er | 0.79 er | 0.13 er | 0.14 er |
| Naphthalene | | | | 0.74 er | 0.97 er | 0.06 er | 0.02 er |
| Acenaphthylene | | | | 0.18 er | 0.12 er | 0.04 er | 0.02 er |
| Acenaphthene | | | | 1.11 er | 0.78 er | 0.09 er | 0.06 er |
| Fluorene | | | | 2.42 er | 0.62 er | 0.09 er | 0.07 er |
| Phenanthrene | | | | 1.34 er | 0.52 er | 0.07 er | 0.06 er |
| Anthracene | | | | 0.48 er | 0.04 er | 0.01 er | 0.00 er |
| Total LPAH | | | | 2.07 Ter | 0.74 Ter | 0.09 Ter | 0.06 Ter |
| Fluoranthene | | | | 0.79 er | 0.22 er | 0.21 er | 0.03 er |
| Pyrene | | | | 0.58 er | 0.29 er | 0.12 er | 0.03 er |
| Benzo(a)anthracene | | | | 1.16 er | 0.38 er | 0.15 er | 0.05 er |
| Chrysene | | | | 0.93 er | 0.35 er | 0.20 er | 0.06 er |
| Total Benzofluoranthene | | | | 1.04 Ter | 0.62 Ter | 0.16 Ter | 0.09 Ter |
| Benzo(a)pyrene | | | | 1.24 er | 0.72 er | 0.15 er | 0.08 er |
| Indeno(1,2,3-cd)pyrene | | | | 0.73 er | 0.43 er | 0.16 er | 0.12 er |
| Dibenz(a,h)anthracene | | | | 0.46 er | 0.29 er | 0.14 er | 0.15 er |
| Benzo(g,h,i)perylene | | | | 0.83 er | 0.46 er | 0.18 er | 0.13 er |
| Total HPAH | | | | 0.64 Ter | 0.27 Ter | 0.13 Ter | 0.04 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB111 | EB112 | EB115 | EB116 | EB117 | EB118 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB111-0000 | SD2-EB112-0000 | SD3-EB115-0000 | SD3-EB116-0000 | SD3-EB117-0000 | SD3-EB118-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB119<br>SD3-EB119-0000<br>0.0 to 10 cm | EB120<br>SD3-EB120-0000<br>0.0 to 10 cm | EB121<br>SD3-EB121-0000<br>0.0 to 10 cm | EB122<br>SD3-EB122-0000<br>0.0 to 10 cm | EB123<br>SD3-EB123-0000<br>0.0 to 10 cm | EB124<br>SD3-EB124-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.08 er | 0.01 er | 0.30 er | 0.53 er | 0.36 er | 0.15 er |
| Dibenzofuran | | 0.16 er | 0.03 er | 0.45 er | 0.79 er | 0.60 er | 0.28 er |
| Naphthalene | | 0.09 er | 0.01 er | 0.43 er | 1.10 er | 0.37 er | 0.19 er |
| Acenaphthylene | | 0.06 er | 0.01 er | 0.14 er | 0.10 er | 0.06 er | 0.03 er |
| Acenaphthene | | 0.22 er | 0.02 er | 0.57 er | 0.74 er | 0.57 er | 0.31 er |
| Fluorene | | 0.15 er | 0.02 er | 0.40 er | 0.52 er | 0.40 er | 0.22 er |
| Phenanthrene | | 0.13 er | 0.02 er | 0.61 er | 0.40 er | 0.34 er | 0.11 er |
| Anthracene | | 0.01 er | 0.00 er | 0.04 er | 0.03 er | 0.02 er | 0.01 er |
| Total LPAH | | 0.17 Ter | 0.02 Ter | 0.64 Ter | 0.66 Ter | 0.42 Ter | 0.18 Ter |
| Fluoranthene | | 0.08 er | 0.01 er | 0.21 er | 0.17 er | 0.13 er | 0.04 er |
| Pyrene | | 0.08 er | 0.01 er | 0.28 er | 0.16 er | 0.14 er | 0.09 er |
| Benzo(a)anthracene | | 0.16 er | 0.04 er | 0.23 er | 0.13 er | 0.11 er | 0.06 er |
| Chrysene | | 0.13 er | 0.03 er | 0.18 er | 0.12 er | 0.09 er | 0.04 er |
| Total Benzofluoranthene | | 0.27 Ter | 0.06 Ter | 0.28 Ter | 0.21 Ter | 0.18 Ter | 0.11 Ter |
| Benzo(a)pyrene | | 0.33 er | 0.06 er | 0.36 er | 0.23 er | 0.20 er | 0.12 er |
| Indeno(1,2,3-cd)pyrene | | 0.41 er | 0.07 er | 0.38 er | 0.26 er | 0.23 er | 0.14 er |
| Dibenz(a,h)anthracene | | 0.36 er | 0.07 er | 0.31 er | 0.23 er | 0.18 er | 0.12 er |
| Benzo(g,h,i)perylene | | 0.49 er | 0.06 er | 0.50 er | 0.27 er | 0.27 er | 0.17 er |
| Total HPAH | | 0.11 Ter | 0.02 Ter | 0.20 Ter | 0.13 Ter | 0.11 Ter | 0.06 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB119<br>SD3-EB119-0000<br>0.0 to 10 cm | EB120<br>SD3-EB120-0000<br>0.0 to 10 cm | EB121<br>SD3-EB121-0000<br>0.0 to 10 cm | EB122<br>SD3-EB122-0000<br>0.0 to 10 cm | EB123<br>SD3-EB123-0000<br>0.0 to 10 cm | EB124<br>SD3-EB124-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125<br>SD3-EB125-0000<br>0.0 to 10 cm | EB126<br>SD3-EB126-0000<br>0.0 to 10 cm | EB127<br>SD3-EB127-0000<br>0.0 to 10 cm | EB128<br>SD3-EB128-0000<br>0.0 to 10 cm | EB129<br>SD3-EB129-0000<br>0.0 to 10 cm | EB130<br>SD3-EB130-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.14 er | 0.45 er | 0.16 er | 0.25 er | 0.33 er | 0.12 er |
| Dibenzofuran | | 0.25 er | 0.85 er | 0.34 er | 0.35 er | 0.62 er | 0.14 er |
| Naphthalene | | 0.23 er | 1.95 er | 0.40 er | 0.27 er | 0.58 er | 0.17 er |
| Acenaphthylene | | 0.03 er | 0.09 er | 0.05 er | 0.04 er | 0.13 er | 0.06 er |
| Acenaphthene | | 0.25 er | 0.85 er | 0.28 er | 0.29 er | 0.57 er | 0.14 er |
| Fluorene | | 0.19 er | 0.53 er | 0.25 er | 0.19 er | 0.39 er | 0.11 er |
| Phenanthrene | | 0.08 er | 0.42 er | 0.11 er | 0.11 er | 0.18 er | 0.08 er |
| Anthracene | | 0.00 er | 0.03 er | 0.01 er | 0.01 er | 0.03 er | 0.01 er |
| Total LPAH | | 0.15 Ter | 0.87 Ter | 0.23 Ter | 0.19 Ter | 0.38 Ter | 0.15 Ter |
| Fluoranthene | | 0.03 er | 0.16 er | 0.05 er | 0.04 er | 0.11 er | 0.04 er |
| Pyrene | | 0.05 er | 0.27 er | 0.07 er | 0.08 er | 0.15 er | 0.06 er |
| Benzo(a)anthracene | | 0.04 er | 0.15 er | 0.06 er | 0.04 er | 0.09 er | 0.16 er |
| Chrysene | | 0.03 er | 0.13 er | 0.05 er | 0.03 er | 0.08 er | 0.18 er |
| Total Benzofluoranthene | | 0.09 Ter | 0.49 Ter | 0.14 Ter | 0.08 Ter | 0.17 Ter | 0.19 Ter |
| Benzo(a)pyrene | | 0.09 er | 0.32 er | 0.15 er | 0.08 er | 0.17 er | 0.18 er |
| Indeno(1,2,3-cd)pyrene | | 0.11 er | 0.35 er | 0.20 er | 0.10 er | 0.18 er | 0.20 er |
| Dibenz(a,h)anthracene | | 0.10 er | 0.25 er | 0.17 er | 0.09 er | 0.15 er | 0.19 er |
| Benzo(g,h,i)perylene | | 0.13 er | 0.44 er | 0.25 er | 0.12 er | 0.20 er | 0.23 er |
| Total HPAH | | 0.04 Ter | 0.19 Ter | 0.06 Ter | 0.05 Ter | 0.10 Ter | 0.08 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB125<br>SD3-EB125-0000<br>0.0 to 10 cm | EB126<br>SD3-EB126-0000<br>0.0 to 10 cm | EB127<br>SD3-EB127-0000<br>0.0 to 10 cm | EB128<br>SD3-EB128-0000<br>0.0 to 10 cm | EB129<br>SD3-EB129-0000<br>0.0 to 10 cm | EB130<br>SD3-EB130-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131<br>SD3-EB131-0000<br>0.0 to 10 cm | EB132<br>SD3-EB132-0000<br>0.0 to 10 cm | EB133<br>SD3-EB133-0000<br>0.0 to 10 cm | EB135<br>SD3-EB135-0000<br>0.0 to 10 cm | EB136<br>SD3-EB136-0000<br>0.0 to 10 cm | EB137<br>SD3-EB137-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.06 er | 0.07 er | 0.06 er | 0.15 er | 0.20 er | 0.35 er |
| Dibenzofuran | | 0.11 er | 0.13 er | 0.09 er | 0.27 er | 0.38 er | 0.39 er |
| Naphthalene | | 0.09 er | 0.13 er | 0.06 er | 0.36 er | 0.52 er | 0.58 er |
| Acenaphthylene | | 0.02 er | 0.02 er | 0.01 er | 0.03 er | 0.02 er | 0.05 er |
| Acenaphthene | | 0.10 er | 0.12 er | 0.08 er | 0.18 er | 0.30 er | 0.38 er |
| Fluorene | | 0.07 er | 0.08 er | 0.06 er | 0.16 er | 0.29 er | 0.22 er |
| Phenanthrene | | 0.04 er | 0.05 er | 0.06 er | 0.09 er | 0.17 er | 0.12 er |
| Anthracene | | 0.00 er | 0.00 er | 0.00 er | 0.01 er | 0.03 er | 0.01 er |
| Total LPAH | | 0.07 Ter | 0.09 Ter | 0.07 Ter | 0.18 Ter | 0.32 Ter | 0.28 Ter |
| Fluoranthene | | 0.02 er | 0.03 er | 0.03 er | 0.04 er | 0.07 er | 0.05 er |
| Pyrene | | 0.03 er | 0.04 er | 0.04 er | 0.06 er | 0.06 er | 0.06 er |
| Benzo(a)anthracene | | 0.05 er | 0.05 er | 0.07 er | 0.06 er | 0.17 er | 0.05 er |
| Chrysene | | 0.04 er | 0.04 er | 0.06 er | 0.06 er | 0.14 er | 0.05 er |
| Total Benzofluoranthene | | 0.09 Ter | 0.09 Ter | 0.11 Ter | 0.14 Ter | 0.23 Ter | 0.08 Ter |
| Benzo(a)pyrene | | 0.10 er | 0.09 er | 0.12 er | 0.15 er | 0.26 er | 0.09 er |
| Indeno(1,2,3-cd)pyrene | | 0.15 er | 0.13 er | 0.18 er | 0.19 er | 0.30 er | 0.14 er |
| Dibenz(a,h)anthracene | | 0.14 er | 0.13 er | 0.15 er | 0.18 er | 0.30 er | 0.13 er |
| Benzo(g,h,i)perylene | | 0.15 er | 0.14 er | 0.19 er | 0.20 er | 0.32 er | 0.14 er |
| Total HPAH | | 0.03 Ter | 0.04 Ter | 0.05 Ter | 0.06 Ter | 0.09 Ter | 0.05 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| | Station ID: | EB131 | EB132 | EB133 | EB135 | EB136 | EB137 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB131-0000 | SD3-EB132-0000 | SD3-EB133-0000 | SD3-EB135-0000 | SD3-EB136-0000 | SD3-EB137-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and *Interpretation Notes*" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | |
| 2,4-Dimethylphenol | | |
| 2-Methylphenol | | |
| 4-Methylphenol | | |
| Pentachlorophenol | | |
| Phenol | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | |
| 2-Methylnaphthalene | | 0.24 er |
| Dibenzofuran | | 0.36 er |
| Naphthalene | | 0.46 er |
| Acenaphthylene | | 0.02 er |
| Acenaphthene | | 0.31 er |
| Fluorene | | 0.23 er |
| Phenanthrene | | 0.12 er |
| Anthracene | | 0.02 er |
| Total LPAH | | 0.26 Ter |
| Fluoranthene | | 0.06 er |
| Pyrene | | 0.09 er |
| Benzo(a)anthracene | | 0.13 er |
| Chrysene | | 0.14 er |
| Total Benzofluoranthene | | 0.19 Ter |
| Benzo(a)pyrene | | 0.22 er |
| Indeno(1,2,3-cd)pyrene | | 0.24 er |
| Dibenz(a,h)anthracene | | 0.23 er |
| Benzo(g,h,i)perylene | | 0.26 er |
| Total HPAH | | 0.09 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-2: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB144 |
|---|---|---|
| | Sample ID: | SD3-EB144-0000 |
| | Depth (cm bgs): | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | |
| Total PCB | | |
| **Inorganics (Total) (er)** | | |
| Arsenic | | |
| Cadmium | | |
| Chromium | | |
| Copper | | |
| Lead | | |
| Mercury | | |
| Zinc | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-3: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment 2LAET Exceedance Ratios

| Constituent | Station ID: | EB004 | EB009 | EB013 | EB028 | EB034 | EB037 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB04-0000 | SD1-EB09-0000 | SD1-EB13-0000 | SD1-EB28-0000 | SD1-EB34-0000 | SD1-EB37-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.30 er | 14.28 er | 18.57 er | 0.02 Jer | 1.28 er | 2.49 er |
| Dibenzofuran | | 0.85 er | 56.00 er | 89.71 er | 0.09 er | 3.14 er | 6.70 er |
| Naphthalene | | 0.28 er | 35.70 er | 10.70 er | 0.05 er | 4.91 er | 6.00 er |
| Acenaphthylene | | 0.10 er | 3.37 Jer | 6.44 Jer | 0.01 Jer | 0.35 er | 0.60 er |
| Acenaphthene | | 0.36 er | 44.79 er | 543.83 er | 0.08 er | 4.50 er | 9.27 er |
| Fluorene | | 1.36 er | 49.10 er | 218.00 er | 0.06 er | 2.00 er | 4.86 er |
| Phenanthrene | | 0.54 er | 22.03 er | 101.66 er | 0.03 er | 0.78 er | 2.66 er |
| Anthracene | | 1.52 er | 102.50 er | 397.72 er | 0.03 er | 0.55 er | 1.06 er |
| Total LPAH | | 0.93 Ter | 57.06 Ter | 226.77 Ter | 0.04 Ter | 1.86 Ter | 3.52 Ter |
| Fluoranthene | | 1.80 er | 284.80 er | 824.00 er | 0.14 er | 1.96 er | 5.84 er |
| Pyrene | | 0.77 er | 133.03 er | 345.45 er | 0.16 er | 2.92 er | 7.42 er |
| Benzo(a)anthracene | | 0.78 er | 83.75 er | 238.75 er | 0.11 er | 0.76 er | 1.44 er |
| Chrysene | | 1.00 er | 66.42 er | 187.85 er | 0.10 er | 0.69 er | 1.26 er |
| Total Benzofluoranthene | | 0.58 Ter | 26.83 Ter | 84.13 Ter | 0.11 Ter | 1.07 Ter | 1.59 Ter |
| Benzo(a)pyrene | | 0.24 er | 12.86 er | 38.00 er | 0.05 er | 0.49 er | 0.66 er |
| Indeno(1,2,3-cd)pyrene | | 0.52 er | 17.10 er | 49.85 er | 0.11 Jer | 0.85 er | 0.95 er |
| Dibenz(a,h)anthracene | | 0.21 er | 7.11 Jer | 19.81 er | 0.03 Jer | 0.38 er | 0.46 er |
| Benzo(g,h,i)perylene | | 0.38 er | 13.36 Jer | 36.94 er | 0.08 er | 0.73 er | 0.90 er |
| Total HPAH | | 0.86 Ter | 95.96 Ter | 270.38 Ter | 0.12 Ter | 1.43 Ter | 3.19 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-3: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment 2LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB094 / SD2-EB94-0000 / 0 to 10 cm |
|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | |
| 2-Methylnaphthalene | | 0.01 er |
| Dibenzofuran | | |
| Naphthalene | | 0.02 er |
| Acenaphthylene | | 0.00 Jer |
| Acenaphthene | | 0.02 er |
| Fluorene | | 0.02 er |
| Phenanthrene | | 0.01 er |
| Anthracene | | 0.00 er |
| Total LPAH | | 0.01 Ter |
| Fluoranthene | | 0.06 er |
| Pyrene | | 0.05 er |
| Benzo(a)anthracene | | 0.03 er |
| Chrysene | | 0.03 er |
| Total Benzofluoranthene | | 0.04 Ter |
| Benzo(a)pyrene | | 0.02 er |
| Indeno(1,2,3-cd)pyrene | | 0.06 er |
| Dibenz(a,h)anthracene | | 0.00 Jer |
| Benzo(g,h,i)perylene | | 0.06 er |
| Total HPAH | | 0.05 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB001 SD1-EB01-0000 0 to 10 cm | EB002 SD1-EB02-0000 0 to 10 cm | EB003 SD1-EB03-0000 0 to 10 cm | EB004 SD1-EB04-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB006 SD1-EB06-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 2.94 er | 4.24 er | 1.21 Uer | 1.17 Uer | 7.58 er | 1.36 Uer |
| 2-Methylphenol | | 0.52 Jer | 0.60 Jer | 0.55 Uer | 0.11 Jer | 1.25 er | 0.16 Jer |
| 4-Methylphenol | | 0.21 er | 10.10 er | 2.20 er | 0.05 er | 0.49 er | 0.16 er |
| Pentachlorophenol | | 0.49 Uer | 1.46 Uer | 0.48 Uer | 0.72 Jer | 0.53 Uer | 0.65 Jer |
| Phenol | | 0.18 er | 9.47 er | 1.31 er | 1.05 er | 0.30 er | 0.14 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 3.11 er | 2.54 er | 0.31 er | | 17.01 er | 0.48 er |
| Dibenzofuran | | 15.02 er | 17.41 er | 1.81 Jer | | 50.04 er | 2.10 er |
| Naphthalene | | 0.07 Uer | 1.75 er | 0.47 Jer | | 28.46 er | 0.61 er |
| Acenaphthylene | | 0.78 er | 0.96 er | 0.12 er | | 0.78 er | 0.25 er |
| Acenaphthene | | 14.37 er | 24.60 er | 1.50 Jer | | 47.88 er | 1.67 er |
| Fluorene | | 10.90 er | 29.34 er | 1.46 Jer | | 32.12 er | 1.65 er |
| Phenanthrene | | 6.23 er | 34.68 er | 0.90 Jer | | 21.16 er | 1.34 er |
| Anthracene | | 1.76 er | 8.63 er | 0.36 er | | 2.25 er | 0.48 er |
| Total LPAH | | 4.17 Ter | 18.03 Ter | 0.76 Ter | | 18.88 Ter | 1.03 Ter |
| Fluoranthene | | 32.93 er | 24.21 er | 1.18 er | | 9.49 er | 1.35 er |
| Pyrene | | 4.16 er | 2.47 er | 0.18 er | | 2.37 er | 0.27 er |
| Benzo(a)anthracene | | 10.00 er | 8.12 er | 0.49 Jer | | 2.01 er | 0.91 er |
| Chrysene | | 11.46 er | 12.58 er | 0.77 Jer | | 2.82 er | 1.66 er |
| Total Benzofluoranthene | | 3.02 Ter | 3.62 Ter | 0.36 Ter | | 2.00 Ter | 1.29 Ter |
| Benzo(a)pyrene | | 2.82 er | 3.78 er | 0.34 er | | 1.74 er | 1.21 er |
| Indeno(1,2,3-cd)pyrene | | 2.76 er | 4.09 er | 0.36 er | | 1.52 er | 1.85 er |
| Dibenz(a,h)anthracene | | 2.50 er | 3.64 er | 0.32 Jer | | 0.01 Uer | 1.75 er |
| Benzo(g,h,i)perylene | | 2.26 er | 3.66 er | 0.30 er | | 1.49 er | 1.56 er |
| Total HPAH | | 13.50 Ter | 10.55 Ter | 0.68 Ter | | 5.37 Ter | 1.38 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB001 | EB002 | EB003 | EB004 | EB005 | EB006 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB01-0000 | SD1-EB02-0000 | SD1-EB03-0000 | SD1-EB04-0000 | SD1-EB05-0000 | SD1-EB06-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 1.42 Ter | | | 2.65 Ter | 5.87 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.36 er | 0.24 Per | 0.07 Uer | 0.07 Uer | 0.07 Uer | 0.26 Per |
| Cadmium | | 0.12 Per | 0.16 Per | 0.05 Uer | 0.07 Per | 0.09 Per | 0.24 er |
| Chromium | | 0.79 er | 0.58 er | 0.03 er | 0.04 er | 0.07 er | 0.24 er |
| Copper | | 1.05 er | 0.80 er | 0.03 er | 0.04 er | 0.10 er | 0.51 er |
| Lead | | 0.18 er | 0.33 er | 0.01 Per | 0.02 Per | 0.06 er | 0.25 er |
| Mercury | | 0.72 er | 0.69 er | 0.04 er | 0.09 er | 0.14 er | 1.63 er |
| Zinc | | 0.58 er | 0.71 er | 0.08 er | 0.13 er | 0.27 er | 0.75 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB007 SD1-EB07-0000 0 to 10 cm | EB008 SD1-EB08-0000 0 to 10 cm | EB009 SD1-EB09-0000 0 to 10 cm | EB010 SD1-EB10-0000 0 to 10 cm | EB011 SD1-EB11-0000 0 to 10 cm | EB012 SD1-EB12-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.26 Uer | 1.19 Uer | 45.17 Jer | 1.22 Uer | 1.18 Uer | 2.90 er |
| 2-Methylphenol | | 0.58 Uer | 0.55 Uer | 9.53 Jer | 0.56 Uer | 0.54 Uer | 0.67 Jer |
| 4-Methylphenol | | 0.04 Jer | 0.14 er | 2.26 Jer | 0.36 er | 0.02 Jer | 0.24 er |
| Pentachlorophenol | | 0.43 Jer | 0.55 Jer | 135.83 Uer | 0.49 Uer | 0.47 Uer | 0.81 Uer |
| Phenol | | 0.09 Uer | 0.12 Uer | 23.26 Uer | 0.39 er | 0.23 er | 0.19 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.11 er | 0.28 Jer | | 0.00 Uer | 0.34 er | 1.01 er |
| Dibenzofuran | | 0.48 er | 1.00 Jer | | 0.78 Jer | 3.07 er | 5.27 er |
| Naphthalene | | 0.08 er | 0.24 Jer | | 0.00 Uer | 0.78 er | 1.55 er |
| Acenaphthylene | | 0.05 er | 0.17 Jer | | 0.05 Jer | 0.12 er | 0.45 er |
| Acenaphthene | | 0.41 Jer | 0.92 Jer | | 0.00 Uer | 3.10 er | 6.07 er |
| Fluorene | | 0.48 er | 0.94 Jer | | 0.60 Jer | 3.02 er | 3.80 er |
| Phenanthrene | | 0.43 er | 0.92 Jer | | 0.40 Jer | 2.08 er | 2.13 er |
| Anthracene | | 0.14 er | 0.33 Jer | | 0.10 er | 0.70 er | 0.65 er |
| Total LPAH | | 0.28 Ter | 0.64 Ter | | 0.21 Ter | 1.53 Ter | 1.95 Ter |
| Fluoranthene | | 0.32 er | 1.15 Jer | | 0.46 Jer | 1.48 er | 1.63 er |
| Pyrene | | 0.07 er | 0.18 Jer | | 0.06 Jer | 0.29 er | 1.62 Jer |
| Benzo(a)anthracene | | 0.24 er | 0.70 Jer | | 0.22 er | 1.03 er | 0.83 er |
| Chrysene | | 0.43 er | 1.19 Jer | | 0.32 er | 1.38 er | 2.04 er |
| Total Benzofluoranthene | | 0.28 Ter | 0.98 Ter | | 0.20 Ter | 0.78 Ter | 2.74 Ter |
| Benzo(a)pyrene | | 0.25 er | 0.91 Jer | | 0.18 er | 0.70 er | 1.87 er |
| Indeno(1,2,3-cd)pyrene | | 0.40 er | 1.58 Jer | | 0.24 er | 0.75 er | 2.09 er |
| Dibenz(a,h)anthracene | | 0.38 er | 1.36 Jer | | 0.23 Jer | 0.65 er | 1.92 er |
| Benzo(g,h,i)perylene | | 0.36 Jer | 1.51 Jer | | 0.19 er | 0.61 er | 1.85 er |
| Total HPAH | | 0.33 Ter | 1.05 Ter | | 0.29 Ter | 1.14 Ter | 3.30 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB007 | EB008 | EB009 | EB010 | EB011 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB07-0000 | SD1-EB08-0000 | SD1-EB09-0000 | SD1-EB10-0000 | SD1-EB11-0000 | SD1-EB12-0000 |
| ***Constituent*** | ***Depth (cm bgs):*** | *0 to 10 cm* | *0 to 10 cm* | *0 to 10 cm* | *0 to 10 cm* | *0 to 10 cm* | *0 to 10 cm* |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 4.66 Ter | 6.51 Ter | | 0.45 Ter | 0.87 Ter | 1.17 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.13 Per | 0.22 Per | 0.40 er | 0.08 Per | 0.10 Per | 0.29 Per |
| Cadmium | | 0.31 er | 0.53 er | 0.23 er | 0.05 Uer | 0.05 Uer | 0.28 er |
| Chromium | | 0.11 er | 0.23 er | 0.96 er | 0.04 er | 0.04 er | 0.23 er |
| Copper | | 0.19 er | 0.30 er | 0.90 er | 0.04 er | 0.04 er | 0.37 er |
| Lead | | 0.16 er | 0.20 er | 0.42 er | 0.02 Per | 0.03 Per | 0.23 er |
| Mercury | | 0.22 er | 0.24 er | 3.21 er | 0.07 Per | 0.09 Per | 10.34 er |
| Zinc | | 0.44 er | 0.64 er | 1.13 er | 0.10 er | 0.13 er | 0.73 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB013<br>SD1-EB13-0000<br>0 to 10 cm | EB014<br>SD1-EB14-0000<br>0 to 10 cm | EB015<br>SD1-EB15-0000<br>0 to 10 cm | EB016<br>SD1-EB16-0000<br>0 to 10 cm | EB017<br>SD1-EB17-0000<br>0 to 10 cm | EB018<br>SD1-EB18-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 306.89 Uer | 1.54 Uer | 1.27 Uer | 10.93 er | 1.31 Uer | 10.65 er |
| 2-Methylphenol | | 141.26 Uer | 0.19 Jer | 0.58 Uer | 2.09 er | 0.29 Jer | 4.09 er |
| 4-Methylphenol | | 13.28 Uer | 0.05 Jer | 0.04 Jer | 0.55 er | 0.09 er | 0.99 er |
| Pentachlorophenol | | 123.61 Uer | 0.62 Uer | 0.51 Uer | 0.88 er | 0.53 Uer | 0.89 Uer |
| Phenol | | 21.19 Uer | 0.10 Uer | 0.08 Uer | 0.40 er | 0.10 Uer | 0.75 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 0.29 er | 0.20 er | 5.01 er | 1.12 er | 4.10 er |
| Dibenzofuran | | | 1.41 er | 1.24 er | 15.33 er | 4.75 er | 25.52 er |
| Naphthalene | | | 0.33 er | 0.25 er | 9.94 er | 1.56 er | 12.15 er |
| Acenaphthylene | | | 0.21 er | 0.16 er | 0.45 er | 0.33 er | 0.68 er |
| Acenaphthene | | | 1.24 er | 1.52 Jer | 22.20 er | 3.88 er | 20.17 er |
| Fluorene | | | 1.30 er | 1.35 er | 9.46 er | 3.42 er | 15.65 er |
| Phenanthrene | | | 0.95 er | 0.78 er | 6.61 er | 1.86 er | 10.25 er |
| Anthracene | | | 0.43 er | 0.29 er | 0.87 er | 0.62 er | 1.41 er |
| Total LPAH | | | 0.78 Ter | 0.63 Ter | 6.65 Ter | 1.73 Ter | 8.83 Ter |
| Fluoranthene | | | 0.95 er | 1.32 er | 4.21 er | 1.95 er | 6.73 er |
| Pyrene | | | 0.33 er | 0.58 er | 0.59 er | 0.40 er | 2.34 er |
| Benzo(a)anthracene | | | 0.83 er | 0.78 er | 1.17 er | 1.34 er | 2.72 er |
| Chrysene | | | 1.48 er | 1.13 er | 1.79 er | 2.58 er | 3.74 er |
| Total Benzofluoranthene | | | 1.19 Ter | 0.94 Ter | 1.32 Ter | 1.52 Ter | 2.29 Ter |
| Benzo(a)pyrene | | | 1.00 er | 0.87 er | 1.14 er | 1.25 er | 2.18 er |
| Indeno(1,2,3-cd)pyrene | | | 1.21 er | 0.89 er | 1.39 er | 1.52 er | 2.22 er |
| Dibenz(a,h)anthracene | | | 1.19 er | 0.77 er | 1.33 er | 1.39 er | 2.21 er |
| Benzo(g,h,i)perylene | | | 1.04 er | 0.73 er | 1.30 er | 1.24 er | 2.04 er |
| Total HPAH | | | 1.25 Ter | 1.42 Ter | 2.20 Ter | 1.80 Ter | 5.25 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB013 | EB014 | EB015 | EB016 | EB017 | EB018 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB13-0000 | SD1-EB14-0000 | SD1-EB15-0000 | SD1-EB16-0000 | SD1-EB17-0000 | SD1-EB18-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 2.89 Ter | 2.72 Ter | 0.91 Ter | 1.35 Ter | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.41 er | 0.22 Per | 0.17 Per | 0.29 Per | 0.14 Per | 0.39 er |
| Cadmium | | 0.50 er | 0.24 er | 0.25 er | 0.18 Per | 0.12 Per | 0.29 er |
| Chromium | | 0.27 er | 0.21 er | 0.10 er | 0.25 er | 0.09 er | 0.25 er |
| Copper | | 0.31 er | 0.38 er | 0.19 er | 0.39 er | 0.14 er | 0.37 er |
| Lead | | 0.40 er | 0.21 er | 0.19 er | 0.21 er | 0.13 er | 0.30 er |
| Mercury | | 2.39 er | 0.52 er | 0.53 er | 1.21 er | 0.41 er | 3.39 er |
| Zinc | | 1.42 er | 0.70 er | 0.78 er | 0.51 er | 0.42 er | 0.81 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Sheded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB019<br>SD1-EB19-0000<br>0 to 10 cm | EB020<br>SD1-EB20-0000-CC<br>0 to 10 cm | EB021<br>SD1-EB21-0000<br>0 to 10 cm | EB022<br>SD1-EB22-0000<br>0 to 10 cm | EB023<br>SD1-EB23-0000<br>0 to 10 cm | EB024<br>SD1-EB24-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 23.44 er | 4.00 er | 2.86 er | 1.29 Jer | 1.06 Uer | 0.76 Jer |
| 2-Methylphenol | | 6.20 er | 0.73 Jer | 0.40 Jer | 0.24 Jer | 0.48 Uer | 0.92 Uer |
| 4-Methylphenol | | 1.23 er | 0.79 er | 0.21 er | 0.16 er | 0.03 Jer | 0.15 er |
| Pentachlorophenol | | 0.74 Uer | 0.77 Uer | 0.60 Uer | 0.56 Jer | 0.42 Uer | 1.05 Jer |
| Phenol | | 0.88 er | 0.59 er | 0.14 Uer | 0.14 er | 0.05 Jer | 0.75 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 8.65 er | 2.40 er | 2.00 er | 1.02 er | 0.26 er | 0.38 er |
| Dibenzofuran | | 53.33 er | 8.71 er | 9.54 er | 4.71 er | 1.44 er | 2.22 er |
| Naphthalene | | 22.42 er | 5.54 er | 2.66 er | 1.58 Jer | 0.27 er | 0.35 er |
| Acenaphthylene | | 0.75 er | 0.37 er | 0.49 er | 0.42 er | 0.03 er | 0.18 er |
| Acenaphthene | | 44.75 er | 11.97 er | 9.60 er | 3.95 er | 1.25 er | 2.83 er |
| Fluorene | | 33.04 er | 5.39 er | 5.95 er | 3.07 er | 0.90 er | 2.16 er |
| Phenanthrene | | 16.72 er | 3.33 er | 3.26 er | 2.22 Jer | 0.66 er | 1.93 er |
| Anthracene | | 2.36 er | 0.74 er | 0.80 er | 0.75 er | 0.09 er | 0.50 er |
| Total LPAH | | 16.58 Ter | 3.74 Ter | 2.95 Ter | 1.91 Ter | 0.42 Ter | 1.20 Ter |
| Fluoranthene | | 12.40 er | 2.98 er | 1.98 er | 2.34 Jer | 0.65 er | 2.86 er |
| Pyrene | | 2.30 er | 0.56 er | 0.53 er | 0.39 Jer | 0.07 er | 0.35 er |
| Benzo(a)anthracene | | 3.21 er | 1.01 er | 1.30 er | 1.70 er | 0.21 er | 1.03 er |
| Chrysene | | 3.63 er | 1.39 er | 2.22 er | 3.81 er | 0.31 er | 1.82 er |
| Total Benzofluoranthene | | 1.62 Ter | 1.24 Ter | 1.80 Ter | 2.11 Ter | 0.18 Ter | 0.85 Ter |
| Benzo(a)pyrene | | 1.26 er | 1.04 er | 1.54 er | 2.06 er | 0.18 er | 0.79 er |
| Indeno(1,2,3-cd)pyrene | | 1.03 er | 1.27 er | 1.85 er | 2.76 er | 0.22 er | 1.06 er |
| Dibenz(a,h)anthracene | | 0.02 Uer | 0.04 Uer | 1.90 er | 2.35 er | 0.00 Uer | 0.91 er |
| Benzo(g,h,i)perylene | | 1.01 er | 1.11 er | 1.52 er | 2.47 er | 0.19 er | 0.89 er |
| Total HPAH | | 5.84 Ter | 1.85 Ter | 2.01 Ter | 2.35 Ter | 0.32 Ter | 1.53 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB019 | EB020 | EB021 | EB022 | EB023 | EB024 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB19-0000 | SD1-EB20-0000-CC | SD1-EB21-0000 | SD1-EB22-0000 | SD1-EB23-0000 | SD1-EB24-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | 0.32 Ter | 1.02 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.17 Per | 0.39 er | 0.17 Per | 0.17 Per | 0.07 Uer | 0.37 er |
| Cadmium | | 0.09 Per | 0.30 er | 0.23 er | 0.14 Per | 0.05 Uer | 0.15 Per |
| Chromium | | 0.10 er | 0.17 er | 0.13 er | 0.12 er | 0.03 er | 0.19 er |
| Copper | | 0.16 er | 0.30 er | 0.21 er | 0.19 er | 0.04 er | 0.29 er |
| Lead | | 0.08 er | 0.40 er | 0.19 er | 0.14 er | 0.03 er | 0.25 er |
| Mercury | | 0.54 er | 1.79 er | 0.93 er | 0.67 er | 0.09 er | 0.99 er |
| Zinc | | 0.22 er | 0.70 er | 0.56 er | 0.42 er | 0.12 er | 0.61 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB025 | EB026 | EB027 | EB028 | EB029 | EB030 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB25-0000 | SD1-EB26-0000 | SD1-EB27-0000 | SD1-EB28-0000 | SD1-EB29-0000 | SD1-EB30-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 3.82 er | 1.17 Jer | 1.70 er | 1.39 Uer | 4.27 er | 1.01 Jer |
| 2-Methylphenol | | 0.99 er | 0.28 Jer | 0.31 Jer | 0.64 Uer | 0.73 Jer | 0.26 Jer |
| 4-Methylphenol | | 0.30 er | 0.08 er | 0.18 er | 0.03 Jer | 0.33 er | 0.21 er |
| Pentachlorophenol | | 0.71 Uer | 0.78 Uer | 0.68 Uer | 0.56 Uer | 0.72 Uer | 0.68 Uer |
| Phenol | | 0.48 er | 0.07 Jer | 0.14 er | 0.09 Uer | 0.29 er | 0.28 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 2.34 er | 0.32 er | 0.66 er | | 2.11 er | 2.17 er |
| Dibenzofuran | | 10.08 er | 11.85 er | 14.34 er | | 6.68 er | 7.86 er |
| Naphthalene | | 3.53 er | 0.35 er | 0.77 er | | 3.81 er | 4.51 er |
| Acenaphthylene | | 0.46 er | 0.58 er | 1.24 er | | 0.15 er | 0.33 er |
| Acenaphthene | | 14.31 er | 34.25 er | 42.11 er | | 7.28 er | 10.54 er |
| Fluorene | | 6.27 er | 12.85 er | 21.92 er | | 4.30 er | 4.78 er |
| Phenanthrene | | 2.96 er | 13.37 er | 10.91 er | | 2.05 er | 2.50 er |
| Anthracene | | 0.83 er | 1.27 er | 3.18 er | | 0.36 er | 0.55 er |
| Total LPAH | | 3.33 Ter | 6.85 Ter | 8.45 Ter | | 2.40 Ter | 3.02 Ter |
| Fluoranthene | | 2.87 er | 13.44 er | 54.34 er | | 1.00 er | 1.70 er |
| Pyrene | | 1.30 er | 1.68 er | 6.95 er | | 0.43 er | 0.47 er |
| Benzo(a)anthracene | | 2.07 er | 4.94 er | 17.19 er | | 0.42 er | 0.69 er |
| Chrysene | | 3.01 er | 5.42 er | 16.91 er | | 0.75 er | 1.19 er |
| Total Benzofluoranthene | | 2.39 Ter | 2.96 Ter | 7.58 Ter | | 0.46 Ter | 1.22 Ter |
| Benzo(a)pyrene | | 2.58 er | 2.72 er | 7.33 er | | 0.41 er | 1.18 er |
| Indeno(1,2,3-cd)pyrene | | 3.42 er | 3.19 er | 6.34 er | | 0.45 er | 1.46 er |
| Dibenz(a,h)anthracene | | 3.04 er | 3.36 er | 6.59 er | | 0.01 Uer | 1.13 er |
| Benzo(g,h,i)perylene | | 3.69 er | 2.85 er | 5.73 er | | 0.42 er | 1.32 er |
| Total HPAH | | 3.54 Ter | 6.42 Ter | 23.27 Ter | | 0.93 Ter | 1.51 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB025<br>SD1-EB25-0000<br>0 to 10 cm | EB026<br>SD1-EB26-0000<br>0 to 10 cm | EB027<br>SD1-EB27-0000<br>0 to 10 cm | EB028<br>SD1-EB28-0000<br>0 to 10 cm | EB029<br>SD1-EB29-0000<br>0 to 10 cm | EB030<br>SD1-EB30-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 1.23 Ter | 4.45 Ter | | 0.70 Ter | 0.96 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.22 Per | 0.22 Per | 0.26 Per | 0.07 Uer | 0.29 Per | 0.26 Per |
| Cadmium | | 0.28 er | 0.16 Per | 0.47 er | 0.05 Uer | 0.10 Per | 0.12 Per |
| Chromium | | 0.13 er | 0.15 er | 0.12 er | 0.05 er | 0.18 er | 0.10 er |
| Copper | | 0.20 er | 0.26 er | 0.21 er | 0.04 er | 0.40 er | 0.16 er |
| Lead | | 0.15 er | 0.15 er | 0.33 er | 0.02 Per | 0.15 er | 0.10 er |
| Mercury | | 2.01 er | 0.61 er | 1.08 er | 0.17 er | 0.91 er | 0.89 er |
| Zinc | | 0.39 er | 0.46 er | 1.55 er | 0.09 er | 0.38 er | 0.27 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB031 / SD1-EB31-0000 / 0 to 10 cm | EB032 / SD1-EB32-0000 / 0 to 10 cm | EB033 / SD1-EB33-0000 / 0 to 10 cm | EB034 / SD1-EB34-0000 / 0 to 10 cm | EB035 / SD1-EB35-0000 / 0 to 10 cm | EB036 / SD1-EB36-0000 / 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 2.37 er | 1.55 Uer | 1.01 Jer | 3.44 Uer | 1.25 Uer | 1.38 Jer |
| 2-Methylphenol | | 0.50 Jer | 0.24 Jer | 0.22 Jer | 0.54 Jer | 0.57 Uer | 0.24 Jer |
| 4-Methylphenol | | 0.32 er | 0.21 er | 0.12 er | 0.67 er | 0.02 Jer | 0.11 er |
| Pentachlorophenol | | 0.68 Uer | 0.74 er | 0.55 Uer | 0.88 Uer | 0.50 Uer | 0.63 Uer |
| Phenol | | 0.37 er | 0.27 er | 0.13 Uer | 0.61 er | 0.11 er | 0.19 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 2.58 er | 1.07 er | 2.06 er | | 0.33 er | 0.94 er |
| Dibenzofuran | | 9.46 er | 4.11 er | 7.89 er | | 1.28 er | 3.21 er |
| Naphthalene | | 5.09 er | 1.86 er | 3.72 er | | 0.46 Jer | 1.53 er |
| Acenaphthylene | | 0.48 er | 0.34 er | 0.37 er | | 0.10 er | 0.09 er |
| Acenaphthene | | 9.76 er | 4.60 er | 8.17 er | | 1.21 er | 3.52 er |
| Fluorene | | 5.17 er | 2.54 er | 4.51 er | | 0.86 er | 2.06 er |
| Phenanthrene | | 2.86 er | 1.52 er | 2.43 er | | 0.59 er | 1.06 er |
| Anthracene | | 0.60 er | 0.44 er | 0.53 er | | 0.14 er | 0.17 er |
| Total LPAH | | 3.33 Ter | 1.59 Ter | 2.67 Ter | | 0.49 Ter | 1.09 Ter |
| Fluoranthene | | 1.69 er | 2.66 er | 1.28 er | | 0.45 er | 0.53 er |
| Pyrene | | 0.69 er | 0.60 er | 0.42 er | | 0.09 Jer | 0.14 er |
| Benzo(a)anthracene | | 0.70 er | 1.50 er | 0.67 er | | 0.36 er | 0.20 er |
| Chrysene | | 1.19 er | 2.27 er | 1.18 er | | 0.42 er | 0.32 er |
| Total Benzofluoranthene | | 1.13 Ter | 1.27 Ter | 1.10 Ter | | 0.37 Ter | 0.22 Ter |
| Benzo(a)pyrene | | 0.98 er | 1.14 er | 1.04 er | | 0.37 er | 0.20 er |
| Indeno(1,2,3-cd)pyrene | | 1.13 er | 1.26 er | 1.20 er | | 0.52 er | 0.24 er |
| Dibenz(a,h)anthracene | | 1.04 er | 1.31 er | 1.14 er | | 0.38 Jer | 0.00 Uer |
| Benzo(g,h,i)perylene | | 1.01 er | 1.06 er | 1.13 er | | 0.49 er | 0.22 er |
| Total HPAH | | 1.68 Ter | 2.02 Ter | 1.33 Ter | | 0.43 Ter | 0.38 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB031 | EB032 | EB033 | EB034 | EB035 | EB036 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB31-0000 | SD1-EB32-0000 | SD1-EB33-0000 | SD1-EB34-0000 | SD1-EB35-0000 | SD1-EB36-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 1.82 Ter | 1.17 Ter | 1.14 Ter | | 1.19 Ter | 0.54 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.31 Per | 0.14 Per | 0.12 Per | 0.37 er | 0.11 Per | 0.11 Per |
| Cadmium | | 0.18 Per | 0.12 Per | 0.05 Uer | 0.24 er | 0.05 Uer | 0.10 Per |
| Chromium | | 0.13 er | 0.09 er | 0.07 er | 0.14 er | 0.06 er | 0.16 er |
| Copper | | 0.20 er | 0.13 er | 0.13 er | 0.28 er | 0.08 er | 0.16 er |
| Lead | | 0.18 er | 0.11 er | 0.09 er | 0.22 er | 0.07 er | 0.21 er |
| Mercury | | 1.24 er | 0.64 er | 0.44 er | 1.84 er | 0.46 er | 1.38 er |
| Zinc | | 0.43 er | 0.31 er | 0.21 er | 0.50 er | 0.18 er | 0.66 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037 SD1-EB37-0000 0 to 10 cm | EB038 SD1-EB38-0000 0 to 10 cm | EB039 SD1-EB39-0000-CC 0 to 10 cm | EB040 SD1-EB40-0000 0 to 10 cm | EB041 SD1-EB41-0000 0 to 10 cm | EB042 SD1-EB42-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 5.10 er | 1.53 Uer | 3.89 er | 0.72 Jer | 4.20 er | 0.97 Jer |
| 2-Methylphenol | | 1.28 er | 0.70 Uer | 0.50 Jer | 0.16 Jer | 0.63 Jer | 0.26 Jer |
| 4-Methylphenol | | 0.42 er | 0.05 Jer | 0.25 er | 0.08 er | 0.31 er | 0.14 er |
| Pentachlorophenol | | 0.82 Uer | 0.61 Uer | 0.60 Uer | 0.46 Uer | 0.67 Uer | 0.61 Uer |
| Phenol | | 0.33 er | 0.10 Uer | 0.17 er | 0.08 er | 0.27 er | 0.17 er |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 0.98 er | 2.33 er | 1.23 er | 3.01 er | 1.91 er |
| Dibenzofuran | | | 4.15 er | 7.37 er | 3.64 er | 17.06 er | 7.48 er |
| Naphthalene | | | 1.64 er | 3.79 er | 1.97 er | 6.42 er | 3.63 er |
| Acenaphthylene | | | 0.25 er | 0.15 er | 0.14 er | 1.12 er | 0.42 er |
| Acenaphthene | | | 4.02 er | 7.76 er | 3.32 er | 18.06 er | 6.49 er |
| Fluorene | | | 2.57 er | 4.87 er | 2.00 er | 9.44 er | 4.06 er |
| Phenanthrene | | | 1.76 er | 2.53 er | 1.27 er | 5.81 er | 2.45 er |
| Anthracene | | | 0.33 er | 0.34 er | 0.21 er | 1.33 er | 0.52 er |
| Total LPAH | | | 1.49 Ter | 2.57 Ter | 1.29 Ter | 5.85 Ter | 2.55 Ter |
| Fluoranthene | | | 1.07 er | 1.17 Jer | 0.67 er | 8.63 er | 1.53 er |
| Pyrene | | | 0.27 er | 0.47 Jer | 0.14 er | 2.25 er | 0.34 er |
| Benzo(a)anthracene | | | 0.60 er | 0.46 er | 0.22 er | 4.42 er | 0.58 er |
| Chrysene | | | 1.05 er | 0.66 er | 0.33 er | 7.19 er | 1.06 er |
| Total Benzofluoranthene | | | 0.79 Ter | 0.46 Ter | 0.30 Ter | 4.13 Ter | 1.02 Ter |
| Benzo(a)pyrene | | | 0.75 er | 0.45 er | 0.28 er | 4.59 er | 0.98 er |
| Indeno(1,2,3-cd)pyrene | | | 0.96 er | 0.65 er | 0.38 er | 4.58 er | 1.34 er |
| Dibenz(a,h)anthracene | | | 0.88 er | 0.63 er | 0.00 Uer | 3.93 er | 1.08 er |
| Benzo(g,h,i)perylene | | | 0.90 er | 0.63 er | 0.39 er | 4.32 er | 1.24 er |
| Total HPAH | | | 0.99 Ter | 1.03 Ter | 0.46 Ter | 6.92 Ter | 1.25 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB037<br>SD1-EB37-0000<br>0 to 10 cm | EB038<br>SD1-EB38-0000<br>0 to 10 cm | EB039<br>SD1-EB39-0000-CC<br>0 to 10 cm | EB040<br>SD1-EB40-0000<br>0 to 10 cm | EB041<br>SD1-EB41-0000<br>0 to 10 cm | EB042<br>SD1-EB42-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 1.57 Ter | 0.82 Ter | 0.60 Ter | 1.62 Ter | 1.51 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.19 Per | 0.22 Per | 0.19 Per | 0.26 Per | 0.28 Per | 0.22 Per |
| Cadmium | | 0.14 Per | 0.10 Per | 0.10 Per | 0.09 Per | 0.11 Per | 0.10 Per |
| Chromium | | 0.12 er | 0.10 er | 0.10 er | 0.12 er | 0.11 er | 0.10 er |
| Copper | | 0.16 er | 0.17 er | 0.17 er | 0.16 er | 0.21 er | 0.15 er |
| Lead | | 0.11 er | 0.12 er | 0.12 er | 0.12 er | 0.14 er | 0.12 er |
| Mercury | | 1.39 er | 0.85 er | 0.96 er | 1.53 er | 1.25 er | 1.53 er |
| Zinc | | 0.24 er | 0.35 er | 0.35 er | 0.28 er | 0.35 er | 0.29 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Sheded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB043<br>SD1-EB43-0000<br>0 to 10 cm | EB045<br>SD1-EB45-0000<br>0 to 10 cm | EB047<br>SD2-EB47-0000<br>0 to 10 cm | EB049<br>SD2-EB49-0000<br>0 to 10 cm | EB052<br>SD2-EB52-0000<br>0 to 10 cm | EB054<br>SD2-EB54-0000-CC<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.78 Uer | 1.16 Jer | | | | |
| 2-Methylphenol | | 0.82 Uer | 0.21 Jer | | | | |
| 4-Methylphenol | | 0.12 er | 0.10 er | | | | |
| Pentachlorophenol | | 0.71 Uer | 0.53 Uer | | | | |
| Phenol | | 0.28 er | 0.13 er | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.13 er | 2.27 er | 0.08 er | 0.14 er | 0.32 er | 0.84 er |
| Dibenzofuran | | 0.58 er | 8.56 er | | | | |
| Naphthalene | | 0.19 Jer | 3.45 er | 0.08 er | 0.14 er | 0.45 er | 1.07 er |
| Acenaphthylene | | 0.07 er | 0.29 er | 0.02 er | 0.07 er | 0.10 er | 0.18 er |
| Acenaphthene | | 0.50 er | 8.01 er | 0.26 er | 0.43 er | 0.92 er | 2.21 er |
| Fluorene | | 0.36 er | 5.85 er | 0.28 er | 0.41 er | 0.68 er | 1.41 er |
| Phenanthrene | | 0.26 Jer | 3.06 er | 0.24 er | 0.45 er | 0.56 er | 0.97 er |
| Anthracene | | 0.07 er | 0.63 er | 0.07 er | 0.12 er | 0.12 er | 0.25 er |
| Total LPAH | | 0.22 Ter | 2.89 Ter | 0.16 Ter | 0.29 Ter | 0.44 Ter | 0.91 Ter |
| Fluoranthene | | 0.17 Jer | 1.97 er | 0.34 er | 0.65 er | 0.54 er | 0.80 er |
| Pyrene | | 0.08 Jer | 0.42 er | 0.04 er | 0.20 er | 0.12 er | 0.18 er |
| Benzo(a)anthracene | | 0.16 Jer | 1.36 er | 0.24 er | 0.57 er | 0.34 er | 0.52 er |
| Chrysene | | 0.29 Jer | 1.96 er | 0.36 er | 0.88 er | 0.54 er | 0.85 er |
| Total Benzofluoranthene | | 0.33 Ter | 1.44 Ter | 0.20 Ter | 0.80 Ter | 0.49 Ter | 0.67 Ter |
| Benzo(a)pyrene | | 0.32 Jer | 1.24 er | 0.20 er | 0.91 er | 0.59 er | 0.71 er |
| Indeno(1,2,3-cd)pyrene | | 0.46 er | 1.34 er | 0.30 er | 1.47 er | 0.93 er | 1.04 er |
| Dibenz(a,h)anthracene | | 0.48 er | 1.43 er | 0.28 er | 1.36 er | 0.19 Jer | 0.87 er |
| Benzo(g,h,i)perylene | | 0.41 er | 1.16 er | 0.29 er | 1.42 er | 0.97 er | 1.04 er |
| Total HPAH | | 0.31 Ter | 1.73 Ter | 0.26 Ter | 0.89 Ter | 0.56 Ter | 0.79 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB043 | EB045 | EB047 | EB049 | EB052 | EB054 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB43-0000 | SD1-EB45-0000 | SD2-EB47-0000 | SD2-EB49-0000 | SD2-EB52-0000 | SD2-EB54-0000-CC |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 1.16 Ter | 0.63 Ter | | 1.37 Ter | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.35 Per | 0.21 Per | | | | |
| Cadmium | | 0.23 er | 0.08 Per | | | | |
| Chromium | | 0.13 er | 0.08 er | | | | |
| Copper | | 0.20 er | 0.48 er | | | | |
| Lead | | 0.16 er | 0.10 er | | | | |
| Mercury | | 1.37 er | 0.77 er | | 0.87 er | | |
| Zinc | | 0.50 er | 0.25 er | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB056 | EB057 | EB060 | EB061 | EB062 | EB063 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB56-0000 | SD2-EB57-0000 | SD2-EB60-0000 | SD2-EB61-0000 | SD2-EB62-0000 | SD2-EB63-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.82 er | 0.50 er | 0.51 er | 0.51 er | 1.60 er | 0.70 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1.07 er | 0.73 er | 0.79 er | 0.84 er | 3.06 er | 1.16 er |
| Acenaphthylene | | 0.23 er | 0.14 er | 0.12 er | 0.10 er | 0.25 er | 0.18 er |
| Acenaphthene | | 1.76 er | 1.08 er | 1.90 er | 2.02 er | 5.04 er | 2.39 er |
| Fluorene | | 1.34 er | 0.77 er | 1.34 er | 1.16 er | 3.29 er | 1.48 er |
| Phenanthrene | | 1.17 er | 0.63 er | 0.90 er | 0.83 er | 2.23 er | 1.02 er |
| Anthracene | | 0.26 er | 0.14 er | 0.26 er | 0.15 er | 0.36 er | 0.19 er |
| Total LPAH | | 0.96 Ter | 0.57 Ter | 0.80 Ter | 0.72 Ter | 2.10 Ter | 0.93 Ter |
| Fluoranthene | | 1.02 er | 0.50 er | 0.82 er | 0.54 er | 1.63 er | 0.71 er |
| Pyrene | | 0.20 er | 0.11 er | 0.16 er | 0.17 er | 0.45 er | 0.20 er |
| Benzo(a)anthracene | | 0.53 er | 0.24 er | 0.50 er | 0.31 er | 0.71 er | 0.34 er |
| Chrysene | | 0.82 er | 0.37 er | 0.97 er | 0.53 er | 1.11 er | 0.54 er |
| Total Benzofluoranthene | | 0.71 Ter | 0.34 Ter | 0.70 Ter | 0.47 Ter | 0.95 Ter | 0.52 Ter |
| Benzo(a)pyrene | | 0.72 er | 0.34 er | 0.72 er | 0.49 er | 0.93 er | 0.51 er |
| Indeno(1,2,3-cd)pyrene | | 1.06 er | 0.59 er | 0.98 er | 0.72 er | 1.04 er | 0.78 er |
| Dibenz(a,h)anthracene | | 0.87 er | 0.53 er | 0.81 er | 0.14 Jer | 0.92 er | 0.64 er |
| Benzo(g,h,i)perylene | | 1.10 er | 0.61 er | 0.93 er | 0.75 er | 1.17 er | 0.83 er |
| Total HPAH | | 0.87 Ter | 0.44 Ter | 0.79 Ter | 0.58 Ter | 1.36 Ter | 0.67 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB056 | EB057 | EB060 | EB061 | EB062 | EB063 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB56-0000 | SD2-EB57-0000 | SD2-EB60-0000 | SD2-EB61-0000 | SD2-EB62-0000 | SD2-EB63-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | 0.93 Ter | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | 0.41 er | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB067 | EB072 | EB073 | EB077 | EB080 | EB082 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB67-0000 | SD2-EB72-0000 | SD2-EB73-0000 | SD2-EB77-0000 | SD2-EB80-0000 | SD2-EB82-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 1.11 er | 1.98 er | 2.00 er | 1.22 er | 3.25 er | 1.89 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1.89 er | 4.82 er | 3.37 er | 1.70 er | 5.23 er | 3.21 er |
| Acenaphthylene | | 0.21 er | 0.44 er | 0.25 er | 0.11 er | 0.26 er | 0.25 er |
| Acenaphthene | | 4.22 er | 14.80 er | 7.03 er | 3.97 er | 12.10 er | 7.71 er |
| Fluorene | | 2.76 er | 10.16 er | 4.53 er | 2.33 er | 6.93 er | 5.36 er |
| Phenanthrene | | 1.68 er | 6.89 er | 2.97 er | 1.40 er | 4.48 er | 2.96 er |
| Anthracene | | 0.43 er | 1.53 er | 0.50 er | 0.23 er | 0.56 er | 0.62 er |
| Total LPAH | | 1.61 Ter | 5.41 Ter | 2.63 Ter | 1.31 Ter | 3.94 Ter | 2.74 Ter |
| Fluoranthene | | 2.45 er | 19.30 er | 1.79 er | 0.86 er | 2.18 er | 1.95 er |
| Pyrene | | 0.43 er | 3.00 er | 0.45 er | 0.19 er | 0.51 er | 0.52 er |
| Benzo(a)anthracene | | 0.84 er | 5.93 er | 0.68 er | 0.29 er | 0.56 er | 1.61 er |
| Chrysene | | 1.27 er | 6.79 er | 1.24 er | 0.51 er | 0.81 er | 2.55 er |
| Total Benzofluoranthene | | 0.82 Ter | 2.68 Ter | 0.88 Ter | 0.39 Ter | 0.61 Ter | 1.49 Ter |
| Benzo(a)pyrene | | 0.77 er | 2.33 er | 0.84 er | 0.38 er | 0.58 er | 1.30 er |
| Indeno(1,2,3-cd)pyrene | | 1.00 er | 2.19 er | 0.87 er | 0.50 er | 0.72 er | 1.31 er |
| Dibenz(a,h)anthracene | | 0.96 er | 1.86 er | 0.83 er | 0.41 er | 0.63 er | 1.05 Jer |
| Benzo(g,h,i)perylene | | 1.02 er | 1.73 er | 0.95 er | 0.47 er | 0.76 er | 1.26 er |
| Total HPAH | | 1.45 Ter | 8.84 Ter | 1.36 Ter | 0.61 Ter | 1.32 Ter | 1.93 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB067 | EB072 | EB073 | EB077 | EB080 | EB082 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB67-0000 | SD2-EB72-0000 | SD2-EB73-0000 | SD2-EB77-0000 | SD2-EB80-0000 | SD2-EB82-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.53 Ter | | | 0.57 Ter | 0.62 Ter | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | 0.88 er | | | 0.64 er | 1.75 er | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB084 | EB085 | EB086 | EB087 | EB088 | EB089 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB84-0000 | SD2-EB85-0000 | SD2-EB86-0000 | SD2-EB87-0000 | SD2-EB88-0000 | SD2-EB89-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 3.64 er | 3.27 er | 1.82 er | 9.46 er | 1.11 er | 0.98 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 5.54 er | 4.07 er | 2.62 er | 13.59 er | 1.70 er | 1.08 er |
| Acenaphthylene | | 0.26 er | 0.12 er | 0.14 er | 0.28 er | 0.18 er | 0.09 er |
| Acenaphthene | | 8.79 er | 9.44 er | 6.52 er | 22.69 er | 4.08 er | 3.74 er |
| Fluorene | | 5.77 er | 6.47 er | 4.59 er | 18.59 er | 2.33 er | 2.15 er |
| Phenanthrene | | 3.78 er | 4.22 er | 2.84 er | 11.09 er | 1.47 er | 1.30 er |
| Anthracene | | 0.47 er | 0.48 er | 0.31 er | 4.17 er | 0.27 er | 0.18 er |
| Total LPAH | | 3.57 Ter | 3.35 Ter | 2.25 Ter | 11.30 Ter | 1.37 Ter | 1.06 Ter |
| Fluoranthene | | 1.75 er | 2.02 er | 1.54 er | 6.19 er | 0.94 er | 0.69 er |
| Pyrene | | 0.30 er | 0.35 er | 0.30 er | 1.16 er | 0.17 er | 0.20 er |
| Benzo(a)anthracene | | 0.43 er | 0.45 er | 0.36 er | 1.95 er | 0.38 er | 0.23 er |
| Chrysene | | 0.56 er | 0.53 er | 0.49 er | 2.53 er | 0.55 er | 0.31 er |
| Total Benzofluoranthene | | 0.51 Ter | 0.44 Ter | 0.39 Ter | 1.69 Ter | 0.43 Ter | 0.29 Ter |
| Benzo(a)pyrene | | 0.48 er | 0.39 er | 0.37 er | 1.58 er | 0.44 er | 0.29 er |
| Indeno(1,2,3-cd)pyrene | | 0.57 er | 0.47 er | 0.53 er | 1.65 er | 0.58 er | 0.40 er |
| Dibenz(a,h)anthracene | | 0.50 er | 0.39 er | 0.45 er | 1.50 er | 0.46 er | 0.11 Jer |
| Benzo(g,h,i)perylene | | 0.60 er | 0.50 er | 0.54 er | 1.51 er | 0.60 er | 0.47 er |
| Total HPAH | | 0.94 Ter | 1.00 Ter | 0.84 Ter | 3.45 Ter | 0.64 Ter | 0.52 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB084 | EB085 | EB086 | EB087 | EB088 | EB089 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB84-0000 | SD2-EB85-0000 | SD2-EB86-0000 | SD2-EB87-0000 | SD2-EB88-0000 | SD2-EB89-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 0.62 Ter | | 1.54 Ter | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.58 er | | 1.09 er | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB091 | EB094 | EB095 | EB096 | EB097 | EB098 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB91-0000 | SD2-EB94-0000 | SD2-EB95-0000 | SD2-EB96-0000 | SD2-EB97-0000 | SD2-EB98-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.65 er | | 0.35 er | 0.81 er | 1.33 er | 0.79 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.90 er | | 0.56 er | 1.26 er | 2.47 er | 1.12 er |
| Acenaphthylene | | 0.16 er | | 0.14 er | 0.12 er | 0.16 er | 0.11 er |
| Acenaphthene | | 1.50 er | | 1.34 er | 3.14 er | 4.29 er | 2.81 er |
| Fluorene | | 1.11 er | | 1.00 er | 1.75 er | 2.63 er | 1.71 er |
| Phenanthrene | | 0.96 er | | 0.66 er | 1.21 er | 1.95 er | 1.45 er |
| Anthracene | | 0.17 er | | 0.12 er | 0.18 er | 0.27 er | 0.30 er |
| Total LPAH | | 0.77 Ter | | 0.54 Ter | 1.04 Ter | 1.73 Ter | 1.12 Ter |
| Fluoranthene | | 0.70 er | | 0.54 er | 0.73 er | 1.02 er | 0.79 er |
| Pyrene | | 0.15 er | | 0.10 er | 0.30 er | 0.29 er | 0.30 er |
| Benzo(a)anthracene | | 0.35 er | | 0.22 er | 0.34 er | 0.35 er | 0.88 er |
| Chrysene | | 0.52 er | | 0.28 er | 0.50 er | 0.55 er | 2.21 er |
| Total Benzofluoranthene | | 0.51 Ter | | 0.33 Ter | 0.49 Ter | 0.50 Ter | 0.81 Ter |
| Benzo(a)pyrene | | 0.54 er | | 0.35 er | 0.55 er | 0.50 er | 0.90 er |
| Indeno(1,2,3-cd)pyrene | | 0.91 er | | 0.58 er | 0.69 er | 0.75 er | 1.20 er |
| Dibenz(a,h)anthracene | | 0.67 er | | 0.11 Jer | 0.17 Jer | 0.60 er | 0.29 er |
| Benzo(g,h,i)perylene | | 0.92 er | | 0.63 er | 0.76 er | 0.79 er | 1.29 er |
| Total HPAH | | 0.63 Ter | | 0.41 Ter | 0.76 Ter | 0.81 Ter | 1.17 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB091 | EB094 | EB095 | EB096 | EB097 | EB098 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB91-0000 | SD2-EB94-0000 | SD2-EB95-0000 | SD2-EB96-0000 | SD2-EB97-0000 | SD2-EB98-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB099 SD2-EB99-0000 0 to 10 cm | EB100 SD2-EB100-0000 0 to 10 cm | EB101 SD2-EB101-0000 0 to 10 cm | EB102 SD2-EB102-0000 0 to 10 cm | EB103 SD2-EB103-0000 0 to 10 cm | EB104 SD2-EB104-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.64 er | 0.83 er | 0.35 er | 0.86 er | 1.66 er | 6.90 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1.07 er | 1.36 er | 0.45 er | 1.15 er | 4.05 er | 11.06 er |
| Acenaphthylene | | 0.07 er | 0.08 er | 0.04 er | 0.07 er | 0.14 er | 0.16 er |
| Acenaphthene | | 2.08 er | 3.30 er | 1.36 er | 3.01 er | 5.29 er | 24.82 er |
| Fluorene | | 1.27 er | 1.84 er | 0.86 er | 1.82 er | 3.25 er | 17.54 er |
| Phenanthrene | | 0.89 er | 1.06 er | 0.61 er | 1.22 er | 3.48 er | 9.63 er |
| Anthracene | | 0.15 er | 0.18 er | 0.09 er | 0.16 er | 0.26 er | 1.88 er |
| Total LPAH | | 0.80 Ter | 1.03 Ter | 0.46 Ter | 0.99 Ter | 2.64 Ter | 8.88 Ter |
| Fluoranthene | | 0.53 er | 0.70 er | 0.40 er | 0.65 er | 1.06 er | 5.56 er |
| Pyrene | | 0.15 er | 0.18 er | 0.09 er | 0.14 er | 0.31 er | 1.28 er |
| Benzo(a)anthracene | | 0.28 er | 0.22 er | 0.16 er | 0.26 er | 0.32 er | 1.11 er |
| Chrysene | | 0.43 er | 0.34 er | 0.23 er | 0.34 er | 0.40 er | 1.54 er |
| Total Benzofluoranthene | | 0.51 Ter | 0.32 Ter | 0.25 Ter | 0.40 Ter | 0.36 Ter | 0.80 Ter |
| Benzo(a)pyrene | | 0.60 er | 0.31 er | 0.28 er | 0.36 er | 0.37 er | 0.71 er |
| Indeno(1,2,3-cd)pyrene | | 0.81 er | 0.46 er | 0.38 er | 0.54 er | 0.50 er | 0.68 er |
| Dibenz(a,h)anthracene | | 0.20 Jer | 0.43 er | 0.08 Jer | 0.46 er | 0.42 er | 0.65 er |
| Benzo(g,h,i)perylene | | 0.82 er | 0.48 er | 0.41 er | 0.61 er | 0.58 er | 0.69 er |
| Total HPAH | | 0.57 Ter | 0.52 Ter | 0.33 Ter | 0.50 Ter | 0.76 Ter | 2.88 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB099 | EB100 | EB101 | EB102 | EB103 | EB104 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB99-0000 | SD2-EB100-0000 | SD2-EB101-0000 | SD2-EB102-0000 | SD2-EB103-0000 | SD2-EB104-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | 0.59 Ter |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | 0.67 er |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB105 SD2-EB105-0000 0 to 10 cm | EB106 SD2-EB106-0000 0 to 10 cm | EB107 SD2-EB107-0000 0 to 10 cm | EB108 SD2-EB108-0000 0 to 10 cm | EB109 SD2-EB109-0000 0 to 10 cm | EB110 SD2-EB110-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 4.49 er | 0.29 er | 0.23 er | 0.10 er | 0.30 er | |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 5.85 er | 0.40 er | 0.28 er | 0.15 er | 0.61 er | |
| Acenaphthylene | | 0.17 er | 0.12 er | 0.06 er | 0.05 er | 0.10 er | |
| Acenaphthene | | 14.83 er | 1.94 er | 0.76 er | 0.21 er | 0.60 er | |
| Fluorene | | 9.44 er | 1.53 er | 0.59 er | 0.19 er | 0.43 er | |
| Phenanthrene | | 5.04 er | 1.12 er | 0.52 er | 0.22 er | 0.51 er | |
| Anthracene | | 0.63 er | 0.26 er | 0.11 er | 0.07 er | 0.10 er | |
| Total LPAH | | 4.56 Ter | 0.77 Ter | 0.36 Ter | 0.17 Ter | 0.43 Ter | |
| Fluoranthene | | 2.55 er | 0.91 er | 0.46 er | 0.21 er | 0.37 er | |
| Pyrene | | 0.44 er | 0.17 er | 0.11 er | 0.04 er | 0.07 er | |
| Benzo(a)anthracene | | 0.48 er | 0.70 er | 0.26 er | 0.20 er | 0.17 er | |
| Chrysene | | 0.61 er | 1.11 er | 0.34 er | 0.32 er | 0.28 er | |
| Total Benzofluoranthene | | 0.57 Ter | 0.88 Ter | 0.37 Ter | 0.31 Ter | 0.22 Ter | |
| Benzo(a)pyrene | | 0.50 er | 0.93 er | 0.40 er | 0.38 er | 0.23 er | |
| Indeno(1,2,3-cd)pyrene | | 0.63 er | 1.18 er | 0.61 er | 0.66 er | 0.37 er | |
| Dibenz(a,h)anthracene | | 0.55 er | 0.99 er | 0.53 er | 0.53 er | 0.29 Jer | |
| Benzo(g,h,i)perylene | | 0.64 er | 1.10 er | 0.61 er | 0.72 er | 0.44 er | |
| Total HPAH | | 1.25 Ter | 0.94 Ter | 0.45 Ter | 0.30 Ter | 0.30 Ter | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB105 | EB106 | EB107 | EB108 | EB109 | EB110 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB105-0000 | SD2-EB106-0000 | SD2-EB107-0000 | SD2-EB108-0000 | SD2-EB109-0000 | SD2-EB110-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | 1.83 Ter | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | 0.53 er | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB111<br>SD2-EB111-0000<br>0 to 10 cm | EB112<br>SD2-EB112-0000<br>0 to 10 cm | EB115<br>SD3-EB115-0000<br>0.0 to 10 cm | EB116<br>SD3-EB116-0000<br>0.0 to 10 cm | EB117<br>SD3-EB117-0000<br>0.0 to 10 cm | EB118<br>SD3-EB118-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | | 0.73 er | 0.73 er | 0.08 er | 0.19 er |
| Dibenzofuran | | | | 4.41 er | 3.07 er | 0.51 er | 0.55 er |
| Naphthalene | | | | 1.27 er | 1.67 er | 0.10 er | 0.04 er |
| Acenaphthylene | | | | 0.18 er | 0.12 er | 0.04 er | 0.02 er |
| Acenaphthene | | | | 3.98 er | 2.81 er | 0.34 er | 0.22 er |
| Fluorene | | | | 8.34 er | 2.14 er | 0.32 er | 0.26 er |
| Phenanthrene | | | | 6.47 er | 2.52 er | 0.34 er | 0.28 er |
| Anthracene | | | | 2.61 er | 0.26 er | 0.06 er | 0.03 er |
| Total LPAH | | | | 4.37 Ter | 1.56 Ter | 0.20 Ter | 0.14 Ter |
| Fluoranthene | | | | 5.95 er | 1.72 er | 1.57 er | 0.29 er |
| Pyrene | | | | 0.82 er | 0.41 er | 0.17 er | 0.04 er |
| Benzo(a)anthracene | | | | 2.87 er | 0.94 er | 0.37 er | 0.14 er |
| Chrysene | | | | 3.89 er | 1.48 er | 0.87 er | 0.28 er |
| Total Benzofluoranthene | | | | 2.05 Ter | 1.22 Ter | 0.32 Ter | 0.17 Ter |
| Benzo(a)pyrene | | | | 2.63 er | 1.53 er | 0.32 er | 0.18 er |
| Indeno(1,2,3-cd)pyrene | | | | 1.90 er | 1.12 er | 0.42 er | 0.31 er |
| Dibenz(a,h)anthracene | | | | 1.28 er | 0.82 er | 0.39 er | 0.41 er |
| Benzo(g,h,i)perylene | | | | 2.06 er | 1.17 er | 0.45 er | 0.33 er |
| Total HPAH | | | | 3.54 Ter | 1.53 Ter | 0.73 Ter | 0.23 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB111 | EB112 | EB115 | EB116 | EB117 | EB118 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB111-0000 | SD2-EB112-0000 | SD3-EB115-0000 | SD3-EB116-0000 | SD3-EB117-0000 | SD3-EB118-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB119 SD3-EB119-0000 0.0 to 10 cm | EB120 SD3-EB120-0000 0.0 to 10 cm | EB121 SD3-EB121-0000 0.0 to 10 cm | EB122 SD3-EB122-0000 0.0 to 10 cm | EB123 SD3-EB123-0000 0.0 to 10 cm | EB124 SD3-EB124-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.14 er | 0.02 er | 0.52 er | 0.89 er | 0.61 er | 0.25 er |
| Dibenzofuran | | 0.63 er | 0.12 er | 1.75 er | 3.07 er | 2.35 er | 1.08 er |
| Naphthalene | | 0.16 er | 0.03 er | 0.74 er | 1.89 er | 0.65 er | 0.32 er |
| Acenaphthylene | | 0.06 er | 0.01 er | 0.14 er | 0.10 er | 0.06 er | 0.03 er |
| Acenaphthene | | 0.81 er | 0.09 er | 2.05 er | 2.66 er | 2.04 er | 1.11 er |
| Fluorene | | 0.53 er | 0.09 er | 1.39 er | 1.81 er | 1.39 er | 0.76 er |
| Phenanthrene | | 0.66 er | 0.09 er | 2.95 er | 1.96 er | 1.65 er | 0.54 er |
| Anthracene | | 0.09 er | 0.02 er | 0.26 er | 0.20 er | 0.14 er | 0.07 er |
| Total LPAH | | 0.36 Ter | 0.05 Ter | 1.35 Ter | 1.40 Ter | 0.89 Ter | 0.38 Ter |
| Fluoranthene | | 0.62 er | 0.11 er | 1.64 er | 1.28 er | 1.01 er | 0.35 er |
| Pyrene | | 0.12 er | 0.01 er | 0.39 er | 0.23 er | 0.20 er | 0.13 er |
| Benzo(a)anthracene | | 0.39 er | 0.10 er | 0.57 er | 0.33 er | 0.29 er | 0.16 er |
| Chrysene | | 0.57 er | 0.14 er | 0.77 er | 0.51 er | 0.39 er | 0.20 er |
| Total Benzofluoranthene | | 0.53 Ter | 0.11 Ter | 0.55 Ter | 0.42 Ter | 0.35 Ter | 0.22 Ter |
| Benzo(a)pyrene | | 0.71 er | 0.12 er | 0.76 er | 0.50 er | 0.43 er | 0.27 er |
| Indeno(1,2,3-cd)pyrene | | 1.08 er | 0.18 er | 1.00 er | 0.68 er | 0.59 er | 0.38 er |
| Dibenz(a,h)anthracene | | 1.00 er | 0.21 er | 0.86 er | 0.64 er | 0.51 er | 0.34 er |
| Benzo(g,h,i)perylene | | 1.24 er | 0.16 er | 1.26 er | 0.70 er | 0.68 er | 0.43 er |
| Total HPAH | | 0.63 Ter | 0.12 Ter | 1.14 Ter | 0.76 Ter | 0.63 Ter | 0.35 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB119 | EB120 | EB121 | EB122 | EB123 | EB124 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB119-0000 | SD3-EB120-0000 | SD3-EB121-0000 | SD3-EB122-0000 | SD3-EB123-0000 | SD3-EB124-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value* > 1

*Shaded Cell Value* > 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB125 | EB126 | EB127 | EB128 | EB129 | EB130 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB125-0000 | SD3-EB126-0000 | SD3-EB127-0000 | SD3-EB128-0000 | SD3-EB129-0000 | SD3-EB130-0000 |
| | Depth (cm bgs): | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.24 er | 0.76 er | 0.27 er | 0.43 er | 0.57 er | 0.21 er |
| Dibenzofuran | | 1.00 er | 3.32 er | 1.34 er | 1.35 er | 2.40 er | 0.57 er |
| Naphthalene | | 0.40 er | 3.35 er | 0.69 er | 0.48 er | 1.01 er | 0.29 er |
| Acenaphthylene | | 0.03 er | 0.09 er | 0.05 er | 0.04 er | 0.13 er | 0.06 er |
| Acenaphthene | | 0.91 er | 3.02 er | 1.03 er | 1.06 er | 2.03 er | 0.52 er |
| Fluorene | | 0.65 er | 1.84 er | 0.86 er | 0.66 er | 1.35 er | 0.40 er |
| Phenanthrene | | 0.40 er | 2.04 er | 0.55 er | 0.53 er | 0.89 er | 0.43 er |
| Anthracene | | 0.05 er | 0.21 er | 0.09 er | 0.07 er | 0.17 er | 0.10 er |
| Total LPAH | | 0.33 Ter | 1.83 Ter | 0.50 Ter | 0.41 Ter | 0.80 Ter | 0.31 Ter |
| Fluoranthene | | 0.26 er | 1.23 er | 0.39 er | 0.33 er | 0.82 er | 0.36 er |
| Pyrene | | 0.07 er | 0.38 er | 0.10 er | 0.11 er | 0.21 er | 0.08 er |
| Benzo(a)anthracene | | 0.11 er | 0.38 er | 0.16 er | 0.11 er | 0.23 er | 0.41 er |
| Chrysene | | 0.15 er | 0.56 er | 0.23 er | 0.15 er | 0.36 er | 0.75 er |
| Total Benzofluoranthene | | 0.18 Ter | 0.96 Ter | 0.27 Ter | 0.17 Ter | 0.34 Ter | 0.38 Ter |
| Benzo(a)pyrene | | 0.20 er | 0.69 er | 0.33 er | 0.18 er | 0.37 er | 0.39 er |
| Indeno(1,2,3-cd)pyrene | | 0.30 er | 0.91 er | 0.53 er | 0.27 er | 0.49 er | 0.53 er |
| Dibenz(a,h)anthracene | | 0.30 er | 0.69 er | 0.47 er | 0.25 er | 0.41 er | 0.53 er |
| Benzo(g,h,i)perylene | | 0.34 er | 1.11 er | 0.63 er | 0.30 er | 0.51 er | 0.59 er |
| Total HPAH | | 0.23 Ter | 1.09 Ter | 0.36 Ter | 0.28 Ter | 0.59 Ter | 0.46 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| | Station ID: | EB125 | EB126 | EB127 | EB128 | EB129 | EB130 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD3-EB125-0000 | SD3-EB126-0000 | SD3-EB127-0000 | SD3-EB128-0000 | SD3-EB129-0000 | SD3-EB130-0000 |
| **Constituent** | **Depth (cm bgs):** | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm | 0.0 to 10 cm |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131 SD3-EB131-0000 0.0 to 10 cm | EB132 SD3-EB132-0000 0.0 to 10 cm | EB133 SD3-EB133-0000 0.0 to 10 cm | EB135 SD3-EB135-0000 0.0 to 10 cm | EB136 SD3-EB136-0000 0.0 to 10 cm | EB137 SD3-EB137-0000 0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.11 er | 0.12 er | 0.10 er | 0.26 er | 0.34 er | 0.59 er |
| Dibenzofuran | | 0.42 er | 0.51 er | 0.36 er | 1.04 er | 1.48 er | 1.51 er |
| Naphthalene | | 0.15 er | 0.22 er | 0.11 er | 0.62 er | 0.90 er | 1.00 er |
| Acenaphthylene | | 0.02 er | 0.02 er | 0.01 er | 0.03 er | 0.02 er | 0.05 er |
| Acenaphthene | | 0.38 er | 0.44 er | 0.29 er | 0.67 er | 1.07 er | 1.36 er |
| Fluorene | | 0.24 er | 0.28 er | 0.22 er | 0.57 er | 1.01 er | 0.76 er |
| Phenanthrene | | 0.23 er | 0.27 er | 0.29 er | 0.43 er | 0.82 er | 0.61 er |
| Anthracene | | 0.04 er | 0.04 er | 0.03 er | 0.06 er | 0.17 er | 0.07 er |
| Total LPAH | | 0.16 Ter | 0.20 Ter | 0.15 Ter | 0.39 Ter | 0.68 Ter | 0.59 Ter |
| Fluoranthene | | 0.22 er | 0.25 er | 0.29 er | 0.34 er | 0.53 er | 0.37 er |
| Pyrene | | 0.04 er | 0.05 er | 0.06 er | 0.09 er | 0.09 er | 0.09 er |
| Benzo(a)anthracene | | 0.12 er | 0.13 er | 0.18 er | 0.16 er | 0.43 er | 0.13 er |
| Chrysene | | 0.18 er | 0.20 er | 0.26 er | 0.25 er | 0.58 er | 0.22 er |
| Total Benzofluoranthene | | 0.18 Ter | 0.18 Ter | 0.21 Ter | 0.28 Ter | 0.46 Ter | 0.17 Ter |
| Benzo(a)pyrene | | 0.21 er | 0.19 er | 0.26 er | 0.32 er | 0.56 er | 0.19 er |
| Indeno(1,2,3-cd)pyrene | | 0.39 er | 0.35 er | 0.47 er | 0.51 er | 0.77 er | 0.38 er |
| Dibenz(a,h)anthracene | | 0.39 er | 0.37 er | 0.42 er | 0.50 er | 0.83 er | 0.36 er |
| Benzo(g,h,i)perylene | | 0.39 er | 0.36 er | 0.50 er | 0.51 er | 0.82 er | 0.37 er |
| Total HPAH | | 0.21 Ter | 0.23 Ter | 0.28 Ter | 0.34 Ter | 0.53 Ter | 0.29 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB131<br>SD3-EB131-0000<br>0.0 to 10 cm | EB132<br>SD3-EB132-0000<br>0.0 to 10 cm | EB133<br>SD3-EB133-0000<br>0.0 to 10 cm | EB135<br>SD3-EB135-0000<br>0.0 to 10 cm | EB136<br>SD3-EB136-0000<br>0.0 to 10 cm | EB137<br>SD3-EB137-0000<br>0.0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | |
| 2,4-Dimethylphenol | | |
| 2-Methylphenol | | |
| 4-Methylphenol | | |
| Pentachlorophenol | | |
| Phenol | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | |
| 2-Methylnaphthalene | | 0.40 er |
| Dibenzofuran | | 1.42 er |
| Naphthalene | | 0.80 er |
| Acenaphthylene | | 0.02 er |
| Acenaphthene | | 1.13 er |
| Fluorene | | 0.81 er |
| Phenanthrene | | 0.61 er |
| Anthracene | | 0.12 er |
| Total LPAH | | 0.56 Ter |
| Fluoranthene | | 0.45 er |
| Pyrene | | 0.12 er |
| Benzo(a)anthracene | | 0.32 er |
| Chrysene | | 0.59 er |
| Total Benzofluoranthene | | 0.38 Ter |
| Benzo(a)pyrene | | 0.47 er |
| Indeno(1,2,3-cd)pyrene | | 0.64 er |
| Dibenz(a,h)anthracene | | 0.64 er |
| Benzo(g,h,i)perylene | | 0.65 er |
| Total HPAH | | 0.50 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-4: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB144 / SD3-EB144-0000 / 0.0 to 10 cm |
|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | |
| Total PCB | | |
| **Inorganics (Total) (er)** | | |
| Arsenic | | |
| Cadmium | | |
| Chromium | | |
| Copper | | |
| Lead | | |
| Mercury | | |
| Zinc | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-5: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB004 SD1-EB04-0000 0 to 10 cm | EB009 SD1-EB09-0000 0 to 10 cm | EB013 SD1-EB13-0000 0 to 10 cm | EB028 SD1-EB28-0000 0 to 10 cm | EB034 SD1-EB34-0000 0 to 10 cm | EB037 SD1-EB37-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.62 er | 29.85 er | 38.80 er | 0.05 Jer | 2.68 er | 5.20 er |
| Dibenzofuran | | 1.11 er | 72.59 er | 116.29 er | 0.11 er | 4.07 er | 8.68 er |
| Naphthalene | | 0.32 er | 40.80 er | 12.23 er | 0.06 er | 5.61 er | 6.85 er |
| Acenaphthylene | | 0.10 er | 3.37 Jer | 6.44 Jer | 0.01 Jer | 0.35 er | 0.60 er |
| Acenaphthene | | 0.53 er | 65.40 er | 794.00 er | 0.12 er | 6.58 er | 13.54 er |
| Fluorene | | 2.51 er | 90.92 er | 403.70 er | 0.11 er | 3.70 er | 9.00 er |
| Phenanthrene | | 1.96 er | 79.33 er | 366.00 er | 0.14 er | 2.84 er | 9.60 er |
| Anthracene | | 7.01 er | 469.79 er | 1822.91 er | 0.14 er | 2.53 er | 4.86 er |
| Total LPAH | | 2.33 Ter | 142.67 Ter | 566.93 Ter | 0.12 Ter | 4.66 Ter | 8.82 Ter |
| Fluoranthene | | 2.65 er | 418.82 er | 1211.76 er | 0.21 er | 2.88 er | 8.58 er |
| Pyrene | | 0.98 er | 168.84 er | 438.46 er | 0.20 er | 3.71 er | 9.42 er |
| Benzo(a)anthracene | | 0.96 er | 103.07 er | 293.84 er | 0.14 er | 0.93 er | 1.77 er |
| Chrysene | | 2.01 er | 132.85 er | 375.71 er | 0.20 er | 1.38 er | 2.52 er |
| Total Benzofluoranthene | | 0.65 Ter | 30.18 Ter | 94.65 Ter | 0.12 Ter | 1.21 Ter | 1.79 Ter |
| Benzo(a)pyrene | | 0.45 er | 24.12 er | 71.25 er | 0.10 er | 0.91 er | 1.25 er |
| Indeno(1,2,3-cd)pyrene | | 0.60 er | 19.66 er | 57.33 er | 0.12 Jer | 0.97 er | 1.09 er |
| Dibenz(a,h)anthracene | | 0.50 er | 16.69 Jer | 46.52 er | 0.09 Jer | 0.89 er | 1.09 er |
| Benzo(g,h,i)perylene | | 0.41 er | 14.35 Jer | 39.70 er | 0.09 er | 0.78 er | 0.97 er |
| Total HPAH | | 1.22 Ter | 135.95 Ter | 383.05 Ter | 0.17 Ter | 2.03 Ter | 4.52 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-5: PSR Marine Sediments Unit Surface (0 to 10 cm) Sediment LAET Exceedance Ratios

| | Station ID: | EB094 |
|---|---|---|
| | Sample ID: | SD2-EB94-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (er)** | | |
| 2-Methylnaphthalene | | 0.02 er |
| Dibenzofuran | | |
| Naphthalene | | 0.02 er |
| Acenaphthylene | | 0.00 Jer |
| Acenaphthene | | 0.03 er |
| Fluorene | | 0.03 er |
| Phenanthrene | | 0.06 er |
| Anthracene | | 0.04 er |
| Total LPAH | | 0.04 Ter |
| Fluoranthene | | 0.09 er |
| Pyrene | | 0.07 er |
| Benzo(a)anthracene | | 0.04 er |
| Chrysene | | 0.07 er |
| Total Benzofluoranthene | | 0.05 Ter |
| Benzo(a)pyrene | | 0.05 er |
| Indeno(1,2,3-cd)pyrene | | 0.07 er |
| Dibenz(a,h)anthracene | | 0.01 Jer |
| Benzo(g,h,i)perylene | | 0.06 er |
| Total HPAH | | 0.07 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 2

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB002 SD1-EB02-0000 0 to 10 cm | EB005 SD1-EB05-0000 0 to 10 cm | EB007 SD1-EB07-0000 0 to 10 cm | EB010 SD1-EB10-0000 0 to 10 cm | EB012 SD1-EB12-0000 0 to 10 cm | EB014 SD1-EB14-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 1.60 | 3.30 | 3.30 | 0.90 | 0.68 UE | 0.27 UE |
| Total TCDF | | 5.40 | 12.00 | 32.00 | 3.00 | 7.30 | 2.00 |
| 2378-TCDD | | 0.27 UI | 1.40 U | 0.27 U | 0.27 U | 0.68 U | 0.27 U |
| Total TCDD | | 2.90 | 1.40 U | 1.60 | 0.84 | 9.90 | 0.45 |
| 12378-PeCDF | | 1.30 UE | 6.50 U | 1.30 UE | 1.30 U | 3.20 U | 1.30 UE |
| 23478-PeCDF | | 1.30 UE | 11.00 | 1.30 UE | 1.30 U | 6.00 | 1.30 UE |
| Total PeCDF | | 8.80 | 21.00 | 39.00 | 3.00 | 41.00 | 9.60 |
| 12378-PeCDD | | 1.30 UI | 6.50 UI | 1.30 UI | 1.30 UI | 3.20 U | 1.30 UI |
| Total PeCDD | | 2.10 | 6.80 | 1.30 U | 1.30 U | 8.90 | 1.30 U |
| 123478-HxCDF | | 5.90 | 6.50 UE | 7.40 | 1.30 UE | 3.20 UE | 2.30 |
| 123678-HxCDF | | 2.90 | 6.50 UE | 3.50 | 1.30 U | 7.90 | 1.30 UI |
| 234678-HxCDF | | 4.00 | 13.00 | 6.80 | 1.30 U | 9.20 | 1.60 |
| 123789-HxCDF | | 3.40 | 9.00 | 3.30 | 1.30 UI | 7.40 | 1.30 |
| Total HxCDF | | 72.00 | 210.00 | 100.00 | 17.00 | 140.00 | 31.00 |
| 123478-HxCDD | | 2.30 | 12.00 | 2.90 | 1.30 U | 5.60 | 1.30 U |
| 123678-HxCDD | | 26.00 | 86.00 | 25.00 | 6.90 | 41.00 | 8.80 |
| 123789-HxCDD | | 5.10 | 25.00 | 7.60 | 2.30 | 13.00 | 1.90 |
| Total HxCDD | | 490.00 | 980.00 | 160.00 | 66.00 | 680.00 | 110.00 |
| 1234678-HpCDF | | 72.00 | 290.00 | 100.00 | 16.00 | 160.00 | 23.00 |
| 1234789-HpCDF | | 5.90 | 28.00 | 8.30 | 1.70 | 15.00 | 1.90 |
| Total HpCDF | | 78.00 | 1400.00 | 110.00 | 69.00 | 690.00 | 82.00 |
| 1234678-HpCDD | | 920.00 | 3600.00 | 640.00 | 170.00 | 1400.00 | 250.00 |
| Total HpCDD | | 5100.00 | 13000.00 | 1900.00 | 550.00 | 5200.00 | 880.00 |
| OCDF | | 250.00 | 1500.00 | 330.00 | 65.00 | 580.00 | 65.00 |
| OCDD | | 11000.00 | 30000.00 | 6500.00 | 1700.00 | 12000.00 | 2500.00 |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: | EB002 | EB005 | EB007 | EB010 | EB012 | EB014 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB02-0000 | SD1-EB05-0000 | SD1-EB07-0000 | SD1-EB10-0000 | SD1-EB12-0000 | SD1-EB14-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| Total 2,3,7,8-TCDD(Equiv) | | 26.34 T | 91.01 T | 20.29 T | 4.65 T | 39.74 T | 6.90 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 823.40 T | 11819.48 T | 1352.86 T | 553.80 T | 1135.42 T | 406.11 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Station ID: | EB015 | EB016 | EB017 | EB023 | EB024 | EB026 |
|---|---|---|---|---|---|---|
| Sample ID: | SD1-EB15-0000 | SD1-EB16-0000 | SD1-EB17-0000 | SD1-EB23-0000 | SD1-EB24-0000 | SD1-EB26-0000 |
| Constituent / Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (ng/kg)** | | | | | | |
| 2378-TCDF | 0.27 UE | 0.27 UE | 5.00 | 0.62 J | 6.90 | 11.00 |
| Total TCDF | 37.00 | 13.00 | 28.00 | 3.40 | 69.00 | 42.00 |
| 2378-TCDD | 0.27 UI | 0.27 U | 0.38 U | 0.27 U | 0.27 UI | 0.32 UI |
| Total TCDD | 11.00 | 8.30 | 9.30 | 0.27 U | 79.00 | 9.80 |
| 12378-PeCDF | 1.30 U | 1.30 UE | 1.90 U | 1.30 U | 1.30 UE | 1.60 UE |
| 23478-PeCDF | 1.30 UE | 3.10 | 6.20 | 1.30 U | 9.40 | 36.00 |
| Total PeCDF | 89.00 | 19.00 | 40.00 | 4.50 | 39.00 | 77.00 |
| 12378-PeCDD | 1.30 UI | 1.30 UI | 1.90 U | 1.30 U | 1.30 UI | 1.60 UI |
| Total PeCDD | 7.00 | 3.90 | 1.90 U | 1.30 U | 36.00 | 43.00 |
| 123478-HxCDF | 16.00 | 1.30 UE | 1.90 UE | 1.30 UE | 18.00 | 42.00 |
| 123678-HxCDF | 1.30 UE | 3.00 | 1.90 UE | 1.30 U | 5.30 | 8.30 |
| 234678-HxCDF | 12.00 | 3.90 | 5.20 | 1.30 U | 8.00 | 18.00 |
| 123789-HxCDF | 8.70 | 3.10 | 3.80 | 1.30 U | 4.90 | 26.00 |
| Total HxCDF | 250.00 | 150.00 | 92.00 | 17.00 | 320.00 | 1300.00 |
| 123478-HxCDD | 4.80 | 2.00 | 2.30 | 1.30 U | 3.60 | 7.50 |
| 123678-HxCDD | 59.00 | 19.00 | 29.00 | 5.60 | 34.00 | 170.00 |
| 123789-HxCDD | 11.00 | 4.30 | 7.20 | 1.30 U | 10.00 | 31.00 |
| Total HxCDD | 870.00 | 280.00 | 310.00 | 69.00 | 550.00 | 2600.00 |
| 1234678-HpCDF | 110.00 | 77.00 | 84.00 | 14.00 | 160.00 | 400.00 |
| 1234789-HpCDF | 7.90 | 1.30 U | 7.80 | 1.30 U | 10.00 | 20.00 |
| Total HpCDF | 660.00 | 320.00 | 400.00 | 57.00 | 170.00 | 1400.00 |
| 1234678-HpCDD | 1600.00 | 580.00 | 820.00 | 180.00 | 1200.00 | 5700.00 |
| Total HpCDD | 5600.00 | 2500.00 | 3000.00 | 640.00 | 4500.00 | 19000.00 |
| OCDF | 240.00 | 200.00 | 340.00 | 41.00 | 450.00 | 610.00 |
| OCDD | 12000.00 | 5300.00 | 8400.00 | 1800.00 | 10000.00 | 45000.00 D |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB015<br>SD1-EB15-0000<br>0 to 10 cm | EB016<br>SD1-EB16-0000<br>0 to 10 cm | EB017<br>SD1-EB17-0000<br>0 to 10 cm | EB023<br>SD1-EB23-0000<br>0 to 10 cm | EB024<br>SD1-EB24-0000<br>0 to 10 cm | EB026<br>SD1-EB26-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total 2,3,7,8-TCDD(Equiv) | | 40.56 T | 17.15 T | 26.20 T | 4.40 T | 37.92 T | 156.19 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 2704.60 T | 451.31 T | 1747.20 T | 338.69 T | 972.30 T | 5784.81 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| | Station ID: | EB028 | EB029 | EB030 | EB031 | EB032 | EB033 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB28-0000 | SD1-EB29-0000 | SD1-EB30-0000 | SD1-EB31-0000 | SD1-EB32-0000 | SD1-EB33-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 0.48 | 7.50 | 8.10 | 12.00 | 2.20 | 3.00 |
| Total TCDF | | *1.40* | *88.00* | *50.00* | *91.00* | *9.50* | *24.00* |
| 2378-TCDD | | 0.27 U | 1.90 | 0.99 | 2.10 | 0.27 UI | 0.56 |
| Total TCDD | | 1.60 | 190.00 | 82.00 | 260.00 | 12.00 | 91.00 |
| 12378-PeCDF | | 1.30 U | 1.30 UE | 1.30 U | 1.30 UE | 1.30 UE | 1.30 U |
| 23478-PeCDF | | 1.30 U | 10.00 | 13.00 | 17.00 | 6.80 | 7.20 |
| Total PeCDF | | 1.30 U | 87.00 | 73.00 | 78.00 | 24.00 | 42.00 |
| 12378-PeCDD | | 1.30 U | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI |
| Total PeCDD | | 1.30 U | 46.00 | 28.00 | 130.00 | 4.10 | 20.00 |
| 123478-HxCDF | | 1.30 UE | 12.00 | 1.30 UE | 24.00 | 9.90 | 5.70 |
| 123678-HxCDF | | 1.30 U | 8.20 | 1.30 UE | 1.30 UE | 4.10 | 3.40 |
| 234678-HxCDF | | 1.30 U | 8.60 | 9.10 | 14.00 | 5.30 | 4.40 |
| 123789-HxCDF | | 1.30 U | 5.40 | 5.40 | 1.30 UE | 2.60 | 2.70 |
| Total HxCDF | | 19.00 | 110.00 | 150.00 | 550.00 | 92.00 | 72.00 |
| 123478-HxCDD | | 1.30 U | 3.70 | 4.60 | 6.60 | 2.30 | 2.30 |
| 123678-HxCDD | | 2.90 | 20.00 | 37.00 | 54.00 | 18.00 | 14.00 |
| 123789-HxCDD | | 1.30 U | 7.30 | 9.90 | 15.00 | 4.40 | 3.70 |
| Total HxCDD | | 16.00 | 290.00 | 340.00 | 830.00 | 260.00 | 210.00 |
| 1234678-HpCDF | | 10.00 | 100.00 | 160.00 | 330.00 | 86.00 | 47.00 |
| 1234789-HpCDF | | 1.30 U | 21.00 | 12.00 | 19.00 | 7.20 | 4.50 |
| Total HpCDF | | 40.00 | 400.00 | 350.00 | 1100.00 | 290.00 | 240.00 |
| 1234678-HpCDD | | 75.00 | 570.00 | 900.00 | 1300.00 | 530.00 | 410.00 |
| Total HpCDD | | 260.00 | 2200.00 | 3000.00 | 4400.00 | 1800.00 | 1600.00 |
| OCDF | | 35.00 | 320.00 | 620.00 | 1000.00 | 300.00 | 190.00 |
| OCDD | | 750.00 | 5100.00 | 8800.00 | 12000.00 | 4600.00 | 3700.00 |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB028 / SD1-EB28-0000 / 0 to 10 cm | EB029 / SD1-EB29-0000 / 0 to 10 cm | EB030 / SD1-EB30-0000 / 0 to 10 cm | EB031 / SD1-EB31-0000 / 0 to 10 cm | EB032 / SD1-EB32-0000 / 0 to 10 cm | EB033 / SD1-EB33-0000 / 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total 2,3,7,8-TCDD(Equiv) | | 1.97 T | 26.50 T | 35.04 T | 52.65 T | 19.41 T | 16.58 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 828.12 T | 2336.00 T | 2507.14 T | 1213.25 T | 1275.76 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB034 / SD1-EB34-0000 / 0 to 10 cm | EB035 / SD1-EB35-0000 / 0 to 10 cm | EB036 / SD1-EB36-0000 / 0 to 10 cm | EB037 / SD1-EB37-0000 / 0 to 10 cm | EB038 / SD1-EB38-0000 / 0 to 10 cm | EB039 / SD1-EB39-0000-CC / 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 11.00 | 3.10 | 4.80 | 22.00 | 2.50 | 4.60 |
| Total TCDF | | 100.00 | 21.00 | 94.00 | 250.00 | 2.50 | 54.00 |
| 2378-TCDD | | 0.27 UI | 0.27 UI | 1.00 | 3.70 | 0.27 UI | 0.87 |
| Total TCDD | | 200.00 | 11.00 | 51.00 | 520.00 | 35.00 | 68.00 |
| 12378-PeCDF | | 1.30 UE | 1.30 U | 1.30 UE | 1.30 UE | 1.30 UE | 1.30 UE |
| 23478-PeCDF | | 20.00 | 3.10 | 1.30 UE | 13.00 | 1.30 UE | 6.70 |
| Total PeCDF | | 80.00 | 20.00 | 38.00 | 94.00 | 18.00 | 45.00 |
| 12378-PeCDD | | 1.30 UI | 1.30 UI | 1.30 UI | 9.60 | 1.30 UI | 1.30 UI |
| Total PeCDD | | 95.00 | 4.30 | 26.00 | 370.00 | 17.00 | 25.00 |
| 123478-HxCDF | | 1.30 UE | 1.30 UE | 7.10 | 1.30 UE | 6.20 | 9.10 |
| 123678-HxCDF | | 10.00 | 1.30 UE | 3.50 | 1.30 UE | 2.60 | 4.60 |
| 234678-HxCDF | | 20.00 | 2.50 | 4.50 | 7.30 | 5.40 | 6.50 |
| 123789-HxCDF | | 8.90 | 1.50 | 1.90 | 1.30 UE | 2.90 | 3.70 |
| Total HxCDF | | 270.00 | 70.00 | 63.00 | 170.00 | 180.00 | 98.00 |
| 123478-HxCDD | | 9.00 | 1.30 U | 2.00 | 7.40 | 2.60 | 2.80 |
| 123678-HxCDD | | 67.00 | 9.50 | 15.00 | 22.00 | 18.00 | 23.00 |
| 123789-HxCDD | | 19.00 | 2.50 | 5.30 | 10.00 | 5.30 | 7.10 |
| Total HxCDD | | 680.00 | 120.00 | 170.00 | 530.00 | 160.00 | 290.00 |
| 1234678-HpCDF | | 550.00 | 31.00 | 63.00 | 84.00 | 70.00 | 92.00 |
| 1234789-HpCDF | | 36.00 | 2.10 | 5.20 | 4.40 | 6.60 | 7.20 |
| Total HpCDF | | 590.00 | 130.00 | 68.00 | 290.00 | 77.00 | 240.00 |
| 1234678-HpCDD | | 2100.00 | 260.00 | 350.00 | 410.00 | 550.00 | 660.00 |
| Total HpCDD | | 5800.00 | 920.00 | 1200.00 | 1400.00 | 1800.00 | 2300.00 |
| OCDF | | 2200.00 | 91.00 | 230.00 | 290.00 | 290.00 | 330.00 |
| OCDD | | 19000.00 J | 2400.00 | 3200.00 | 3400.00 | 4500.00 | 5800.00 |

*See Table 4-2 for* 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB034<br>SD1-EB34-0000<br>0 to 10 cm | EB035<br>SD1-EB35-0000<br>0 to 10 cm | EB036<br>SD1-EB36-0000<br>0 to 10 cm | EB037<br>SD1-EB37-0000<br>0 to 10 cm | EB038<br>SD1-EB38-0000<br>0 to 10 cm | EB039<br>SD1-EB39-0000-CC<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total 2,3,7,8-TCDD(Equiv) | | 72.55 T | 8.88 T | 13.02 T | 30.54 T | 15.60 T | 24.08 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 1168.68 T | 394.60 T | | 975.37 T | 830.41 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| | Station ID: | EB040 | EB041 | EB042 | EB043 | EB045 | EB049 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB40-0000 | SD1-EB41-0000 | SD1-EB42-0000 | SD1-EB43-0000 | SD1-EB45-0000 | SD2-EB49-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 4.90 | 6.00 | 4.10 | 4.00 | 14.00 | 3.70 |
| Total TCDF | | 97.00 | 89.00 | 75.00 | 34.00 | 78.00 | 34.00 |
| 2378-TCDD | | 1.40 | 1.70 | 0.76 | 0.35 | 0.91 | 0.40 U |
| Total TCDD | | 170.00 | 120.00 | 96.00 | 14.00 | 79.00 | 16.00 |
| 12378-PeCDF | | 1.30 UI | 9.90 | 1.30 UE | 1.30 UE | 1.30 U | 1.90 UI |
| 23478-PeCDF | | 1.30 UE | 18.00 | 5.60 | 11.00 | 1.30 UI | 6.00 |
| Total PeCDF | | 61.00 | 100.00 | 51.00 | 36.00 | 35.00 | 97.00 |
| 12378-PeCDD | | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.30 UI | 1.90 UI |
| Total PeCDD | | 75.00 | 79.00 | 26.00 | 14.00 | 13.00 | 7.90 |
| 123478-HxCDF | | 8.20 | 33.00 | 7.30 | 1.30 UE | 2.80 | 9.50 |
| 123678-HxCDF | | 4.30 | 6.60 | 3.70 | 4.60 | 4.40 | 4.20 |
| 234678-HxCDF | | 5.40 | 19.00 | 5.10 | 8.70 | 5.20 | 6.80 |
| 123789-HxCDF | | 2.40 | 16.00 | 2.70 | 4.30 | 2.60 | 6.80 |
| Total HxCDF | | 76.00 | 670.00 | 77.00 | 230.00 | 75.00 | 240.00 |
| 123478-HxCDD | | 3.60 | 6.70 | 2.50 | 1.70 | 1.30 UI | 1.90 U |
| 123678-HxCDD | | 16.00 | 68.00 | 16.00 | 17.00 | 17.00 | 29.00 |
| 123789-HxCDD | | 6.20 | 18.00 | 5.00 | 4.50 | 5.90 | 1.90 UI |
| Total HxCDD | | 170.00 | 1500.00 | 200.00 | 130.00 | 280.00 | 360.00 |
| 1234678-HpCDF | | 64.00 | 270.00 | 59.00 | 85.00 | 77.00 | 64.00 |
| 1234789-HpCDF | | 4.70 | 22.00 | 5.40 | 12.00 | 5.50 | 10.00 |
| Total HpCDF | | 69.00 | 940.00 | 210.00 | 470.00 | 330.00 | 460.00 |
| 1234678-HpCDD | | 330.00 | 2500.00 | 400.00 | 390.00 | 580.00 | 610.00 |
| Total HpCDD | | 950.00 | 12000.00 | 1300.00 | 1100.00 | 2200.00 | 2000.00 |
| OCDF | | 210.00 | 800.00 | 270.00 | 360.00 | 240.00 | 340.00 |
| OCDD | | 2700.00 | 17000.00 | 2900.00 | 2700.00 | 4800.00 | 5000.00 |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| | Station ID: | EB040 | EB041 | EB042 | EB043 | EB045 | EB049 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB40-0000 | SD1-EB41-0000 | SD1-EB42-0000 | SD1-EB43-0000 | SD1-EB45-0000 | SD2-EB49-0000 |
| **Constituent** | **Depth (cm bgs):** | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| Total 2,3,7,8-TCDD(Equiv) | | 13.39 T | 74.24 T | 16.01 T | 18.26 T | 17.76 T | 21.18 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 705.10 T | 3374.77 T | 1231.84 T | 961.05 T | 1045.00 T | 962.72 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB060 SD2-EB60-0000 0 to 10 cm | EB067 SD2-EB67-0000 0 to 10 cm | EB077 SD2-EB77-0000 0 to 10 cm | EB080 SD2-EB80-0000 0 to 10 cm | EB085 SD2-EB85-0000 0 to 10 cm | EB087 SD2-EB87-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 0.40 U | 0.40 U | 0.40 U | 0.40 U | 3.20 | 7.60 |
| Total TCDF | | 0.40 U | 6.70 | 2.50 | 1.50 | 15.00 | 100.00 |
| 2378-TCDD | | 0.40 U | 0.40 U | 0.40 U | 0.40 U | 0.40 U | 0.40 U |
| Total TCDD | | 3.50 | 21.00 | 12.00 | 5.80 | 51.00 | 79.00 |
| 12378-PeCDF | | 1.90 U | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 3.30 |
| 23478-PeCDF | | 1.90 U | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 6.30 |
| Total PeCDF | | 34.00 | 4.50 | 20.00 | 5.90 | 19.00 | 73.00 |
| 12378-PeCDD | | 1.90 U | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 1.90 UI |
| Total PeCDD | | 1.90 U | 9.30 | 2.00 U | 1.90 U | 25.00 | 48.00 |
| 123478-HxCDF | | 1.90 UE | 2.00 UE | 2.00 UE | 1.90 UE | 2.00 UE | 1.90 UE |
| 123678-HxCDF | | 1.90 UE | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 4.10 |
| 234678-HxCDF | | 4.00 | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 5.40 |
| 123789-HxCDF | | 3.60 | 2.00 U | 2.00 U | 1.90 U | 2.00 U | 4.00 |
| Total HxCDF | | 58.00 | 21.00 | 28.00 | 4.80 | 16.00 | 68.00 |
| 123478-HxCDD | | 2.80 | 2.00 U | 2.00 UI | 1.90 U | 2.00 U | 1.90 UI |
| 123678-HxCDD | | 15.00 | 8.10 | 2.00 UI | 3.40 | 9.10 | 25.00 |
| 123789-HxCDD | | 5.50 | 2.00 U | 2.00 U | 1.90 U | 4.10 | 14.00 |
| Total HxCDD | | 290.00 | 86.00 | 110.00 | 43.00 | 150.00 | 330.00 |
| 1234678-HpCDF | | 58.00 | 38.00 | 77.00 | 11.00 | 40.00 | 140.00 |
| 1234789-HpCDF | | 1.90 UI | 2.00 U | 2.00 UI | 1.90 U | 3.90 | 9.80 |
| Total HpCDF | | 240.00 | 160.00 | 270.00 | 47.00 | 190.00 | 560.00 |
| 1234678-HpCDD | | 580.00 | 220.00 | 220.00 | 89.00 | 290.00 | 740.00 |
| Total HpCDD | | 1900.00 | 660.00 | 690.00 | 370.00 | 950.00 | 2500.00 |
| OCDF | | 170.00 | 170.00 | 260.00 | 43.00 | 200.00 | 430.00 |
| OCDD | | 6200.00 | 2400.00 | 2100.00 | 850.00 | 3400.00 | 7500.00 |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB060<br>SD2-EB60-0000<br>0 to 10 cm | EB067<br>SD2-EB67-0000<br>0 to 10 cm | EB077<br>SD2-EB77-0000<br>0 to 10 cm | EB080<br>SD2-EB80-0000<br>0 to 10 cm | EB085<br>SD2-EB85-0000<br>0 to 10 cm | EB087<br>SD2-EB87-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total 2,3,7,8-TCDD(Equiv) | | 15.84 T | 5.96 T | 5.33 T | 2.23 T | 8.57 T | 26.15 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 1320.00 T | 350.58 T | 355.33 T | 101.50 T | 476.61 T | 1188.77 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB104 SD2-EB104-0000 0 to 10 cm | EB106 SD2-EB106-0000 0 to 10 cm |
|---|---|---|---|
| **Dioxins and Furans (ng/kg)** | | | |
| 2378-TCDF | | 2.60 | 0.40 U |
| Total TCDF | | 19.00 | 1.30 |
| 2378-TCDD | | 0.40 U | 0.40 U |
| Total TCDD | | 22.00 | 1.40 |
| 12378-PeCDF | | 2.00 U | 2.00 U |
| 23478-PeCDF | | 2.00 U | 2.00 U |
| Total PeCDF | | 20.00 | 30.00 |
| 12378-PeCDD | | 2.00 U | 2.00 U |
| Total PeCDD | | 8.40 | 2.00 U |
| 123478-HxCDF | | 2.00 UE | 2.00 UE |
| 123678-HxCDF | | 2.00 U | 2.00 UE |
| 234678-HxCDF | | 2.00 U | 3.40 |
| 123789-HxCDF | | 2.00 U | 3.30 |
| Total HxCDF | | 19.00 | 41.00 |
| 123478-HxCDD | | 2.00 UI | 2.00 U |
| 123678-HxCDD | | 10.00 | 14.00 |
| 123789-HxCDD | | 2.00 UI | 5.10 |
| Total HxCDD | | 170.00 | 240.00 |
| 1234678-HpCDF | | 60.00 | 64.00 |
| 1234789-HpCDF | | 2.00 UI | 2.00 UI |
| Total HpCDF | | 260.00 | 280.00 |
| 1234678-HpCDD | | 380.00 | 560.00 |
| Total HpCDD | | 1300.00 | 1800.00 |
| OCDF | | 240.00 | 230.00 |
| OCDD | | 4000.00 | 6000.00 |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-6: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Results Compared with Elliott Bay Average Background Concentrations

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB104<br>SD2-EB104-0000<br>0 to 10 cm | EB106<br>SD2-EB106-0000<br>0 to 10 cm |
|---|---|---|---|
| Total 2,3,7,8-TCDD(Equiv) | | 9.90 T | 15.05 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 450.00 T | 1157.69 T |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard: PSRBGSED*

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB002<br>SD1-EB02-0000<br>0 to 10 cm | EB005<br>SD1-EB05-0000<br>0 to 10 cm | EB007<br>SD1-EB07-0000<br>0 to 10 cm | EB010<br>SD1-EB10-0000<br>0 to 10 cm | EB012<br>SD1-EB12-0000<br>0 to 10 cm | EB014<br>SD1-EB14-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 25.04 Ter | 86.51 Ter | 19.28 Ter | 4.42 Ter | 37.77 Ter | 6.56 Ter |
| **Dioxins and Furans - TOCN (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 6.73 Ter | 96.61 Ter | 11.05 Ter | 4.52 Ter | 9.28 Ter | 3.31 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| | Station ID: | EB015 | EB016 | EB017 | EB023 | EB024 | EB026 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB15-0000 | SD1-EB16-0000 | SD1-EB17-0000 | SD1-EB23-0000 | SD1-EB24-0000 | SD1-EB26-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 38.56 Ter | 16.30 Ter | 24.91 Ter | 4.18 Ter | 36.04 Ter | 148.46 Ter |
| **Dioxins and Furans - TOCN (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 22.10 Ter | 3.68 Ter | 14.28 Ter | 2.76 Ter | 7.94 Ter | 47.28 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | EB028<br>SD1-EB28-0000<br>0 to 10 cm | EB029<br>SD1-EB29-0000<br>0 to 10 cm | EB030<br>SD1-EB30-0000<br>0 to 10 cm | EB031<br>SD1-EB31-0000<br>0 to 10 cm | EB032<br>SD1-EB32-0000<br>0 to 10 cm | EB033<br>SD1-EB33-0000<br>0 to 10 cm |
|---|---|---|---|---|---|---|---|
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 1.87 Ter | 25.19 Ter | 33.30 Ter | 50.04 Ter | 18.45 Ter | 15.76 Ter |
| **Dioxins and Furans - TOCN (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 6.76 Ter | 19.09 Ter | 20.49 Ter | 9.91 Ter | 10.42 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| | Station ID: | EB034 | EB035 | EB036 | EB037 | EB038 | EB039 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB34-0000 | SD1-EB35-0000 | SD1-EB36-0000 | SD1-EB37-0000 | SD1-EB38-0000 | SD1-EB39-0000-CC |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 68.96 Ter | 8.44 Ter | 12.37 Ter | 29.03 Ter | 14.83 Ter | 22.89 Ter |
| **Dioxins and Furans - TOCN (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | | 9.55 Ter | 3.22 Ter | | 7.97 Ter | 6.78 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| | Station ID: | EB040 | EB041 | EB042 | EB043 | EB045 | EB049 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-EB40-0000 | SD1-EB41-0000 | SD1-EB42-0000 | SD1-EB43-0000 | SD1-EB45-0000 | SD2-EB49-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 12.73 Ter | 70.57 Ter | 15.22 Ter | 17.35 Ter | 16.88 Ter | 20.13 Ter |
| **Dioxins and Furans - TOCN (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 5.76 Ter | 27.58 Ter | 10.06 Ter | 7.65 Ter | 6.54 Ter | 7.86 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| | Station ID: | EB060 | EB067 | EB077 | EB080 | EB085 | EB087 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB60-0000 | SD2-EB67-0000 | SD2-EB77-0000 | SD2-EB80-0000 | SD2-EB85-0000 | SD2-EB87-0000 |
| Constituent | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Dioxins and Furans (er)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 15.05 Ter | 5.66 Ter | 5.06 Ter | 2.12 Ter | 8.15 Ter | 24.86 Ter |
| ***Dioxins and Furans - TOCN (er)*** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 10.78 Ter | 2.86 Ter | 2.90 Ter | 0.82 Ter | 3.89 Ter | 9.71 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-7: PSR Marine Sediments Unit Surface Sediment 2,3,7,8-TCDD Exceedance Ratios Based on Comparison to Elliott Bay Background

| | Station ID: | EB104 | EB106 |
|---|---|---|---|
| | Sample ID: | SD2-EB104-0000 | SD2-EB106-0000 |
| Constituent | Depth (cm bgs): | *0 to 10 cm* | *0 to 10 cm* |
| **Dioxins and Furans (er)** | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 9.41 Ter | 14.30 Ter |
| **Dioxins and Furans - TOCN (er)** | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 3.67 Ter | 9.46 Ter |

See Table 4-2 for 2,3,7,8-TCDD (Equiv.) background screening values and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 5

## Table D-8: Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results

| Constituent | Station ID: | BK001 | BK001 | BK001D | BK002 | BK003 | BK004 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-BK01-0000 | SD2-BK01-0000 | SD1-BK01D-0000 | SD1-BK02-0000 | SD1-BK03-0000 | SD2-BK04-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 31.40 U | | 33.30 U | 36.90 U | 35.50 U | |
| 2-Chloronaphthalene | | | | | | | 14.40 U |
| 2-Methylnaphthalene | | 23.70 J | 19.90 | 15.20 J | 13.50 J | 35.50 U | 55.70 |
| 2-Methylphenol | | 31.40 U | | 33.30 U | 36.90 U | 35.50 U | |
| 4-Methylphenol | | 31.40 U | | 33.30 U | 11.40 J | 35.50 U | |
| Carbazole | | | | | | | 4.70 J |
| Dibenzofuran | | 65.60 | | 21.30 J | 15.90 J | 35.50 U | |
| Naphthalene, 1-methyl | | | | | | | 36.00 |
| Pentachlorophenol | | 157.00 U | | 166.00 U | 185.00 U | 178.00 U | |
| Phenol | | 31.40 U | | 33.30 U | 94.90 | 35.50 U | |
| Retene | | | | | | | 375.00 |
| Naphthalene | | 47.70 | 26.20 | 29.80 J | 36.90 U | 35.50 U | 232.00 |
| Acenaphthylene | | 19.30 J | 18.50 | 15.40 J | 26.40 J | 35.50 U | 37.10 |
| Acenaphthene | | 226.00 | 43.80 | 63.00 | 17.10 J | 35.50 U | 32.30 |
| Fluorene | | 222.00 | 52.50 | 64.40 | 23.70 J | 35.50 U | 36.50 |
| Phenanthrene | | 2220.00 | 542.00 | 635.00 | 138.00 | 35.50 U | 217.00 |
| Anthracene | | 728.00 | 164.00 | 200.00 | 80.70 | 35.50 U | 88.80 |
| Total LPAH | | 3463.00 T | 847.00 T | 1007.60 T | 285.90 T | 35.50 UT | 643.70 T |
| Fluoranthene | | 2270.00 | 660.00 | 550.00 | 237.00 | 35.50 U | 308.00 |
| Pyrene | | 4130.00 | 924.00 | 907.00 | 232.00 | 38.10 U | 395.00 |
| Benzo(a)anthracene | | 1640.00 | 331.00 | 335.00 | 121.00 | 35.50 U | 85.90 |
| Chrysene | | 1890.00 | 354.00 | 387.00 | 201.00 | 35.50 U | 131.00 |
| Benzo(b)fluoranthene | | 1450.00 | 374.00 | 298.00 | 247.00 | 35.50 U | 146.00 |
| Benzo(k)fluoranthene | | 656.00 | 125.00 | 133.00 | 97.20 | 35.50 U | 52.40 |
| Total Benzofluoranthene | | 2106.00 T | 499.00 T | 431.00 T | 344.20 T | 35.50 UT | 198.40 T |

See Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

## Table D-8: Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results

| Constituent | Station ID: | BK001 | BK001 | BK001D | BK002 | BK003 | BK004 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD1-BK01-0000 | SD2-BK01-0000 | SD1-BK01D-0000 | SD1-BK02-0000 | SD1-BK03-0000 | SD2-BK04-0000 |
| | Depth (cm bgs): | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm | 0 to 10 cm |
| Benzo(a)pyrene | | 1430.00 | 394.00 | 271.00 | 158.00 | 35.50 U | 83.40 |
| Indeno(1,2,3-cd)pyrene | | 669.00 | 190.00 | 136.00 | 106.00 | 35.50 U | 54.60 |
| Dibenz(a,h)anthracene | | 180.00 | 42.50 | 27.60 J | 30.40 J | 35.50 U | 12.40 J |
| Benzo(g,h,i)perylene | | 654.00 | 213.00 | 128.00 | 98.20 | 35.50 U | 62.10 |
| Total HPAH | | 14969.00 T | 3607.50 T | 3172.60 T | 1527.80 T | 38.10 UT | 1330.80 T |
| Total B(a)P equivalent | | 1994.35 T | 527.60 T | 377.21 T | 236.97 T | 35.50 UT | 125.10 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 3160.00 J | 829.16 | 1617.02 J | 1227.27 J | | 7957.14 |
| Dibenzofuran | | 8746.66 | | 2265.95 J | 1445.45 J | | |
| Naphthalene | | 6360.00 | 1091.66 | 3170.21 J | 36.90 U | | 33142.85 |
| Acenaphthylene | | 2573.33 J | 770.83 | 1638.29 J | 2400.00 J | | 5300.00 |
| Acenaphthene | | 30133.33 | 1825.00 | 6702.12 | 1554.54 J | | 4614.28 |
| Fluorene | | 29600.00 | 2187.50 | 6851.06 | 2154.54 J | | 5214.28 |
| Phenanthrene | | 296000.00 | 22583.33 | 67553.19 | 12545.45 | | 31000.00 |
| Anthracene | | 97066.66 | 6833.33 | 21276.59 | 7336.36 | | 12685.71 |
| Total LPAH | | 461733.33 T | 35291.66 T | 107191.48 T | 25990.90 T | | 91957.14 T |
| Fluoranthene | | 302666.66 | 27500.00 | 58510.63 | 21545.45 | | 44000.00 |
| Pyrene | | 550666.66 | 38500.00 | 96489.36 | 21090.90 | | 56428.57 |
| Benzo(a)anthracene | | 218666.66 | 13791.66 | 35638.29 | 11000.00 | | 12271.42 |
| Chrysene | | 252000.00 | 14750.00 | 41170.21 | 18272.72 | | 18714.28 |
| Total Benzofluoranthene | | 280800.00 T | 20791.66 T | 45851.06 T | 31290.90 T | | 28342.85 T |
| Benzo(a)pyrene | | 190666.66 | 16416.66 | 28829.78 | 14363.63 | | 11914.28 |
| Indeno(1,2,3-cd)pyrene | | 89200.00 | 7916.66 | 14468.08 | 9636.36 | | 7800.00 |
| Dibenz(a,h)anthracene | | 24000.00 | 1770.83 | 2936.17 J | 2763.63 J | | 1771.42 J |
| Benzo(g,h,i)perylene | | 87200.00 | 8875.00 | 13617.02 | 8927.27 | | 8871.42 |
| Total HPAH | | 1995866.66 T | 150312.50 T | 337510.63 T | 138890.90 T | | 190114.28 T |

See Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

## Table D-8: Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | BK001 SD1-BK01-0000 0 to 10 cm | BK001 SD2-BK01-0000 0 to 10 cm | BK001D SD1-BK01D-0000 0 to 10 cm | BK002 SD1-BK02-0000 0 to 10 cm | BK003 SD1-BK03-0000 0 to 10 cm | BK004 SD2-BK04-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 265913.33 T | 21983.50 T | 40129.46 T | 21543.00 T | | 17872.14 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 3.10 U | 12.00 U | 3.30 U | 18.00 U | 2.00 U | 13.00 UJ |
| Aroclor 1221 | | 3.10 U | 23.00 U | 3.30 U | 18.00 U | 2.00 U | 13.00 UJ |
| Aroclor 1232 | | 3.10 U | 12.00 U | 3.30 U | 18.00 U | 2.00 U | 13.00 UJ |
| Aroclor 1242 | | 3.10 U | 12.00 U | 3.30 U | 18.00 U | 2.00 U | 13.00 UJ |
| Aroclor 1248 | | 3.10 U | 12.00 U | 3.30 U | 18.00 U | 2.00 U | 13.00 UJ |
| Aroclor 1254 | | 3.10 J | 14.00 U | 5.00 | 19.00 | 1.20 J | 150.00 J |
| Aroclor 1260 | | 2.70 J | 12.00 U | 5.70 | 31.00 | 1.10 J | 49.00 |
| Total PCB | | 5.80 T | 23.00 UT | 10.70 T | 50.00 T | 2.30 T | 199.00 T |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 773.33 T | 23.00 UT | 1138.29 T | 4545.45 T | | 28428.57 T |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 2378-TCDF | | 0.49 | 0.51 | 0.62 | 1.30 | 0.42 | 0.40 U |
| Total TCDF | | 0.49 | 0.51 | 2.40 | 5.00 | 0.80 | 0.40 U |
| 2378-TCDD | | 0.27 U | 0.40 U | 0.27 U | 0.27 UI | 0.27 U | 0.40 U |
| Total TCDD | | 0.80 | 0.40 U | 1.50 | 2.30 | 0.33 | 1.80 |
| 12378-PeCDF | | 1.30 U | 2.00 UE | 1.30 U | 1.30 U | 1.30 U | 2.00 U |
| 23478-PeCDF | | 1.30 U | 2.00 U | 1.30 U | 1.90 | 1.30 U | 2.00 U |
| Total PeCDF | | 1.30 U | 2.00 U | 3.30 | 14.00 | 1.30 U | 3.30 |
| 12378-PeCDD | | 1.30 U | 2.00 U | 1.30 U | 1.30 U | 1.30 U | 2.00 U |
| Total PeCDD | | 1.30 U | 2.00 U | 1.30 U | 1.30 U | 1.30 U | 2.00 U |
| 123478-HxCDF | | 1.30 U | 2.00 U | 1.30 UE | 1.30 UE | 1.30 U | 2.00 UE |
| 123678-HxCDF | | 1.30 U | 2.00 U | 1.30 U | 1.30 | 1.30 U | 2.00 U |
| 234678-HxCDF | | 1.30 U | 2.00 U | 1.30 U | 1.60 | 1.30 U | 2.00 U |

See Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

## Table D-8: Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | BK001 SD1-BK01-0000 0 to 10 cm | BK001 SD2-BK01-0000 0 to 10 cm | BK001D SD1-BK01D-0000 0 to 10 cm | BK002 SD1-BK02-0000 0 to 10 cm | BK003 SD1-BK03-0000 0 to 10 cm | BK004 SD2-BK04-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| 123789-HxCDF | | 2.10 | 2.00 U | 1.30 U | 1.30 U | 1.30 U | 2.00 U |
| Total HxCDF | | 2.10 | 2.10 | 3.10 | 17.00 | 1.30 U | 6.30 |
| 123478-HxCDD | | 1.30 U | 2.00 U | 1.30 U | 1.30 U | 1.30 U | 2.00 UI |
| 123678-HxCDD | | 1.30 U | 2.00 U | 1.30 UI | 5.10 | 1.30 U | 2.00 U |
| 123789-HxCDD | | 1.30 U | 2.00 U | 1.30 U | 2.70 | 1.30 U | 2.00 U |
| Total HxCDD | | 11.00 | 3.40 | 12.00 | 45.00 | 4.30 | 17.00 |
| 1234678-HpCDF | | 4.00 | 2.90 | 6.10 | 15.00 | 1.60 | 5.10 |
| 1234789-HpCDF | | 1.30 U | 2.00 U | 1.30 U | 1.50 | 1.30 U | 2.00 U |
| Total HpCDF | | 13.00 | 9.20 | 18.00 | 52.00 | 5.10 | 23.00 |
| 1234678-HpCDD | | 18.00 | 11.00 | 20.00 | 91.00 | 7.10 | 30.00 |
| Total HpCDD | | 41.00 | 26.00 | 48.00 | 300.00 | 18.00 | 75.00 |
| OCDF | | 10.00 | 6.70 | 15.00 | 44.00 | 4.00 | 24.00 |
| OCDD | | 130.00 | 93.00 | 180.00 | 760.00 | 51.00 | 290.00 |
| Total 2,3,7,8-TCDD(Equiv) | | 0.61 T | 0.28 T | 0.51 T | 4.02 T | 0.18 T | 0.66 T |
| **Dioxins and Furans - TOCN (ng/kg)** | | | | | | | |
| Total 2,3,7,8-TCDD(Equiv) | | 82.53 T | 12.07 T | 55.10 T | 366.27 T | | 95.00 T |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Aluminum | | 6670.00 | | 7540.00 | 7610.00 | 4870.00 | |
| Arsenic | | 4.00 U | | 9.00 P | 4.00 U | 4.00 U | |
| Cadmium | | 0.30 U | | 0.30 U | 0.30 U | 0.30 U | |
| Chromium | | 19.50 | | 21.60 | 19.40 | 13.00 | |
| Copper | | 8.15 | | 11.90 | 18.60 | 3.87 | |
| Iron | | 17000.00 | | 17800.00 | 11500.00 | 8000.00 | |
| Lead | | 12.00 P | | 15.10 | 21.70 | 8.90 P | |
| Mercury | | 0.05 | 0.07 J | 0.10 | 0.15 | 0.02 | 0.21 |
| Nickel | | 21.00 | | 23.10 | 18.20 | 12.80 | |

See Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

## Table D-8: Elliott Bay Background Surface (0 to 10 cm) Sediment Analytical Results

| Constituent | Station ID: / Sample ID: / Depth (cm bgs): | BK001 SD1-BK01-0000 0 to 10 cm | BK001 SD2-BK01-0000 0 to 10 cm | BK001D SD1-BK01D-0000 0 to 10 cm | BK002 SD1-BK02-0000 0 to 10 cm | BK003 SD1-BK03-0000 0 to 10 cm | BK004 SD2-BK04-0000 0 to 10 cm |
|---|---|---|---|---|---|---|---|
| Zinc | | 49.60 | | 52.50 | 43.90 | 23.30 | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.75 | 2.40 | 0.94 | 1.10 | 0.29 | 0.70 |
| Percent Moisture (%) | | 28.00 | | 26.00 | 31.00 | 33.00 | |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | 7.00 | | 3.00 | | | |
| 4750-2000 microns-Fractional | | 9.00 | 6.00 | 8.00 | | | 3.00 |
| 2000-1000 microns-Fractional | | 5.00 | 5.00 | 6.00 | 1.00 | | 2.00 |
| 1000-500 microns-Fractional | | 8.00 | 9.00 | 9.00 | 1.00 | 2.00 | 3.00 |
| 500-250 microns-Fractional % | | 29.00 | 29.00 | 29.00 | 12.00 | 17.00 | 11.00 |
| 250-125 microns-Fractional % | | 26.00 | 30.00 | 25.00 | 48.00 | 65.00 | 29.00 |
| 125-62.4 microns-Fractional | | 8.00 | 12.00 | 10.00 | 16.00 | 13.00 | 31.00 |
| Total Percent Sand | | 76.00 T | 85.00 T | 79.00 T | 78.00 T | 97.00 T | 76.00 T |
| 62.5-31.2 microns-Fractional | | 1.00 | | 1.00 | 5.00 | | 10.00 |
| 31.2-15.6 microns-Fractional | | | 1.00 | 1.00 | 4.00 | 1.00 | 3.00 |
| 15.6-7.8 microns-Fractional | | 1.00 | 2.00 | 1.00 | 3.00 | | 1.00 |
| 7.8-3.9 microns-Fractional % | | 1.00 | 2.00 | 1.00 | 2.00 | | 1.00 |
| 3.9-1.9 microns-Fractional % | | 1.00 | 2.00 | 2.00 | 2.00 | | 1.00 |
| 1.9-0.9 microns-Fractional % | | | 2.00 | 1.00 | 2.00 | 1.00 | 1.00 |
| < 0.9 microns-Fractional % | | 2.00 | | 2.00 | 3.00 | | 2.00 |
| Balance-Fractional % | | 2.00 | | 1.00 | 1.00 | 1.00 | 2.00 |
| Total Percent Fines | | 8.00 T | 9.00 T | 10.00 T | 22.00 T | 3.00 T | 21.00 T |

See Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB003 SD2-EB03-0000A-CC 0 to 4 | EB003 SD2-EB03-0040-CC 4 to 8 | EB003 SD2-EB03-0080-CC 8 to 12 | EB003 SD2-EB03-0120-CC 12 to 16 | EB003 SD2-EB03-0160-CC 16 to 20 | EB012 SD2-EB12-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 10.70 UJ | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 20.90 U |
| 2-Methylnaphthalene | | 6.80 J | 1.20 J | 1.80 J | 2.90 J | 2.20 J | 6100.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 2.60 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 947.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 12.30 | 1.20 J | 1.60 J | 3.20 J | 1.70 J | 6330.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 54.90 | 11.90 | 25.90 | 40.50 | 33.90 | 965.00 |
| Naphthalene | | 42.60 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 34000.00 |
| Acenaphthylene | | 3.50 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 626.00 |
| Acenaphthene | | 16.00 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 16100.00 |
| Fluorene | | 29.90 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 13100.00 |
| Phenanthrene | | 150.00 J | 11.20 U | 16.40 | 11.40 U | 9.20 U | 26800.00 |
| Anthracene | | 144.00 J | 11.20 U | 1.50 J | 11.40 U | 1.20 J | 13800.00 |
| Total LPAH | | 386.00 T | 11.20 UT | 17.90 T | 11.40 UT | 1.20 T | 106426.00 T |
| Fluoranthene | | 404.00 J | 11.20 U | 26.10 | 11.40 U | 9.20 U | 64100.00 |
| Pyrene | | 320.00 | 8.30 J | 148.00 | 4.20 J | 4.00 J | 74600.00 |
| Benzo(a)anthracene | | 185.00 J | 22.40 U | 22.60 U | 22.70 U | 18.40 U | 10400.00 |
| Chrysene | | 454.00 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 14500.00 |
| Benzo(b)fluoranthene | | 84.40 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 13500.00 |
| Benzo(k)fluoranthene | | 40.10 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 6670.00 |
| Total Benzofluoranthene | | 124.50 T | 11.20 UT | 11.30 UT | 11.40 UT | 9.20 UT | 20170.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Station ID: | EB003 | EB003 | EB003 | EB003 | EB003 | EB012 |
|---|---|---|---|---|---|---|
| Sample ID: | SD2-EB03-0000A-CC | SD2-EB03-0040-CC | SD2-EB03-0080-CC | SD2-EB03-0120-CC | SD2-EB03-0160-CC | SD2-EB12-0000A |
| **Constituent** Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| Benzo(a)pyrene | 47.60 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 8170.00 |
| Indeno(1,2,3-cd)pyrene | 16.00 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 2730.00 |
| Dibenz(a,h)anthracene | 5.80 J | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 913.00 |
| Benzo(g,h,i)perylene | 12.70 | 11.20 U | 11.30 U | 11.40 U | 9.20 U | 2290.00 |
| Total HPAH | 1569.60 T | 8.30 T | 174.10 T | 4.20 T | 4.00 T | 197873.00 T |
| Total B(a)P equivalent | 82.79 T | 22.40 UT | 22.60 UT | 22.70 UT | 18.40 UT | 11827.20 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | |
| 2-Methylnaphthalene | 1014.92 J | | 295.08 J | 290.00 J | 247.19 J | 190625.00 |
| Dibenzofuran | | | | | | |
| Naphthalene | 6358.20 | | 11.30 U | 11.40 U | 9.20 U | 1062500.00 |
| Acenaphthylene | 522.38 J | | 11.30 U | 11.40 U | 9.20 U | 19562.50 |
| Acenaphthene | 2388.05 | | 11.30 U | 11.40 U | 9.20 U | 565625.00 |
| Fluorene | 4462.68 J | | 11.30 U | 11.40 U | 9.20 U | 409375.00 |
| Phenanthrene | 22388.05 J | | 2688.52 | 11.40 U | 9.20 U | 837500.00 |
| Anthracene | 21492.53 J | | 245.90 J | 11.40 U | 134.83 J | 431250.00 |
| Total LPAH | 57611.94 T | | 2934.42 T | 11.40 UT | 134.83 T | 3325812.50 T |
| Fluoranthene | 60298.50 J | | 4278.68 | 11.40 U | 9.20 U | 2003125.00 |
| Pyrene | 47761.19 | | 24262.29 | 420.00 J | 449.43 J | 2331250.00 |
| Benzo(a)anthracene | 27611.94 J | | 22.60 U | 22.70 U | 18.40 U | 325000.00 |
| Chrysene | 67761.19 J | | 11.30 U | 11.40 U | 9.20 U | 453125.00 |
| Total Benzofluoranthene | 18582.08 T | | 11.30 UT | 11.40 UT | 9.20 UT | 630312.50 T |
| Benzo(a)pyrene | 7104.47 | | 11.30 U | 11.40 U | 9.20 U | 255312.50 |
| Indeno(1,2,3-cd)pyrene | 2388.05 | | 11.30 U | 11.40 U | 9.20 U | 85312.50 |
| Dibenz(a,h)anthracene | 865.67 J | | 11.30 U | 11.40 U | 9.20 U | 28531.25 |
| Benzo(g,h,i)perylene | 1895.52 | | 11.30 U | 11.40 U | 9.20 U | 71562.50 |
| Total HPAH | 234268.65 T | | 28540.98 T | 420.00 T | 449.43 T | 6183531.25 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Sheded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB003 SD2-EB03-0000A-CC 0 to 4 | EB003 SD2-EB03-0040-CC 4 to 8 | EB003 SD2-EB03-0080-CC 8 to 12 | EB003 SD2-EB03-0120-CC 12 to 16 | EB003 SD2-EB03-0160-CC 16 to 20 | EB012 SD2-EB12-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 12357.46 T | | 22.60 UT | 22.70 UT | 18.40 UT | 369600.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.67 | 0.47 | 0.61 | 1.00 | 0.89 | 3.20 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB003 | EB003 | EB003 | EB003 | EB003 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB03-0000A-CC | SD2-EB03-0040-CC | SD2-EB03-0080-CC | SD2-EB03-0120-CC | SD2-EB03-0160-CC | SD2-EB12-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB012 | EB012 | EB013 | EB013 | EB013 | EB013 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB12-0040 | SD2-EB12-0080 | SD2-EB13-0000A | SD2-EB13-0040 | SD2-EB13-0080 | SD2-EB13-0120 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | 3680.00 | 316.00 | 108.00 U | 37.70 U |
| 2-Chloronaphthalene | | 677.00 U | 12.80 U | | | | |
| 2-Methylnaphthalene | | 7800.00 | 3840.00 J | 890000.00 | 50700.00 | 41400.00 | 1850.00 |
| 2-Methylphenol | | | | 669.00 U | 96.30 U | 108.00 U | 37.70 U |
| 4-Methylphenol | | | | 2060.00 | 108.00 | 108.00 U | 37.70 U |
| Carbazole | | 3510.00 | 793.00 | | | | |
| Dibenzofuran | | | | 612000.00 | 28900.00 | 22900.00 | 1030.00 |
| Naphthalene, 1-methyl | | 7360.00 | 3190.00 J | 470000.00 | 28400.00 | 25800.00 | 1120.00 |
| Pentachlorophenol | | | | 1340.00 U | 482.00 U | 217.00 U | 75.40 U |
| Phenol | | | | 669.00 U | 96.30 U | 108.00 U | 37.70 U |
| Retene | | 10300.00 | 5380.00 | | | | |
| Naphthalene | | 26800.00 | 12000.00 | 3310000.00 | 112000.00 | 76900.00 | 3670.00 |
| Acenaphthylene | | 1520.00 | 499.00 | 14100.00 | 760.00 | 658.00 | 24.00 J |
| Acenaphthene | | 39200.00 | 13000.00 | 781000.00 | 38000.00 | 31800.00 | 1420.00 |
| Fluorene | | 24800.00 | 12300.00 | 821000.00 | 34800.00 | 27600.00 | 1260.00 |
| Phenanthrene | | 59700.00 | 30000.00 | 2290000.00 | 74200.00 | 60700.00 | 2830.00 |
| Anthracene | | 29500.00 | 6680.00 | 1950000.00 | 12600.00 | 9350.00 | 416.00 |
| Total LPAH | | 181520.00 T | 74479.00 T | 9166100.00 T | 272360.00 T | 209008.00 T | 9620.00 T |
| Fluoranthene | | 121000.00 | 34500.00 | 934000.00 | 32400.00 | 26900.00 | 1300.00 |
| Pyrene | | 68600.00 | 19300.00 | 547000.00 | 19600.00 | 17000.00 | 747.00 |
| Benzo(a)anthracene | | 16000.00 | 4020.00 J | 174000.00 | 6430.00 | 5100.00 | 196.00 |
| Chrysene | | 23300.00 | 4450.00 J | 172000.00 | 5730.00 | 4740.00 | 188.00 |
| Benzo(b)fluoranthene | | 10400.00 | 2000.00 | 75300.00 | 3290.00 | 2570.00 | 132.00 |
| Benzo(k)fluoranthene | | 4420.00 | 765.00 | 29100.00 | 1170.00 | 1140.00 | 39.70 |
| Total Benzofluoranthene | | 14820.00 T | 2765.00 T | 104400.00 T | 4460.00 T | 3710.00 T | 171.70 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB012 SD2-EB12-0040 4 to 8 | EB012 SD2-EB12-0080 8 to 12 | EB013 SD2-EB13-0000A 0 to 4 | EB013 SD2-EB13-0040 4 to 8 | EB013 SD2-EB13-0080 8 to 12 | EB013 SD2-EB13-0120 12 to 16 |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 6140.00 | 1020.00 | 40600.00 | 1920.00 | 1600.00 | 77.90 |
| Indeno(1,2,3-cd)pyrene | | 1600.00 | 319.00 | 14600.00 | 777.00 | 669.00 | 74.60 J |
| Dibenz(a,h)anthracene | | 504.00 J | 92.60 | 5800.00 | 332.00 J | 338.00 J | 75.40 U |
| Benzo(g,h,i)perylene | | 2160.00 | 368.00 | 9040.00 | 515.00 | 452.00 | 48.20 J |
| Total HPAH | | 256324.00 T | 66834.60 T | 2001440.00 T | 72164.00 T | 60509.00 T | 2803.40 T |
| Total B(a)P equivalent | | 9731.50 T | 1758.60 T | 73253.00 T | 3319.13 T | 2788.04 T | 118.74 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | 240000.00 J | | 4609090.90 | 5447368.42 | 330357.14 |
| Dibenzofuran | | | | | 2627272.72 | 3013157.89 | 183928.57 |
| Naphthalene | | | 750000.00 | | 10181818.18 | 10381578.94 | 655357.14 |
| Acenaphthylene | | | 31187.50 | | 69090.90 | 86578.94 | 4285.71 J |
| Acenaphthene | | | 612500.00 | | 3454545.45 | 4184210.52 | 253571.42 |
| Fluorene | | | 768750.00 | | 3163636.36 | 3631578.94 | 225000.00 |
| Phenanthrene | | | 1875000.00 | | 6745454.54 | 7986842.10 | 505357.14 |
| Anthracene | | | 417500.00 | | 1145454.54 | 1230263.15 | 74285.71 |
| Total LPAH | | | 4654937.50 T | | 24760090.00 T | 27501052.63 T | 1717857.14 T |
| Fluoranthene | | | 2156250.00 | | 2945454.54 | 3539473.68 | 232142.85 |
| Pyrene | | | 1206250.00 | | 1781818.18 | 2236842.10 | 133392.85 |
| Benzo(a)anthracene | | | 251250.00 J | | 584545.45 | 671052.63 | 35000.00 |
| Chrysene | | | 278125.00 J | | 520909.09 | 623684.21 | 33571.42 |
| *Total Benzofluoranthene* | | | 172812.50 T | | 405454.54 T | 488157.89 T | 30660.71 T |
| Benzo(a)pyrene | | | 63750.00 | | 174545.45 | 210526.31 | 13910.71 |
| Indeno(1,2,3-cd)pyrene | | | 19937.50 | | 70636.36 | 88026.31 | 13321.42 J |
| Dibenz(a,h)anthracene | | | 5787.50 | | 30181.81 J | 44473.68 J | 75.40 U |
| Benzo(g,h,i)perylene | | | 23000.00 | | 46818.18 | 59473.68 | 8607.14 J |
| Total HPAH | | | 4177162.50 T | | 6560363.63 T | 7961710.52 T | 500607.14 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS

*Shaded Cell Standard:* CSL

*LAET*

*2LAET*

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Station ID: | EB012 | EB012 | EB013 | EB013 | EB013 | EB013 |
|---|---|---|---|---|---|---|
| Sample ID: | SD2-EB12-0040 | SD2-EB12-0080 | SD2-EB13-0000A | SD2-EB13-0040 | SD2-EB13-0080 | SD2-EB13-0120 |
| **Constituent** Depth (feet bgs): | 4 to 8 | 8 to 12 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 |
| Total B(a)P equivalent | | 109912.50 T | | 301739.09 T | 366847.36 T | 21204.46 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | |
| Aroclor 1016 | | | 134.00 U | 12.00 UJ | 12.00 UJ | 9.50 U |
| Aroclor 1221 | | | 134.00 U | 12.00 UJ | 12.00 UJ | 9.50 U |
| Aroclor 1232 | | | 134.00 U | 12.00 UJ | 12.00 UJ | 9.50 U |
| Aroclor 1242 | | | 134.00 U | 12.00 UJ | 12.00 UJ | 1.90 U |
| Aroclor 1248 | | | 134.00 U | 12.00 UJ | 12.00 UJ | 9.50 U |
| Aroclor 1254 | | | 210.00 J | 4.80 U | 5.40 U | 9.50 U |
| Aroclor 1260 | | | 81.00 J | 4.80 U | 5.40 U | 1.90 U |
| Total PCB | | | 291.00 T | 12.00 UT | 12.00 UT | 9.50 UT |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | |
| Total PCB | | | | 12.00 UT | 12.00 UT | 9.50 UT |
| **Inorganics (Total) (mg/kg)** | | | | | | |
| Arsenic | | | 11.00 | 5.30 | 4.00 U | 5.20 |
| Cadmium | | | 1.58 | 0.30 U | 0.30 U | 0.30 U |
| Chromium | | | 67.40 | 16.20 | 19.10 | 16.30 |
| Copper | | | 61.70 | 15.90 | 16.50 | 18.20 |
| Lead | | | 81.00 | 11.00 | 5.50 | 5.90 |
| Mercury | | | 0.70 | 0.03 | 0.02 | 0.02 |
| Nickel | | | 25.60 | 12.60 | 12.50 | 13.20 |
| Zinc | | | 252.00 | 34.00 | 31.10 | 32.50 |
| **Conventional Parameters** | | | | | | |
| Total Organic Carbon (%) | 7.10 | 1.60 | 4.10 | 1.10 | 0.76 | 0.56 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB012 | EB012 | EB013 | EB013 | EB013 | EB013 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB12-0040 | SD2-EB12-0080 | SD2-EB13-0000A | SD2-EB13-0040 | SD2-EB13-0080 | SD2-EB13-0120 |
| Constituent | Depth (feet bgs): | 4 to 8 | 8 to 12 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | 3.00 | | | |
| 4750-2000 microns-Fractional | | | | 3.00 | 1.00 | | |
| 2000-1000 microns-Fractional | | | | 2.00 | | | |
| 1000-500 microns-Fractional | | | | 2.00 | 1.00 | | |
| 500-250 microns-Fractional % | | | | 5.00 | 14.00 | 9.00 | 1.00 |
| 250-125 microns-Fractional % | | | | 7.00 | 22.00 | 27.00 | 12.00 |
| 125-62.4 microns-Fractional | | | | 17.00 | 22.00 | 26.00 | 34.00 |
| Total Percent Sand | | | | 33.00 T | 59.00 T | 62.00 T | 47.00 T |
| 62.5-31.2 microns-Fractional | | | | 18.00 | 16.00 | 16.00 | 23.00 |
| 31.2-15.6 microns-Fractional | | | | 16.00 | 10.00 | 9.00 | 14.00 |
| 15.6-7.8 microns-Fractional | | | | 8.00 | 4.00 | 5.00 | 6.00 |
| 7.8-3.9 microns-Fractional % | | | | 5.00 | 3.00 | 2.00 | 4.00 |
| 3.9-1.9 microns-Fractional % | | | | 4.00 | 2.00 | 2.00 | 1.00 |
| 1.9-0.9 microns-Fractional % | | | | 3.00 | 2.00 | 1.00 | 3.00 |
| < 0.9 microns-Fractional % | | | | 4.00 | 2.00 | 1.00 | 2.00 |
| Balance-Fractional % | | | | 3.00 | 1.00 | 2.00 | |
| Total Percent Fines | | | | 61.00 T | 40.00 T | 38.00 T | 53.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB013 | EB015 | EB015 | EB015 | EB015 | EB015 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB13-0160 | SD2-EB15-0000A | SD2-EB15-0040 | SD2-EB15-0080 | SD2-EB15-0120 | SD2-EB15-0160 |
| | Depth (feet bgs): | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 21.80 U | | | | | |
| 2-Chloronaphthalene | | | 12.60 U | 110.00 U | | | |
| 2-Methylnaphthalene | | 132.00 J | 256.00 | 361.00 | 4.80 J | 12.80 U | 12.50 U |
| 2-Methylphenol | | 21.80 U | | | | | |
| 4-Methylphenol | | 21.80 U | | | | | |
| Carbazole | | | 78.60 | 55.20 J | | | |
| Dibenzofuran | | 99.40 | | | | | |
| Naphthalene, 1-methyl | | 82.80 J | 160.00 | 247.00 | | | |
| Pentachlorophenol | | 43.60 U | | | | | |
| Phenol | | 21.80 U | | | | | |
| Retene | | | 263.00 | 148.00 | | | |
| Naphthalene | | 238.00 J | 690.00 | 1330.00 | 11.20 J | 12.80 UJ | 12.50 U |
| Acenaphthylene | | 21.80 U | 175.00 | 138.00 | 13.10 U | 12.80 U | 12.50 U |
| Acenaphthene | | 132.00 | 327.00 | 742.00 | 6.50 J | 12.80 U | 12.50 U |
| Fluorene | | 128.00 | 380.00 | 699.00 | 7.60 J | 12.80 U | 12.50 U |
| Phenanthrene | | 308.00 | 1160.00 | 1460.00 | 21.60 | 7.70 J | 4.20 J |
| Anthracene | | 46.60 | 723.00 | 805.00 | 9.70 J | 12.80 U | 12.50 U |
| Total LPAH | | 852.60 T | 3455.00 T | 5174.00 T | 56.60 T | 7.70 T | 4.20 T |
| Fluoranthene | | 132.00 | 1680.00 | 1680.00 | 21.10 | 12.80 U | 12.50 U |
| Pyrene | | 78.80 | 8360.00 | 8410.00 | 148.00 | 12.80 U | 12.50 U |
| Benzo(a)anthracene | | 22.30 | 872.00 | 768.00 | 12.20 J | 12.80 U | 12.50 U |
| Chrysene | | 23.60 | 1380.00 | 1360.00 | 9.60 J | 12.80 U | 12.50 U |
| Benzo(b)fluoranthene | | 27.70 J | 3790.00 | 2170.00 | 34.40 | 12.80 U | 12.50 U |
| Benzo(k)fluoranthene | | 21.80 U | 1560.00 | 912.00 | 14.80 | 12.80 U | 12.50 U |
| Total Benzofluoranthene | | 27.70 T | 5350.00 T | 3082.00 T | 49.20 T | 12.80 UT | 12.50 UT |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB013 | EB015 | EB015 | EB015 | EB015 | EB015 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB13-0160 | SD2-EB15-0000A | SD2-EB15-0040 | SD2-EB15-0080 | SD2-EB15-0120 | SD2-EB15-0160 |
| | Depth (feet bgs): | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 |
| Benzo(a)pyrene | | 21.80 U | 2230.00 | 1340.00 | 18.80 | 12.80 U | 12.50 U |
| Indeno(1,2,3-cd)pyrene | | 21.80 U | 1050.00 | 504.00 | 7.90 J | 25.70 U | 25.10 U |
| Dibenz(a,h)anthracene | | 43.60 U | 339.00 | 138.00 | 26.20 U | 25.70 U | 25.10 U |
| Benzo(g,h,i)perylene | | 21.80 U | 848.00 | 428.00 | 8.40 J | 12.80 U | 12.50 U |
| Total HPAH | | 284.40 T | 22109.00 T | 17710.00 T | 275.20 T | 25.70 UT | 25.10 UT |
| Total B(a)P equivalent | | 5.02 T | 3157.18 T | 1832.68 T | 24.40 T | 25.70 UT | 25.10 UT |
| ***Semi-Volatile Organic Compounds - TOCN (ug/kg)*** | | | | | | | |
| 2-Methylnaphthalene | | 20952.38 J | 14222.22 | 45696.20 | | 12.80 U | |
| Dibenzofuran | | 15777.77 | | | | | |
| Naphthalene | | 37777.77 J | 38333.33 | 168354.43 | | 12.80 UJ | |
| Acenaphthylene | | 21.80 U | 9722.22 | 17468.35 | | 12.80 U | |
| Acenaphthene | | 20952.38 | 18166.66 | 93924.05 | | 12.80 U | |
| Fluorene | | 20317.46 | 21111.11 | 88481.01 | | 12.80 U | |
| Phenanthrene | | 48888.88 | 64444.44 | 184810.12 | | 1069.44 J | |
| Anthracene | | 7396.82 | 40166.66 | 101898.73 | | 12.80 U | |
| Total LPAH | | 135333.33 T | 191944.44 T | 654936.70 T | | 1069.44 T | |
| Fluoranthene | | 20952.38 | 93333.33 | 212658.22 | | 12.80 U | |
| Pyrene | | 12507.93 | 464444.44 | 1064556.96 | | 12.80 U | |
| Benzo(a)anthracene | | 3539.68 | 48444.44 | 97215.18 | | 12.80 U | |
| Chrysene | | 3746.03 | 76666.66 | 172151.89 | | 12.80 U | |
| Total Benzofluoranthene | | 4396.82 T | 297222.22 T | 390126.58 T | | 12.80 UT | |
| Benzo(a)pyrene | | 21.80 U | 123888.88 | 169620.25 | | 12.80 U | |
| Indeno(1,2,3-cd)pyrene | | 21.80 U | 58333.33 | 63797.46 | | 25.70 U | |
| Dibenz(a,h)anthracene | | 43.60 U | 18833.33 | 17468.35 | | 25.70 U | |
| Benzo(g,h,i)perylene | | 21.80 U | 47111.11 | 54177.21 | | 12.80 U | |
| Total HPAH | | 45142.85 T | 1228277.77 T | 2241772.15 T | | 25.70 UT | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB013 SD2-EB13-0160 16 to 20 | EB015 SD2-EB15-0000A 0 to 4 | EB015 SD2-EB15-0040 4 to 8 | EB015 SD2-EB15-0080 8 to 12 | EB015 SD2-EB15-0120 12 to 16 | EB015 SD2-EB15-0160 16 to 20 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 797.39 T | 175398.88 T | 231984.81 T | | 25.70 UT | |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 22.00 U | | | | | |
| Aroclor 1221 | | 22.00 U | | | | | |
| Aroclor 1232 | | 22.00 U | | | | | |
| Aroclor 1242 | | 22.00 U | | | | | |
| Aroclor 1248 | | 22.00 U | | | | | |
| Aroclor 1254 | | 22.00 U | | | | | |
| Aroclor 1260 | | 22.00 U | | | | | |
| Total PCB | | 22.00 UT | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | 22.00 UT | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | 4.00 U | | | | | |
| Cadmium | | 0.30 U | | | | | |
| Chromium | | 18.40 | | | | | |
| Copper | | 17.10 | | | | | |
| Lead | | 4.80 | | | | | |
| Mercury | | 0.02 | | | | | |
| Nickel | | 14.40 | | | | | |
| Zinc | | 32.30 | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.63 | 1.80 | 0.79 | 0.38 | 0.72 | 0.39 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB013 | EB015 | EB015 | EB015 | EB015 | EB015 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB13-0160 | SD2-EB15-0000A | SD2-EB15-0040 | SD2-EB15-0080 | SD2-EB15-0120 | SD2-EB15-0160 |
| Constituent | Depth (feet bgs): | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 |
| ***Grain Size (%)*** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | 1.00 | | | | | |
| 250-125 microns-Fractional % | | 23.00 | | | | | |
| 125-62.4 microns-Fractional | | 34.00 | | | | | |
| Total Percent Sand | | 58.00 T | | | | | |
| 62.5-31.2 microns-Fractional | | 19.00 | | | | | |
| 31.2-15.6 microns-Fractional | | 10.00 | | | | | |
| 15.6-7.8 microns-Fractional | | 5.00 | | | | | |
| 7.8-3.9 microns-Fractional % | | 3.00 | | | | | |
| 3.9-1.9 microns-Fractional % | | 1.00 | | | | | |
| 1.9-0.9 microns-Fractional % | | 1.00 | | | | | |
| < 0.9 microns-Fractional % | | 2.00 | | | | | |
| Balance-Fractional % | | 1.00 | | | | | |
| Total Percent Fines | | 42.00 T | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB027 SD2-EB27-0000A 0 to 4 | EB027 SD2-EB27-0040 4 to 8 | EB027 SD2-EB27-0080 8 to 12 | EB027 SD2-EB27-0120 12 to 16 | EB027 SD2-EB27-0160 16 to 20 | EB031 SD2-EB31-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 55.50 U | 52.50 U | 525.00 U | 41.10 U | 10.20 U | 23.60 U |
| 2-Methylnaphthalene | | 25600.00 | 196000.00 | 1570000.00 | 36200.00 | 419.00 | 991.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 2170.00 | 12000.00 | 95400.00 | 2690.00 | 214.00 | 513.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 19200.00 | 118000.00 | 897000.00 | 21400.00 | 304.00 | 576.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 732.00 | 1140.00 | 4470.00 | 265.00 | 44.00 | 202.00 |
| Naphthalene | | 43200.00 | 326000.00 | 3190000.00 | 79800.00 | 1920.00 | 5760.00 |
| Acenaphthylene | | 645.00 | 1620.00 | 33800.00 | 825.00 | 17.80 | 209.00 |
| Acenaphthene | | 37800.00 | 206000.00 | 1490000.00 | 41000.00 | 1450.00 | 1920.00 |
| Fluorene | | 41100.00 | 210000.00 | 1490000.00 | 40500.00 | 1440.00 | 1840.00 |
| Phenanthrene | | 103000.00 | 492000.00 | 3750000.00 | 97100.00 | 3560.00 | 3630.00 |
| Anthracene | | 14000.00 | 50100.00 | 406000.00 | 13500.00 | 643.00 | 1600.00 |
| Total LPAH | | 239745.00 T | 1287720.00 T | 10359800.00 T | 272725.00 T | 9030.80 T | 14759.00 T |
| Fluoranthene | | 48300.00 | 204000.00 | 1530000.00 | 53160.00 | 2440.00 | 5690.00 |
| Pyrene | | 29600.00 | 114000.00 | 933000.00 | 32300.00 | 1480.00 | 10300.00 |
| Benzo(a)anthracene | | 7570.00 | 26400.00 | 221000.00 | 8690.00 | 368.00 | 1040.00 |
| Chrysene | | 6760.00 | 25500.00 | 201000.00 | 8460.00 | 386.00 | 1260.00 |
| Benzo(b)fluoranthene | | 4230.00 | 14000.00 | 101000.00 | 3770.00 | 160.00 | 2430.00 |
| Benzo(k)fluoranthene | | 1630.00 | 6440.00 | 46900.00 | 1860.00 | 77.60 | 1030.00 |
| Total Benzofluoranthene | | 5860.00 T | 20440.00 T | 147900.00 T | 5630.00 T | 237.60 T | 3460.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS / LAET

*Shaded Cell Standard:* CSL / 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| Benzo(a)pyrene | | 2570.00 | 9140.00 | 61700.00 | 2350.00 | 91.10 | 1430.00 |
| Indeno(1,2,3-cd)pyrene | | 811.00 | 2730.00 | 17700.00 | 723.00 | 24.60 | 594.00 |
| Dibenz(a,h)anthracene | | 254.00 | 948.00 | 6210.00 | 225.00 | 9.80 J | 174.00 |
| Benzo(g,h,i)perylene | | 706.00 | 2200.00 | 14400.00 | 571.00 | 20.90 | 540.00 |
| Total HPAH | | 102431.00 T | 407358.00 T | 3132910.00 T | 112049.00 T | 5058.00 T | 24488.00 T |
| Total B(a)P equivalent | | 4108.16 T | 14690.90 T | 102550.00 T | 3920.36 T | 157.32 T | 2021.96 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 2560000.00 | 5939393.93 | 44857142.85 | 3693877.55 | | 66066.66 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 4320000.00 | 9878787.87 | 91142857.14 | 8142857.14 | | 384000.00 |
| Acenaphthylene | | 64500.00 | 49090.90 | 965714.28 | 84183.67 | | 13933.33 |
| Acenaphthene | | 3780000.00 | 6303030.30 | 42571428.57 | 4183673.46 | | 128000.00 |
| Fluorene | | 4110000.00 | 6363636.36 | 42571428.57 | 4132653.06 | | 109333.33 |
| Phenanthrene | | 10300000.00 | 14909090.90 | 107142857.14 | 9908163.26 | | 242000.00 |
| Anthracene | | 1400000.00 | 1518181.81 | 11600000.00 | 1377551.02 | | 106666.66 |
| Total LPAH | | 23974500.00 T | 39021818.18 T | 295994285.71 T | 27829081.63 T | | 983933.33 T |
| Fluoranthene | | 4830000.00 | 6181818.18 | 43714285.71 | 5416367.34 | | 379333.33 |
| Pyrene | | 2960000.00 | 3454545.45 | 26657142.85 | 3295918.36 | | 686666.66 |
| Benzo(a)anthracene | | 757000.00 | 860606.06 | 6314285.71 | 886734.69 | | 69333.33 |
| Chrysene | | 676000.00 | 772727.27 | 5742857.14 | 863265.30 | | 84000.00 |
| Total Benzofluoranthene | | 586000.00 T | 619393.93 T | 4225714.28 T | 574489.79 T | | 230666.66 T |
| Benzo(a)pyrene | | 257000.00 | 276969.69 | 1762857.14 | 239795.91 | | 95333.33 |
| Indeno(1,2,3-cd)pyrene | | 81100.00 | 82727.27 | 505714.28 | 73775.51 | | 39600.00 |
| Dibenz(a,h)anthracene | | 25400.00 | 28727.27 | 177428.57 | 22959.18 | | 11600.00 |
| Benzo(g,h,i)perylene | | 70600.00 | 66666.66 | 411428.57 | 58265.30 | | 36000.00 |
| Total HPAH | | 10243100.00 T | 12344181.81 T | 89511714.28 T | 11433571.42 T | | 1632533.33 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| Total B(a)P equivalent | | 410816.00 T | 445178.78 T | 2930000.00 T | 400036.73 T | | 134797.33 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| ***Inorganics (Total) (mg/kg)*** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.00 | 3.30 | 3.50 | 0.98 | 0.34 | 1.50 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| ***Grain Size (%)*** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS

*Shaded Cell Standard:* CSL

*LAET*

*2LAET*

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB031 SD2-EB31-0040 4 to 8 | EB031 SD2-EB31-0080 8 to 12 | EB031 SD2-EB31-0120 12 to 16 | EB032 SD2-EB32-0000A 0 to 4 | EB032 SD2-EB32-0040 4 to 8 | EB032 SD2-EB32-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 10.80 U | 11.30 U | 10.80 U | 514.00 U | 20.70 U | 10.30 U |
| 2-Methylnaphthalene | | 4.70 J | 5.40 J | 7.00 J | 46300.00 | 1690.00 | 313.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 10.80 U | 11.30 U | 10.80 U | 7620.00 | 654.00 | 25.60 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 4.20 J | 5.20 J | 7.00 J | 47200.00 | 1090.00 | 225.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 84.50 | 143.00 | 211.00 | 1230.00 | 582.00 | 144.00 |
| Naphthalene | | 11.00 | 8.50 J | 7.00 J | 136000.00 | 2190.00 | 532.00 |
| Acenaphthylene | | 1.80 J | 4.20 J | 10.80 U | 1920.00 | 87.60 | 8.10 J |
| Acenaphthene | | 2.60 J | 2.10 J | 10.80 U | 133000.00 | 5560.00 | 490.00 |
| Fluorene | | 10.80 U | 5.00 J | 10.80 U | 159000.00 | 6500.00 | 599.00 |
| Phenanthrene | | 16.80 | 29.00 | 17.60 | 404000.00 | 17500.00 | 1590.00 |
| Anthracene | | 6.60 J | 8.90 J | 3.70 J | 39500.00 | 1750.00 | 166.00 |
| Total LPAH | | 38.80 T | 57.70 T | 28.30 T | 873420.00 T | 33587.60 T | 3385.10 T |
| Fluoranthene | | 35.90 | 47.00 | 19.60 | 231000.00 | 7990.00 | 755.00 |
| Pyrene | | 34.20 | 45.90 | 19.60 | 129000.00 | 4620.00 | 421.00 |
| Benzo(a)anthracene | | 21.50 U | 16.50 J | 21.50 U | 30500.00 | 1600.00 | 126.00 |
| Chrysene | | 6.60 J | 16.30 | 10.80 U | 28200.00 | 1350.00 | 115.00 |
| Benzo(b)fluoranthene | | 9.00 J | 17.50 | 8.50 J | 15800.00 | 878.00 | 68.20 |
| Benzo(k)fluoranthene | | 4.60 J | 9.40 J | 3.50 J | 6260.00 | 419.00 | 25.00 |
| Total Benzofluoranthene | | 13.60 T | 26.90 T | 12.00 T | 22060.00 T | 1297.00 T | 93.20 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB031 SD2-EB31-0040 4 to 8 | EB031 SD2-EB31-0080 8 to 12 | EB031 SD2-EB31-0120 12 to 16 | EB032 SD2-EB32-0000A 0 to 4 | EB032 SD2-EB32-0040 4 to 8 | EB032 SD2-EB32-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 6.10 J | 15.40 | 10.80 U | 8990.00 | 690.00 | 40.20 |
| Indeno(1,2,3-cd)pyrene | | 3.10 J | 9.60 J | 10.80 U | 2610.00 | 268.00 | 13.50 |
| Dibenz(a,h)anthracene | | 10.80 U | 11.30 U | 10.80 U | 1020.00 | 72.80 | 4.40 J |
| Benzo(g,h,i)perylene | | 3.80 J | 12.90 | 10.80 U | 2450.00 | 239.00 | 12.90 |
| Total HPAH | | 103.30 T | 190.50 T | 51.20 T | 455830.00 T | 18126.80 T | 1581.20 T |
| Total B(a)P equivalent | | 7.36 T | 19.87 T | 0.88 T | 14991.80 T | 1042.94 T | 65.73 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 626.66 J | 870.96 J | 933.33 J | 1929166.66 | 252238.80 | 35568.18 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1466.66 | 1370.96 J | 933.33 J | 5666666.66 | 326865.67 | 60454.54 |
| Acenaphthylene | | 240.00 J | 677.41 J | 10.80 U | 80000.00 | 13074.62 | 920.45 J |
| Acenaphthene | | 346.66 J | 338.70 J | 10.80 U | 5541666.66 | 829850.74 | 55681.81 |
| Fluorene | | 10.80 U | 806.45 J | 10.80 U | 6625000.00 | 970149.25 | 68068.18 |
| Phenanthrene | | 2240.00 | 4677.41 | 2346.66 | 16833333.33 | 2611940.29 | 180681.81 |
| Anthracene | | 880.00 J | 1435.48 J | 493.33 J | 1645833.33 | 261194.02 | 18863.63 |
| Total LPAH | | 5173.33 T | 9306.45 T | 3773.33 T | 36392500.00 T | 5013074.62 T | 384670.45 T |
| Fluoranthene | | 4786.66 | 7580.64 | 2613.33 | 9625000.00 | 1192537.31 | 85795.45 |
| Pyrene | | 4560.00 | 7403.22 | 2613.33 | 5375000.00 | 689552.23 | 47840.90 |
| Benzo(a)anthracene | | 21.50 U | 2661.29 J | 21.50 U | 1270833.33 | 238805.97 | 14318.18 |
| Chrysene | | 880.00 J | 2629.03 | 10.80 U | 1175000.00 | 201492.53 | 13068.18 |
| Total Benzofluoranthene | | 1813.33 T | 4338.70 T | 1600.00 T | 919166.66 T | 193582.08 T | 10590.90 T |
| Benzo(a)pyrene | | 813.33 J | 2483.87 | 10.80 U | 374583.33 | 102985.07 | 4568.18 |
| Indeno(1,2,3-cd)pyrene | | 413.33 J | 1548.38 J | 10.80 U | 108750.00 | 40000.00 | 1534.09 |
| Dibenz(a,h)anthracene | | 10.80 U | 11.30 U | 10.80 U | 42500.00 | 10865.67 | 500.00 J |
| Benzo(g,h,i)perylene | | 506.66 J | 2080.64 | 10.80 U | 102083.33 | 35671.64 | 1465.90 |
| Total HPAH | | 13773.33 T | 30725.80 T | 6826.66 T | 18992916.66 T | 2705492.53 T | 179681.81 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB031 SD2-EB31-0040 4 to 8 | EB031 SD2-EB31-0080 8 to 12 | EB031 SD2-EB31-0120 12 to 16 | EB032 SD2-EB32-0000A 0 to 4 | EB032 SD2-EB32-0040 4 to 8 | EB032 SD2-EB32-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 981.68 T | 3204.88 T | 118.00 T | 624658.33 T | 155662.68 T | 7469.88 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.75 | 0.62 | 0.75 | 2.40 | 0.67 | 0.88 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB031 | EB031 | EB031 | EB032 | EB032 | EB032 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB31-0040 | SD2-EB31-0080 | SD2-EB31-0120 | SD2-EB32-0000A | SD2-EB32-0040 | SD2-EB32-0080 |
| Constituent | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB032 SD2-EB32-0120 12 to 16 | EB032 SD2-EB32-0160 16 to 20 | EB034 SD2-EB34-0000A 0 to 4 | EB034 SD2-EB34-0040 4 to 8 | EB034 SD2-EB34-0080 8 to 12 | EB041 SD2-EB41-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | 113.00 U |
| 2-Chloronaphthalene | | 9.50 U | 10.70 U | 13.40 U | 10.20 U | 10.30 U | |
| 2-Methylnaphthalene | | 13.00 | 11.00 | 1780.00 | 21.30 | 2.30 J | 2290.00 |
| 2-Methylphenol | | | | | | | 113.00 U |
| 4-Methylphenol | | | | | | | 107.00 J |
| Carbazole | | 9.50 U | 10.70 U | 510.00 | 10.20 U | 10.30 U | |
| Dibenzofuran | | | | | | | 13900.00 |
| Naphthalene, 1-methyl | | 10.00 | 10.00 J | 2070.00 | 15.40 | 2.40 J | 2500.00 |
| Pentachlorophenol | | | | | | | 226.00 U |
| Phenol | | | | | | | 113.00 U |
| Retene | | 174.00 | 44.00 | 1820.00 | 221.00 | 87.80 | |
| Naphthalene | | 21.40 | 19.30 | 7950.00 | 28.60 | 10.30 U | 9120.00 |
| Acenaphthylene | | 9.50 U | 10.70 U | 244.00 | 10.20 U | 10.30 U | 858.00 |
| Acenaphthene | | 13.90 | 11.40 | 5600.00 | 17.00 | 10.30 U | 33000.00 |
| Fluorene | | 18.60 | 13.80 | 2840.00 | 13.40 | 10.30 U | 28600.00 |
| Phenanthrene | | 54.90 | 50.40 | 5340.00 | 44.80 | 10.30 U | 61000.00 |
| Anthracene | | 6.60 J | 4.20 J | 5780.00 | 15.50 | 1.60 J | 16300.00 |
| Total LPAH | | 115.40 T | 99.10 T | 27754.00 T | 119.30 T | 1.60 T | 148878.00 T |
| Fluoranthene | | 29.20 | 22.70 | 16600.00 | 67.40 | 10.30 U | 57500.00 |
| Pyrene | | 20.70 | 14.50 | 12600.00 | 66.40 | 5.00 J | 38900.00 |
| Benzo(a)anthracene | | 19.00 U | 21.40 U | 3100.00 | 13.80 J | 20.70 U | 10500.00 |
| Chrysene | | 7.90 J | 10.70 U | 3450.00 | 16.70 | 10.30 U | 10900.00 |
| Benzo(b)fluoranthene | | 6.60 J | 10.70 U | 2320.00 | 13.10 | 10.30 U | 6520.00 |
| Benzo(k)fluoranthene | | 2.20 J | 10.70 U | 875.00 | 5.20 J | 10.30 U | 2340.00 |
| Total Benzofluoranthene | | 8.80 T | 10.70 UT | 3195.00 T | 18.30 T | 10.30 UT | 6860.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB032 SD2-EB32-0120 12 to 16 | EB032 SD2-EB32-0160 16 to 20 | EB034 SD2-EB34-0000A 0 to 4 | EB034 SD2-EB34-0040 4 to 8 | EB034 SD2-EB34-0080 8 to 12 | EB041 SD2-EB41-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 9.50 U | 10.70 U | 1740.00 | 10.20 U | 10.30 U | 3840.00 |
| Indeno(1,2,3-cd)pyrene | | 2.90 J | 10.70 U | 664.00 | 10.20 U | 10.30 U | 1330.00 |
| Dibenz(a,h)anthracene | | 9.50 U | 10.70 U | 47.10 | 10.20 U | 10.30 U | 506.00 J |
| Benzo(g,h,i)perylene | | 3.00 J | 10.70 U | 524.00 | 10.20 U | 10.30 U | 986.00 |
| Total HPAH | | 72.50 T | 37.20 T | 41920.10 T | 182.60 T | 5.00 T | 133122.00 T |
| Total B(a)P equivalent | | 0.97 T | 21.40 UT | 2407.70 T | 2.75 T | 20.70 UT | 6015.30 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 2166.66 | | 45641.02 | 2917.80 | 418.18 J | 152666.66 |
| Dibenzofuran | | | | | | | 926666.66 |
| Naphthalene | | 3566.66 | | 203846.15 | 3917.80 | 10.30 U | 608000.00 |
| Acenaphthylene | | 9.50 U | | 6256.41 | 10.20 U | 10.30 U | 57200.00 |
| Acenaphthene | | 2316.66 | | 143589.74 | 2328.76 | 10.30 U | 2200000.00 |
| Fluorene | | 3100.00 | | 72820.51 | 1835.61 | 10.30 U | 1906666.66 |
| Phenanthrene | | 9150.00 | | 136923.07 | 6136.98 | 10.30 U | 4066666.66 |
| Anthracene | | 1100.00 J | | 148205.12 | 2123.28 | 290.90 J | 1086666.66 |
| Total LPAH | | 19233.33 T | | 711641.02 T | 16342.46 T | 290.90 T | 9925200.00 T |
| Fluoranthene | | 4866.66 | | 425641.02 | 9232.87 | 10.30 U | 3833333.33 |
| Pyrene | | 3450.00 | | 323076.92 | 9095.89 | 909.09 J | 2593333.33 |
| Benzo(a)anthracene | | 19.00 U | | 79487.17 | 1890.41 J | 20.70 U | 700000.00 |
| Chrysene | | 1316.66 J | | 88461.53 | 2287.67 | 10.30 U | 726666.66 |
| Total Benzofluoranthene | | 1466.66 T | | 81923.07 T | 2506.84 T | 10.30 UT | 590666.66 T |
| Benzo(a)pyrene | | 9.50 U | | 44615.38 | 10.20 U | 10.30 U | 242666.66 |
| Indeno(1,2,3-cd)pyrene | | 483.33 J | | 17025.64 | 10.20 U | 10.30 U | 88666.66 |
| Dibenz(a,h)anthracene | | 9.50 U | | 1207.69 | 10.20 U | 10.30 U | 33733.33 J |
| Benzo(g,h,i)perylene | | 500.00 J | | 13435.89 | 10.20 U | 10.30 U | 65733.33 |
| Total HPAH | | 12083.33 T | | 1074874.35 T | 25013.69 T | 909.09 T | 6874800.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB032 SD2-EB32-0120 12 to 16 | EB032 SD2-EB32-0160 16 to 20 | EB034 SD2-EB34-0000A 0 to 4 | EB034 SD2-EB34-0040 4 to 8 | EB034 SD2-EB34-0080 8 to 12 | EB041 SD2-EB41-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 163.31 T | | 61735.89 T | 377.90 T | 20.70 UT | 401020.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | 28.00 U |
| Aroclor 1221 | | | | | | | 28.00 U |
| Aroclor 1232 | | | | | | | 28.00 U |
| Aroclor 1242 | | | | | | | 5.60 U |
| Aroclor 1248 | | | | | | | 28.00 U |
| Aroclor 1254 | | | | | | | 28.00 U |
| Aroclor 1260 | | | | | | | 5.60 U |
| Total PCB | | | | | | | 28.00 UT |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | 28.00 UT |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | 4.50 |
| Cadmium | | | | | | | 0.34 |
| Chromium | | | | | | | 24.40 |
| Copper | | | | | | | 36.00 |
| Lead | | | | | | | 102.00 |
| Mercury | | | | | | | 0.29 |
| Nickel | | | | | | | 21.10 |
| Zinc | | | | | | | 61.80 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.60 | 0.47 | 3.90 | 0.73 | 0.55 | 1.50 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB032 | EB032 | EB034 | EB034 | EB034 | EB041 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB32-0120 | SD2-EB32-0160 | SD2-EB34-0000A | SD2-EB34-0040 | SD2-EB34-0080 | SD2-EB41-0000A |
| Constituent | Depth (feet bgs): | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 0 to 4 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | 1.00 |
| 2000-1000 microns-Fractional | | | | | | | 1.00 |
| 1000-500 microns-Fractional | | | | | | | 2.00 |
| 500-250 microns-Fractional % | | | | | | | 7.00 |
| 250-125 microns-Fractional % | | | | | | | 16.00 |
| 125-62.4 microns-Fractional | | | | | | | 19.00 |
| Total Percent Sand | | | | | | | 45.00 T |
| 62.5-31.2 microns-Fractional | | | | | | | 17.00 |
| 31.2-15.6 microns-Fractional | | | | | | | 12.00 |
| 15.6-7.8 microns-Fractional | | | | | | | 7.00 |
| 7.8-3.9 microns-Fractional % | | | | | | | 6.00 |
| 3.9-1.9 microns-Fractional % | | | | | | | 3.00 |
| 1.9-0.9 microns-Fractional % | | | | | | | 3.00 |
| < 0.9 microns-Fractional % | | | | | | | 5.00 |
| Balance-Fractional % | | | | | | | 1.00 |
| Total Percent Fines | | | | | | | 54.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB041 | EB041 | EB041 | EB041 | EB042 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB41-0120 | SD2-EB41-0160 | SD2-EB42-0000A | SD2-EB42-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | 35.80 U | 18.20 U | 22.50 U | 21.50 U | | |
| 2-Chloronaphthalene | | | | | | 11.00 U | 9.60 U |
| 2-Methylnaphthalene | | 20.60 J | 150.00 | 22.50 U | 21.50 U | 346.00 | 2.60 J |
| 2-Methylphenol | | 35.80 U | 18.20 U | 22.50 U | 21.50 U | | |
| 4-Methylphenol | | 35.80 U | 18.20 U | 22.50 U | 21.50 U | | |
| Carbazole | | | | | | 57.40 | 9.60 U |
| Dibenzofuran | | 407.00 | 27.30 | 22.50 U | 21.50 U | | |
| Naphthalene, 1-methyl | | 33.20 J | 120.00 | 22.50 U | 21.50 U | 256.00 | 2.30 J |
| Pentachlorophenol | | 71.60 U | 36.30 U | 45.00 U | 43.00 U | | |
| Phenol | | 35.80 U | 18.20 U | 22.50 U | 21.50 U | | |
| Retene | | | | | | 167.00 | 49.80 |
| Naphthalene | | 931.00 | 2030.00 | 6.70 J | 21.50 U | 1400.00 | 15.60 |
| Acenaphthylene | | 18.00 J | 18.20 U | 22.50 U | 21.50 U | 110.00 | 1.40 J |
| Acenaphthene | | 1170.00 | 108.00 | 6.50 J | 4.30 J | 474.00 | 2.10 J |
| Fluorene | | 1040.00 | 70.80 | 7.50 J | 21.50 U | 421.00 | 9.60 U |
| Phenanthrene | | 2630.00 | 182.00 | 20.80 J | 20.50 J | 944.00 | 9.60 U |
| Anthracene | | 212.00 | 12.20 J | 20.40 J | 9.60 J | 392.00 | 2.60 J |
| Total LPAH | | 6001.00 T | 2403.00 T | 61.90 T | 34.40 T | 3741.00 T | 21.70 T |
| Fluoranthene | | 1530.00 | 94.70 | 22.60 | 21.50 U | 976.00 | 7.80 J |
| Pyrene | | 941.00 | 60.90 | 15.60 J | 8.20 J | 1720.00 | 12.60 |
| Benzo(a)anthracene | | 225.00 | 18.20 U | 59.80 | 21.50 U | 243.00 | 19.20 U |
| Chrysene | | 199.00 | 18.20 U | 115.00 | 21.50 U | 406.00 | 9.60 U |
| Benzo(b)fluoranthene | | 119.00 | 20.00 J | 63.50 | 21.50 U | 678.00 | 4.60 J |
| Benzo(k)fluoranthene | | 44.40 | 18.20 U | 20.50 J | 21.50 U | 314.00 | 9.60 U |
| Total Benzofluoranthene | | 163.40 T | 20.00 T | 84.00 T | 21.50 UT | 992.00 T | 4.60 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB041 SD2-EB41-0040 4 to 8 | EB041 SD2-EB41-0080 8 to 12 | EB041 SD2-EB41-0120 12 to 16 | EB041 SD2-EB41-0160 16 to 20 | EB042 SD2-EB42-0000A 0 to 4 | EB042 SD2-EB42-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 72.70 | 18.20 U | 30.70 | 21.50 U | 434.00 | 9.60 UJ |
| Indeno(1,2,3-cd)pyrene | | 63.20 J | 18.20 U | 37.90 J | 21.50 U | 178.00 | 9.60 U |
| Dibenz(a,h)anthracene | | 71.60 U | 36.30 U | 45.00 U | 43.00 U | 50.00 | 9.60 U |
| Benzo(g,h,i)perylene | | 42.70 J | 18.20 U | 24.10 J | 21.50 U | 166.00 | 9.60 U |
| Total HPAH | | 3237.00 T | 175.60 T | 389.70 T | 8.20 T | 5165.00 T | 25.00 T |
| Total B(a)P equivalent | | 114.06 T | 2.00 T | 47.14 T | 43.00 UT | 597.44 T | 0.46 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | | 22.50 U | 21.50 U | 38444.44 | |
| Dibenzofuran | | | | 22.50 U | 21.50 U | | |
| Naphthalene | | | | 1063.49 J | 21.50 U | 155555.55 | |
| Acenaphthylene | | | | 22.50 U | 21.50 U | 12222.22 | |
| Acenaphthene | | | | 1031.74 J | 716.66 J | 52666.66 | |
| Fluorene | | | | 1190.47 J | 21.50 U | 46777.77 | |
| Phenanthrene | | | | 3301.58 J | 3416.66 J | 104888.88 | |
| Anthracene | | | | 3238.09 J | 1600.00 J | 43555.55 | |
| Total LPAH | | | | 9825.39 T | 5733.33 T | 415666.66 T | |
| Fluoranthene | | | | 3587.30 | 21.50 U | 108444.44 | |
| Pyrene | | | | 2476.19 J | 1366.66 J | 191111.11 | |
| Benzo(a)anthracene | | | | 9492.06 | 21.50 U | 27000.00 | |
| Chrysene | | | | 18253.96 | 21.50 U | 45111.11 | |
| Total Benzofluoranthene | | | | 13333.33 T | 21.50 UT | 110222.22 T | |
| Benzo(a)pyrene | | | | 4873.01 | 21.50 U | 48222.22 | |
| Indeno(1,2,3-cd)pyrene | | | | 6015.87 J | 21.50 U | 19777.77 | |
| Dibenz(a,h)anthracene | | | | 45.00 U | 43.00 U | 5555.55 | |
| Benzo(g,h,i)perylene | | | | 3825.39 J | 21.50 U | 18444.44 | |
| Total HPAH | | | | 61857.14 T | 1366.66 T | 573888.88 T | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB041 SD2-EB41-0040 4 to 8 | EB041 SD2-EB41-0080 8 to 12 | EB041 SD2-EB41-0120 12 to 16 | EB041 SD2-EB41-0160 16 to 20 | EB042 SD2-EB42-0000A 0 to 4 | EB042 SD2-EB42-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | | | 7482.53 T | 43.00 UT | 66382.88 T | |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | 13.00 UJ | 18.00 U | 23.00 U | 7.80 UJ | | |
| Aroclor 1221 | | 13.00 UJ | 18.00 U | 23.00 U | 7.80 UJ | | |
| Aroclor 1232 | | 13.00 UJ | 18.00 U | 23.00 U | 7.80 UJ | | |
| Aroclor 1242 | | 13.00 UJ | 18.00 U | 23.00 U | 7.80 UJ | | |
| Aroclor 1248 | | 13.00 UJ | 18.00 U | 23.00 U | 7.80 UJ | | |
| Aroclor 1254 | | 9.00 U | 18.00 U | 23.00 U | 22.00 U | | |
| Aroclor 1260 | | 1.80 U | 18.00 U | 23.00 U | 22.00 U | | |
| Total PCB | | 13.00 UT | 18.00 UT | 23.00 UT | 22.00 UT | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | 23.00 UT | 22.00 UT | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | 4.00 U | 5.30 | 6.30 | 7.20 | | |
| Cadmium | | 0.30 U | 0.30 U | 0.30 U | 0.30 U | | |
| Chromium | | 14.50 | 9.54 | 20.70 | 17.50 | | |
| Copper | | 9.24 | 7.59 | 16.70 | 19.90 | | |
| Lead | | 3.50 | 4.90 | 4.90 | 3.00 | | |
| Mercury | | 0.23 | 0.02 U | 0.04 | 0.16 | | |
| Nickel | | 9.02 | 8.75 | 13.20 | 15.30 | | |
| Zinc | | 22.30 | 20.30 | 31.70 | 34.50 | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.48 | 0.23 | 0.63 | 0.60 | 0.90 | 0.30 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB041 | EB041 | EB041 | EB041 | EB042 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB41-0120 | SD2-EB41-0160 | SD2-EB42-0000A | SD2-EB42-0040 |
| **Constituent** | **Depth (feet bgs):** | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | 1.00 | | | | |
| 1000-500 microns-Fractional | | 3.00 | 14.00 | 3.00 | | | |
| 500-250 microns-Fractional % | | 39.00 | 55.00 | 14.00 | 1.00 | | |
| 250-125 microns-Fractional % | | 34.00 | 22.00 | 12.00 | 5.00 | | |
| 125-62.4 microns-Fractional | | 10.00 | 3.00 | 19.00 | 22.00 | | |
| Total Percent Sand | | 86.00 T | 95.00 T | 48.00 T | 28.00 T | | |
| 62.5-31.2 microns-Fractional | | 6.00 | 2.00 | 23.00 | 29.00 | | |
| 31.2-15.6 microns-Fractional | | 3.00 | 1.00 | 14.00 | 21.00 | | |
| 15.6-7.8 microns-Fractional | | 1.00 | | 5.00 | 8.00 | | |
| 7.8-3.9 microns-Fractional % | | 1.00 | 1.00 | 4.00 | 5.00 | | |
| 3.9-1.9 microns-Fractional % | | | | 2.00 | 3.00 | | |
| 1.9-0.9 microns-Fractional % | | 1.00 | | 1.00 | 2.00 | | |
| < 0.9 microns-Fractional % | | | | 2.00 | 3.00 | | |
| Balance-Fractional % | | 2.00 | 1.00 | 1.00 | 1.00 | | |
| Total Percent Fines | | 14.00 T | 5.00 T | 52.00 T | 72.00 T | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB049 SD2-EB49-0000A 0 to 4 | EB049 SD2-EB49-0040 4 to 8 | EB049 SD2-EB49-0080 8 to 12 | EB049 SD2-EB49-0120 12 to 16 | EB049 SD2-EB49-0160 16 to 20 | EB066 SD2-EB66-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 69.00 U | 11.60 U | 12.10 U | | | 22.40 U |
| 2-Methylnaphthalene | | 14500.00 | 26800.00 | 618.00 | 6.40 J | 8.60 J | 1950.00 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 1560.00 | 1390.00 | 83.60 | | | 742.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 9110.00 | 17700.00 | 890.00 | | | 1790.00 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 450.00 | 372.00 | 102.00 | | | 468.00 |
| Naphthalene | | 30200.00 | 55100.00 | 4050.00 | 20.40 | 26.70 | 10900.00 |
| Acenaphthylene | | 261.00 | 331.00 | 13.90 | 12.30 U | 12.30 U | 642.00 |
| Acenaphthene | | 16200.00 | 27800.00 | 1150.00 | 6.60 J | 8.30 J | 4730.00 |
| Fluorene | | 14600.00 | 26900.00 | 806.00 | 7.40 J | 6.60 J | 4720.00 |
| Phenanthrene | | 32000.00 | 67500.00 | 1280.00 | 19.60 | 19.40 | 12000.00 |
| Anthracene | | 3520.00 | 7440.00 | 139.00 | 5.70 J | 1.70 J | 5390.00 |
| Total LPAH | | 96781.00 T | 185071.00 T | 7438.90 T | 59.70 T | 62.70 T | 38382.00 T |
| Fluoranthene | | 16900.00 | 32900.00 | 639.00 | 14.10 | 12.30 U | 41400.00 |
| Pyrene | | 11000.00 | 22900.00 | 466.00 | 28.00 | 12.30 U | 49600.00 |
| Benzo(a)anthracene | | 3900.00 | 5210.00 | 107.00 | 4.90 J | 12.30 U | 10500.00 |
| Chrysene | | 4190.00 | 4940.00 | 100.00 | 6.80 J | 12.30 U | 10600.00 |
| Benzo(b)fluoranthene | | 2360.00 | 2500.00 | 65.60 | 12.30 U | 12.30 U | 12200.00 |
| Benzo(k)fluoranthene | | 1020.00 | 1310.00 | 25.60 | 12.30 U | 12.30 U | 5990.00 |
| Total Benzofluoranthene | | 3380.00 T | 3810.00 T | 91.20 T | 12.30 UT | 12.30 UT | 18190.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| Benzo(a)pyrene | | 1530.00 | 1840.00 | 43.20 | 12.30 U | 12.30 U | 8770.00 |
| Indeno(1,2,3-cd)pyrene | | 500.00 | 544.00 | 14.10 | 24.60 U | 24.70 U | 2690.00 |
| Dibenz(a,h)anthracene | | 144.00 | 155.00 | 2.80 J | 24.60 U | 24.70 U | 1380.00 |
| Benzo(g,h,i)perylene | | 458.00 | 439.00 | 15.90 | 12.30 U | 12.30 U | 2520.00 |
| Total HPAH | | 42002.00 T | 72738.00 T | 1479.20 T | 53.80 T | 24.70 UT | 145650.00 T |
| Total B(a)P equivalent | | 2364.39 T | 2838.44 T | 65.02 T | 0.49 T | 24.70 UT | 12759.50 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 852941.17 | 1488888.88 | 116603.77 | | | 150000.00 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1776470.58 | 3061111.11 | 764150.94 | | | 838461.53 |
| Acenaphthylene | | 15352.94 | 18388.88 | 2622.64 | | | 49384.61 |
| Acenaphthene | | 952941.17 | 1544444.44 | 216981.13 | | | 363846.15 |
| Fluorene | | 858823.52 | 1494444.44 | 152075.47 | | | 363076.92 |
| Phenanthrene | | 1882352.94 | 3750000.00 | 241509.43 | | | 923076.92 |
| Anthracene | | 207058.82 | 413333.33 | 26226.41 | | | 414615.38 |
| Total LPAH | | 5693000.00 T | 10281722.22 T | 1403566.03 T | | | 2952461.53 T |
| Fluoranthene | | 994117.64 | 1827777.77 | 120566.03 | | | 3184615.38 |
| Pyrene | | 647058.82 | 1272222.22 | 87924.52 | | | 3815384.61 |
| Benzo(a)anthracene | | 229411.76 | 289444.44 | 20188.67 | | | 807692.30 |
| Chrysene | | 246470.58 | 274444.44 | 18867.92 | | | 815384.61 |
| Total Benzofluoranthene | | 198823.52 T | 211666.66 T | 17207.54 T | | | 1399230.76 T |
| Benzo(a)pyrene | | 90000.00 | 102222.22 | 8150.94 | | | 674615.38 |
| Indeno(1,2,3-cd)pyrene | | 29411.76 | 30222.22 | 2660.37 | | | 206923.07 |
| Dibenz(a,h)anthracene | | 8470.58 | 8611.11 | 528.30 J | | | 106153.84 |
| Benzo(g,h,i)perylene | | 26941.17 | 24388.88 | 3000.00 | | | 193846.15 |
| Total HPAH | | 2470705.88 T | 4041000.00 T | 279094.33 T | | | 11203846.15 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB049 SD2-EB49-0000A 0 to 4 | EB049 SD2-EB49-0040 4 to 8 | EB049 SD2-EB49-0080 8 to 12 | EB049 SD2-EB49-0120 12 to 16 | EB049 SD2-EB49-0160 16 to 20 | EB066 SD2-EB66-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 139081.76 T | 157691.11 T | 12269.05 T | | | 981500.00 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 1.70 | 1.80 | 0.53 | 0.26 | 0.34 | 1.30 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| Constituent | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB066 | EB066 | EB066 | EB066 | EB072 | EB072 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB66-0040 | SD2-EB66-0080 | SD2-EB66-0120 | SD2-EB66-0160 | SD2-EB72-0000A | SD2-EB72-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | 539.00 U | 19.50 U | 9.10 U | 9.90 U | 10600.00 | 8.20 U |
| 2-Methylnaphthalene | | 4150.00 | 668.00 | 9.60 | 4.70 J | 3780.00 | 56.60 |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | 581.00 | 188.00 | 0.00 J | 9.90 U | 57.30 U | 19.10 |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | 3850.00 | 555.00 | 7.40 J | 3.90 J | 4870.00 | 63.30 |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | 327.00 J | 71.40 | 23.40 | 39.50 | 298.00 | 70.90 |
| Naphthalene | | 10000.00 | 1070.00 | 20.40 | 7.10 J | 16200.00 | 161.00 |
| Acenaphthylene | | 539.00 U | 22.60 | 9.10 U | 9.90 U | 595.00 | 6.30 J |
| Acenaphthene | | 17100.00 | 1700.00 | 22.40 | 5.10 J | 14000.00 | 134.00 |
| Fluorene | | 20900.00 | 1720.00 | 26.60 | 7.20 J | 2800.00 | 139.00 |
| Phenanthrene | | 69000.00 | 5360.00 | 95.00 | 31.10 | 29000.00 | 368.00 |
| Anthracene | | 13200.00 | 516.00 | 11.70 | 2.80 J | 3300.00 | 36.10 |
| Total LPAH | | 130200.00 T | 10388.60 T | 176.10 T | 53.30 T | 65895.00 T | 844.40 T |
| Fluoranthene | | 45700.00 | 3120.00 | 62.10 | 24.30 | 16300.00 | 205.00 |
| Pyrene | | 33100.00 | 1980.00 | 44.10 | 19.20 | 21400.00 | 152.00 |
| Benzo(a)anthracene | | 11100.00 | 506.00 | 18.20 U | 19.80 U | 2620.00 | 34.40 |
| Chrysene | | 21000.00 | 394.00 | 8.90 J | 9.90 U | 3210.00 | 32.40 |
| Benzo(b)fluoranthene | | 3980.00 | 310.00 | 6.60 J | 3.60 J | 3640.00 | 27.20 |
| Benzo(k)fluoranthene | | 2500.00 | 132.00 | 3.20 J | 9.90 U | 1440.00 | 11.60 |
| Total Benzofluoranthene | | 6480.00 T | 442.00 T | 9.80 T | 3.60 T | 5080.00 T | 38.80 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB066 | EB066 | EB066 | EB066 | EB072 | EB072 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB66-0040 | SD2-EB66-0080 | SD2-EB66-0120 | SD2-EB66-0160 | SD2-EB72-0000A | SD2-EB72-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| Benzo(a)pyrene | | 2660.00 | 35.30 | 9.10 U | 9.90 U | 2130.00 | 19.90 |
| Indeno(1,2,3-cd)pyrene | | 542.00 | 41.40 | 9.10 U | 9.90 U | 644.00 | 9.90 |
| Dibenz(a,h)anthracene | | 226.00 J | 14.30 J | 9.10 U | 9.90 U | 205.00 | 1.70 J |
| Benzo(g,h,i)perylene | | 507.00 J | 26.60 | 9.10 U | 9.90 U | 590.00 | 9.80 |
| Total HPAH | | 121315.00 T | 6559.60 T | 124.90 T | 47.10 T | 52379.00 T | 503.90 T |
| Total B(a)P equivalent | | 4494.20 T | 137.05 T | 0.70 T | 0.36 T | 3063.01 T | 28.89 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | 658730.15 | | | | 252000.00 | 10107.14 |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 1587301.58 | | | | 1080000.00 | 28750.00 |
| Acenaphthylene | | 539.00 U | | | | 39666.66 | 1125.00 J |
| Acenaphthene | | 2714285.71 | | | | 933333.33 | 23928.57 |
| Fluorene | | 3317460.31 | | | | 186666.66 | 24821.42 |
| Phenanthrene | | 10952380.95 | | | | 1933333.33 | 65714.28 |
| Anthracene | | 2095238.09 | | | | 220000.00 | 6446.42 |
| Total LPAH | | 20666666.66 T | | | | 4393000.00 T | 150785.71 T |
| Fluoranthene | | 7253968.25 | | | | 1086666.66 | 36607.14 |
| Pyrene | | 5253968.25 | | | | 1426666.66 | 27142.85 |
| Benzo(a)anthracene | | 1761904.76 | | | | 188000.00 | 6142.85 |
| Chrysene | | 3333333.33 | | | | 214000.00 | 5785.71 |
| Total Benzofluoranthene | | 1028571.42 T | | | | 338666.66 T | 6928.57 T |
| Benzo(a)pyrene | | 422222.22 | | | | 142000.00 | 3553.57 |
| Indeno(1,2,3-cd)pyrene | | 86031.74 | | | | 42933.33 | 1767.85 |
| Dibenz(a,h)anthracene | | 35873.01 J | | | | 13666.66 | 303.57 J |
| Benzo(g,h,i)perylene | | 60476.19 J | | | | 39333.33 | 1750.00 |
| Total HPAH | | 19256349.20 T | | | | 3491933.33 T | 89982.14 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB066 SD2-EB66-0040 4 to 8 | EB066 SD2-EB66-0080 8 to 12 | EB066 SD2-EB66-0120 12 to 16 | EB066 SD2-EB66-0160 16 to 20 | EB072 SD2-EB72-0000A 0 to 4 | EB072 SD2-EB72-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 713365.07 T | | | | 204200.66 T | 5160.42 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.63 | 0.24 | 0.21 | 0.33 | 1.50 | 0.56 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB066 | EB066 | EB066 | EB066 | EB072 | EB072 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB66-0040 | SD2-EB66-0080 | SD2-EB66-0120 | SD2-EB66-0160 | SD2-EB72-0000A | SD2-EB72-0040 |
| **Constituent** | **Depth (feet bgs):** | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB072 | EB078 | EB078 | EB087 | EB087 | EB087 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB72-0080 | SD2-EB78-0000A | SD2-EB78-0040 | SD2-EB87-0000A | SD2-EB87-0040 | SD2-EB87-0080 |
| | Depth (feet bgs): | 8 to 12 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Chloronaphthalene | | | 104.00 U | 10.70 U | 118.00 U | 10.90 U | 10.50 U |
| 2-Methylnaphthalene | | 5.90 J | 1030.00 | 5.00 J | 1480.00 | 11.20 | 3.50 J |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Carbazole | | | 94.50 J | 10.70 U | 139.00 | 10.90 U | 10.50 U |
| Dibenzofuran | | | | | | | |
| Naphthalene, 1-methyl | | | 757.00 | 4.50 J | 1110.00 | 9.40 J | 2.90 J |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| Retene | | | 204.00 | 124.00 | 300.00 | 212.00 | 102.00 |
| Naphthalene | | 19.20 | 4960.00 | 10.40 J | 5630.00 | 13.70 | 4.00 J |
| Acenaphthylene | | 11.80 U | 104.00 U | 10.70 U | 153.00 | 3.90 J | 10.50 U |
| Acenaphthene | | 14.30 | 1160.00 | 10.70 U | 2300.00 | 5.10 J | 10.50 U |
| Fluorene | | 13.50 | 1110.00 | 10.70 U | 2080.00 | 9.50 J | 10.50 U |
| Phenanthrene | | 40.80 | 2990.00 | 17.50 | 4900.00 | 36.10 | 11.90 |
| Anthracene | | 4.50 J | 818.00 | 4.40 J | 1220.00 | 9.30 J | 2.20 J |
| Total LPAH | | 92.30 T | 11038.00 T | 32.30 T | 16283.00 T | 77.60 T | 18.10 T |
| Fluoranthene | | 18.60 | 2200.00 | 16.00 | 4170.00 | 51.50 | 12.40 |
| Pyrene | | 18.90 | 4560.00 | 18.80 | 7170.00 | 81.90 | 12.40 |
| Benzo(a)anthracene | | 4.70 J | 347.00 | 21.40 U | 1040.00 | 15.70 J | 21.00 U |
| Chrysene | | 11.80 U | 499.00 | 10.70 U | 1380.00 | 17.00 | 4.00 J |
| Benzo(b)fluoranthene | | 11.80 U | 882.00 | 5.80 J | 1520.00 | 16.80 | 10.50 U |
| Benzo(k)fluoranthene | | 11.80 U | 377.00 | 10.70 U | 530.00 | 9.50 J | 10.50 U |
| Total Benzofluoranthene | | 11.80 UT | 1259.00 T | 5.80 T | 2050.00 T | 26.30 T | 10.50 UT |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB072 SD2-EB72-0080 8 to 12 | EB078 SD2-EB78-0000A 0 to 4 | EB078 SD2-EB78-0040 4 to 8 | EB087 SD2-EB87-0000A 0 to 4 | EB087 SD2-EB87-0040 4 to 8 | EB087 SD2-EB87-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 11.80 U | 470.00 | 10.70 U | 820.00 | 10.90 U | 10.50 U |
| Indeno(1,2,3-cd)pyrene | | 23.70 U | 149.00 | 10.70 U | 292.00 | 4.80 J | 2.70 J |
| Dibenz(a,h)anthracene | | 23.70 U | 42.80 J | 10.70 U | 87.60 J | 10.90 U | 10.50 U |
| Benzo(g,h,i)perylene | | 11.80 U | 173.00 | 10.70 U | 263.00 | 10.90 U | 2.90 J |
| Total HPAH | | 42.20 T | 9699.80 T | 40.60 T | 17272.60 T | 197.20 T | 34.40 T |
| Total B(a)P equivalent | | 0.47 T | 654.86 T | 0.58 T | 1199.48 T | 3.84 T | 0.27 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | | |
| 2-Methylnaphthalene | | | 103000.00 | 909.09 J | 105714.28 | 1272.72 | 514.70 J |
| Dibenzofuran | | | | | | | |
| Naphthalene | | | 496000.00 | 1890.90 J | 402142.85 | 1556.81 | 588.23 J |
| Acenaphthylene | | | 104.00 U | 10.70 U | 10928.57 | 443.18 J | 10.50 U |
| Acenaphthene | | | 116000.00 | 10.70 U | 164285.71 | 579.54 J | 10.50 U |
| Fluorene | | | 111000.00 | 10.70 U | 148571.42 | 1079.54 J | 10.50 U |
| Phenanthrene | | | 299000.00 | 3181.81 | 350000.00 | 4102.27 | 1750.00 |
| Anthracene | | | 81800.00 | 800.00 J | 87142.85 | 1056.81 J | 323.52 J |
| Total LPAH | | | 1103800.00 T | 5872.72 T | 1163071.42 T | 8818.18 T | 2661.76 T |
| Fluoranthene | | | 220000.00 | 2909.09 | 297857.14 | 5852.27 | 1823.52 |
| Pyrene | | | 456000.00 | 3418.18 | 512142.85 | 9306.81 | 1823.52 |
| Benzo(a)anthracene | | | 34700.00 | 21.40 U | 74285.71 | 1784.09 J | 21.00 U |
| Chrysene | | | 49900.00 | 10.70 U | 98571.42 | 1931.81 | 588.23 J |
| Total Benzofluoranthene | | | 125900.00 T | 1054.54 T | 146428.57 T | 2988.63 T | 10.50 UT |
| Benzo(a)pyrene | | | 47000.00 | 10.70 U | 58571.42 | 10.90 U | 10.50 U |
| Indeno(1,2,3-cd)pyrene | | | 14900.00 | 10.70 U | 20857.14 | 545.45 J | 397.05 J |
| Dibenz(a,h)anthracene | | | 4280.00 J | 10.70 U | 6257.14 J | 10.90 U | 10.50 U |
| Benzo(g,h,i)perylene | | | 17300.00 | 10.70 U | 18785.71 | 10.90 U | 426.47 J |
| Total HPAH | | | 969980.00 T | 7381.81 T | 1233757.14 T | 22409.09 T | 5058.82 T |

*See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.*

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: | EB072 | EB078 | EB078 | EB087 | EB087 | EB087 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB72-0080 | SD2-EB78-0000A | SD2-EB78-0040 | SD2-EB87-0000A | SD2-EB87-0040 | SD2-EB87-0080 |
| | Depth (feet bgs): | 8 to 12 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 8 | 8 to 12 |
| Total B(a)P equivalent | | | 65486.90 T | 105.45 T | 85677.14 T | 436.59 T | 40.29 T |
| **Pesticides/PCBs (ug/kg)** | | | | | | | |
| Aroclor 1016 | | | | | | | |
| Aroclor 1221 | | | | | | | |
| Aroclor 1232 | | | | | | | |
| Aroclor 1242 | | | | | | | |
| Aroclor 1248 | | | | | | | |
| Aroclor 1254 | | | | | | | |
| Aroclor 1260 | | | | | | | |
| Total PCB | | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Nickel | | | | | | | |
| Zinc | | | | | | | |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.31 | 1.00 | 0.55 | 1.40 | 0.88 | 0.68 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB072 | EB078 | EB078 | EB087 | EB087 | EB087 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB72-0080 | SD2-EB78-0000A | SD2-EB78-0040 | SD2-EB87-0000A | SD2-EB87-0040 | SD2-EB87-0080 |
| **Constituent** | **Depth (feet bgs):** | 8 to 12 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | | | |
| 1000-500 microns-Fractional | | | | | | | |
| 500-250 microns-Fractional % | | | | | | | |
| 250-125 microns-Fractional % | | | | | | | |
| 125-62.4 microns-Fractional | | | | | | | |
| Total Percent Sand | | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | | |
| < 0.9 microns-Fractional % | | | | | | | |
| Balance-Fractional % | | | | | | | |
| Total Percent Fines | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB087<br>SD2-EB87-0120<br>12 to 16 | EB104<br>SD2-EB104-0000A<br>0 to 4 | EB104<br>SD2-EB104-0040<br>4 to 8 | EB113<br>SD2-EB113-0000A<br>0 to 4 | EB113<br>SD2-EB113-0040<br>4 to 7 |
|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/kg)** | | | | | | |
| 2,4-Dimethylphenol | | | | | | |
| 2-Chloronaphthalene | | 10.50 U | 111.00 U | 11.00 U | 2620.00 U | 146.00 U |
| 2-Methylnaphthalene | | 1.40 J | 548.00 | 12.40 | 96400.00 | 40500.00 |
| 2-Methylphenol | | | | | | |
| 4-Methylphenol | | | | | | |
| Carbazole | | 10.50 U | 98.10 J | 11.00 U | 56000.00 | 15200.00 |
| Dibenzofuran | | | | | | |
| Naphthalene, 1-methyl | | 1.40 J | 303.00 | 12.40 | 76500.00 | 35000.00 |
| Pentachlorophenol | | | | | | |
| Phenol | | | | | | |
| Retene | | 20.20 | 233.00 | 193.00 | 3440.00 | 83300.00 |
| Naphthalene | | 10.50 U | 2430.00 | 34.10 | 407000.00 | 216000.00 |
| Acenaphthylene | | 10.50 U | 202.00 | 7.10 J | 6120.00 | 2160.00 |
| Acenaphthene | | 10.50 U | 572.00 | 26.80 | 833000.00 | 178000.00 |
| Fluorene | | 10.50 U | 622.00 | 16.10 | 344000.00 | 96200.00 |
| Phenanthrene | | 13.20 | 1630.00 | 77.00 | 1970000.00 | 413000.00 |
| Anthracene | | 1.90 J | 725.00 | 42.60 | 659000.00 | 143000.00 |
| Total LPAH | | 15.10 T | 6181.00 T | 203.70 T | 4219120.00 T | 1048360.00 T |
| Fluoranthene | | 9.10 J | 1820.00 | 109.00 | 972000.00 | 311000.00 |
| Pyrene | | 8.30 J | 2970.00 | 107.00 | 545000.00 | 171000.00 |
| Benzo(a)anthracene | | 21.00 U | 520.00 | 19.50 J | 93800.00 | 34600.00 |
| Chrysene | | 2.60 J | 682.00 | 21.70 | 91000.00 | 40100.00 |
| Benzo(b)fluoranthene | | 10.50 U | 1060.00 | 23.20 | 30700.00 | 13400.00 |
| Benzo(k)fluoranthene | | 10.50 U | 455.00 | 9.80 J | 11900.00 | 4800.00 |
| Total Benzofluoranthene | | 10.50 UT | 1515.00 T | 33.00 T | 42600.00 T | 18200.00 T |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB087 SD2-EB87-0120 12 to 16 | EB104 SD2-EB104-0000A 0 to 4 | EB104 SD2-EB104-0040 4 to 8 | EB113 SD2-EB113-0000A 0 to 4 | EB113 SD2-EB113-0040 4 to 7 |
|---|---|---|---|---|---|---|
| Benzo(a)pyrene | | 10.50 U | 673.00 | 11.00 U | 13600.00 | 6320.00 |
| Indeno(1,2,3-cd)pyrene | | 10.50 U | 275.00 | 11.00 U | 1860.00 J | 1330.00 |
| Dibenz(a,h)anthracene | | 10.50 U | 71.10 J | 11.00 U | 950.00 J | 491.00 |
| Benzo(g,h,i)perylene | | 10.50 U | 264.00 | 11.00 U | 1560.00 J | 1280.00 |
| Total HPAH | | 20.00 T | 8790.10 T | 290.20 T | 1762390.00 T | 584321.00 T |
| Total B(a)P equivalent | | 0.00 T | 934.83 T | 4.38 T | 27396.00 T | 11832.10 T |
| **Semi-Volatile Organic Compounds - TOCN (ug/kg)** | | | | | | |
| 2-Methylnaphthalene | | 200.00 J | 27400.00 | 1722.22 | | |
| Dibenzofuran | | | | | | |
| Naphthalene | | 10.50 U | 121500.00 | 4736.11 | | |
| Acenaphthylene | | 10.50 U | 10100.00 | 986.11 J | | |
| Acenaphthene | | 10.50 U | 28600.00 | 3722.22 | | |
| Fluorene | | 10.50 U | 31100.00 | 2236.11 | | |
| Phenanthrene | | 1885.71 | 81500.00 | 10694.44 | | |
| Anthracene | | 271.42 J | 36250.00 | 5916.66 | | |
| Total LPAH | | 2157.14 T | 309050.00 T | 28291.66 T | | |
| Fluoranthene | | 1300.00 J | 91000.00 | 15138.88 | | |
| Pyrene | | 1185.71 J | 148500.00 | 14861.11 | | |
| Benzo(a)anthracene | | 21.00 U | 26000.00 | 2708.33 J | | |
| Chrysene | | 371.42 J | 34100.00 | 3013.88 | | |
| Total Benzofluoranthene | | 10.50 UT | 75750.00 T | 4583.33 T | | |
| Benzo(a)pyrene | | 10.50 U | 33650.00 | 11.00 U | | |
| Indeno(1,2,3-cd)pyrene | | 10.50 U | 13750.00 | 11.00 U | | |
| Dibenz(a,h)anthracene | | 10.50 U | 3555.00 J | 11.00 U | | |
| Benzo(g,h,i)perylene | | 10.50 U | 13200.00 | 11.00 U | | |
| Total HPAH | | 2857.14 T | 439505.00 T | 40305.55 T | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB087 SD2-EB87-0120 12 to 16 | EB104 SD2-EB104-0000A 0 to 4 | EB104 SD2-EB104-0040 4 to 8 | EB113 SD2-EB113-0000A 0 to 4 | EB113 SD2-EB113-0040 4 to 7 |
|---|---|---|---|---|---|---|
| Total B(a)P equivalent | | 0.37 T | 46741.60 T | 609.68 T | | |
| **Pesticides/PCBs (ug/kg)** | | | | | | |
| Aroclor 1016 | | | | | | |
| Aroclor 1221 | | | | | | |
| Aroclor 1232 | | | | | | |
| Aroclor 1242 | | | | | | |
| Aroclor 1248 | | | | | | |
| Aroclor 1254 | | | | | | |
| Aroclor 1260 | | | | | | |
| Total PCB | | | | | | |
| **Pesticides/PCBs - TOCN (ug/kg)** | | | | | | |
| Total PCB | | | | | | |
| **Inorganics (Total) (mg/kg)** | | | | | | |
| Arsenic | | | | | | |
| Cadmium | | | | | | |
| Chromium | | | | | | |
| Copper | | | | | | |
| Lead | | | | | | |
| Mercury | | | | | | |
| Nickel | | | | | | |
| Zinc | | | | | | |
| **Conventional Parameters** | | | | | | |
| Total Organic Carbon (%) | | 0.70 | 2.00 | 0.72 | 12.00 | 18.00 |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-9: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment Analytical Results and SMS/AET Exceedances

| | Station ID: | EB087 | EB104 | EB104 | EB113 | EB113 |
|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB87-0120 | SD2-EB104-0000A | SD2-EB104-0040 | SD2-EB113-0000A | SD2-EB113-0040 |
| Constituent | Depth (feet bgs): | 12 to 16 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 7 |
| **Grain Size (%)** | | | | | | |
| >4750 microns-Fractional % | | | | | | |
| 4750-2000 microns-Fractional | | | | | | |
| 2000-1000 microns-Fractional | | | | | | |
| 1000-500 microns-Fractional | | | | | | |
| 500-250 microns-Fractional % | | | | | | |
| 250-125 microns-Fractional % | | | | | | |
| 125-62.4 microns-Fractional | | | | | | |
| Total Percent Sand | | | | | | |
| 62.5-31.2 microns-Fractional | | | | | | |
| 31.2-15.6 microns-Fractional | | | | | | |
| 15.6-7.8 microns-Fractional | | | | | | |
| 7.8-3.9 microns-Fractional % | | | | | | |
| 3.9-1.9 microns-Fractional % | | | | | | |
| 1.9-0.9 microns-Fractional % | | | | | | |
| < 0.9 microns-Fractional % | | | | | | |
| Balance-Fractional % | | | | | | |
| Total Percent Fines | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Standard:* SQS LAET

*Shaded Cell Standard:* CSL 2LAET

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB003 | EB003 | EB003 | EB003 | EB003 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB03-0000A-CC | SD2-EB03-0040-CC | SD2-EB03-0080-CC | SD2-EB03-0120-CC | SD2-EB03-0160-CC | SD2-EB12-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.01 Jer | | 0.00 Jer | 0.00 Jer | 0.00 Jer | 2.97 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.03 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 6.25 er |
| Acenaphthylene | | 0.00 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.29 er |
| Acenaphthene | | 0.04 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 9.92 er |
| Fluorene | | 0.05 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 5.18 er |
| Phenanthrene | | 0.04 Jer | | 0.00 er | 0.00 Uer | 0.00 Uer | 1.74 er |
| Anthracene | | 0.01 Jer | | 0.00 Jer | 0.00 Uer | 0.00 Jer | 0.35 er |
| Total LPAH | | 0.07 Ter | | 0.00 Ter | 0.00 UTer | 0.00 Ter | 4.26 Ter |
| Fluoranthene | | 0.05 Jer | | 0.00 er | 0.00 Uer | 0.00 Uer | 1.66 er |
| Pyrene | | 0.03 er | | 0.01 er | 0.00 Jer | 0.00 Jer | 1.66 er |
| Benzo(a)anthracene | | 0.10 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 1.20 er |
| Chrysene | | 0.14 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.98 er |
| Total Benzofluoranthene | | 0.04 Ter | | 0.00 UTer | 0.00 UTer | 0.00 UTer | 1.40 Ter |
| Benzo(a)pyrene | | 0.03 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 1.21 er |
| Indeno(1,2,3-cd)pyrene | | 0.02 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.96 er |
| Dibenz(a,h)anthracene | | 0.02 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.86 er |
| Benzo(g,h,i)perylene | | 0.02 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.91 er |
| Total HPAH | | 0.04 Ter | | 0.00 Ter | 0.00 Ter | 0.00 Ter | 1.16 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB003 | EB003 | EB003 | EB003 | EB003 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB03-0000A-CC | SD2-EB03-0040-CC | SD2-EB03-0080-CC | SD2-EB03-0120-CC | SD2-EB03-0160-CC | SD2-EB12-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB012 | EB012 | EB013 | EB013 | EB013 | EB013 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB12-0040 | SD2-EB12-0080 | SD2-EB13-0000A | SD2-EB13-0040 | SD2-EB13-0080 | SD2-EB13-0120 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | 126.89 er | 10.89 er | 3.72 Uer | 1.30 Uer |
| 2-Methylphenol | | | | 10.61 Uer | 1.52 Uer | 1.71 Uer | 0.59 Uer |
| 4-Methylphenol | | | | 3.07 er | 0.16 er | 0.16 Uer | 0.05 Uer |
| Pentachlorophenol | | | | 1.94 Uer | 0.69 Uer | 0.31 Uer | 0.10 Uer |
| Phenol | | | | 0.55 Uer | 0.08 Uer | 0.09 Uer | 0.03 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 3.75 Jer | | | 72.01 er | 85.11 er | 5.16 er |
| Dibenzofuran | | | | | 45.29 er | 51.95 er | 3.17 er |
| Naphthalene | | 4.41 er | | | 59.89 er | 61.06 er | 3.85 er |
| Acenaphthylene | | 0.47 er | | | 1.04 er | 1.31 er | 0.06 Jer |
| Acenaphthene | | 14.25 er | | | 60.60 er | 73.40 er | 4.44 er |
| Fluorene | | 9.73 er | | | 40.04 er | 45.96 er | 2.84 er |
| Phenanthrene | | 3.90 er | | | 14.05 er | 16.63 er | 1.05 er |
| Anthracene | | 0.34 er | | | 0.95 er | 1.02 er | 0.06 er |
| Total LPAH | | 5.96 Ter | | | 31.74 Ter | 35.25 Ter | 2.20 Ter |
| Fluoranthene | | 1.79 er | | | 2.45 er | 2.94 er | 0.19 er |
| Pyrene | | 0.86 er | | | 1.27 er | 1.59 er | 0.09 er |
| Benzo(a)anthracene | | 0.93 Jer | | | 2.16 er | 2.48 er | 0.12 er |
| Chrysene | | 0.60 Jer | | | 1.13 er | 1.35 er | 0.07 er |
| Total Benzofluoranthene | | 0.38 Ter | | | 0.90 Ter | 1.08 Ter | 0.06 Ter |
| Benzo(a)pyrene | | 0.30 er | | | 0.83 er | 1.00 er | 0.06 er |
| Indeno(1,2,3-cd)pyrene | | 0.22 er | | | 0.80 er | 1.00 er | 0.15 Jer |
| Dibenz(a,h)anthracene | | 0.17 er | | | 0.91 Jer | 1.34 Jer | 0.00 Uer |
| Benzo(g,h,i)perylene | | 0.29 er | | | 0.60 er | 0.76 er | 0.11 Jer |
| Total HPAH | | 0.78 Ter | | | 1.23 Ter | 1.50 Ter | 0.09 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB012 SD2-EB12-0040 4 to 8 | EB012 SD2-EB12-0080 8 to 12 | EB013 SD2-EB13-0000A 0 to 4 | EB013 SD2-EB13-0040 4 to 8 | EB013 SD2-EB13-0080 8 to 12 | EB013 SD2-EB13-0120 12 to 16 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | 0.00 UTer | 0.00 UTer | 0.00 UTer |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | 0.11 er | 0.05 er | 0.04 Uer | 0.05 er |
| Cadmium | | | | 0.23 er | 0.04 Uer | 0.04 Uer | 0.04 Uer |
| Chromium | | | | 0.24 er | 0.06 er | 0.07 er | 0.06 er |
| Copper | | | | 0.15 er | 0.04 er | 0.04 er | 0.04 er |
| Lead | | | | 0.15 er | 0.02 er | 0.01 er | 0.01 er |
| Mercury | | | | 1.19 er | 0.05 er | 0.04 er | 0.04 er |
| Zinc | | | | 0.26 er | 0.03 er | 0.03 er | 0.03 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB013 | EB015 | EB015 | EB015 | EB015 | EB015 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB13-0160 | SD2-EB15-0000A | SD2-EB15-0040 | SD2-EB15-0080 | SD2-EB15-0120 | SD2-EB15-0160 |
| | Depth (feet bgs): | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 0.75 Uer | | | | | |
| 2-Methylphenol | | 0.34 Uer | | | | | |
| 4-Methylphenol | | 0.03 Uer | | | | | |
| Pentachlorophenol | | 0.06 Uer | | | | | |
| Phenol | | 0.01 Uer | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.32 Jer | 0.22 er | 0.71 er | | 0.00 Uer | |
| Dibenzofuran | | 0.27 er | | | | | |
| Naphthalene | | 0.22 Jer | 0.22 er | 0.99 er | | 0.00 UJer | |
| Acenaphthylene | | 0.00 Uer | 0.14 er | 0.26 er | | 0.00 Uer | |
| Acenaphthene | | 0.36 er | 0.31 er | 1.64 er | | 0.00 Uer | |
| Fluorene | | 0.25 er | 0.26 er | 1.12 er | | 0.00 Uer | |
| Phenanthrene | | 0.10 er | 0.13 er | 0.38 er | | 0.00 Jer | |
| Anthracene | | 0.00 er | 0.03 er | 0.08 er | | 0.00 Uer | |
| Total LPAH | | 0.17 Ter | 0.24 Ter | 0.83 Ter | | 0.00 Ter | |
| Fluoranthene | | 0.01 er | 0.07 er | 0.17 er | | 0.00 Uer | |
| Pyrene | | 0.00 er | 0.33 er | 0.76 er | | 0.00 Uer | |
| Benzo(a)anthracene | | 0.01 er | 0.17 er | 0.36 er | | 0.00 Uer | |
| Chrysene | | 0.00 er | 0.16 er | 0.37 er | | 0.00 Uer | |
| Total Benzofluoranthene | | 0.00 Ter | 0.66 Ter | 0.86 Ter | | 0.00 UTer | |
| Benzo(a)pyrene | | 0.00 Uer | 0.58 er | 0.80 er | | 0.00 Uer | |
| Indeno(1,2,3-cd)pyrene | | 0.00 Uer | 0.66 er | 0.72 er | | 0.00 Uer | |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.57 er | 0.52 er | | 0.00 Uer | |
| Benzo(g,h,i)perylene | | 0.00 Uer | 0.60 er | 0.69 er | | 0.00 Uer | |
| Total HPAH | | 0.00 Ter | 0.23 Ter | 0.42 Ter | | UTer | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB013 SD2-EB13-0160 16 to 20 | EB015 SD2-EB15-0000A 0 to 4 | EB015 SD2-EB15-0040 4 to 8 | EB015 SD2-EB15-0080 8 to 12 | EB015 SD2-EB15-0120 12 to 16 | EB015 SD2-EB15-0160 16 to 20 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.00 UTer | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.04 Uer | | | | | |
| Cadmium | | 0.04 Uer | | | | | |
| Chromium | | 0.06 er | | | | | |
| Copper | | 0.04 er | | | | | |
| Lead | | 0.00 er | | | | | |
| Mercury | | 0.03 er | | | | | |
| Zinc | | 0.03 er | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB027 SD2-EB27-0000A 0 to 4 | EB027 SD2-EB27-0040 4 to 8 | EB027 SD2-EB27-0080 8 to 12 | EB027 SD2-EB27-0120 12 to 16 | EB027 SD2-EB27-0160 16 to 20 | EB031 SD2-EB31-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 40.00 er | 92.80 er | 700.89 er | 57.71 er | | 1.03 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 25.41 er | 58.11 er | 536.13 er | 47.69 er | | 2.25 er |
| Acenaphthylene | | 0.97 er | 0.74 er | 14.63 er | 1.27 er | | 0.21 er |
| Acenaphthene | | 66.31 er | 110.57 er | 746.86 er | 73.39 er | | 2.24 er |
| Fluorene | | 52.02 er | 80.55 er | 538.87 er | 52.31 er | | 1.38 er |
| Phenanthrene | | 21.45 er | 31.06 er | 223.21 er | 20.64 er | | 0.50 er |
| Anthracene | | 1.16 er | 1.26 er | 9.66 er | 1.14 er | | 0.08 er |
| Total LPAH | | 30.73 Ter | 50.02 Ter | 379.47 Ter | 35.67 Ter | | 1.26 Ter |
| Fluoranthene | | 4.02 er | 5.15 er | 36.42 er | 4.51 er | | 0.31 er |
| Pyrene | | 2.11 er | 2.46 er | 19.04 er | 2.35 er | | 0.49 er |
| Benzo(a)anthracene | | 2.80 er | 3.18 er | 23.38 er | 3.28 er | | 0.25 er |
| Chrysene | | 1.46 er | 1.67 er | 12.48 er | 1.87 er | | 0.18 er |
| Total Benzofluoranthene | | 1.30 Ter | 1.37 Ter | 9.39 Ter | 1.27 Ter | | 0.51 Ter |
| Benzo(a)pyrene | | 1.22 er | 1.31 er | 8.39 er | 1.14 er | | 0.45 er |
| Indeno(1,2,3-cd)pyrene | | 0.92 er | 0.94 er | 5.74 er | 0.83 er | | 0.45 er |
| Dibenz(a,h)anthracene | | 0.76 er | 0.87 er | 5.37 er | 0.69 er | | 0.35 er |
| Benzo(g,h,i)perylene | | 0.90 er | 0.85 er | 5.27 er | 0.74 er | | 0.46 er |
| Total HPAH | | 1.93 Ter | 2.32 Ter | 16.88 Ter | 2.15 Ter | | 0.30 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| Constituent | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB031 SD2-EB31-0040 4 to 8 | EB031 SD2-EB31-0080 8 to 12 | EB031 SD2-EB31-0120 12 to 16 | EB032 SD2-EB32-0000A 0 to 4 | EB032 SD2-EB32-0040 4 to 8 | EB032 SD2-EB32-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.00 Jer | 0.01 Jer | 0.01 Jer | 30.14 er | 3.94 er | 0.55 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.00 er | 0.00 Jer | 0.00 Jer | 33.33 er | 1.92 er | 0.35 er |
| Acenaphthylene | | 0.00 Jer | 0.01 Jer | 0.00 Uer | 1.21 er | 0.19 er | 0.01 Jer |
| Acenaphthene | | 0.00 Jer | 0.00 Jer | 0.00 Uer | 97.22 er | 14.55 er | 0.97 er |
| Fluorene | | 0.00 Uer | 0.01 Jer | 0.00 Uer | 83.86 er | 12.28 er | 0.86 er |
| Phenanthrene | | 0.00 er | 0.00 er | 0.00 er | 35.06 er | 5.44 er | 0.37 er |
| Anthracene | | 0.00 Jer | 0.00 Jer | 0.00 Jer | 1.37 er | 0.21 er | 0.01 er |
| Total LPAH | | 0.00 Ter | 0.01 Ter | 0.00 Ter | 46.65 Ter | 6.42 Ter | 0.49 Ter |
| Fluoranthene | | 0.00 er | 0.00 er | 0.00 er | 8.02 er | 0.99 er | 0.07 er |
| Pyrene | | 0.00 er | 0.00 er | 0.00 er | 3.83 er | 0.49 er | 0.03 er |
| Benzo(a)anthracene | | 0.00 Uer | 0.00 Jer | 0.00 Uer | 4.70 er | 0.88 er | 0.05 er |
| Chrysene | | 0.00 Jer | 0.00 er | 0.00 Uer | 2.55 er | 0.43 er | 0.02 er |
| Total Benzofluoranthene | | 0.00 Ter | 0.00 Ter | 0.00 Ter | 2.04 Ter | 0.43 Ter | 0.02 Ter |
| Benzo(a)pyrene | | 0.00 Jer | 0.01 er | 0.00 Uer | 1.78 er | 0.49 er | 0.02 er |
| Indeno(1,2,3-cd)pyrene | | 0.00 Jer | 0.01 Jer | 0.00 Uer | 1.23 er | 0.45 er | 0.01 er |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 1.28 er | 0.32 er | 0.01 Jer |
| Benzo(g,h,i)perylene | | 0.00 Jer | 0.02 er | 0.00 Uer | 1.30 er | 0.45 er | 0.01 er |
| Total HPAH | | 0.00 Ter | 0.00 Ter | 0.00 Ter | 3.58 Ter | 0.51 Ter | 0.03 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB031 | EB031 | EB031 | EB032 | EB032 | EB032 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB31-0040 | SD2-EB31-0080 | SD2-EB31-0120 | SD2-EB32-0000A | SD2-EB32-0040 | SD2-EB32-0080 |
| **Constituent** | **Depth (feet bgs):** | 4 to 8 | 8 to 12 | 12 to 16 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB032 SD2-EB32-0120 12 to 16 | EB032 SD2-EB32-0160 16 to 20 | EB034 SD2-EB34-0000A 0 to 4 | EB034 SD2-EB34-0040 4 to 8 | EB034 SD2-EB34-0080 8 to 12 | EB041 SD2-EB41-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | 3.89 Uer |
| 2-Methylphenol | | | | | | | 1.79 Uer |
| 4-Methylphenol | | | | | | | 0.15 Jer |
| Pentachlorophenol | | | | | | | 0.32 Uer |
| Phenol | | | | | | | 0.09 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.03 er | | 0.71 er | 0.04 er | 0.00 Jer | 2.38 er |
| Dibenzofuran | | | | | | | 15.97 er |
| Naphthalene | | 0.02 er | | 1.19 er | 0.02 er | 0.00 Uer | 3.57 er |
| Acenaphthylene | | 0.00 Uer | | 0.09 er | 0.00 Uer | 0.00 Uer | 0.86 er |
| Acenaphthene | | 0.04 er | | 2.51 er | 0.04 er | 0.00 Uer | 38.59 er |
| Fluorene | | 0.03 er | | 0.92 er | 0.02 er | 0.00 Uer | 24.13 er |
| Phenanthrene | | 0.01 er | | 0.28 er | 0.01 er | 0.00 Uer | 8.47 er |
| Anthracene | | 0.00 Jer | | 0.12 er | 0.00 er | 0.00 Jer | 0.90 er |
| Total LPAH | | 0.02 Ter | | 0.91 Ter | 0.02 Ter | 0.00 Ter | 12.72 Ter |
| Fluoranthene | | 0.00 er | | 0.35 er | 0.00 er | 0.00 Uer | 3.19 er |
| Pyrene | | 0.00 er | | 0.23 er | 0.00 er | 0.00 Jer | 1.85 er |
| Benzo(a)anthracene | | 0.00 Uer | | 0.29 er | 0.00 Jer | 0.00 Uer | 2.59 er |
| Chrysene | | 0.00 Jer | | 0.19 er | 0.00 er | 0.00 Uer | 1.57 er |
| Total Benzofluoranthene | | 0.00 Ter | | 0.18 Ter | 0.00 Ter | 0.00 UTer | 1.31 Ter |
| Benzo(a)pyrene | | 0.00 Uer | | 0.21 er | 0.00 Uer | 0.00 Uer | 1.15 er |
| Indeno(1,2,3-cd)pyrene | | 0.00 Jer | | 0.19 er | 0.00 Uer | 0.00 Uer | 1.00 er |
| Dibenz(a,h)anthracene | | 0.00 Uer | | 0.03 er | 0.00 Uer | 0.00 Uer | 1.02 Jer |
| Benzo(g,h,i)perylene | | 0.00 Jer | | 0.17 er | 0.00 Uer | 0.00 Uer | 0.84 er |
| Total HPAH | | 0.00 Ter | | 0.20 Ter | 0.00 Ter | 0.00 Ter | 1.67 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB032 | EB032 | EB034 | EB034 | EB034 | EB041 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB32-0120 | SD2-EB32-0160 | SD2-EB34-0000A | SD2-EB34-0040 | SD2-EB34-0080 | SD2-EB41-0000A |
| **Constituent** | **Depth (feet bgs):** | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | 0.00 UTer |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | 0.04 er |
| Cadmium | | | | | | | 0.05 er |
| Chromium | | | | | | | 0.09 er |
| Copper | | | | | | | 0.09 er |
| Lead | | | | | | | 0.19 er |
| Mercury | | | | | | | 0.50 er |
| Zinc | | | | | | | 0.06 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB041 | EB041 | EB041 | EB041 | EB042 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB41-0120 | SD2-EB41-0160 | SD2-EB42-0000A | SD2-EB42-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.23 Uer | 0.62 Uer | 0.77 Uer | 0.74 Uer | | |
| 2-Methylphenol | | 0.56 Uer | 0.28 Uer | 0.35 Uer | 0.34 Uer | | |
| 4-Methylphenol | | 0.05 Uer | 0.02 Uer | 0.03 Uer | 0.03 Uer | | |
| Pentachlorophenol | | 0.10 Uer | 0.05 Uer | 0.06 Uer | 0.06 Uer | | |
| Phenol | | 0.02 Uer | 0.01 Uer | 0.01 Uer | 0.01 Uer | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | | 0.00 Uer | 0.00 Uer | 0.60 er | |
| Dibenzofuran | | | | 0.00 Uer | 0.00 Uer | | |
| Naphthalene | | | | 0.00 Jer | 0.00 Uer | 0.91 er | |
| Acenaphthylene | | | | 0.00 Uer | 0.00 Uer | 0.18 er | |
| Acenaphthene | | | | 0.01 Jer | 0.01 Jer | 0.92 er | |
| Fluorene | | | | 0.01 Jer | 0.00 Uer | 0.59 er | |
| Phenanthrene | | | | 0.00 Jer | 0.00 Jer | 0.21 er | |
| Anthracene | | | | 0.00 Jer | 0.00 Jer | 0.03 er | |
| Total LPAH | | | | 0.01 Ter | 0.00 Ter | 0.53 Ter | |
| Fluoranthene | | | | 0.00 er | 0.00 Uer | 0.09 er | |
| Pyrene | | | | 0.00 Jer | 0.00 Jer | 0.13 er | |
| Benzo(a)anthracene | | | | 0.03 er | 0.00 Uer | 0.10 er | |
| Chrysene | | | | 0.03 er | 0.00 Uer | 0.09 er | |
| Total Benzofluoranthene | | | | 0.02 Ter | 0.00 UTer | 0.24 Ter | |
| Benzo(a)pyrene | | | | 0.02 er | 0.00 Uer | 0.22 er | |
| Indeno(1,2,3-cd)pyrene | | | | 0.06 Jer | 0.00 Uer | 0.22 er | |
| Dibenz(a,h)anthracene | | | | 0.00 Uer | 0.00 Uer | 0.16 er | |
| Benzo(g,h,i)perylene | | | | 0.04 Jer | 0.00 Uer | 0.23 er | |
| Total HPAH | | | | 0.01 Ter | 0.00 Ter | 0.10 Ter | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB041 SD2-EB41-0040 4 to 8 | EB041 SD2-EB41-0080 8 to 12 | EB041 SD2-EB41-0120 12 to 16 | EB041 SD2-EB41-0160 16 to 20 | EB042 SD2-EB42-0000A 0 to 4 | EB042 SD2-EB42-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | 0.00 UTer | 0.00 UTer | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.04 Uer | 0.05 er | 0.06 er | 0.07 er | | |
| Cadmium | | 0.04 Uer | 0.04 Uer | 0.04 Uer | 0.04 Uer | | |
| Chromium | | 0.05 er | 0.03 er | 0.07 er | 0.06 er | | |
| Copper | | 0.02 er | 0.01 er | 0.04 er | 0.05 er | | |
| Lead | | 0.00 er | 0.00 er | 0.00 er | 0.00 er | | |
| Mercury | | 0.39 er | 0.03 Uer | 0.07 er | 0.28 er | | |
| Zinc | | 0.02 er | 0.02 er | 0.03 er | 0.03 er | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 13.32 er | 23.26 er | 1.82 er | | | 2.34 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 10.44 er | 18.00 er | 4.49 er | | | 4.93 er |
| Acenaphthylene | | 0.23 er | 0.27 er | 0.03 er | | | 0.74 er |
| Acenaphthene | | 16.71 er | 27.09 er | 3.80 er | | | 6.38 er |
| Fluorene | | 10.87 er | 18.91 er | 1.92 er | | | 4.59 er |
| Phenanthrene | | 3.92 er | 7.81 er | 0.50 er | | | 1.92 er |
| Anthracene | | 0.17 er | 0.34 er | 0.02 er | | | 0.34 er |
| Total LPAH | | 7.29 Ter | 13.18 Ter | 1.79 Ter | | | 3.78 Ter |
| Fluoranthene | | 0.82 er | 1.52 er | 0.10 er | | | 2.65 er |
| Pyrene | | 0.46 er | 0.90 er | 0.06 er | | | 2.72 er |
| Benzo(a)anthracene | | 0.84 er | 1.07 er | 0.07 er | | | 2.99 er |
| Chrysene | | 0.53 er | 0.59 er | 0.04 er | | | 1.77 er |
| Total Benzofluoranthene | | 0.44 Ter | 0.47 Ter | 0.03 Ter | | | 3.10 Ter |
| Benzo(a)pyrene | | 0.42 er | 0.48 er | 0.03 er | | | 3.21 er |
| Indeno(1,2,3-cd)pyrene | | 0.33 er | 0.34 er | 0.03 er | | | 2.35 er |
| Dibenz(a,h)anthracene | | 0.25 er | 0.26 er | 0.01 Jer | | | 3.21 er |
| Benzo(g,h,i)perylene | | 0.34 er | 0.31 er | 0.03 er | | | 2.48 er |
| Total HPAH | | 0.46 Ter | 0.76 Ter | 0.05 Ter | | | 2.11 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB066 SD2-EB66-0040 4 to 8 | EB066 SD2-EB66-0080 8 to 12 | EB066 SD2-EB66-0120 12 to 16 | EB066 SD2-EB66-0160 16 to 20 | EB072 SD2-EB72-0000A 0 to 4 | EB072 SD2-EB72-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 10.29 er | | | | 3.93 er | 0.15 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 9.33 er | | | | 6.35 er | 0.16 er |
| Acenaphthylene | | 0.00 Uer | | | | 0.60 er | 0.01 Jer |
| Acenaphthene | | 47.61 er | | | | 16.37 er | 0.41 er |
| Fluorene | | 41.99 er | | | | 2.36 er | 0.31 er |
| Phenanthrene | | 22.81 er | | | | 4.02 er | 0.13 er |
| Anthracene | | 1.74 er | | | | 0.18 er | 0.00 er |
| Total LPAH | | 26.49 Ter | | | | 5.63 Ter | 0.19 Ter |
| Fluoranthene | | 6.04 er | | | | 0.90 er | 0.03 er |
| Pyrene | | 3.75 er | | | | 1.01 er | 0.01 er |
| Benzo(a)anthracene | | 6.52 er | | | | 0.69 er | 0.02 er |
| Chrysene | | 7.24 er | | | | 0.46 er | 0.01 er |
| Total Benzofluoranthene | | 2.28 Ter | | | | 0.75 Ter | 0.01 Ter |
| Benzo(a)pyrene | | 2.01 er | | | | 0.67 er | 0.01 er |
| Indeno(1,2,3-cd)pyrene | | 0.97 er | | | | 0.48 er | 0.02 er |
| Dibenz(a,h)anthracene | | 1.08 Jer | | | | 0.41 er | 0.00 Jer |
| Benzo(g,h,i)perylene | | 1.03 Jer | | | | 0.50 er | 0.02 er |
| Total HPAH | | 3.63 Ter | | | | 0.65 Ter | 0.01 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB066 | EB066 | EB066 | EB066 | EB072 | EB072 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB66-0040 | SD2-EB66-0080 | SD2-EB66-0120 | SD2-EB66-0160 | SD2-EB72-0000A | SD2-EB72-0040 |
| **Constituent** | **Depth (feet bgs):** | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB072 SD2-EB72-0080 8 to 12 | EB078 SD2-EB78-0000A 0 to 4 | EB078 SD2-EB78-0040 4 to 8 | EB087 SD2-EB87-0000A 0 to 4 | EB087 SD2-EB87-0040 4 to 8 | EB087 SD2-EB87-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 1.60 er | 0.01 Jer | 1.65 er | 0.01 er | 0.00 Jer |
| Dibenzofuran | | | | | | | |
| Naphthalene | | | 2.91 er | 0.01 Jer | 2.36 er | 0.00 er | 0.00 Jer |
| Acenaphthylene | | | 0.00 Uer | 0.00 Uer | 0.16 er | 0.00 Jer | 0.00 Uer |
| Acenaphthene | | | 2.03 er | 0.00 Uer | 2.88 er | 0.01 Jer | 0.00 Uer |
| Fluorene | | | 1.40 er | 0.00 Uer | 1.88 er | 0.01 Jer | 0.00 Uer |
| Phenanthrene | | | 0.62 er | 0.00 er | 0.72 er | 0.00 er | 0.00 er |
| Anthracene | | | 0.06 er | 0.00 Jer | 0.07 er | 0.00 Jer | 0.00 Jer |
| Total LPAH | | | 1.41 Ter | 0.00 Ter | 1.49 Ter | 0.01 Ter | 0.00 Ter |
| Fluoranthene | | | 0.18 er | 0.00 er | 0.24 er | 0.00 er | 0.00 er |
| Pyrene | | | 0.32 er | 0.00 er | 0.36 er | 0.00 er | 0.00 er |
| Benzo(a)anthracene | | | 0.12 er | 0.00 Uer | 0.27 er | 0.00 Jer | 0.00 Uer |
| Chrysene | | | 0.10 er | 0.00 Uer | 0.21 er | 0.00 er | 0.00 Jer |
| Total Benzofluoranthene | | | 0.27 Ter | 0.00 Ter | 0.32 Ter | 0.00 Ter | 0.00 UTer |
| Benzo(a)pyrene | | | 0.22 er | 0.00 Uer | 0.27 er | 0.00 Uer | 0.00 Uer |
| Indeno(1,2,3-cd)pyrene | | | 0.16 er | 0.00 Uer | 0.23 er | 0.00 Jer | 0.00 Jer |
| Dibenz(a,h)anthracene | | | 0.12 Jer | 0.00 Uer | 0.18 Jer | 0.00 Uer | 0.00 Uer |
| Benzo(g,h,i)perylene | | | 0.22 er | 0.00 Uer | 0.24 er | 0.00 Uer | 0.00 Jer |
| Total HPAH | | | 0.18 Ter | 0.00 Ter | 0.23 Ter | 0.00 Ter | 0.00 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB072<br>SD2-EB72-0080<br>8 to 12 | EB078<br>SD2-EB78-0000A<br>0 to 4 | EB078<br>SD2-EB78-0040<br>4 to 8 | EB087<br>SD2-EB87-0000A<br>0 to 4 | EB087<br>SD2-EB87-0040<br>4 to 8 | EB087<br>SD2-EB87-0080<br>8 to 12 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB087<br>SD2-EB87-0120<br>12 to 16 | EB104<br>SD2-EB104-0000A<br>0 to 4 | EB104<br>SD2-EB104-0040<br>4 to 8 | EB113<br>SD2-EB113-0000A<br>0 to 4 | EB113<br>SD2-EB113-0040<br>4 to 7 |
|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | |
| 2,4-Dimethylphenol | | | | | | |
| 2-Methylphenol | | | | | | |
| 4-Methylphenol | | | | | | |
| Pentachlorophenol | | | | | | |
| Phenol | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | |
| 2-Methylnaphthalene | | 0.00 Jer | 0.42 er | 0.02 er | | |
| Dibenzofuran | | | | | | |
| Naphthalene | | 0.00 Uer | 0.71 er | 0.02 er | | |
| Acenaphthylene | | 0.00 Uer | 0.15 er | 0.01 Jer | | |
| Acenaphthene | | 0.00 Uer | 0.50 er | 0.06 er | | |
| Fluorene | | 0.00 Uer | 0.39 er | 0.02 er | | |
| Phenanthrene | | 0.00 er | 0.16 er | 0.02 er | | |
| Anthracene | | 0.00 Jer | 0.03 er | 0.00 er | | |
| Total LPAH | | 0.00 Ter | 0.39 Ter | 0.03 Ter | | |
| Fluoranthene | | 0.00 Jer | 0.07 er | 0.01 er | | |
| Pyrene | | 0.00 Jer | 0.10 er | 0.01 er | | |
| Benzo(a)anthracene | | 0.00 Uer | 0.09 er | 0.01 Jer | | |
| Chrysene | | 0.00 Jer | 0.07 er | 0.00 er | | |
| Total Benzofluoranthene | | 0.00 UTer | 0.16 Ter | 0.01 Ter | | |
| Benzo(a)pyrene | | 0.00 Uer | 0.16 er | 0.00 Uer | | |
| Indeno(1,2,3-cd)pyrene | | 0.00 Uer | 0.15 er | 0.00 Uer | | |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.10 Jer | 0.00 Uer | | |
| Benzo(g,h,i)perylene | | 0.00 Uer | 0.16 er | 0.00 Uer | | |
| Total HPAH | | 0.00 Ter | 0.08 Ter | 0.00 Ter | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-10: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment CSL Exceedance Ratios

| | Station ID: | EB087 | EB104 | EB104 | EB113 | EB113 |
|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB87-0120 | SD2-EB104-0000A | SD2-EB104-0040 | SD2-EB113-0000A | SD2-EB113-0040 |
| **Constituent** | **Depth (feet bgs):** | 12 to 16 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 7 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | |
| Total PCB | | | | | | |
| **Inorganics (Total) (er)** | | | | | | |
| Arsenic | | | | | | |
| Cadmium | | | | | | |
| Chromium | | | | | | |
| Copper | | | | | | |
| Lead | | | | | | |
| Mercury | | | | | | |
| Zinc | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* *1*

*Shaded Cell Value >* *10*

## Table D-11: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment 2LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB003 / SD2-EB03-0040-CC / 4 to 8 | EB012 / SD2-EB12-0040 / 4 to 8 | EB013 / SD2-EB13-0000A / 0 to 4 | EB015 / SD2-EB15-0080 / 8 to 12 | EB015 / SD2-EB15-0160 / 16 to 20 | EB027 / SD2-EB27-0160 / 16 to 20 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.00 Jer | 5.57 er | 635.71 er | 0.00 Jer | 0.00 Uer | 0.29 er |
| Dibenzofuran | | | | 874.28 er | | | |
| Naphthalene | | 0.00 Uer | 11.16 er | 1379.16 er | 0.00 Jer | 0.00 Uer | 0.80 er |
| Acenaphthylene | | 0.00 Uer | 1.16 er | 10.84 er | 0.01 Uer | 0.00 Uer | 0.01 er |
| Acenaphthene | | 0.01 Uer | 53.69 er | 1069.86 er | 0.00 Jer | 0.01 Uer | 1.98 er |
| Fluorene | | 0.01 Uer | 24.80 er | 821.00 er | 0.00 Jer | 0.01 Uer | 1.44 er |
| Phenanthrene | | 0.00 Uer | 11.05 er | 424.07 er | 0.00 er | 0.00 Jer | 0.65 er |
| Anthracene | | 0.00 Uer | 6.70 er | 443.18 er | 0.00 Jer | 0.00 Uer | 0.14 er |
| Total LPAH | | 0.00 UTer | 13.96 Ter | 705.08 Ter | 0.00 Ter | 0.00 Ter | 0.69 Ter |
| Fluoranthene | | 0.00 Uer | 48.40 er | 373.60 er | 0.00 er | 0.00 Uer | 0.97 er |
| Pyrene | | 0.00 Jer | 20.78 er | 165.75 er | 0.04 er | 0.00 Uer | 0.44 er |
| Benzo(a)anthracene | | 0.01 Uer | 11.25 er | 108.75 er | 0.00 Jer | 0.00 Uer | 0.23 er |
| Chrysene | | 0.00 Uer | 8.32 er | 61.42 er | 0.00 Jer | 0.00 Uer | 0.13 er |
| Total Benzofluoranthene | | 0.00 UTer | 4.11 Ter | 29.00 Ter | 0.01 Ter | 0.00 UTer | 0.06 Ter |
| Benzo(a)pyrene | | 0.00 Uer | 2.04 er | 13.53 er | 0.00 er | 0.00 Uer | 0.03 er |
| Indeno(1,2,3-cd)pyrene | | 0.01 Uer | 2.60 er | 21.15 er | 0.01 Jer | 0.03 Uer | 0.03 er |
| Dibenz(a,h)anthracene | | 0.02 Uer | 0.93 Jer | 10.74 er | 0.04 Uer | 0.04 Uer | 0.01 Jer |
| Benzo(g,h,i)perylene | | 0.01 Uer | 3.00 er | 12.55 er | 0.01 Jer | 0.01 Uer | 0.02 er |
| Total HPAH | | 0.00 Ter | 15.07 Ter | 117.73 Ter | 0.01 Ter | 0.00 UTer | 0.29 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-11: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment 2LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB032 SD2-EB32-0160 16 to 20 | EB041 SD2-EB41-0040 4 to 8 | EB041 SD2-EB41-0080 8 to 12 | EB042 SD2-EB42-0040 4 to 8 | EB049 SD2-EB49-0120 12 to 16 | EB049 SD2-EB49-0160 16 to 20 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.00 er | 0.01 Jer | 0.10 er | 0.00 Jer | 0.00 Jer | 0.00 Jer |
| Dibenzofuran | | | 0.58 er | 0.03 er | | | |
| Naphthalene | | 0.00 er | 0.38 er | 0.84 er | 0.00 er | 0.00 er | 0.01 er |
| Acenaphthylene | | 0.00 Uer | 0.01 Jer | 0.01 Uer | 0.00 Jer | 0.00 Uer | 0.00 Uer |
| Acenaphthene | | 0.01 er | 1.60 er | 0.14 er | 0.00 Jer | 0.00 Jer | 0.01 Jer |
| *Fluorene* | | 0.01 er | 1.04 er | 0.07 er | 0.00 Uer | 0.00 Jer | 0.00 Jer |
| Phenanthrene | | 0.00 er | 0.48 er | 0.03 er | 0.00 Uer | 0.00 er | 0.00 er |
| Anthracene | | 0.00 Jer | 0.04 er | 0.00 Jer | 0.00 Jer | 0.00 Jer | 0.00 Jer |
| Total LPAH | | 0.00 Ter | 0.46 Ter | 0.18 Ter | 0.00 Ter | 0.00 Ter | 0.00 Ter |
| Fluoranthene | | 0.00 er | 0.61 er | 0.03 er | 0.00 Jer | 0.00 er | 0.00 Uer |
| Pyrene | | 0.00 er | 0.28 er | 0.01 er | 0.00 er | 0.00 er | 0.00 Uer |
| Benzo(a)anthracene | | 0.01 Uer | 0.14 er | 0.01 Uer | 0.01 Uer | 0.00 Jer | 0.00 Uer |
| Chrysene | | 0.00 Uer | 0.07 er | 0.00 Uer | 0.00 Uer | 0.00 Jer | 0.00 Uer |
| Total Benzofluoranthene | | 0.00 UTer | 0.04 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer | 0.00 UTer |
| Benzo(a)pyrene | | 0.00 Uer | 0.02 er | 0.00 Uer | 0.00 UJer | 0.00 Uer | 0.00 Uer |
| Indeno(1,2,3-cd)pyrene | | 0.01 Uer | 0.09 Jer | 0.02 Uer | 0.01 Uer | 0.03 Uer | 0.03 Uer |
| Dibenz(a,h)anthracene | | 0.01 Uer | 0.13 Uer | 0.06 Uer | 0.01 Uer | 0.04 Uer | 0.04 Uer |
| Benzo(g,h,i)perylene | | 0.01 Uer | 0.05 Jer | 0.02 Uer | 0.01 Uer | 0.01 Uer | 0.01 Uer |
| Total HPAH | | 0.00 Ter | 0.19 Ter | 0.01 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-11: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment 2LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB066 SD2-EB66-0080 8 to 12 | EB066 SD2-EB66-0120 12 to 16 | EB066 SD2-EB66-0160 16 to 20 | EB072 SD2-EB72-0080 8 to 12 | EB113 SD2-EB113-0000A 0 to 4 | EB113 SD2-EB113-0040 4 to 7 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.47 er | 0.00 er | 0.00 Jer | 0.00 Jer | 68.85 er | 28.92 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.44 er | 0.00 er | 0.00 Jer | 0.00 er | 169.58 er | 90.00 er |
| Acenaphthylene | | 0.01 er | 0.00 Uer | 0.00 Uer | 0.00 Uer | 4.70 er | 1.66 er |
| Acenaphthene | | 2.32 er | 0.03 er | 0.00 Jer | 0.01 er | 1141.09 er | 243.83 er |
| Fluorene | | 1.72 er | 0.02 er | 0.00 Jer | 0.01 er | 344.00 er | 96.20 er |
| Phenanthrene | | 0.99 er | 0.01 er | 0.00 er | 0.00 er | 364.81 er | 76.48 er |
| Anthracene | | 0.11 er | 0.00 er | 0.00 Jer | 0.00 Jer | 149.77 er | 32.50 er |
| Total LPAH | | 0.79 Ter | 0.01 Ter | 0.00 Ter | 0.00 Ter | 324.54 Ter | 80.64 Ter |
| Fluoranthene | | 1.24 er | 0.02 er | 0.00 er | 0.00 er | 388.80 er | 124.40 er |
| Pyrene | | 0.60 er | 0.01 er | 0.00 er | 0.00 er | 165.15 er | 51.81 er |
| Benzo(a)anthracene | | 0.31 er | 0.01 Uer | 0.01 Uer | 0.00 Jer | 58.62 er | 21.62 er |
| Chrysene | | 0.14 er | 0.00 Jer | 0.00 Uer | 0.00 Uer | 32.50 er | 14.32 er |
| Total Benzofluoranthene | | 0.12 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer | 11.83 Ter | 5.05 Ter |
| Benzo(a)pyrene | | 0.01 er | 0.00 Uer | 0.00 Uer | 0.00 Uer | 4.53 er | 2.10 er |
| Indeno(1,2,3-cd)pyrene | | 0.06 er | 0.01 Uer | 0.01 Uer | 0.03 Uer | 2.69 Jer | 1.92 er |
| Dibenz(a,h)anthracene | | 0.02 Jer | 0.01 Uer | 0.01 Uer | 0.04 Uer | 1.75 Jer | 0.90 er |
| Benzo(g,h,i)perylene | | 0.03 er | 0.01 Uer | 0.01 Uer | 0.01 Uer | 2.19 Jer | 1.77 er |
| Total HPAH | | 0.38 Ter | 0.00 Ter | 0.00 Ter | 0.00 Ter | 103.67 Ter | 34.37 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB003 SD2-EB03-0000A-CC 0 to 4 | EB003 SD2-EB03-0040-CC 4 to 8 | EB003 SD2-EB03-0080-CC 8 to 12 | EB003 SD2-EB03-0120-CC 12 to 16 | EB003 SD2-EB03-0160-CC 16 to 20 | EB012 SD2-EB12-0000A 0 to 4 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.02 Jer | | 0.00 Jer | 0.00 Jer | 0.00 Jer | 5.01 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.06 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 10.73 er |
| Acenaphthylene | | 0.00 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 0.29 er |
| Acenaphthene | | 0.14 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 35.35 er |
| Fluorene | | 0.19 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 17.79 er |
| Phenanthrene | | 0.22 Jer | | 0.02 er | 0.00 Uer | 0.00 Uer | 8.37 er |
| Anthracene | | 0.09 Jer | | 0.00 Jer | 0.00 Uer | 0.00 Jer | 1.96 er |
| Total LPAH | | 0.15 Ter | | 0.00 Ter | 0.00 UTer | 0.00 Ter | 8.98 Ter |
| Fluoranthene | | 0.37 Jer | | 0.02 er | 0.00 Uer | 0.00 Uer | 12.51 er |
| Pyrene | | 0.04 er | | 0.02 er | 0.00 Jer | 0.00 Jer | 2.33 er |
| Benzo(a)anthracene | | 0.25 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 2.95 er |
| Chrysene | | 0.61 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 4.11 er |
| Total Benzofluoranthene | | 0.08 Ter | | 0.00 UTer | 0.00 UTer | 0.00 UTer | 2.74 Ter |
| Benzo(a)pyrene | | 0.07 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 2.57 er |
| Indeno(1,2,3-cd)pyrene | | 0.07 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 2.50 er |
| Dibenz(a,h)anthracene | | 0.07 Jer | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 2.37 er |
| Benzo(g,h,i)perylene | | 0.06 er | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 2.30 er |
| Total HPAH | | 0.24 Ter | | 0.02 Ter | 0.00 Ter | 0.00 Ter | 6.44 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB003 | EB003 | EB003 | EB003 | EB003 | EB012 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB03-0000A-CC | SD2-EB03-0040-CC | SD2-EB03-0080-CC | SD2-EB03-0120-CC | SD2-EB03-0160-CC | SD2-EB12-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB012 SD2-EB12-0040 4 to 8 | EB012 SD2-EB12-0080 8 to 12 | EB013 SD2-EB13-0000A 0 to 4 | EB013 SD2-EB13-0040 4 to 8 | EB013 SD2-EB13-0080 8 to 12 | EB013 SD2-EB13-0120 12 to 16 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | 126.89 er | 10.89 er | 3.72 Uer | 1.30 Uer |
| 2-Methylphenol | | | | 10.61 Uer | 1.52 Uer | 1.71 Uer | 0.59 Uer |
| 4-Methylphenol | | | | 3.07 er | 0.16 er | 0.16 Uer | 0.05 Uer |
| Pentachlorophenol | | | | 3.72 Uer | 1.33 Uer | 0.60 Uer | 0.20 Uer |
| Phenol | | | | 1.59 Uer | 0.22 Uer | 0.25 Uer | 0.08 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 6.31 Jer | | 121.29 er | 143.35 er | 8.69 er |
| Dibenzofuran | | | | | 175.15 er | 200.87 er | 12.26 er |
| Naphthalene | | | 7.57 er | | 102.84 er | 104.86 er | 6.61 er |
| Acenaphthylene | | | 0.47 er | | 1.04 er | 1.31 er | 0.06 Jer |
| Acenaphthene | | | 50.78 er | | 215.90 er | 261.51 er | 15.84 er |
| Fluorene | | | 33.42 er | | 137.54 er | 157.89 er | 9.78 er |
| Phenanthrene | | | 18.75 er | | 67.45 er | 79.86 er | 5.05 er |
| Anthracene | | | 1.89 er | | 5.20 er | 5.59 er | 0.33 er |
| Total LPAH | | | 12.58 Ter | | 66.91 Ter | 74.32 Ter | 4.64 Ter |
| Fluoranthene | | | 13.47 er | | 18.40 er | 22.12 er | 1.45 er |
| Pyrene | | | 1.20 er | | 1.78 er | 2.23 er | 0.13 er |
| Benzo(a)anthracene | | | 2.28 Jer | | 5.31 er | 6.10 er | 0.31 er |
| Chrysene | | | 2.52 Jer | | 4.73 er | 5.66 er | 0.30 er |
| Total Benzofluoranthene | | | 0.75 Ter | | 1.76 Ter | 2.12 Ter | 0.13 Ter |
| Benzo(a)pyrene | | | 0.64 er | | 1.76 er | 2.12 er | 0.14 er |
| Indeno(1,2,3-cd)pyrene | | | 0.58 er | | 2.07 er | 2.58 er | 0.39 Jer |
| Dibenz(a,h)anthracene | | | 0.48 er | | 2.51 Jer | 3.70 Jer | 0.00 Uer |
| Benzo(g,h,i)perylene | | | 0.74 er | | 1.51 er | 1.91 er | 0.27 Jer |
| Total HPAH | | | 4.35 Ter | | 6.83 Ter | 8.29 Ter | 0.52 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB012 SD2-EB12-0040 4 to 8 | EB012 SD2-EB12-0080 8 to 12 | EB013 SD2-EB13-0000A 0 to 4 | EB013 SD2-EB13-0040 4 to 8 | EB013 SD2-EB13-0080 8 to 12 | EB013 SD2-EB13-0120 12 to 16 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | 0.00 UTer | 0.00 UTer | 0.00 UTer |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | 0.19 er | 0.09 er | 0.07 Uer | 0.09 er |
| Cadmium | | | | 0.30 er | 0.05 Uer | 0.05 Uer | 0.05 Uer |
| Chromium | | | | 0.25 er | 0.06 er | 0.07 er | 0.06 er |
| Copper | | | | 0.15 er | 0.04 er | 0.04 er | 0.04 er |
| Lead | | | | 0.18 er | 0.02 er | 0.01 er | 0.01 er |
| Mercury | | | | 1.71 er | 0.08 er | 0.06 er | 0.06 er |
| Zinc | | | | 0.61 er | 0.08 er | 0.07 er | 0.07 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB013 SD2-EB13-0160 16 to 20 | EB015 SD2-EB15-0000A 0 to 4 | EB015 SD2-EB15-0040 4 to 8 | EB015 SD2-EB15-0080 8 to 12 | EB015 SD2-EB15-0120 12 to 16 | EB015 SD2-EB15-0160 16 to 20 |
|---|---|---|---|---|---|---|---|
| ***Semi-Volatile Organic Compounds (er)*** | | | | | | | |
| 2,4-Dimethylphenol | | 0.75 Uer | | | | | |
| 2-Methylphenol | | 0.34 Uer | | | | | |
| 4-Methylphenol | | 0.03 Uer | | | | | |
| Pentachlorophenol | | 0.12 Uer | | | | | |
| Phenol | | 0.05 Uer | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.55 Jer | 0.37 er | 1.20 er | | 0.00 Uer | |
| Dibenzofuran | | 1.05 er | | | | | |
| Naphthalene | | 0.38 Jer | 0.38 er | 1.70 er | | 0.00 UJer | |
| Acenaphthylene | | 0.00 Uer | 0.14 er | 0.26 er | | 0.00 Uer | |
| Acenaphthene | | 1.30 er | 1.13 er | 5.87 er | | 0.00 Uer | |
| Fluorene | | 0.88 er | 0.91 er | 3.84 er | | 0.00 Uer | |
| Phenanthrene | | 0.48 er | 0.64 er | 1.84 er | | 0.01 Jer | |
| Anthracene | | 0.03 er | 0.18 er | 0.46 er | | 0.00 Uer | |
| Total LPAH | | 0.36 Ter | 0.51 Ter | 1.77 Ter | | 0.00 Ter | |
| Fluoranthene | | 0.13 er | 0.58 er | 1.32 er | | 0.00 Uer | |
| Pyrene | | 0.01 er | 0.46 er | 1.06 er | | 0.00 Uer | |
| Benzo(a)anthracene | | 0.03 er | 0.44 er | 0.88 er | | 0.00 Uer | |
| Chrysene | | 0.03 er | 0.69 er | 1.56 er | | 0.00 Uer | |
| Total Benzofluoranthene | | 0.01 Ter | 1.29 Ter | 1.69 Ter | | 0.00 UTer | |
| Benzo(a)pyrene | | 0.00 Uer | 1.25 er | 1.71 er | | 0.00 Uer | |
| Indeno(1,2,3-cd)pyrene | | 0.00 Uer | 1.71 er | 1.87 er | | 0.00 Uer | |
| Dibenz(a,h)anthracene | | 0.00 Uer | 1.56 er | 1.45 er | | 0.00 Uer | |
| Benzo(g,h,i)perylene | | 0.00 Uer | 1.51 er | 1.74 er | | 0.00 Uer | |
| Total HPAH | | 0.04 Ter | 1.27 Ter | 2.33 Ter | | 0.00 UTer | |

*See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.*

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB013 | EB015 | EB015 | EB015 | EB015 | EB015 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB13-0160 | SD2-EB15-0000A | SD2-EB15-0040 | SD2-EB15-0080 | SD2-EB15-0120 | SD2-EB15-0160 |
| Constituent | Depth (feet bgs): | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | 0.00 UTer | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.07 Uer | | | | | |
| Cadmium | | 0.05 Uer | | | | | |
| Chromium | | 0.07 er | | | | | |
| Copper | | 0.04 er | | | | | |
| Lead | | 0.01 er | | | | | |
| Mercury | | 0.05 er | | | | | |
| Zinc | | 0.07 er | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 67.36 er | 156.29 er | 1180.45 er | 97.20 er | | 1.73 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 43.63 er | 99.78 er | 920.63 er | 82.25 er | | 3.87 er |
| Acenaphthylene | | 0.97 er | 0.74 er | 14.63 er | 1.27 er | | 0.21 er |
| Acenaphthene | | 236.25 er | 393.93 er | 2660.71 er | 261.47 er | | 8.00 er |
| Fluorene | | 176.69 er | 276.67 er | 1850.93 er | 179.68 er | | 4.75 er |
| Phenanthrene | | 103.00 er | 149.09 er | 1071.42 er | 99.08 er | | 2.42 er |
| Anthracene | | 6.36 er | 6.90 er | 52.72 er | 6.26 er | | 0.48 er |
| Total LPAH | | 64.79 Ter | 105.46 Ter | 799.98 Ter | 75.21 Ter | | 2.65 Ter |
| Fluoranthene | | 30.18 er | 38.63 er | 273.21 er | 33.86 er | | 2.37 er |
| Pyrene | | 2.96 er | 3.45 er | 26.65 er | 3.29 er | | 0.68 er |
| Benzo(a)anthracene | | 6.88 er | 7.82 er | 57.40 er | 8.06 er | | 0.63 er |
| Chrysene | | 6.14 er | 7.02 er | 52.20 er | 7.84 er | | 0.76 er |
| Total Benzofluoranthene | | 2.54 Ter | 2.69 Ter | 18.37 Ter | 2.49 Ter | | 1.00 Ter |
| Benzo(a)pyrene | | 2.59 er | 2.79 er | 17.80 er | 2.42 er | | 0.96 er |
| Indeno(1,2,3-cd)pyrene | | 2.38 er | 2.43 er | 14.87 er | 2.16 er | | 1.16 er |
| Dibenz(a,h)anthracene | | 2.11 er | 2.39 er | 14.78 er | 1.91 er | | 0.96 er |
| Benzo(g,h,i)perylene | | 2.27 er | 2.15 er | 13.27 er | 1.87 er | | 1.16 er |
| Total HPAH | | 10.66 Ter | 12.85 Ter | 93.24 Ter | 11.90 Ter | | 1.70 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB027 | EB027 | EB027 | EB027 | EB027 | EB031 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB27-0000A | SD2-EB27-0040 | SD2-EB27-0080 | SD2-EB27-0120 | SD2-EB27-0160 | SD2-EB31-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB031 SD2-EB31-0040 4 to 8 | EB031 SD2-EB31-0080 8 to 12 | EB031 SD2-EB31-0120 12 to 16 | EB032 SD2-EB32-0000A 0 to 4 | EB032 SD2-EB32-0040 4 to 8 | EB032 SD2-EB32-0080 8 to 12 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.01 Jer | 0.02 Jer | 0.02 Jer | 50.76 er | 6.63 er | 0.93 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.01 er | 0.01 Jer | 0.00 Jer | 57.23 er | 3.30 er | 0.61 er |
| Acenaphthylene | | 0.00 Jer | 0.01 Jer | 0.00 Uer | 1.21 er | 0.19 er | 0.01 Jer |
| Acenaphthene | | 0.02 Jer | 0.02 Jer | 0.00 Uer | 346.35 er | 51.86 er | 3.48 er |
| Fluorene | | 0.00 Uer | 0.03 Jer | 0.00 Uer | 286.04 er | 42.18 er | 2.95 er |
| Phenanthrene | | 0.02 er | 0.04 er | 0.02 er | 168.33 er | 26.11 er | 1.80 er |
| Anthracene | | 0.00 Jer | 0.00 Jer | 0.00 Jer | 7.48 er | 1.18 er | 0.08 er |
| Total LPAH | | 0.01 Ter | 0.02 Ter | 0.01 Ter | 98.35 Ter | 13.54 Ter | 1.03 Ter |
| Fluoranthene | | 0.02 er | 0.04 er | 0.01 er | 60.15 er | 7.45 er | 0.53 er |
| Pyrene | | 0.00 er | 0.00 er | 0.00 er | 5.37 er | 0.68 er | 0.04 er |
| Benzo(a)anthracene | | 0.00 Uer | 0.02 Jer | 0.00 Uer | 11.55 er | 2.17 er | 0.13 er |
| Chrysene | | 0.00 Jer | 0.02 er | 0.00 Uer | 10.68 er | 1.83 er | 0.11 er |
| Total Benzofluoranthene | | 0.00 Ter | 0.01 Ter | 0.00 Ter | 3.99 Ter | 0.84 Ter | 0.04 Ter |
| Benzo(a)pyrene | | 0.00 Jer | 0.02 er | 0.00 Uer | 3.78 er | 1.04 er | 0.04 er |
| Indeno(1,2,3-cd)pyrene | | 0.01 Jer | 0.04 Jer | 0.00 Uer | 3.19 er | 1.17 er | 0.04 er |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.00 Uer | 0.00 Uer | 3.54 er | 0.90 er | 0.04 Jer |
| Benzo(g,h,i)perylene | | 0.01 Jer | 0.06 er | 0.00 Uer | 3.29 er | 1.15 er | 0.04 er |
| Total HPAH | | 0.01 Ter | 0.03 Ter | 0.00 Ter | 19.78 Ter | 2.81 Ter | 0.18 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB031 | EB031 | EB031 | EB032 | EB032 | EB032 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB31-0040 | SD2-EB31-0080 | SD2-EB31-0120 | SD2-EB32-0000A | SD2-EB32-0040 | SD2-EB32-0080 |
| **Constituent** | **Depth (feet bgs):** | 4 to 8 | 8 to 12 | 12 to 16 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB032 | EB032 | EB034 | EB034 | EB034 | EB041 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB32-0120 | SD2-EB32-0160 | SD2-EB34-0000A | SD2-EB34-0040 | SD2-EB34-0080 | SD2-EB41-0000A |
| | Depth (feet bgs): | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 0 to 4 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | 3.89 Uer |
| 2-Methylphenol | | | | | | | 1.79 Uer |
| 4-Methylphenol | | | | | | | 0.15 Jer |
| Pentachlorophenol | | | | | | | 0.62 Uer |
| Phenol | | | | | | | 0.26 Uer |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.05 er | | 1.20 er | 0.07 er | 0.01 Jer | 4.01 er |
| Dibenzofuran | | | | | | | 61.77 er |
| Naphthalene | | 0.03 er | | 2.05 er | 0.03 er | 0.00 Uer | 6.14 er |
| Acenaphthylene | | 0.00 Uer | | 0.09 er | 0.00 Uer | 0.00 Uer | 0.86 er |
| Acenaphthene | | 0.14 er | | 8.97 er | 0.14 er | 0.00 Uer | 137.50 er |
| Fluorene | | 0.13 er | | 3.16 er | 0.07 er | 0.00 Uer | 82.89 er |
| Phenanthrene | | 0.09 er | | 1.36 er | 0.06 er | 0.00 Uer | 40.66 er |
| Anthracene | | 0.00 Jer | | 0.67 er | 0.00 er | 0.00 Jer | 4.93 er |
| Total LPAH | | 0.05 Ter | | 1.92 Ter | 0.04 Ter | 0.00 Ter | 26.82 Ter |
| Fluoranthene | | 0.03 er | | 2.66 er | 0.05 er | 0.00 Uer | 23.95 er |
| Pyrene | | 0.00 er | | 0.32 er | 0.00 er | 0.00 Jer | 2.59 er |
| Benzo(a)anthracene | | 0.00 Uer | | 0.72 er | 0.01 Jer | 0.00 Uer | 6.36 er |
| Chrysene | | 0.01 Jer | | 0.80 er | 0.02 er | 0.00 Uer | 6.60 er |
| Total Benzofluoranthene | | 0.00 Ter | | 0.35 Ter | 0.01 Ter | 0.00 UTer | 2.56 Ter |
| Benzo(a)pyrene | | 0.00 Uer | | 0.45 er | 0.00 Uer | 0.00 Uer | 2.45 er |
| Indeno(1,2,3-cd)pyrene | | 0.01 Jer | | 0.50 er | 0.00 Uer | 0.00 Uer | 2.60 er |
| Dibenz(a,h)anthracene | | 0.00 Uer | | 0.10 er | 0.00 Uer | 0.00 Uer | 2.81 Jer |
| Benzo(g,h,i)perylene | | 0.01 Jer | | 0.43 er | 0.00 Uer | 0.00 Uer | 2.12 er |
| Total HPAH | | 0.01 Ter | | 1.11 Ter | 0.02 Ter | 0.00 Ter | 9.24 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB032 | EB032 | EB034 | EB034 | EB034 | EB041 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB32-0120 | SD2-EB32-0160 | SD2-EB34-0000A | SD2-EB34-0040 | SD2-EB34-0080 | SD2-EB41-0000A |
| Constituent | Depth (feet bgs): | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 | 8 to 12 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | 0.00 UTer |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | 0.07 er |
| Cadmium | | | | | | | 0.06 er |
| Chromium | | | | | | | 0.09 er |
| Copper | | | | | | | 0.09 er |
| Lead | | | | | | | 0.22 er |
| Mercury | | | | | | | 0.72 er |
| Zinc | | | | | | | 0.15 er |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB041 | EB041 | EB041 | EB041 | EB042 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB41-0120 | SD2-EB41-0160 | SD2-EB42-0000A | SD2-EB42-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | 1.23 Uer | 0.62 Uer | 0.77 Uer | 0.74 Uer | | |
| 2-Methylphenol | | 0.56 Uer | 0.28 Uer | 0.35 Uer | 0.34 Uer | | |
| 4-Methylphenol | | 0.05 Uer | 0.02 Uer | 0.03 Uer | 0.03 Uer | | |
| Pentachlorophenol | | 0.19 Uer | 0.10 Uer | 0.12 Uer | 0.11 Uer | | |
| Phenol | | 0.08 Uer | 0.04 Uer | 0.05 Uer | 0.05 Uer | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | | 0.00 Uer | 0.00 Uer | 1.01 er | |
| Dibenzofuran | | | | 0.00 Uer | 0.00 Uer | | |
| Naphthalene | | | | 0.01 Jer | 0.00 Uer | 1.57 er | |
| Acenaphthylene | | | | 0.00 Uer | 0.00 Uer | 0.18 er | |
| Acenaphthene | | | | 0.06 Jer | 0.04 Jer | 3.29 er | |
| Fluorene | | | | 0.05 Jer | 0.00 Uer | 2.03 er | |
| Phenanthrene | | | | 0.03 Jer | 0.03 Jer | 1.04 er | |
| Anthracene | | | | 0.01 Jer | 0.00 Jer | 0.19 er | |
| Total LPAH | | | | 0.02 Ter | 0.01 Ter | 1.12 Ter | |
| Fluoranthene | | | | 0.02 er | 0.00 Uer | 0.67 er | |
| Pyrene | | | | 0.00 Jer | 0.00 Jer | 0.19 er | |
| Benzo(a)anthracene | | | | 0.08 er | 0.00 Uer | 0.24 er | |
| Chrysene | | | | 0.16 er | 0.00 Uer | 0.41 er | |
| Total Benzofluoranthene | | | | 0.05 Ter | 0.00 UTer | 0.47 Ter | |
| Benzo(a)pyrene | | | | 0.04 er | 0.00 Uer | 0.48 er | |
| Indeno(1,2,3-cd)pyrene | | | | 0.17 Jer | 0.00 Uer | 0.58 er | |
| Dibenz(a,h)anthracene | | | | 0.00 Uer | 0.00 Uer | 0.46 er | |
| Benzo(g,h,i)perylene | | | | 0.12 Jer | 0.00 Uer | 0.59 er | |
| Total HPAH | | | | 0.06 Ter | 0.00 Ter | 0.59 Ter | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Sheded Cell Value > 10*

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB041 | EB041 | EB041 | EB041 | EB042 | EB042 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB41-0120 | SD2-EB41-0160 | SD2-EB42-0000A | SD2-EB42-0040 |
| Constituent | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | 0.00 UTer | 0.00 UTer | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | 0.07 Uer | 0.09 er | 0.11 er | 0.12 er | | |
| Cadmium | | 0.05 Uer | 0.05 Uer | 0.05 Uer | 0.05 Uer | | |
| Chromium | | 0.05 er | 0.03 er | 0.07 er | 0.06 er | | |
| Copper | | 0.02 er | 0.01 er | 0.04 er | 0.05 er | | |
| Lead | | 0.00 er | 0.01 er | 0.01 er | 0.00 er | | |
| Mercury | | 0.57 er | 0.04 Uer | 0.10 er | 0.40 er | | |
| Zinc | | 0.05 er | 0.04 er | 0.07 er | 0.08 er | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| | Depth (feet bgs): | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 22.44 er | 39.18 er | 3.06 er | | | 3.94 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 17.94 er | 30.92 er | 7.71 er | | | 8.46 er |
| Acenaphthylene | | 0.23 er | 0.27 er | 0.03 er | | | 0.74 er |
| Acenaphthene | | 59.55 er | 96.52 er | 13.56 er | | | 22.74 er |
| Fluorene | | 37.34 er | 64.97 er | 6.61 er | | | 15.78 er |
| Phenanthrene | | 16.82 er | 37.50 er | 2.41 er | | | 9.23 er |
| Anthracene | | 0.94 er | 1.87 er | 0.11 er | | | 1.88 er |
| Total LPAH | | 15.38 Ter | 27.78 Ter | 3.79 Ter | | | 7.97 Ter |
| Fluoranthene | | 6.21 er | 11.42 er | 0.75 er | | | 19.90 er |
| Pyrene | | 0.64 er | 1.27 er | 0.08 er | | | 3.81 er |
| Benzo(a)anthracene | | 2.08 er | 2.63 er | 0.18 er | | | 7.34 er |
| Chrysene | | 2.24 er | 2.49 er | 0.17 er | | | 7.41 er |
| Total Benzofluoranthene | | 0.86 Ter | 0.92 Ter | 0.07 Ter | | | 6.08 Ter |
| Benzo(a)pyrene | | 0.90 er | 1.03 er | 0.08 er | | | 6.81 er |
| Indeno(1,2,3-cd)pyrene | | 0.86 er | 0.88 er | 0.07 er | | | 6.08 er |
| Dibenz(a,h)anthracene | | 0.70 er | 0.71 er | 0.04 Jer | | | 8.84 er |
| Benzo(g,h,i)perylene | | 0.86 er | 0.78 er | 0.09 er | | | 6.25 er |
| Total HPAH | | 2.57 Ter | 4.20 Ter | 0.29 Ter | | | 11.67 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB049 | EB049 | EB049 | EB049 | EB049 | EB066 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB49-0000A | SD2-EB49-0040 | SD2-EB49-0080 | SD2-EB49-0120 | SD2-EB49-0160 | SD2-EB66-0000A |
| **Constituent** | **Depth (feet bgs):** | 0 to 4 | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB066 | EB066 | EB066 | EB066 | EB072 | EB072 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB66-0040 | SD2-EB66-0080 | SD2-EB66-0120 | SD2-EB66-0160 | SD2-EB72-0000A | SD2-EB72-0040 |
| | Depth (feet bgs): | 4 to 8 | 8 to 12 | 12 to 16 | 16 to 20 | 0 to 4 | 4 to 8 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | 17.33 er | | | | 6.63 er | 0.26 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 16.03 er | | | | 10.90 er | 0.29 er |
| Acenaphthylene | | 0.00 Uer | | | | 0.60 er | 0.01 Jer |
| Acenaphthene | | 169.64 er | | | | 58.33 er | 1.49 er |
| Fluorene | | 144.23 er | | | | 8.11 er | 1.07 er |
| Phenanthrene | | 109.52 er | | | | 19.33 er | 0.65 er |
| Anthracene | | 9.52 er | | | | 1.00 er | 0.02 er |
| Total LPAH | | 55.85 Ter | | | | 11.87 Ter | 0.40 Ter |
| Fluoranthene | | 45.33 er | | | | 6.79 er | 0.22 er |
| Pyrene | | 5.25 er | | | | 1.42 er | 0.02 er |
| Benzo(a)anthracene | | 16.01 er | | | | 1.70 er | 0.05 er |
| Chrysene | | 30.30 er | | | | 1.94 er | 0.05 er |
| Total Benzofluoranthene | | 4.47 Ter | | | | 1.47 Ter | 0.03 Ter |
| Benzo(a)pyrene | | 4.26 er | | | | 1.43 er | 0.03 er |
| Indeno(1,2,3-cd)pyrene | | 2.53 er | | | | 1.26 er | 0.05 er |
| Dibenz(a,h)anthracene | | 2.98 Jer | | | | 1.13 er | 0.02 Jer |
| Benzo(g,h,i)perylene | | 2.59 Jer | | | | 1.26 er | 0.05 er |
| Total HPAH | | 20.05 Ter | | | | 3.63 Ter | 0.09 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value > 1*

*Shaded Cell Value > 10*

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB066 SD2-EB66-0040 4 to 8 | EB066 SD2-EB66-0080 8 to 12 | EB066 SD2-EB66-0120 12 to 16 | EB066 SD2-EB66-0160 16 to 20 | EB072 SD2-EB72-0000A 0 to 4 | EB072 SD2-EB72-0040 4 to 8 |
|---|---|---|---|---|---|---|---|
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB072<br>SD2-EB72-0080<br>8 to 12 | EB078<br>SD2-EB78-0000A<br>0 to 4 | EB078<br>SD2-EB78-0040<br>4 to 8 | EB087<br>SD2-EB87-0000A<br>0 to 4 | EB087<br>SD2-EB87-0040<br>4 to 8 | EB087<br>SD2-EB87-0080<br>8 to 12 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | |
| 2-Methylphenol | | | | | | | |
| 4-Methylphenol | | | | | | | |
| Pentachlorophenol | | | | | | | |
| Phenol | | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | | |
| 2-Methylnaphthalene | | | 2.71 er | 0.02 Jer | 2.78 er | 0.03 er | 0.01 Jer |
| Dibenzofuran | | | | | | | |
| Naphthalene | | | 5.01 er | 0.01 Jer | 4.06 er | 0.01 er | 0.00 Jer |
| Acenaphthylene | | | 0.00 Uer | 0.00 Uer | 0.16 er | 0.00 Jer | 0.00 Uer |
| Acenaphthene | | | 7.25 er | 0.00 Uer | 10.26 er | 0.03 Jer | 0.00 Uer |
| Fluorene | | | 4.82 er | 0.00 Uer | 6.45 er | 0.04 Jer | 0.00 Uer |
| Phenanthrene | | | 2.99 er | 0.03 er | 3.50 er | 0.04 er | 0.01 er |
| Anthracene | | | 0.37 er | 0.00 Jer | 0.39 er | 0.00 Jer | 0.00 Jer |
| Total LPAH | | | 2.98 Ter | 0.01 Ter | 3.14 Ter | 0.02 Ter | 0.00 Ter |
| Fluoranthene | | | 1.37 er | 0.01 er | 1.86 er | 0.03 er | 0.01 er |
| Pyrene | | | 0.45 er | 0.00 er | 0.51 er | 0.00 er | 0.00 er |
| Benzo(a)anthracene | | | 0.31 er | 0.00 Uer | 0.67 er | 0.01 Jer | 0.00 Uer |
| Chrysene | | | 0.45 er | 0.00 Uer | 0.89 er | 0.01 er | 0.00 Jer |
| Total Benzofluoranthene | | | 0.54 Ter | 0.00 Ter | 0.63 Ter | 0.01 Ter | 0.00 UTer |
| Benzo(a)pyrene | | | 0.47 er | 0.00 Uer | 0.59 er | 0.00 Uer | 0.00 Uer |
| Indeno(1,2,3-cd)pyrene | | | 0.43 er | 0.00 Uer | 0.61 er | 0.01 Jer | 0.01 Jer |
| Dibenz(a,h)anthracene | | | 0.35 Jer | 0.00 Uer | 0.52 Jer | 0.00 Uer | 0.00 Uer |
| Benzo(g,h,i)perylene | | | 0.55 er | 0.00 Uer | 0.60 er | 0.00 Uer | 0.01 Jer |
| Total HPAH | | | 1.01 Ter | 0.00 Ter | 1.28 Ter | 0.02 Ter | 0.00 Ter |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: | EB072 | EB078 | EB078 | EB087 | EB087 | EB087 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB72-0080 | SD2-EB78-0000A | SD2-EB78-0040 | SD2-EB87-0000A | SD2-EB87-0040 | SD2-EB87-0080 |
| | Depth (feet bgs): | 8 to 12 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 8 | 8 to 12 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | | |
| Total PCB | | | | | | | |
| **Inorganics (Total) (er)** | | | | | | | |
| Arsenic | | | | | | | |
| Cadmium | | | | | | | |
| Chromium | | | | | | | |
| Copper | | | | | | | |
| Lead | | | | | | | |
| Mercury | | | | | | | |
| Zinc | | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB087<br>SD2-EB87-0120<br>12 to 16 | EB104<br>SD2-EB104-0000A<br>0 to 4 | EB104<br>SD2-EB104-0040<br>4 to 8 | EB113<br>SD2-EB113-0000A<br>0 to 4 | EB113<br>SD2-EB113-0040<br>4 to 7 |
|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | |
| 2,4-Dimethylphenol | | | | | | |
| 2-Methylphenol | | | | | | |
| 4-Methylphenol | | | | | | |
| Pentachlorophenol | | | | | | |
| Phenol | | | | | | |
| **Semi-Volatile Organic Compounds - TOCN (er)** | | | | | | |
| 2-Methylnaphthalene | | 0.00 Jer | 0.72 er | 0.04 er | | |
| Dibenzofuran | | | | | | |
| Naphthalene | | 0.00 Uer | 1.22 er | 0.04 er | | |
| Acenaphthylene | | 0.00 Uer | 0.15 er | 0.01 Jer | | |
| Acenaphthene | | 0.00 Uer | 1.78 er | 0.23 er | | |
| Fluorene | | 0.00 Uer | 1.35 er | 0.09 er | | |
| Phenanthrene | | 0.01 er | 0.81 er | 0.10 er | | |
| Anthracene | | 0.00 Jer | 0.16 er | 0.02 er | | |
| Total LPAH | | 0.00 Ter | 0.83 Ter | 0.07 Ter | | |
| Fluoranthene | | 0.00 Jer | 0.56 er | 0.09 er | | |
| Pyrene | | 0.00 Jer | 0.14 er | 0.01 er | | |
| Benzo(a)anthracene | | 0.00 Uer | 0.23 er | 0.02 Jer | | |
| Chrysene | | 0.00 Jer | 0.31 er | 0.02 er | | |
| Total Benzofluoranthene | | 0.00 UTer | 0.32 Ter | 0.01 Ter | | |
| Benzo(a)pyrene | | 0.00 Uer | 0.33 er | 0.00 Uer | | |
| Indeno(1,2,3-cd)pyrene | | 0.00 Uer | 0.40 er | 0.00 Uer | | |
| Dibenz(a,h)anthracene | | 0.00 Uer | 0.29 Jer | 0.00 Uer | | |
| Benzo(g,h,i)perylene | | 0.00 Uer | 0.42 er | 0.00 Uer | | |
| Total HPAH | | 0.00 Ter | 0.45 Ter | 0.04 Ter | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-12: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment SQS Exceedance Ratios

| | Station ID: | EB087 | EB104 | EB104 | EB113 | EB113 |
|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB87-0120 | SD2-EB104-0000A | SD2-EB104-0040 | SD2-EB113-0000A | SD2-EB113-0040 |
| Constituent | Depth (feet bgs): | 12 to 16 | 0 to 4 | 4 to 8 | 0 to 4 | 4 to 7 |
| **Pesticides/PCBs - TOCN (er)** | | | | | | |
| Total PCB | | | | | | |
| ***Inorganics (Total) (er)*** | | | | | | |
| Arsenic | | | | | | |
| Cadmium | | | | | | |
| Chromium | | | | | | |
| Copper | | | | | | |
| Lead | | | | | | |
| Mercury | | | | | | |
| Zinc | | | | | | |

See Appendix F (Table F-1) for the list of samples compared with AETs and Appendix D "Data Table Key and Interpretation Notes" for additional table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-13: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment LAET Exceedance Ratios

| Constituent | Station ID: | EB003 | EB012 | EB013 | EB015 | EB015 | EB027 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB03-0040-CC | SD2-EB12-0040 | SD2-EB13-0000A | SD2-EB15-0080 | SD2-EB15-0160 | SD2-EB27-0160 |
| | Depth (feet bgs): | 4 to 8 | 4 to 8 | 0 to 4 | 8 to 12 | 16 to 20 | 16 to 20 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.00 Jer | 11.64 er | 1328.35 er | 0.00 Jer | 0.01 Uer | 0.62 er |
| Dibenzofuran | | | | 1133.33 er | | | |
| Naphthalene | | 0.00 Uer | 12.76 er | 1576.19 er | 0.00 Jer | 0.00 Uer | 0.91 er |
| Acenaphthylene | | 0.00 Uer | 1.16 er | 10.84 er | 0.01 Uer | 0.00 Uer | 0.01 er |
| Acenaphthene | | 0.02 Uer | 78.40 er | 1562.00 er | 0.01 Jer | 0.02 Uer | 2.90 er |
| Fluorene | | 0.02 Uer | 45.92 er | 1520.37 er | 0.01 Jer | 0.02 Uer | 2.66 er |
| Phenanthrene | | 0.00 Uer | 39.80 er | 1526.66 er | 0.01 er | 0.00 Jer | 2.37 er |
| Anthracene | | 0.01 Uer | 30.72 er | 2031.25 er | 0.01 Jer | 0.01 Uer | 0.66 er |
| Total LPAH | | 0.00 UTer | 34.90 Ter | 1762.71 Ter | 0.01 Ter | 0.00 Ter | 1.73 Ter |
| Fluoranthene | | 0.00 Uer | 71.17 er | 549.41 er | 0.01 er | 0.00 Uer | 1.43 er |
| Pyrene | | 0.00 Jer | 26.38 er | 210.38 er | 0.05 er | 0.00 Uer | 0.56 er |
| Benzo(a)anthracene | | 0.01 Uer | 13.84 er | 133.84 er | 0.00 Jer | 0.00 Uer | 0.28 er |
| Chrysene | | 0.00 Uer | 16.64 er | 122.85 er | 0.00 Jer | 0.00 Uer | 0.27 er |
| Total Benzofluoranthene | | 0.00 UTer | 4.63 Ter | 32.62 Ter | 0.01 Ter | 0.00 UTer | 0.07 Ter |
| Benzo(a)pyrene | | 0.00 Uer | 3.83 er | 25.37 er | 0.01 er | 0.00 Uer | 0.05 er |
| Indeno(1,2,3-cd)pyrene | | 0.01 Uer | 3.00 er | 24.33 er | 0.01 Jer | 0.04 Uer | 0.04 er |
| Dibenz(a,h)anthracene | | 0.04 Uer | 2.19 Jer | 25.21 er | 0.11 Uer | 0.10 Uer | 0.04 Jer |
| Benzo(g,h,i)perylene | | 0.01 Uer | 3.22 er | 13.49 er | 0.01 Jer | 0.01 Uer | 0.03 er |
| Total HPAH | | 0.00 Ter | 21.36 Ter | 166.78 Ter | 0.02 Ter | 0.00 UTer | 0.42 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-13: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment LAET Exceedance Ratios

| Constituent | Station ID: | EB032 | EB041 | EB041 | EB042 | EB049 | EB049 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB32-0160 | SD2-EB41-0040 | SD2-EB41-0080 | SD2-EB42-0040 | SD2-EB49-0120 | SD2-EB49-0160 |
| | Depth (feet bgs): | 16 to 20 | 4 to 8 | 8 to 12 | 4 to 8 | 12 to 16 | 16 to 20 |
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.01 er | 0.03 Jer | 0.22 er | 0.00 Jer | 0.00 Jer | 0.01 Jer |
| Dibenzofuran | | | 0.75 er | 0.05 er | | | |
| Naphthalene | | 0.00 er | 0.44 er | 0.96 er | 0.00 er | 0.00 er | 0.01 er |
| Acenaphthylene | | 0.00 Uer | 0.01 Jer | 0.01 Uer | 0.00 Jer | 0.00 Uer | 0.00 Uer |
| Acenaphthene | | 0.02 er | 2.34 er | 0.21 er | 0.00 Jer | 0.01 Jer | 0.01 Jer |
| Fluorene | | 0.02 er | 1.92 er | 0.13 er | 0.01 Uer | 0.01 Jer | 0.01 Jer |
| Phenanthrene | | 0.03 er | 1.75 er | 0.12 er | 0.00 Uer | 0.01 er | 0.01 er |
| Anthracene | | 0.00 Jer | 0.22 er | 0.01 Jer | 0.00 Jer | 0.00 Jer | 0.00 Jer |
| Total LPAH | | 0.01 Ter | 1.15 Ter | 0.46 Ter | 0.00 Ter | 0.01 Ter | 0.01 Ter |
| Fluoranthene | | 0.01 er | 0.90 er | 0.05 er | 0.00 Jer | 0.00 er | 0.00 Uer |
| Pyrene | | 0.00 er | 0.36 er | 0.02 er | 0.00 er | 0.01 er | 0.00 Uer |
| Benzo(a)anthracene | | 0.01 Uer | 0.17 er | 0.01 Uer | 0.01 Uer | 0.00 Jer | 0.00 Uer |
| Chrysene | | 0.00 Uer | 0.14 er | 0.01 Uer | 0.00 Uer | 0.00 Jer | 0.00 Uer |
| Total Benzofluoranthene | | 0.00 UTer | 0.05 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer | 0.00 UTer |
| Benzo(a)pyrene | | 0.00 Uer | 0.04 er | 0.01 Uer | 0.00 UJer | 0.00 Uer | 0.00 Uer |
| Indeno(1,2,3-cd)pyrene | | 0.01 Uer | 0.10 Jer | 0.03 Uer | 0.01 Uer | 0.04 Uer | 0.04 Uer |
| Dibenz(a,h)anthracene | | 0.04 Uer | 0.31 Uer | 0.15 Uer | 0.04 Uer | 0.10 Uer | 0.10 Uer |
| Benzo(g,h,i)perylene | | 0.01 Uer | 0.06 Jer | 0.02 Uer | 0.01 Uer | 0.01 Uer | 0.01 Uer |
| Total HPAH | | 0.00 Ter | 0.26 Ter | 0.01 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-13: PSR Marine Sediments Unit Shallow (0 to 20 ft) Subsurface Sediment LAET Exceedance Ratios

| Constituent | Station ID: / Sample ID: / Depth (feet bgs): | EB066 SD2-EB66-0080 8 to 12 | EB066 SD2-EB66-0120 12 to 16 | EB066 SD2-EB66-0160 16 to 20 | EB072 SD2-EB72-0080 8 to 12 | EB113 SD2-EB113-0000A 0 to 4 | EB113 SD2-EB113-0040 4 to 7 |
|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (er)** | | | | | | | |
| 2-Methylnaphthalene | | 0.99 er | 0.01 er | 0.00 Jer | 0.00 Jer | 143.88 er | 60.44 er |
| Dibenzofuran | | | | | | | |
| Naphthalene | | 0.50 er | 0.00 er | 0.00 Jer | 0.00 er | 193.80 er | 102.85 er |
| Acenaphthylene | | 0.01 er | 0.00 Uer | 0.00 Uer | 0.00 Uer | 4.70 er | 1.66 er |
| Acenaphthene | | 3.40 er | 0.04 er | 0.01 Jer | 0.02 er | 1666.00 er | 356.00 er |
| Fluorene | | 3.18 er | 0.04 er | 0.01 Jer | 0.02 er | 637.03 er | 178.14 er |
| Phenanthrene | | 3.57 er | 0.06 er | 0.02 er | 0.02 er | 1313.33 er | 275.33 er |
| Anthracene | | 0.53 er | 0.01 er | 0.00 Jer | 0.00 Jer | 686.45 er | 148.95 er |
| Total LPAH | | 1.99 Ter | 0.03 Ter | 0.01 Ter | 0.01 Ter | 811.38 Ter | 201.60 Ter |
| Fluoranthene | | 1.83 er | 0.03 er | 0.01 er | 0.01 er | 571.76 er | 182.94 er |
| Pyrene | | 0.76 er | 0.01 er | 0.00 er | 0.00 er | 209.61 er | 65.76 er |
| Benzo(a)anthracene | | 0.38 er | 0.01 Uer | 0.01 Uer | 0.00 Jer | 72.15 er | 26.61 er |
| Chrysene | | 0.28 er | 0.00 Jer | 0.00 Uer | 0.00 Uer | 85.00 er | 28.64 er |
| Total Benzofluoranthene | | 0.13 Ter | 0.00 Ter | 0.00 Ter | 0.00 UTer | 13.31 Ter | 5.68 Ter |
| Benzo(a)pyrene | | 0.02 er | 0.00 Uer | 0.00 Uer | 0.00 Uer | 8.50 er | 3.95 er |
| Indeno(1,2,3-cd)pyrene | | 0.06 er | 0.01 Uer | 0.01 Uer | 0.03 Uer | 3.10 Jer | 2.21 er |
| Dibenz(a,h)anthracene | | 0.06 Jer | 0.03 Uer | 0.04 Uer | 0.10 Uer | 4.13 Jer | 2.13 er |
| Benzo(g,h,i)perylene | | 0.03 er | 0.01 Uer | 0.01 Uer | 0.01 Uer | 2.35 Jer | 1.91 er |
| Total HPAH | | 0.54 Ter | 0.01 Ter | 0.00 Ter | 0.00 Ter | 146.86 Ter | 48.69 Ter |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

*Boxed Cell Value >* 1

*Shaded Cell Value >* 10

## Table D-14: PSR Marine Sediments Unit Deep (0 to 96 ft) Subsurface Sediment Analytical Results

| Constituent | Station ID: | EB014 | EB014 | EB016 | EB016 | EB114 | EB114 |
|---|---|---|---|---|---|---|---|
| | Sample ID: | SD2-EB14-0320 | SD2-EB14-0700 | SD2-EB16-0320 | SD2-EB16-0720 | SD2-EB114-0300 | SD2-EB114-0380 |
| | Depth (feet bgs): | 32.0 | 70.0 | 32.0 | 72.0 | 30.0 | 38.0 |
| **Conventional Parameters** | | | | | | | |
| Total Organic Carbon (%) | | 0.43 | 0.98 | 0.76 | 0.94 | 0.84 | 0.20 |
| **Grain Size (%)** | | | | | | | |
| >4750 microns-Fractional % | | | | | | | |
| 4750-2000 microns-Fractional | | | | | | | |
| 2000-1000 microns-Fractional | | | | | 1.00 | | 1.00 |
| 1000-500 microns-Fractional | | | 1.00 | | 6.00 | | 16.00 |
| 500-250 microns-Fractional % | | 3.00 | 6.00 | 1.00 | 57.00 | 1.00 | 54.00 |
| 250-125 microns-Fractional % | | 26.00 | 30.00 | 12.00 | 27.00 | 12.00 | 22.00 |
| 125-62.4 microns-Fractional | | 36.00 | 33.00 | 23.00 | 3.00 | 30.00 | 5.00 |
| Total Percent Sand | | 65.00 T | 70.00 T | 36.00 T | 94.00 T | 43.00 T | 98.00 T |
| 62.5-31.2 microns-Fractional | | 9.00 | 14.00 | 25.00 | 2.00 | 24.00 | 1.00 |
| 31.2-15.6 microns-Fractional | | 13.00 | 6.00 | 20.00 | 1.00 | 15.00 | 1.00 |
| 15.6-7.8 microns-Fractional | | 4.00 | 3.00 | 9.00 | | 6.00 | |
| 7.8-3.9 microns-Fractional % | | 3.00 | 2.00 | 4.00 | 1.00 | 4.00 | |
| 3.9-1.9 microns-Fractional % | | 1.00 | 1.00 | 3.00 | | 2.00 | |
| 1.9-0.9 microns-Fractional % | | 2.00 | 1.00 | 2.00 | | 2.00 | |
| < 0.9 microns-Fractional % | | 1.00 | 1.00 | 1.00 | | 2.00 | |
| Balance-Fractional % | | 2.00 | 2.00 | | 2.00 | 2.00 | |
| Total Percent Fines | | 35.00 T | 30.00 T | 64.00 T | 6.00 T | 57.00 T | 2.00 T |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

## Table D-14: PSR Marine Sediments Unit Deep (0 to 96 ft) Subsurface Sediment Analytical Results

| Constituent | Station ID: | EB114 | EB114 | EB114 |
|---|---|---|---|---|
| | Sample ID: | SD2-EB114-0560 | SD2-EB114-0640 | SD2-EB114-0920 |
| | Depth (feet bgs): | 56.0 | 64.0 | 92.0 |
| **Conventional Parameters** | | | | |
| Total Organic Carbon (%) | | 0.78 | 0.36 | 0.43 |
| **Grain Size (%)** | | | | |
| >4750 microns-Fractional % | | | | |
| 4750-2000 microns-Fractional | | | | |
| 2000-1000 microns-Fractional | | | | |
| 1000-500 microns-Fractional | | | 7.00 | 2.00 |
| 500-250 microns-Fractional % | | 2.00 | 32.00 | 22.00 |
| 250-125 microns-Fractional % | | 18.00 | 20.00 | 24.00 |
| 125-62.4 microns-Fractional | | 28.00 | 17.00 | 17.00 |
| Total Percent Sand | | 48.00 T | 76.00 T | 65.00 T |
| 62.5-31.2 microns-Fractional | | 21.00 | 11.00 | 13.00 |
| 31.2-15.6 microns-Fractional | | 13.00 | 6.00 | 11.00 |
| 15.6-7.8 microns-Fractional | | 7.00 | 3.00 | 4.00 |
| 7.8-3.9 microns-Fractional % | | 3.00 | 1.00 | 3.00 |
| 3.9-1.9 microns-Fractional % | | 2.00 | 1.00 | 1.00 |
| 1.9-0.9 microns-Fractional % | | 2.00 | 1.00 | 1.00 |
| < 0.9 microns-Fractional % | | 2.00 | 1.00 | 2.00 |
| Balance-Fractional % | | 2.00 | | |
| Total Percent Fines | | 52.00 T | 24.00 T | 35.00 T |

See Appendix D "Data Table Key and Interpretation Notes" for table interpretation guidance.

# APPENDIX E

# CHEMICAL AND BIOLOGICAL DATA VALIDATION SUMMARIES

- E.1 Chemical Data Validation Summaries
  - Phase 1 Sediment Data Validation Report
  - Phase 2 Sediment and Tissue Data Validation Report
  - Phase 2 Water Data Validation Report
  - Phase 3 Sediment Data Validation Report
- E.2 Biological Data Validation Summaries
  - Surface Sediment Laboratory Acute Toxicity tests
  - Surface Sediment Laboratory Clam Growth Bioassay and Bioaccumulation Study
  - Benthic Infaunal Data

# APPENDIX E.1

# PHASE 1 SEDIMENT DATA VALIDATION REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

RECEIVED
JUN 1 3 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

June 12, 1996

MEMORANDUM

SUBJECT: Report of Data Validation of Selected Polynuclear Aromatic Hydrocarbons and Phenolics Results for the Pacific Sound Resources Project Samples 96162600, 96162601, 96162602, 96162603, 96162604, 96162605, 96162606, 96162607, 96162608, 96162609, 96162610, 96162611, 96162612, 96162613, 96162614, 96162615, 96162616, 96162617, 96162618, 96162619, 96162620, 96162621, 96162622, 96162623, 96162624, 96162625, 96162626, 96162627, 96162628, 96162629, 96162630, 96162631, 96162632, 96162633, 96162634, 96162635, 96162636, 96162637, 96162638, 96162639, 96162640, 96162641, 96162642, 96162643, 96162644, 96162645, 96162646, 96162647, 96162648, and 96162650

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Sally Thomas, Project Officer
USEPA

CC: Nancy Musgrove, Roy F. Weston

The following is a QA data validation report of the selected polynuclear aromatic hydrocarbons (PAHs) and phenolics analyses' results for soil samples collected for the Pacific Sound Resources project. The analyses were performed at the USEPA Region 10 Laboratory using a modified SW846 Method 8270B. This report covers the samples listed above.

The project code for these samples is TEC-666A and the account number is 10PTFA10M2.

Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in USEPA SW846 Method 8270B and the USEPA CLP National Functional Guidelines for Organic Data Review, revision 12/94.

Printed on Recycled Paper.

I. Holding Times: Acceptable

The recommended holding time for the extraction of soil samples is 14 days from the date of sampling. The holding time for extracts is 40 days. The samples were extracted and analyzed within holding times. No qualifiers were applied on this basis.

II. GC/MS Tuning and Performance: Acceptable

The tuning summary agreed with the raw data. All decafluorotriphenylphosphine ion abundance met criteria. All sample analyses were preceded by a tune less than 12 hours prior to analysis. No data qualifiers were required on the basis of the tuning data.

III. Initial Calibration: Acceptable

Two instruments (A and B) were used for the analyses. Eight-point initial calibrations were performed on 05/08/96, 05/28/96, and 06/05/96 for the target compounds on instrument A. An eight-point initial calibration was performed on 04/03/96 for the target compounds on instrument B. All percent relative standard deviations (%RSDs) met the criteria of $\leq$30%. All average RRFs met the criteria of $\geq$0.05. Correlation coefficients for calibration curves were $\geq$0.99.

IV. Continuing Calibration: Acceptable

The continuing calibration check standard met the criteria for frequency of analysis and RRT windows for all target compounds and surrogates. The calculation of the % recoveries was checked and the calculation method was correct. The RRFs were $\geq$0.05 and the recoveries for the target compounds met the criteria of 75-125%.

V. Blanks:

Method blank pairs (BS6115/BS6115D and BS6122/BS6122D) were prepared and analyzed with each sample extraction batch. The highest amounts between the method blanks were used to evaluate the sample results. Target compounds detected in the samples were reported without qualification if the sample result area integration exceeded five times that of the blanks. Detected sample results were qualified U if the area integration was below this criterion. The sample concentration or the laboratory quantitation limit (QL), whichever is greater, was reported as the qualified result.

An initial analysis of method blank BS6122D resulted with most of the PAHs detected at trace levels below the quantitation limits. This extract had undergone gel-permeation chromatography

(GPC) clean-up after a sample extract high in levels of PAHs. A second fraction from the remaining non-GPC cleaned extract was also analyzed which resulted with almost all of the PAHs non-detected. This suggested that a slight amount of carry-over between extracts may have occurred in the use of the GPC system. Judging from the amounts found in the GPC cleaned extract of method blank BS6122D, the potential carry-over would only be significant in cases where extracts with low concentrations of PAHs were GPC cleaned after extracts with high concentrations. The following sample results were qualified due to the possibility of carry-over:

| Sample | |
|---|---|
| 96162602 | Naphthalene, acenaphthene, dibenzofuran, fluorene, phenanthrene, benzo(a)anthracene, chrysene, and benzo(b)fluoranthene results were qualified J and may be biased high. |
| 96162607 | All results for detected PAHs were qualified J and may be biased high. |
| 96162609 | Dibenzofuran, fluorene, phenanthrene, fluoranthene, and pyrene results were qualified J and may be biased high. The results for naphthalene, 2-methylnaphthalene, and acenaphthene were qualified U. |
| 96162614 | The acenaphthene result was qualified J and may be biased high. |
| 96162622 | Naphthalene, phenanthrene, fluoranthene, and pyrene results were qualified J and may be biased high. |
| 96162635 | Naphthalene and pyrene results were qualified J and may be biased high. |
| 96162640 | Fluoranthene and pyrene results were qualified J and may be biased high. |
| 96162647 | All detected target compounds were qualified U with the quantitation limit or detected concentration, whichever is higher, reported. |
| 96162648 | Naphthalene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, and benzo(a)pyrene results were qualified J and may be biased high. |

VI. Surrogates:

The following samples and surrogates could not be measured due to significant spectral interference from high levels of target compounds or unknowns:

| Sample | Surrogate |
|---|---|
| 96162608 | All |
| 96162612 | All |
| 96162617 | d10-pyrene |
| 96162627 | d10-pyrene<br>d14-terphenyl |

The measurable surrogate recoveries met the CLP Statement of Work specifications for the samples, blanks, and matrix spikes. No qualifiers were applied based on the surrogate recoveries.

VII. Matrix Spike/Matrix Spike Duplicate (MS/MSD):

MS/MSD analyses were performed using samples 96162606(S1/S2), 96162611(S1/S2), and 96162637(S1/S2). The MS/MSD criteria described in the CLP Statement of Work and the Region 10 acceptance ranges (50-150% recovery, ≤50% relative percent difference, RPD) were applied.

The recoveries for phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene could not be determined for MS/MSD 96162606S1/S2 due to the spike levels being <5X the native amounts. The following measurable recoveries did not meet the applied criteria:

| Compound | % Recovery (S1/S2) | RPD |
|---|---|---|
| phenol | 107/ | |
| acenaphthene | | 20.3 |
| benzo(g,h,i)perylene | /47.5 | |

Phenol was not detected in sample 96162606. No qualifiers were applied based on the MS recovery of phenol since the high result does not indicate a problem with the reported non-detected result for this sample. The acenaphthene and benzo(g,h,i)perylene detected results for this sample were qualified J due to the MS/MSD results above.

The recoveries for naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene could not be determined for MS/MSD 96162611S1/S2 due to the spike levels being <5X the native amounts. The following measurable recovery did not meet the applied criteria:

| Compound | % Recovery (S1/S2) | RPD |
|---|---|---|
| phenol | /91.6 | |

Phenol was not detected in sample 96162611. No qualifiers were applied based on the MSD recovery of phenol since the high result does not indicate a problem with the reported non-detected result for this sample.

The recoveries for naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene could not be determined for MS/MSD 96162637S1/S2 due to the spike levels being <5X the native amounts. The measurable recoveries met the applied criteria.

VIII. Internal Standard Performance: Acceptable

The retention time variations of all internal standards were within 30 seconds of the continuing calibration standards. The %area of all the internal standards fell within the specified 50% to 200% of the continuing calibration standards. No qualifiers were applied based on the internal standards' response.

IX. TCL Compound Identification: Acceptable

All detected TCL compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

X. Compound Quantitation:

Compound quantitation was evaluated correctly. The appropriate internal standards were used. The correct quantitation ions and relative response factors or calibration curves were used. Some analytes were detected in this sample set at levels below the lowest calibration concentration of the initial calibration curve. Since the Practical Quantitation Limit is based on this lowest initial calibration standard, these values were assigned the J qualifier. No additional qualifiers were required on the basis of compound quantitation.

The extracts for samples 96162608 and 96162612 could only be analyzed with high dilution factors due to the large amounts of target compounds and unknowns causing detector saturation at lower dilution factors. This resulted in much higher quantitation limits for non-detected compounds.

The reported pyrene result for sample 96162611 was slightly above the upper calibration range. This result was qualified J.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in the USEPA SW846 Method 8270B and the USEPA CLP National Functional Guidelines for Organic Data Review, revision 12/94.

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

DATA QUALIFIERS

| | | |
|---|---|---|
| U | - | The analyte was not detected at or above the reported result. |
| J | - | The analyte was positively identified. The associated numerical result is an estimate. |
| 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 $3 \times 10^6$. |
| REJ | - | The data are unusable for all purposes. |
| N | - | 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. |
| UJ | - | The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample. |
| NAF | - | Not analyzed for. |
| NAR | - | No analytical result. |
| * | - | The analyte was present in the sample. (Visual aid to locate detected compounds on the report sheet.) |

4200-02

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

RECEIVED
JUN 06 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

Reply To
Attn Of: OE-095

June 5, 1996

**MEMORANDUM**

SUBJECT: Data Validation Report for Grain Size, Percent Solids and Total Organic Carbon (TOC) Analysis of Samples from Pacific Sound Resources Site

FROM: Ginna Grepo-Grove, Chemist
Office of Environmental Assessment

TO: Sally Thomas, RPM
Office of Environmental Clean-up

The quality assurance (QA) review of fifty-one sediment samples collected from the above referenced site has been completed. These sample were analyzed for grain size, TO and percent solids in accordance with the method specifications of the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96). The grain size analyses were performed by Soil Technology, Inc. Of Bainbridge , WA and the TO and percent solids determinations were performed by Analytical Resources, Inc. Of Seattle, WA. The following samples were reviewed in this report:

| | | | |
|---|---|---|---|
| 96162600 | 96162601 | 96162602 | 96162603 |
| 96162604 | 96162605 | 96162606 | 96162607 |
| 96162608 | 96162609 | 96162610 | 96162611 |
| 96162612 | 96162613 | 96162614 | 96162615 |
| 96162616 | 96162617 | 96162618 | 96162619 |
| 96162620 | 96162621 | 96162622 | 96162623 |
| 96162624 | 96162625 | 96162626 | 96162627 |
| 96162628 | 96162629 | 96162630 | 96162631 |
| 96162631 | 96162632 | 96162633 | 96162634 |
| 96162635 | 96162636 | 96162637 | 96162638 |
| 96162639 | 96162640 | 96162641 | 96162642 |
| 96162643 | 96162644 | 96162645 | 96162646 |
| 96162647 | 96162648 | 96162650 | |

**DATA QUALIFICATIONS**

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96), the ASTM D422-63, ASTM D2216 and EPA 9060,

Printed on Recycled Paper

the conventional analytical protocols for the Puget Sound Estuary Programs (PSEP) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (2/94).

The conclusions presented herein are based on the information provided for the review.

**Holding Time** - Acceptable

All of the samples met the method and technical (40 CFR 136 water criteria) required holding times. The Holding Time Summary, listing the pertinent sample collection, laboratory receipt and analysis dates is attached at the end of this validation report.

**Instrument Calibration** - Acceptable

The analytical balance used for both TO, percent solids and grain size analyses were monitored and calibrated by the laboratories daily. The balances were documented to be accurate up to 0.1 mg..

**Initial Calibrations** - Acceptable

Initial calibrations for TO analyses were performed at the beginning of each analytical sequence. The percent relative standard deviations (%RSDs) were all less than 10% and the initial calibration standard recoveries were within the range of 90-110%.

**Continuing Calibrations** - Acceptable

All of the continuing calibration verification standards (CCVs) for TO analyses met the criteria for frequency of analysis and the recovery criteria of 90-110%.

**Detection Limits** - Acceptable

All of the samples analyses were at the percent detection limits required by the sampling plan. All of the reported results were within the calibration linear range and were adjusted for sample amount and percent moisture. The TO results were corrected for system blank values and the grain size analyses were corrected for salt interferences.

**Blanks** - Acceptable

The frequency of analysis of laboratory blanks was met. All of the TO results were corrected for system blank values.

**Laboratory Control Sample (LCS)** - Acceptable

For each TO analytical sequence, a standard reference material (NBS2704) was analyzed for LCS. The frequency of analysis of the LCS and the recovery criteria were met. The recoveries ranged from 90-99%. For grain size determinations, the sum of all the fractions were less than 5%.

**Laboratory Triplicates** - Acceptable

The frequency of analysis for laboratory triplicates were met for TO, grain size and percent solids. The percent relative standard deviations (%RSDs) were all less than 15%.

**Matrix Spike/Duplicate (MS/MSD) Analyses** - Acceptable

The frequency of analyses and recovery criteria were met for all TO analyses. The recoveries ranged from 77-120% and the relative percent differences (RPDs) ranged from 4 - 21%.

**Field Duplicates** - Not Applicable

The field duplicate samples were not identified in the chain-of-custody documents.

**Overall Assessment**

All of the samples were analyzed in accordance with the sampling and analysis plan specifications. Data results are acceptable and can be used for all purposes.

## Holding Time Summary

| | | Date of Analysis | | |
|---|---|---|---|---|
| Sample Number | Collection Date | Percent Solids | TOC | Grain Size |
| 96162600 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162601 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162602 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162603 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162604 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162605 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162606 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162607 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162608 | 04/19/96 | 04/23/96 | 04/25/96 | 05/01/96 |
| 96162609 | 04/19/96 | 04/23/96 | 04/25/96 | 05/01/96 |
| 96162610 | 04/18/96 | 04/22/96 | 04/29/96 | 05/01/96 |
| 96162611 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162612 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162613 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162614 | 04/19/96 | 04/2396 | 04/29/96 | 05/06/96 |
| 96162615 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162616 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162617 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162618 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162619 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162620 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162621 | 04/18/96 | 04/22/96 | 04/29/96 | 05/06/96 |
| 96162622 | 04/18/96 | 04/22/96 | 04/25/96 | 05/06/96 |
| 96162623 | 04/18/96 | 04/22/96 | 04/25/96 | 05/06/96 |
| 96162624 | 04/18/96 | 04/22/96 | 04/25/96 | 05/06/96 |
| 96162625 | 04/18/96 | 04/22/96 | 04/25/96 | 05/06/96 |

## Holding Time Summary

| | | Date of Analysis | | |
|---|---|---|---|---|
| Sample Number | Collection Date | Percent Solids | TOC | Grain Size |
| 96162626 | 04/16/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162627 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162628 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162629 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162630 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162631 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162632 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162633 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162634 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162635 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162636 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162637 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162638 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162639 | 04/15/96 | 04/17/96 | 04/24/96 | 04/25/96 |
| 96162640 | 04/15/96 | 04/17/96 | 04/24/96 | 05/01/96 |
| 96162641 | 04/15/96 | 04/17/96 | 04/24/96 | 05/01/96 |
| 96162642 | 04/15/96 | 04/17/96 | 04/24/96 | 05/01/96 |
| 96162643 | 04/15/96 | 04/17/96 | 04/24/96 | 05/01/96 |
| 96162644 | 04/19/96 | 04/23/96 | 04/25/96 | 05/06/96 |
| 96162645 | 04/19/96 | 04/23/96 | 04/25/96 | 05/06/96 |
| 96162646 | 04/19/96 | 04/23/96 | 04/25/96 | 05/06/96 |
| 96162647 | 04/19/96 | 04/23/96 | 04/25/96 | 05/06/96 |
| 96162648 | 04/16/96 | 04/17/96 | 04/24/96 | 05/06/96 |
| 96162650 | 04/18/96 | 04/22/96 | 04/25/96 | 05/06/96 |

DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

R - The data are unusable for all purposes.

N - 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.

UJ - The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

June 4, 1996

RECEIVED
JUN 06 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

Reply
To
Attn of: MGREPOGR
OEA-095

**MEMORANDUM**

Subject: Data Validation Report for Polychlorinated Dioxins (PCDDs) and Polychlorinated Furans (PCDFs) Analysis of Samples from Pacific Sound Resources (PSR) Offshore Unit

From: Ginna Grepo-Grove, Chemist
Quality Assurance & Data Unit, OEA

To: Sally Thomas, Site Manager
Office of Environmental Cleanup

The quality assurance (QA) review of 34 soil samples collected from the above referenced site has been completed. These sample were analyzed for PCDDs/PCDFs in accordance with the USEPA Method 1613B - Tetra- through Octa-chlorinated Dioxins and Furans by Isotope Dilution High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS) - Revision B, 10/94 by Maxim/Twin City Testing Corporation of St. Paul, MN. The following samples were reviewed in this report:

| | | | |
|---|---|---|---|
| 96162601 | 96162604 | 96162606 | 96162609 |
| 96162611 | 96162613 | 96162614 | 96162615 |
| 96162616 | 96162623 | 96162624 | 96162626 |
| 96162628 | 96162629 | 96162630 | 96162631 |
| 96162632 | 96162633 | 96162634 | 96162635 |
| 96162636 | 96162637 | 96162638 | 96162639 |
| 96162640 | 96162641 | 96162642 | 96162643 |
| 96162644 | 96162645 | 96162646 | 96162647 |
| 96162648 | 96162650 | | |

**DATA QUALIFICATIONS**

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Sampling and Analysis Plan (SAP) for Pacific Sound Resources (PSR) Offshore Unit (4/96), Method 1613, Revision B and the USEPA CLP National Functional Guidelines for Organic Data Review (2/94).

Printed on Recycled Paper

The conclusions presented herein are based on the information provided for the review.

**Holding Time** - Acceptable

There are no established method holding times for PCDD/PCDF analysis. All of the samples were extracted and analyzed within 30 days of sample collection. None of the data were qualified on the basis of holding time. Table 1 - Holding Time Summary with pertinent sample collection, extraction, clean-up and analysis dates is attached at the end of this report.

**Mass Calibration** - Acceptable

The frequency of analysis and criteria for mass calibrations and resolution checks were met. The resolution of the mass spectrometer was verified to have a minimum of 10,000 (10% valley) resolving power before and after each analytical sequence. The exact mass of m/z 380.9760 (PFK) were within 5 ppm of the required values. Each of the lock masses were within 10% of full scale. None of the results were qualified on this basis.

**Initial Calibrations** - Acceptable

One Varian HRMS instrument was used in the analyses. The initial calibrations performed for both DB5 and DB225 columns met the method specified acceptance criteria. The percent relative standard deviations (%RSDs) for both native and labeled compounds ranged from 3.1 - 16.3% for both columns. All of the ion abundance, signal-to-noise (S/N) ratios and retention times were within the control limits. The % valley between the peaks that elute most closely to the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and tetrachlorodibenzofuran (TCDF) isomers were all less than 25%. None of the reported results were qualified on this basis.

**Retention Time Window and Isomer Specificity Check** - Acceptable

The frequency of analysis, the retention times and chromatographic resolution as expressed by the percent valley criteria were met. The % valley between the peaks that elute most closely to the 2,3,7,8-TCDD and TCDF isomers were all less than 25%. The retention times for all of the polychlorinated dibenzofuran and dibenzodioxin homologues were established and properly labeled from the first to the last eluters. All of the ion abundance and S/N ratios were within the method specified control limits.

**Continuing Calibrations** - Acceptable

All of the continuing calibration verification standards (CCVs) met the criteria for frequency of analysis, the ion abundance ratios, the retention time, the chromatographic resolution, the S/N ratios and the percent differences (%D) criteria.

The resolution between 2,3,7,8-TCDD and TCDF isomers (%valley) were all less than 25%. The absolute retention times of 13C-2,3,7,8-TCDD exceeded 25 minutes in the DB5 column and 15 minutes in the DB225 column. None of the results were qualified on the basis of continuing calibrations.

**Instrument Sensitivity Check** - Acceptable

The laboratory had demonstrated that the instrument used retained adequate sensitivity throughout the course of sample analysis. One half of the lowest concentration standard (CC1) was analyzed with the initial calibration standards. All of the applicable QC criteria were met in the analysis, i.e., the ion abundance ratio, the retention time criteria and the S/N ratio for all of the unlabeled PCDD/PCDF ions and the labeled internal and recovery standards. None of the results were qualified on this basis.

**Blanks**

The frequency of analysis of laboratory blanks was met. Background levels for all target compounds were below the quantitation limits with the exception of 1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin (OCDD) detected in the blank 62577 ( approximately 3 ng/Kg). The OCDD detected in the associated samples were greater than five times the value in the blank 62577, therefore, none of the associated results were qualified on this basis.

**Laboratory Control Sample (LCS)** - Acceptable

The frequency of analysis and recovery criteria for the LCS were met. The LCS recoveries ranged from 59-138%. None of the reported results were qualified on this basis.

**Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)**

Samples 96162628 and 96162646 were utilized for the MS/MSD analyses. The spike recoveries ranged from 70 - 120% with the exception of HpCDD and OCDD. The HpCDD and OCDD values in the MS/MSD (for both QC samples) varied due to the relatively high levels of native materials in the samples. The relative percent differences (RPDs) between MS and MSD analyses ranged from 0-26% (with the exception of HpCDD and OCDD) for both MS/MSD analyses. None of the sample results were qualified on the basis of MS/MSD

analyses.

**Laboratory Duplicate Analysis**

Samples 96162637 and 96162644 were utilized for laboratory duplicate analyses. The frequency of analysis and RPD criterion (35%) were met by both duplicate samples with the exception of the following:

- total pentachlorodibenzo-p-dioxin (PeCDD) (46.7%), 1,2,3,4,6,7,8-heptachlorodibenzofuran (HpCDF) (43.0%) and total HpCDF (69.8%) in duplicate samples 96162637
- total hexachlorodibenzo-p-dioxin (HxCDD) in duplicate sample 96162644.

The variability in RPD values can be attributed to chromatographic interferences and other native materials present in the samples. None of the associated sample results were qualified on this basis.

**System Monitoring Compounds (SMC)/Surrogates**

The method does not require the addition of surrogates in the samples prior to extraction and analysis. However, a clean-up standard was added to all of the samples, blanks and QC samples prior to extract clean-up to monitor the clean-up efficiency. All of the clean-up recoveries were acceptable and ranged from 61 - 127%.

**Analytical Sequence** - Acceptable

All of the standards, blanks, samples and QC samples were analyzed in accordance with the method-specified analytical sequence.

**Internal Standards** - Acceptable

Internal standards were added to each of the standard, sample and blank(s) to monitor the efficiency of the analytical method. The labeled compound recoveries were acceptable and ranged from 53 - 148% for all samples, blank, and QC samples.

**Compound Identification**

All of the detected compounds met the retention times, the S/N and the ion abundance ratio criteria specified by the method. The ion abundance ratio criteria (0.88-1.20) was not met for 1,2,3,4,7,8,9-heptachlorodibenzofuran (HpCDF) for sample 96162615 (ratio = 1.24). The target compound, 1,2,3,4,7,8,9-HpCDF with unacceptable ion abundance ratio was qualified as non-detected.

**Compound Quantitation and Detection Limits**

All of the samples were analyzed at the method and SAP required quantitation limits. The mean response factors calculated from the initial calibrations were used in the quantitation of the detected results.

All of the reported results were within the calibration linear range with the exception of OCDD detected in samples 96162626 and 96162634. The OCDD reported for these samples exceeded the calibration range and were qualified as estimates, "J". The OCDD values should be considered as the minimum amount present in these samples. For data users, it is recommended that the OCDD value reported off the 96162626 dilution be used. Because only one of the OCDD m/z's was outside the calibration range, the dilution analysis was not performed for sample 96162634.

All of the 2,3,7,8-TCDF values reported were calculated off the DB225 column with the exception of the 2,3,7,8-TCDF reported for sample 96162623 (calculated off the DB5 column). The extract for this sample was lost between the DB5 and confirmation analysis due to a faulty conical vial. Due to the presence interferences, the concentration of 2,3,7,8-TCDF reported for sample 96162623 was qualified as estimated, "J". Target compound responses masked by polychlorinated diphenyl ethers (PCDPEs) were reported as non-detected on the Forms I.

**Laboratory Contact**

The laboratory was contacted on June 4, 1996 to obtain the following:

- information regarding the analytical run for sample 96162623 on the DB225 column
- the raw data for the 2,3,7,8-TCDF analysis of sample 96162623 on the DB225 column.

The communication log is included as an enclosure to this validation report.

**Overall Assessment**

All of the samples were analyzed in accordance with the method and Sample and Analysis Plan's specifications. Data results are acceptable and can be used for all purposes.

## Table 1 - Holding Time Summary

| Sample Number | Collection Date | Receipt Date | Extraction Date | Clean-up Date | Analysis Date |
|---|---|---|---|---|---|
| 96162601 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162604 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162606 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162609 | 04/19/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162611 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162613 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/09/96 |
| 96162614 | 04/19/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162615 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/09/96 |
| 96162616 | 04/18/96 | 04/23/96 | 05/15/96 | 05/17/96 | 05/22/96 |
| 96162623 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/09/96 |
| 96162624 | 04/18/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/09/96 |
| 96162626 | 04/16/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/02/96 |
| 96162628 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162629 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162630 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162631 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162632 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |

## Table 1 - Holding Time Summary

| Sample Number | Collection Date | Receipt Date | Extraction Date | Clean-up Date | Analysis Date |
|---|---|---|---|---|---|
| 96162633 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162634 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162635 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162636 | 04/15/96 | 04/17/96 | 05/15/96 | 04/26/96 | 05/03/96 |
| 96162637 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162638 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162639 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/03/96 |
| 96162640 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/04/96 |
| 96162641 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/04/96 |
| 96162642 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/04/96 |
| 96162643 | 04/15/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/04/96 |
| 96162644 | 04/19/96 | 04/17/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162645 | 04/19/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/13/96 |
| 96162646 | 04/19/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/13/96 |
| 96162647 | 04/19/96 | 04/23/96 | 05/01/96 | 05/03/96 | 05/10/96 |
| 96162648 | 04/16/96 | 04/17/96 | 04/24/96 | 04/26/96 | 05/10/96 |
| 96162650 | 04/18/96 | 04/25/96 | 05/01/96 | 05/03/96 | 05/13/96 |

DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

R - The data are unusable for all purposes.

N - 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.

UJ - The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

RECEIVED
JUN 07 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

MEMORANDUM

DATE: June 3, 1996

TO: Sally Thomas, Project Manager, USEPA, Region 10

FROM: Isa Chamberlain, Chemist, USEPA, Region 10

SUBJECT: Quality Assurance Review of Pacific Sound Resources - Total Metals Analysis
Sample Nos.: 96162600 to 96162650
Project Code: TEC-666A
Account Code: 10PTFA10MM2LA00

CC: Nancy Musgrove, Weston Project Manager, Weston, Inc.

The following is a quality assurance narrative for the total metals analysis of fifty sediment samples from Pacific Sound Resources. The analysis was performed following USEPA and laboratory guidelines by the ESAT Team at the USEPA Manchester Environmental Laboratory, Port Orchard, WA. This quality assurance review was conducted for the following samples:

| | | | | | |
|---|---|---|---|---|---|
| 96162600 | 96162601 | 96162602 | 96162603 | 96162604 | 96162605 |
| 96162606 | 96162607 | 96162608 | 96162609 | 96162610 | 96162611 |
| 96162612 | 96162613 | 96162614 | 96162615 | 96162616 | 96162617 |
| 96162618 | 96162619 | 96162620 | 96162621 | 96162622 | 96162623 |
| 96162624 | 96162625 | 96162626 | 96162627 | 96162628 | 96162629 |
| 96161630 | 96162631 | 96162632 | 96162633 | 96162634 | 96162635 |
| 96162636 | 96162637 | 96162638 | 96162639 | 96162640 | 96162641 |
| 96162642 | 96162643 | 96162644 | 96162645 | 96162646 | 96162647 |
| 96162648 | 96162650 | | | | |



Printed on Recycled Paper

**Data Qualifications**

The following comments refer to the ESAT Team's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM03.0*, the *Manchester Environmental Laboratory Quality Assurance Manual, revision 5/88*, and the *Sampling and Analysis plan for Pacific Sound Resources Offshore Unit, revision 2/96*.

**1.0 Timeliness** - Acceptable

The suggested holding time from the date of collection for mercury in soils is 28 days and holding time for the remaining metals in water is 180 days. The samples were collected beginning on 04/15/96. Mercury analysis was completed by 05/09/96, twenty-five days from collection of the first sample. The remaining metals analyses were completed 05/08/96, twenty-four days from the beginning of sample collection. No qualification was required.

**2.0 Sample Preparation** - Acceptable

Samples were prepared for mercury analysis on 05/01/96, 05/08/96, and 05/09/96. Samples were prepared for ICP-AES analysis on 04/19/96, 04/29/96, 04/30/96, and 05/06/96, following Manchester Laboratory hot-plate digestion procedures. The samples were dried (in a 50 °C oven for CVAAS, in a 100 °C oven for ICP-AES) and homogenized before digestion. All results were reported on a dry weight basis. All sample preparation was in accordance with Manchester Laboratory and CLP protocols. Qualification was not required on this basis.

**3.0 Calibrations** - Acceptable

The samples were analyzed by CVAAS (Cold Vapor Atomic Absorption Spectroscopy) on 05/01/96, 05/08/96, and 05/09/96 for total mercury. Initial calibrations included a blank and at least four standards, as required. The analytical curves were linear and had correlation coefficients greater than the minimum required 0.995.

All samples were analyzed by ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) on 04/22/95, 04/24/96, 05/07/96, and 05/08/96. The instrument was standardized according to the analytical method using a blank and a series of calibration standards.

No qualification was required on this basis.

**4.0 Reference Control Samples/Calibration Verification** - Acceptable

Laboratory reference control samples are required before and after sample analysis and after every 10 samples during analysis. All control samples met frequency and recovery criteria of 90-110% for ICP-AES and 80-120% for CVAAS (mercury) analysis. Qualification was not required on this basis.

**5.0 Blanks** - Acceptable

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were recommended for qualification if the analyte concentration was less than ten times the analytical value in the blank.

One of the procedural blanks for ICP-AES analysis contained aluminum and iron; another contained zinc. However, the associated sample results had concentrations greater than ten times the values in the procedural blanks. Analyte concentrations in all other procedural blanks were less than the requested detection limits; therefore, no qualification was required on this basis.

**6.0 ICP-AES Interference Check Sample** - Acceptable

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run. The acceptance criterion for the ICS is 80% - 120%. All results met frequency and recovery requirements on the days of analysis.

**7.0 Duplicate Analysis** - Acceptable

Duplicate analysis was performed on samples 96162627, 96162612, and 96162613 for CVAAS, and 96162626, 96162612, and 96162647 for ICP-AES. Duplicate analysis results showed acceptable precision as displayed by RPD values less than 35% for soils, as specified in the QAPP. Qualification of the data on this basis was not required.

**8.0 Field Duplicate Analysis** - Not Applicable

Field duplicate analysis was not indicated in the field collection documentation.

**9.0 Matrix Spike Analysis** - Acceptable

Matrix spike sample analyses are performed to provide information about the effect of the sample matrix on digestion and measurement methods. The QAPP specifies that the matrix spike recovery must be within the limits of 75 - 125% for soil.

Matrix spike analysis for mercury was performed on samples 96162627, 96162612 and 96162613; matrix spike analysis for ICP-AES was performed on sample 96162626, 96162612, and 96162647. All matrix spike recoveries were within specified limits; therefore, no qualification was required on this basis.

**10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC** - Not Applicable

GFAAS was not used for the analysis of these samples.

**11.0 ICP-AES Serial Dilution** - Acceptable

Samples 96162648, 96162600, and 96162613 were analyzed by serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference; therefore, no qualification was required on this basis.

**12.0 Detection Limits** - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the (U) qualifier is recommended for attachment. Any sample result falling between the detection limit and the quantitation limit is recommended for qualification as an estimate (P). This notifies the data user that the element was detected at the reported value, but below the minimum level of practical quantitation determined to be within precision limits of 10% relative standard deviation.

**13.0 Overall Assessment of the Data**

This quality assurance review of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*.

The following is a summary of the recommended qualification for the Pacific Sound Resources total metals analysis. Sample results falling between the detection limit and the quantitation limit were qualified (P). Sample results below the detection limit were qualified (U).

No additional qualification was required.

Definitions of laboratory data qualifiers are attached.

Below are the definitions for the qualifiers used in the Inorganics area when qualifying data from Inorganics analysis.

DATA QUALIFIERS

U - Element was analyzed but not detected. The associated numerical value is the instrument detection limit/method detection limit.

P - The analyte was detected above the Instrument Detection Limit, but not quantified within expected limits of precision. The laboratory has established minimum quantitation limits having a relative standard deviation of no more than 10%

H - The samples were analyzed after the suggested holding time limit.

E - The reported value is an estimate because of the presence of interference. An explanatory note will be included with the report.

B - Analyte is found in the analytical blank as well as the sample indicating possible/probable blank contamination. If analytes are found in any of the associated procedural blanks the concentration in the samples must be at least ten times the quantity observed in the blank. If the sample result fails these criteria the sample result is qualified (B).

N - Spiked sample recovery not within control limits.

NAR - There is no analysis result for this analyte.

NA - Not Applicable/Not Required.

S - Sample was analyzed by method of standard additions.

\+ - Sample was analyzed by method of standard additions and the correlation coefficient was less than 0.995.

* - The analyte was present in the sample.

W - Post spike out of specified range, and sample was less than 50% the spike range, and sample was less than 50% the spike added.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

RECEIVED
JUN 0 3 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

May 10, 1996

MEMORANDUM

SUBJECT: Data Review of Pacific Sound Resources Sediment Samples for PCBs

FROM: R. H. Rieck, Chemist R. H. Rieck

TO: Sally Thomas, Project Officer

The Quality Assurance review of 38 sediment samples from Pacific Sound Resources for PCBs has been completed. Extraction and analysis of the water sample and associated blanks and MSDs was performed by EPA Methods 3540 (extraction) and 8081 (analysis) modified for PCBs.

I. Holding Times:

Acceptable. The samples were collected on 4/16-19/96 and extracted on 4/24/96 and 5/1/96. Thus all extractions were performed within the fourteen day holding time for soil/sediment.
The sample extracts were analyzed for PCBs on 5/7/96. All holding times until analysis were within the allowable 40 days. With all holding times being acceptable no qualifiers were assigned on this basis.

II. Instrument Performance:

A Tracor GC using dual ECD detectors with DB-608 and a DB-5 megabore columns was used for this analysis.

A. DDT Retention Time: Not required for this analysis.

B. Retention Time Windows: Acceptable. Retention times for the standards were within the windows set by the initial calibration. The retention time windows used were 1.0% of the initial retention time.

C. DDT/Endrin Degradation: Not required for this analysis.

D. Surrogate Retention Times: Acceptable. All samples had retention time percent differences less than 1.0% for the surrogates 4,4'-Dibromo-octafluorobiphenyl (DBOB), Tetrachloro-m-xylene (TMX), and Decachlorobiphenyl (DCB).

Printed on Recycled Paper

III. Calibration:

A. Initial Calibration: Acceptable. A six point calibration was used for Aroclors 1242 and 1260. A five point calibration was used for Aroclor 1254. All calibration curves were generated using a quadratic equation and had correlation coefficients of 0.999 or better. Furthermore, a single point curve was injected for Aroclors 1016, 1221, 1232, and 1248 which were used for the determination of the Practical Quantitation Limit (PQL) and pattern recognition.

B. Analytical Sequence: Acceptable.

C. Continuing Calibration: Acceptable. The continuing calibration standards were within the 15 percent difference criteria for both columns. Therefore, no qualifiers were assigned on this basis.

IV. Method Blank Analysis:

Acceptable. Four blanks, BS6115, BS6115D, BS6122 and BS6122D, were analyzed with the sediment samples. No target peaks occurred at or above the quantitation limit in any blank. Therefore, no qualifiers were assigned on this basis.

V. Surrogate Recoveries:

Acceptable. The DBOB recoveries ranged from 51%-96% and the TMX recoveries ranged from 44%-92%. DCB recoveries ranged from 80%-117%. The surrogate recoveries were generally lower in two of the blanks, BS6122 and BS6122D . No qualifiers were assigned on this basis.

VI. Matrix Spike/Matrix Spike Duplicate:

Samples 96162606 and 96162635 were spiked in duplicate with Aroclors 1242 and 1260. The recoveries for Aroclor 1242 were 60% and 115% for sample 96162606 which had a high native Aroclor concentration and 84% and 85% for Aroclor 1260. Sample 96162635 had 95% and 95% recoveries for Aroclor 1242 and 105% and 106% recoveries for Aroclor 1260. The recoveries for the spiked PCB compounds were within the expected range and considered acceptable. Moreover the overall precision was acceptable when one takes into account the high native Aroclor 1242 concentration in sample 96162606. No qualifiers were assigned on this basis.

VII. Compound Identification/Quantitation:

All sediment samples contained various concentrations of PCBs. Aroclors 1242, 1254 and 1260 were observed in all samples although some of the PCBs were below the reporting limit. Four of the samples, 96162628, 96162644, 96162645 and 96162647, contained very low concentrations of PCBs and required additional concentration. Because of the "weathering effect" which is

demonstrated by the convolution of the peak ratios, the results for the Aroclor 1242 results are all flagged "J" as estimates.

VIII. Overall Assessment/Data Use:

Acceptable for use with the qualifiers as assigned in the sections above. The data was evaluated using the guidelines set out in the "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" (Feb. '88).

# APPENDIX E.1

# PHASE 2 SEDIMENT AND TISSUE DATA VALIDATION REPORT

# DATA QUALITY AND ANALYSES

## 1.0 CHEMICAL DATA QUALITY

As part of the Phase 2 sampling effort, sediment and fish tissue samples collected in the Offshore Unit and clams exposed in the laboratory to site-collected were analyzed for PAHs, phenolics, dibenzofuran, PCBs, dioxins/furans, inorganics, total organic carbon, percent lipids, and geotechnical parameters (including grain size). Analyses performed on individual samples were selected based on historical information concerning processes and chemicals used at the upland facility and the chemical distribution demonstrated by the Phase 1 sediment data.

The BNAs, PCBs, PAHs, percent lipids, and inorganics analyses were performed by the EPA Manchester laboratory; dioxins/furans by Maxim Technologies Inc., of St. Paul, Minnesota; and total organic carbon by Analytical Resources Incorporated of Seattle, Washington. Analyses were conducted in accordance Puget Sound Estuaries Protocol (PSEP) modifications to the procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, 3rd edition) and American Society for Testing and Materials.

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis by the laboratory. A data review was performed on laboratory quality control results summary sheets to ensure they met data quality objectives for the project. Data review was performed by the EPA Region 10 Quality Assurance Branch and followed the format outlined in the *Laboratory Data Functional Guidelines for Evaluating Organic Analyses, revision 2/94* and the *Laboratory Data Functional Guidelines for Evaluating Inorganic Analyses, revision 2/94* modified to include specific criteria of the individual analytical methods. Raw laboratory data including calibrations, sample login forms, sample preparation logs and bench sheets, quantitation reports, mass spectra, and chromatograms are kept on file at the laboratory.

Results of the data reviews, organized by analysis class, follow.

## 2.0 SEMIVOLATILES

### 2.1 Analytical Methods

Samples for PAH analysis were prepared using EPA Method 3550, ultrasonic extraction. Samples for PAHs, phenolics, and dibenzofuran analyses were analyzed utilizing a modified EPA SW-846 Method 8270.

### 2.2 Sample Holding Times

All samples were extracted within holding time limits of 14 days for sediment and tissue and 7 days for water and analyzed within 40 days.

According to the memorandum dated 12/2/96, sediment samples 96392702, 96392703, 96392704, 96392711, 96392721, 96392724, 96392728, 96392734, 96392735, 96392736, and

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

96392737 were extracted four days past the recommended holding time maximum. This exceedance was not judged to be significant toward the reported target compounds' results since the samples were stored under refrigeration. Therefore, no qualifiers were assigned.

In memorandum dated 11/14/96, water sample 96404968 was received one day past holding time limits for extraction (7 days). Sample results were qualified J/UJ.

## 2.3 GC/MS Tuning and Performance

All tuning check compound mass abundances and ratios were within contract required limit.

## 2.4 Initial Calibration

All target compound list (TCL) analytes and system monitoring compounds were within contract-required limits for the initial calibration with average relative response factors ***RRF*** greater than or equal to 0.05 and percent relative standard deviations (percent RSD) or ***RSD*** of less than or equal to 30 percent.

## 2.5 Continuing Calibration

All target compound list (TCL) analytes were within contract-required limits for the continuing calibrations with average relative response factors ***RRF*** greater than or equal to 0.05 and ***RSD*** percent differences of less than or equal to 25 percent, with the exception of:

| Date of Memorandum | CCV Date | Analyte | RRF | Associated Samples |
|---|---|---|---|---|
| 11/14/96 (water) | 10/31/96 | 3B-Coprostanol | <0.05 | 96404968 |
| | | | | 96404969 |

Associated results for the above compounds were qualified J if detected and UJ if nondetected.

## 2.6 Blank Contamination

No target analytes were detected in laboratory or field blanks, with the exception of the following:

| Date of Memorandum | Blank ID | Compound (CAS) | Concentration |
|---|---|---|---|
| 11/19/96 (sediment) | BS6289A | 1,2-Benzenedicarboxylic (84640) | 95.8 NJ (µg/kg) |
| | | 1,2-Benzenedicarboxylic (89189) | 92.8 NJ |
| | | 2,5-Hexanedione (110134) | 127 NJ |
| | | 3-Hexyn-2-ol, 5-methyl- (23293507) | 583 NJ |
| | | 4-Penten-2-one, 4-methyl (3744023) | 554 NJ |
| | | Butane, 2,3-dimethyl- (79298) | 160 NJ |
| | | Hydrocarbon Unknown 01 | 43.1 NJ |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Date of Memorandum | Blank ID | Compound (CAS) | Concentration |
|---|---|---|---|
| | | Hydrocarbon Unknown 02 | 69.8 NJ |
| | | Hydrocarbon Unknown 03 | 148 NJ |
| | | Hydrocarbon Unknown 04 | 107 NJ |
| | | Hydrocarbon Unknown 04 | 62 NJ |
| | | Hydrocarbon Unknown 05 | 123 NJ |
| | | Hydrocarbon Unknown 06 | 91.9 NJ |
| | | Hydrocarbon Unknown 07 | 106 NJ |
| | | Hydrocarbon Unknown 08 | 50.4 NJ |
| | | Hydrocarbon Unknown 09 | 217 NJ |
| | | Unknown 01 | 109 NJ |
| | | Unknown 02 | 83.7 NJ |
| | | Unknown 03 | 81.9 NJ |
| | | Unknown 05 | 159 NJ |
| | BS6289AD | 1,2-Benzenedicarboxylic (17851535) | 176 NJ (µg/kg) |
| | | 1H-Pyrrole-2,5-dione (541593) | 573 NJ |
| | | 2,5-Hexanedione (110134) | 195 NJ |
| | | Ethane, 1,1,2,2-Tetrachloro (79345) | 67.2 NJ |
| | | Hydrocarbon Unknown 01 | 54.3 NJ |
| | | Hydrocarbon Unknown 02 | 136 NJ |
| | | Hydrocarbon Unknown 03 | 84.1 NJ |
| | | Hydrocarbon Unknown 04 | 102 NJ |
| | | Hydrocarbon Unknown 04 | 94.4 NJ |
| | | Hydrocarbon Unknown 05 | 63.6 NJ |
| | | Hydrocarbon Unknown 06 | 83.5 NJ |
| | | Hydrocarbon Unknown 07 | 183 NJ |
| | | Hydrocarbon Unknown 08 | 110 NJ |
| | | Phthalate Unknown | 222 NJ |
| | | UNKNOWN | 853 NJ |
| | | Unknown 02 | 229 NJ |
| | | Unknown 03 | 239 NJ |
| | | Unknown 05 | 52.0 NJ |
| | | Unknown 06 | 47.5 NJ |
| | | Unknown 07 | 165 NJ |
| | BS6290A | 1,2-Benzenedicarboxylic (89189) | 266 NJ (µg/kg) |
| | | Hydrocarbon Unknown 01 | 145 NJ |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Date of Memorandum | Blank ID | Compound (CAS) | Concentration |
|---|---|---|---|
| | | Hydrocarbon Unknown 04 | 313 NJ |
| | | Unknown 01 | 312 NJ |
| | | Unknown 02 | 256 NJ |
| | | Unknown 03 | 548 NJ |
| | | Unknown 05 | 114 NJ |
| | BS6290AD | 1,2-Benzenedicarboxylic (17851535) | 532 NJ (µg/kg) |
| | | 1,2-Benzenedicarboxylic (84640) | 181 NJ |
| | | 2,5-Hexanedione (110134) | 102 NJ |
| | | 2-Pentanone, 3-methyl (565617) | 255 NJ |
| | | Ethanol, 2-(2-methoxyeth) (111773) | 180 NJ |
| | | Hydrocarbon Unknown 01 | 53.6 NJ |
| | | Hydrocarbon Unknown 02 | 54.3 NJ |
| | | Hydrocarbon Unknown 03 | 133 NJ |
| | | Hydrocarbon Unknown 04 | 121 NJ |
| | | Hydrocarbon Unknown 07 | 87.8 NJ |
| | | Hydrocarbon Unknown 08 | 54.6 NJ |
| | | Unknown 01 | 593 NJ |
| | | Unknown 02 | 269 NJ |
| | | Unknown 03 | 358 NJ |
| | | Unknown 05 | 82.4 NJ |
| | | Unknown 06 | 86.9 NJ |
| | | Unknown 07 | 65.5 NJ |
| | | Unknown 09 | 150 NJ |
| | | Unknown 10 | 44.2 NJ |
| | | Unknown 11 | 120 NJ |
| 11/14/96 (water) | BW6283A | 2-Cyclohexen-1-ol (822673) | 0.38 NJ (µg/L) |
| | | 7-Oxabicyclo[4.1.0]hepta (286204) | 1.6 NJ |
| | | Hydrocarbon Unknown 04 | 0.84 NJ |
| | | Phthalate Unknown 01 | 0.28 NJ |
| | | Phthalate Unknown 02 | 0.28 NJ |
| | | Surrogate Artifact #1-190 | 0.25 NJ |
| | | Surrogate Artifact #2-190 | 0.34 NJ |
| | | Surrogate Artifact #3-216 | 0.28 NJ |
| | | Unknown 01 | 0.25 NJ |
| | | Unknown 02 | 0.29 NJ |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Date of Memorandum | Blank ID | Compound (CAS) | Concentration |
|---|---|---|---|
| | | Unknown 03 | 0.27 NJ |
| | BW6283DA | Pyrene | 0.75 (µg/L) |
| | | Phthalate Unknown 01 | 4.3 NJ |
| | | Phthalate Unknown 02 | 6.9 NJ |
| | | Phthalate Unknown 03 | 8.5 NJ |
| | | Phthalate Unknown 04 | 4.4 NJ |
| | | Phthalate Unknown 05 | 4.7 NJ |
| | | Phthalate Unknown 06 | 6.0 NJ |
| | | Phthalate Unknown 07 | 4.7 NJ |
| | | Phthalate Unknown 08 | 5.6 NJ |
| | | Phthalate Unknown 09 | 5.5 NJ |
| | | Phthalate Unknown 10 | 11.7 NJ |
| | | Phthalate Unknown 11 | 24.0 NJ |
| | | Phthalate Unknown 12 | 20.7 NJ |
| | | Phthalate Unknown 13 | 16.5 NJ |
| | | Phthalate Unknown 14 | 6.0 NJ |
| | | Phthalate Unknown 15 | 9.6 NJ |
| | | Phthalate Unknown 16 | 5.9 NJ |
| | | Phthalate Unknown 17 | 7.0 NJ |
| | | Phthalate Unknown 18 | 9.4 NJ |
| | | Phthalate Unknown 19 | 6.0 NJ |
| | | Unknown 01 | 7.2 NJ |
| | BW6290 | 2-Cyclohexen-1-ol (822673) | 0.43 NJ (µg/L) |
| | | 2-Cyclohexen-1-one (930687) | 0.50 NJ |
| | | 7-Oxabicyclo[4.1.0]hepta (286204) | 1.3 NJ |
| | | Surrogate Artifact #2-190 | 0.24 NJ |
| | BW6290D | 2-Cyclohexen-1-ol (822673) | 0.41 NJ (µg/L) |
| | | 2-Cyclohexen-1-one (930687) | 0.49 NJ |
| | | 7-Oxabicyclo[4.1.0]hepta (286204) | 1.4 NJ |
| | | Surrogate Artifact #2-190 | 0.29 NJ |
| | BW6296 | 2-Cyclohexen-1-ol (822673) | 0.27 NJ (µg/L) |
| | | 7-Oxabicyclo[4.1.0]hepta (286204) | 1.0 NJ |
| | | Hydrocarbon Unknown 01 | 0.30 NJ |
| | | Surrogate Artifact #2-190 | 0.34 NJ |
| | | Unknown 01 | 1.9 NJ |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Date of Memorandum | Blank ID | Compound (CAS) | Concentration |
|---|---|---|---|
| | BW6296D | 2,5-Cyclohexadiene-1,4-d (18232036) | 0.24 NJ (µg/L) |
| | | 2-Cyclohexen-1-ol (822673) | 0.26 NJ |
| | | 7-Oxabicyclo[4.1.0]hepta (286204) | 1.2 NJ |
| | | Hydrocarbon Unknown 01 | 0.30 NJ |
| | | Hydrocarbon Unknown 02 | 0.44 NJ |
| | | Surrogate Artifact #2-190 | 0.35 NJ |
| | | Unknown 01 | 0.30 NJ |

Reported levels of the above compounds were qualified as undetected with an adjusted quantitation limit (UJ) in the samples if concentrations were less than five times concentrations present in the blank (ten times for common laboratory contaminants [e.g., phthalates]). Tentatively identified compounds found in the blanks were deleted from the sample results.

## 2.7 Surrogate Recovery

All surrogate compound recoveries were within QC limits except the following:

| Date of Memorandum | Sample | Surrogate | Percent Recovery |
|---|---|---|---|
| 11/19/96 (sediment) | 96404909 | 1,2-Dichlorobenzene-d4 | 8 |
| | | Nitrobenzene-d5 | 19 |
| 12/20/96 (tissue) | 96454341 | 1,2-Dichlorobenzene-d4 | <10 |

PAH results for samples listed above have been qualified as estimated concentrations (J) when two or more surrogate recoveries within a compound class (acid or base/neutral) are outside QC limits. Detection limits have been qualified estimated (UJ) for samples in which two or more surrogate recoveries within a compound class (acid or base/neutral) are below QC criteria.

Tissue sample 96454341 (memo dated 12/20/96) had undetects results for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene were judged to be associated with the surrogate above and were qualified as rejected (R).

## 2.8 Matrix Spike Compound Recovery

A limited number of matrix spike (MS) and matrix spike duplicate (MSD) and blank spike analyses were performed by the laboratory. Spiked compound recoveries were within advisory QC limits except for the following:

| Date of Memorandum | Spiked Compound | MS Recovery | MSD Recovery | RPD | QC Limits |
|---|---|---|---|---|---|
| 10/28/96 (sediment) | Benzo(a)pyrene | 49% | | | 50-150% |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Date of Memorandum | Spiked Compound | MS Recovery | MSD Recovery | RPD | QC Limits |
|---|---|---|---|---|---|
| | Benzo(a)pyrene | | | 59% | ≤50% |
| | Indeno(1,2,3-cd)pyrene | | | 52% | ≤50% |

The sample (96404931), used for the MS/MSD, was qualified estimated detection limit (UJ) for benzo(a)pyrene because the percent recovery was lower than the QC limit. Indeno(1,2,3-cd)pyrene was not qualified because it was undetected in the sample. When the relative percent difference exceeds the QC limit only the detected compounds get qualified as estimated (J).

The memorandum dated 11/14/96 for water samples, states that an MS/MSD analysis was not performed using a sample from this set. No qualifiers were assigned.

## 2.9 Internal Standard Performance

Internal standard areas were within contract requirements of -50 percent to +100 percent of associated calibration internal standard areas. Retention time shifts for internal standards met contract requirements of less than 30 seconds.

## 2.10 Target Compound List Compound Identification

All detected TCL compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

## 2.11 Compound Quantitation

Some target analytes were detected at levels below the lowest calibration concentration of the initial calibration curve. Since the Practical Quantitation Limit (PQL) is based on this lowest initial calibration standard, these values were assigned the J qualifier.

The 2-methylnaphthalene, 1-methylnaphthalene, benzo(a)pyrene, and chrysene results reported for sediment sample 96404902 (memo dated 11/12/96) were qualified estimated (J) due to the exceedance of the instrument calibration range. Reanalysis with dilution resulted with values below the calibration range and were not reported for the compounds and sample.

## 2.12 Tentatively Identified Compounds

Spectra for all tentatively identified compounds met criteria for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

## 2.13 Field Duplicates

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Approximately five percent of samples submitted to the laboratory were "blind" field duplicates. Advisory QC limit for relative percent difference (RPD) of 50 percent was established when detected concentrations are greater than five times the sample quantitation limit. All samples met advisory QC limits.

## 3.0 POLYCHLORINATED BIPHENYLS (PCBS)

### 3.1 Analytical Methods

Samples for PCB analysis were prepared using EPA Method 3550, ultrasonic extraction. The samples were analyzed by gas chromatography/electron capture detection utilizing EPA Method 8080.

### 3.2 Sample Holding Times

All samples were prepared and analyzed within holding time limits of 14 days for sediment and tissue and 7 days for water, with the exception of the following:

| Date of Memorandum | Sample ID | Collection Date | Holding Time |
|---|---|---|---|
| 12/19/96 (sediment) | 96404968 (water blank) | 10/1/96 | 8 days |
| | 96382526 | 9/18/96 | 43-57 days |
| | 96382529 | 9/19/96 | 43-57 days |
| | 96382531 | 9/19/96 | 43-57 days |
| | 96382533 | 9/19/96 | 43-57 days |
| | 96382534 | 9/19/96 | 43-57 days |
| | 96382535 | 9/20/96 | 43-57 days |
| | 96382537 | 9/20/96 | 43-57 days |
| | 96382541 | 9/21/96 | 43-57 days |
| | 96382543 | 9/20/96 | 43-57 days |
| | 96382546 | 9/21/96 | 43-57 days |
| | 96404906 | 10/1/96 | 43-57 days |
| | 96404907 | 10/1/96 | 43-57 days |
| | 96404926 | 10/3/96 | 43-57 days |
| | 96404929 | 10/3/96 | 43-57 days |

The results associated with the samples were qualified as estimated (JH or UJH) because they were extracted outside the holding time limit.

### 3.3 Initial Calibration

Two instruments (A and B) were used for these analyses. Four- and five-point initial calibrations for PCB 1260, 1254, and 1242 were performed just prior to the sample analyses except for the

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

week 40 samples (9640-). The PCB 1254 initial calibration was performed just after sample analyses instead of before for no adequate reason. Qualifiers were not judged to be necessary on this basis. Correlation coefficients for calibration curves were ≥0.995. Single point calibrations were performed for PCBs 1016, 1221, 1232, and 1248 for detection and identification purposes. Single point calibration was also used to determine all surrogate recoveries and the matrix spike recoveries.

In the memo dated 12/19/96, the baseline noise for one of the columns (F-channel) on instrument A was excessively noisy such that detection and quantitation for the low level PCB standards were questionable. Detected PCB results were reported from the other column (E-channel) from this instrument due to the more stable baseline unless the F-channel result was significantly lower. In these cases the lower of the two results were reported.

### 3.4 Continuing Calibration

The continuing calibration check standards did not meet the criteria for frequency of analysis for PCB 1254 for the week 40 (9640-) samples as a standard was only analyzed at the beginning and at the end (initial calibration) of the 3-day sequence. This reflects poor analytical practice; however, no qualifiers were applied on this basis since the associated PCB 1254 results were either non-detected or qualified J due to lack of consistent values between the characteristic peaks.

The percent differences (%D's) between the measured and true values were ≤15 percent for PCBs 1254, 1260, and 1242 for the quantitation column (E-channel). The F-channel PCB-1260 results were often slightly >15 percent to the positive. No qualifiers were applied based on the %D's from the continuing calibrations as detected PCB-1260 results were reported from the E-channel.

### 3.5 Blank Contamination

No target analytes were detected in laboratory or field blanks.

### 3.6 Surrogate Recovery

All surrogate compound recoveries were within advisory QC limits with the exception of :

| Date of Memorandum | Samples | Tetrachloro-m-xylene | Decachlorobiphenyl |
|---|---|---|---|
| 1/20/97 (tissue) | 96382511 | 17% | 24% |
| | 96382515 | 28% | 37% |
| | 96382505 | 30% | acceptable |
| | 96382522 | acceptable | 40% |

Samples with tetrachloro-m-xylene recoveries less than the specified limit were qualified as estimated (J/UJ) for Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, and Aroclor 1248.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Samples with decachlorobiphenyl recoveries less than the specified limits were qualified as estimated (J/UJ) for Aroclor 1254 and Aroclor 1260.

### 3.7 Matrix Spike Compound Recovery

A limited number of matrix spike (MS) and matrix spike duplicate (MSD) and blank spike analyses were performed by the laboratory. Spiked compound recoveries were within advisory QC limits of 75-150% and a relative percent difference (RPD) less than 30 percent with the exception of the MS/MSD of 96382522. This MS/MSD had an RPD (71%) greater than the specified limit. Tissue sample 96382522 (memo dated 1/20/97) was qualified as estimated (J) for Aroclor 1260.

### 3.8 PCB Identification

All detected PCBs were compared to standards for pattern matching in the chromatograms from both dissimilar columns. The chromatograms were judged to be reasonable for PCB detection.

For the memo dated 12/19/96, sediment samples 96382533, 96382534, 96382535, and 96382541 were qualified J due to the lack of consistency between results for the characteristic peaks of PCB-1254.

### 3.9 Compound Quantitation

For the memo dated 12/19/96 for sediment sample 96404905, PCB-1260 was detected below the lowest calibration concentration of the initial calibration curve and was qualified J. Analysis of a more concentrated extract for this sample for lower quantitation limits and a more accurate PCB-1260 measurement resulted in chromatograms of poor resolution between PCBs and interferences. The results from the more dilute extract are being reported for this sample.

## 4.0 INORGANICS

### 4.1 Analytical Methods

Samples for mercury analysis were prepared using the EPA CLP SOW 1.8 method. Samples for other metals analysis were prepared using EPA Method 3050, acid digestion. Mercury was analyzed by EPA Method 7471, cold vapor AA. Arsenic and thallium were analyzed by graphite furnace AA, EPA Methods 7060 and 7841, respectively. All other metals were determined by ICP spectroscopy, EPA SW-846 Method 6010.

### 4.2 Sample Holding Times

All samples were prepared and analyzed within holding time limits of 6 months (28 days for mercury).

### 4.3 Sample Preparation

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

All sample preparation procedures were in accordance with the TDF, Manchester Laboratory, and CLP protocols.

### 4.4 Calibration

Samples were analyzed for arsenic, cadmium, chromium, copper, nickel, lead, and zinc by ICP-AES. The instrument was standardized according to the analytical method using one blank and a single calibration standard for each element. Samples were analyzed for mercury by CVAAS. The initial calibration included one blank and at least four standards. The correlation coefficient was greater than 0.995. All calibrations were performed as required and met the criteria for acceptance.

### 4.5 Reference Control Samples/Calibration Verification

Reference control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. Control limits for ICP-AES reference sample, ERA Priority Pollutant/CLP Inorganic Soil, are 75-125 percent of the certified value. Acceptance limits of recovery for the mercury control sample are 80-120 percent of NIST 2704 reference material. All recoveries met the acceptance criteria for control samples.

### 4.6 Blank Contamination

No target analytes were detected in laboratory or field blanks.

In memorandum dated 11/14/96, it was noted that trace concentrations of zinc were found in the ICP-AES analysis; however, all sample results were greater than 10 times the value of the preparation blank. No qualifiers were assigned.

### 4.7 ICP-AES Interference Check Sample

The interference check sample (LCS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis was performed as required at the beginning and end of each sample analysis run and recoveries were within the specified criteria of 80-120 percent.

### 4.8 Duplicate Analysis

The percent relative percent differences (RPDs) were within the control limit of 20 percent.

### 4.9 Matrix Spike Analysis

Matrix spike recoveries were within QC limits of 75 percent to 125 percent, with the exception of:

| Date of Memorandum | Analyte | MS %R | MSD %R |
|---|---|---|---|
| 11/14/96 (water) | Lead | 68% | 84% |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

It was the professional judgment of the validator that the MS/MSD percent recoveries were not significant for lead, so the lead results for water samples in the 11/14/96 memorandum were not qualified.

### 4.10 ICP Serial Dilution Analysis

All concentration were less than 50 times the IDL and if the concentration was greater than 50 times the IDL the percent difference were ±10 percent of the serial dilution result.

### 4.11 Detection Limits

Sample results below the instrument detection limit (IDL) were assigned the value of the instrument detection limit and the "U" qualifier was assigned.

In memorandums dated 11/20/96 and 12/18/96, detection limit goals for mercury of 0.05 mg/kg was not met due to the complex matrix of the samples (tissue). The detection limit for this data sets is 0.08 mg/kg.

## 5.0 POLYCHLORINATED DIOXINS/FURANS

### 5.1 Analytical Methods

Samples for dioxin/furan analysis were analyzed utilizing EPA Method 1613B by Maxim Technologies Inc.

### 5.2 Sample Holding Times

All samples were prepared within 30 days and analyzed within the 14 day holding time limit for sediment.

### 5.3 Instrument Performance

A VG Model 70SE high resolution mass spectrometer equipped with HP5890 gas chromatograph was used in all of the analyses. GC/MS performance standards were analyzed at the beginning and at the end of each analytical sequence. The frequency of analysis of the performance check standard was met. The mass spectrometer was operated in the electron impact ionization mode with a minimum resolving power of 10,000; the exact mass of m/z 380.9760 was within 5 ppm, each lock-mass is within 10 percent of full scale and the signal-to-noise (S/N) ratio is ≥10 percent. All of the applicable technical acceptance criteria were met by the instrument before and after each analytical sequence.

### 5.4 Initial Calibration

An initial calibration was performed for each column. The initial calibrations met the method specified acceptance criteria with percent relative standard deviations (%RSDs) that were less

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

than 15 percent for both native and labeled compounds in both columns. All of the ion abundance ratios, S/N ratios and retention times were within the control limits.

### 5.5 Retention Time Window and Isomer Specificity Check

The frequency of analysis, the retention times and resolution as expressed by the percent valley criteria were met. The percent valley between 2,3,7,8-tetrachlorodibenzodioxin (TCDD) and the closest tetrachlorodibenzofuran (TCDF) isomer was less than 25 percent. The retention times for all of the polychlorinated dibenzofuran and dibenzodioxin homologues were established and properly labeled from the first to the last eluters. All of the ion abundance and S/N ratios were within the method specified control limits.

### 5.6 Continuing Calibrations

The continuing calibration verification standards (CCVs) met the criteria for frequency of analysis, the ion abundance ratios, the retention time, the chromatographic resolution, the S/N ratios and the percent difference (%D).

### 5.7 Compound Quantitation and Detection Limits

All of the samples were analyzed at the method required quantitation limits. The 2,3,7,8-TCDF results were confirmed on both columns. The values for this compound were calculated off the DB225 column due to the interferences in the DB5 column.

### 5.8 Blank Contamination

No target analytes were detected in laboratory or field blanks, with the exception of:

| Date of Memorandum | Blank ID | Analyte |
|---|---|---|
| 1/2/97 (fish tissue) | Blank | OCDD |

Sample results for OCDD were qualified as undetected (U) due to blank contamination if the sample results was less than five times the blank concentration.

### 5.9 Analytical Sequence

All of the standards, blanks, samples and QC samples were analyzed in accordance with the method-specified analytical sequence.

### 5.10 Surrogate Recoveries

Surrogates were not required by the method. However, a clean-up recovery standard (2,3,7,8-TCDD-C134) was added to each of the samples. The recoveries for this standard were acceptable.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 5.11 Laboratory Control Sample/Duplicate (LCS/LCSD)

Spiked reagent blank water and duplicates were analyzed for LCS/LCSD analyses. All of the applicable technical acceptance criteria for the LCS/LCSD analyses were met.

### 5.12 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The frequency of analysis of MS/MSD was met. All of the spike and spike duplicate recoveries met the criteria.

In the memorandum dated 12/4/96, elevated amounts of 1,2,3,4,6,7,8-heptachlorodibenzodioxin (HpCDD) and octachlorodibenzodioxin (OCDD) were obtained both 96382546MS and MSD due to the interfering concentrations of the compounds native to the sample. Qualifiers were not applied to the associated sample results based on the MS/MSD analytical results.

### 5.13 Internal Standards

The internal standard recoveries were within QC limits. Except in the memorandum dated 12/4/96, some of the labeled compound isomer recoveries were outside the QC limits. However, since the quantitations of the isomers were based on the isotope dilution, the associated data were not qualified on this basis.

### 5.14 Compound Identification

All of the detected compounds met the ion abundance ratios, the S/N ratios and the retention times criteria specified by the method.

## 6.0 TOTAL ORGANIC CARBON

### 6.1 Analytical Methods

Samples for total organic carbon (TOC) analysis were analyzed utilizing the method by Plumb, 1981.

### 6.2 Sample Holding Times

All samples were prepared and analyzed within holding time limits of 14 days for sediment.

### 6.3 Instrument Calibration

The analytical balance used for TOC determination was monitored and calibrated by the laboratory daily. The balance was documented to be accurate up to 0.1 milligrams.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

### 6.4 Initial Calibration

Initial calibration for TOC analyses were performed at the beginning of each analytical sequence. The initial calibration standard recoveries were acceptable.

### 6.5 Continuing Calibration

All of the continuing calibration verification standards (CCVs) for TOC analyses met the criteria for frequency of analysis and the recovery criteria of 90-110 percent.

### 6.6 Detection Limits

All of the samples analyses were at the percent detection limits required by the sampling plan. All of the reported results were within the calibration linear range and were adjusted for sample size and percent moisture. The TOC results were corrected for system blank values.

### 6.7 Blank Contamination

TOC was not detected in laboratory blanks.

### 6.8 Laboratory Control Standard (LCS)

All LCS recoveries were within QC limits 75-125 percent.

### 6.9 Standard Reference Material (SRM)

For each TOC analytical sequence, a standard reference material (NBS2704) was analyzed. The frequency of analysis and recovery criteria for SRM were met.

### 6.10 Laboratory Triplicates

The frequency of analysis and percent relative standard deviations (%RSDs) for laboratory triplicates were met.

### 6.11 Matrix Spike Analysis

Matrix spike recoveries were within QC limits of 75-125 percent.

### 6.12 Field Duplicate Sample Analysis

Approximately five percent of samples submitted to the laboratory were "blind" field duplicates. Advisory QC limit for relative percent difference (RPD) of 50 percent was established when detected concentrations are greater than five times the sample quantitation limit. All samples met advisory QC limits.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## 7.0 GEOTECHNICAL PARAMETERS

### 7.1 Analytical Methods

Samples for grain size were analyzed in accordance with the method specifications in the Sampling and Analysis Plan (SAP) for Pacific Sound Resources (PSR) Offshore Unit (4/96).

### 7.2 Sample Holding Times

All samples were prepared and analyzed within holding time limits.

### 7.3 Instrument Calibration

The analytical balance used for the analyses was monitored and calibrated by the laboratory daily. The balance was documented to be accurate up to 0.1 milligrams.

### 7.5 Laboratory Control Sample (LCS)

For grain size determinations, the sum of all the fractions were less than 5 percent.

### 7.6 Laboratory Duplicate Analyses

The frequency of analysis and the relative percent differences (%RPDs) between duplicate results were within 10 percent for both QC samples.

### 7.8 Field Duplicate Sample Analysis

Approximately five percent of samples submitted to the laboratory were "blind" field duplicates. Advisory QC limit for relative percent difference (RPD) of 50 percent was established when detected concentrations are greater than five times the sample quantitation limit. All samples met advisory QC limits.

## 8.0 OVERALL DATA QUALITY

The following is a summary of the qualifiers assigned during the data validation:

| Analysis | Validation Parameter | Matrix | Date of Memorandum | Associated Samples | Qualifiers Assigned |
|---|---|---|---|---|---|
| Semivolatiles | Holding Times | Water | 11/14/96 | 96404968 | JH/UJH |
| | Continuing Calibration | Water | 11/14/96 | 96404968 | J if detected |
| | | | | | UJ if nondetected |
| | | | | 96404969 | J if detected |
| | | | | | UJ if nondetected |
| | Blanks | Sediment | 11/19/96 | All samples | UJ if the sample concentration is less than 5 times the blank |
| | | Water | 11/14/96 | | |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Analysis | Validation Parameter | Matrix | Date of Memorandum | Associated Samples | Qualifiers Assigned |
|---|---|---|---|---|---|
| | | | | | concentration |
| | Surrogates | Sediment | 11/19/96 | 96404909 | J/UJ for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene |
| | | Tissue | 12/20/96 | 96454341 | R for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene |
| | MS/MSD | Sediment | 10/28/96 | 96404931 | UJ for benzo(a)pyrene |
| | Below PQL | various | various | various | J for analytes detected below the PQL |
| | Instrument Calibration | 11/12/96 | Sediment | 96404902 | J for 2-methylnaphthalene, 1-methylnaphthalene, benzo(a)pyrene, and chrysene |
| PCBs | Holding Times | Blank (water) | 12/19/96 | 96404968 | JH/UJH |
| | | Sediment | | 96382526 | |
| | | | | 96382529 | |
| | | | | 96382531 | |
| | | | | 96382533 | |
| | | | | 96382534 | |
| | | | | 96382535 | |
| | | | | 96382537 | |
| | | | | 96382541 | |
| | | | | 96382543 | |
| | | | | 96382546 | |
| | | | | 96404906 | |
| | | | | 96404907 | |
| | | | | 96404926 | |
| | | | | 96404929 | |
| | Surrogates | Tissue | 1/20/97 | 96382511 | J/UJ for Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260 |
| | | | | 96382515 | |
| | | | | 96382505 | J/UJ for Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, and Aroclor 1248 |
| | | | | 96382522 | J/UJ for Aroclor 1254 and Aroclor 1260 |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| Analysis | Validation Parameter | Matrix | Date of Memorandum | Associated Samples | Qualifiers Assigned |
|---|---|---|---|---|---|
| | MS/MSD | Tissue | 1/20/97 | 96382522 | J for Aroclor 1260 |
| | PCB Identification | Sediment | 12/19/96 | 96382533<br>96382534<br>96382535<br>96382541 | J due to the lack of consistency between results for the characteristic peaks of Aroclor 1254 |
| Inorganics | below IDL | various | various | various | U for analytes detected below the IDL |
| Dioxin/Furans | Blanks | Tissue | 1/2/97 | All samples | UJ if the sample concentration for OCDD is less than 5 times the blank |

All the data is useable as qualified with the exception of the three compounds that were rejected for sample 96454341. This data is not useable in any form.

## 9.0 DATA QUALIFIERS

The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

**U** - The analyte was not detected at the given quantitation limit.

**J** - The analyte was positively identified and detected; however, the concentration is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.

**UJ** - The analyte was not detected; the associated quantitation limit is an estimated value.

**R** - Data are rejected due to significant exceedance of quality control criteria. The analyte may or may not be present. Additional sampling and analysis are required to determine.

**N** - Tentative identification; The analyte exhibits low spectral match parameters but, based on the analyst's or reviewer's judgment, is present.

**D** - Value was obtained from reanalysis of a diluted sample.

**P** - There was a greater than 25 percent difference for detected concentrations between the two GC columns for the analyte.

**UI** - The analyte was not detected due to matrix interferences.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**UE -** The analyte was not detected due to PCDPE interferences.

**H -** The sample was analyzed outside the holding time limit.

## 10.0 DATA ASSESSMENT

Data review and assessment was performed by the EPA Region 10 Quality Assurance Branch.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

March 21, 1997

MEMORANDUM

SUBJECT: Report of Data Validation of Polynuclear Aromatic Hydrocarbons' Results for the Pacific Sound Resources Project Samples 96364550, 96364551, 96364552, 96364553, 96364554, 96374565, 96374566, 96374567, 96374568, 96374569, 96374570, 96382545, 96392725, 96392726, 96392727, 96392732, 96392733, and 96404942

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Sally Thomas, Project Officer
USEPA

CC: Nancy Musgrove, Roy F. Weston

RECEIVED
MAR 2 6 1997
ROY F. WESTON, INC.
SEATTLE OPERATIONS

The following is a QA data validation report of the polynuclear aromatic hydrocarbons (PAHs) analyses' results for sediment samples collected for the Pacific Sound Resources project. These samples were stored frozen from the time of receipt by the laboratory. The analyses were performed at the USEPA Region 10 Laboratory using a modified SW846 Method 8270B. This report covers the samples listed above.

The project code for these samples is TEC-666B and the account number is 10PTFA10M2.

Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in USEPA SW846 Method 8270B and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

I. Holding Times:

The samples were collected between 09/05/96 to 10/03/96 and were stored frozen from the time of receipt by the laboratory. Extractions were not performed until 03/05/97, however, since the samples were frozen during storage the holding times were judged to be acceptable. Extracts were analyzed within 40 days from the

Printed on Recycled Paper

time of preparation. No qualifiers were applied based on the holding times.

II. GC/MS Tuning and Performance: Acceptable

The tuning summary agreed with the raw data. All decafluorotriphenylphosphine ion abundance met criteria. All sample analyses were preceded by a tune less than 12 hours prior to analysis. No data qualifiers were required on the basis of the tuning data.

III. Initial Calibration: Acceptable

An eight-point initial calibration was performed on 11/25/96 for the target compounds. All percent relative standard deviations (%RSDs) met the criteria of $\leq$30%. All average RRFs met the criteria of $\geq$0.05. Correlation coefficients for calibration curves were $\geq$0.99.

IV. Continuing Calibration: Acceptable

The continuing calibration check standard met the criteria for frequency of analysis and RRT windows for all target compounds and surrogates. The RRFs were $\geq$0.05 and the recoveries for the target compounds met the criteria of 75-125%.

V. Blanks:

A method blank was prepared and analyzed with the sample extraction batch. Target compounds detected in the samples were reported without qualification if the sample result area integration exceeded five times that of the blanks. Detected sample results were qualified U if the area integration was below this criterion. The sample concentration or the laboratory quantitation limit (QL), whichever is greater, was reported as the qualified result.

VI. Surrogates: Acceptable

The SW846 Method 8270B and the Functional Guidelines specifications for surrogate recoveries were applied. Only the recoveries for the neutral surrogates were used to evaluate the sample results. The surrogate recoveries met the applied criteria.

VII. Matrix Spike/Matrix Spike Duplicate (MS/MSD):

An MS/MSD analysis was performed using sample 96392726 (S1/S2). The MS/MSD criteria described in the CLP Statement of Work and the Region 10 acceptance ranges (50-150% recovery, ≤50% relative percent difference, RPD) were applied. The recoveries met the applied criteria except for the following:

| Compound | %Recovery (S1/S2) |
|---|---|
| naphthalene | 48.1/ |

The above compound was not detected in sample 96392726. The reported result for this compound and sample was qualified UJ due to the low recovery.

VIII. Internal Standard Performance: Acceptable

The retention time variations of all internal standards were within 30 seconds of the continuing calibration standards. The %area of all the internal standards fell within the specified 50% to 200% of the continuing calibration standards. No qualifiers were applied based on the internal standards' response.

IX. TCL Compound Identification: Acceptable

All detected TCL compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

X. Compound Quantitation:

Some target compounds were detected in this sample set at levels below the lowest calibration concentration of the initial calibration curve. Since the Practical Quantitation Limit is based on this lowest initial calibration standard, these values were assigned the J qualifier.

XI. Reference Sample:

The Sequim Bay reference sample (LCS7064) was extracted and analyzed with the samples. The PAH results from this analysis were within two standard deviations of the calculated averages for this reference sample. No criteria for the Sequim Bay reference sample have been established yet at this time.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in the USEPA SW846 Method 8270B and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

DATA QUALIFIERS

| | | |
|---|---|---|
| U | - | The analyte was not detected at or above the reported result. |
| J | - | The analyte was positively identified. The associated numerical result is an estimate. |
| 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 $3 \times 10^6$. |
| REJ | - | The data are unusable for all purposes. |
| N | - | 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. |
| UJ | - | The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample. |
| NAF | - | Not analyzed for. |
| NAR | - | No analytical result. |
| * | - | The analyte was present in the sample. (Visual aid to locate detected compounds on the report sheet.) |

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OE-095

April 9, 1997

**MEMORANDUM**

SUBJECT: Data Validation Report for Grain Size, Percent Solids and Total Organic Carbon (TOC) Analysis of Samples from Pacific Sound Resources Site

FROM: Ginna Grepo-Grove, Chemist
Office of Environmental Assessment

TO: Sally Thomas, RPM
Office of Environmental Clean-up

CC: Roger McGinnis, Roy F. Weston, Inc.

The quality assurance (QA) review of nine sediment samples collected from the above referenced site has been completed. These sample were analyzed for TOC and percent solids in accordance with the method specifications of the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96). Sample 96382545 was also analyzed for apparent grain size performed by Rosa Environmental and Geotechnical Laboratory, Inc.,in Seattle, WA. The TOC and percent solids determinations were performed by Analytical Resources, Inc. Of Seattle, WA. The following samples were reviewed for TOC and percent solids in this report:

| | | |
|---|---|---|
| 96364550 | 96364551 | 96364552 |
| 96364553 | 96364565 | 96364566 |
| 96364567 | 96364568 | 96364570 |

**DATA QUALIFICATIONS**

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96), the EPA 160.3, the conventional analytical protocols for the Puget Sound Estuary Programs (PSEP), the Plumb (1981) TOC method and the USEPA CLP National Functional Guidelines for Inorganic Data Review (2/94).

The conclusions presented herein are based on the information provided for the review.

Printed on Recycled Paper

**Holding Time** - Acceptable

All of the samples met the method and technical (40 CFR 136 water criteria) required holding times. All of the samples were archived and frozen until analysis. The Holding Time Summary, listing the pertinent sample collection, laboratory receipt and analysis dates is attached at the end of this validation report.

**Instrument Calibration** - Acceptable

The analytical balance used for both TOC, percent solids and grain size analyses were monitored and calibrated by the laboratories daily. The balances were documented to be accurate up to 0.1 mg..

**Initial Calibrations** - Acceptable

Initial calibrations for TOC analyses were performed at the beginning of each analytical sequence. The percent relative standard deviations (%RSDs) were all less than 25% and the initial calibration standard recoveries were within the range of 90-110%.

**Continuing Calibrations** - Acceptable

All of the continuing calibration verification standards (CCVs) for TOC analyses met the criteria for frequency of analysis and the recovery criteria of 90-110%.

**Detection Limits** - Acceptable

All of the samples analyses were at the percent detection limits required by the sampling plan. All of the reported results were within the calibration linear range and were adjusted for sample amount and percent moisture. The TOC results were corrected for system blank values.

**Blanks** - Acceptable

The frequency of analysis of laboratory blanks was met. All of the TOC results were corrected for system blank values.

**Laboratory Control Sample (LCS)** - Acceptable

For each TOC analytical sequence, a standard reference material (NBS2704) was analyzed for LCS. The frequency of analysis of the LCS and the recovery criteria were met. The LCS recovery was 103%. For grain size determinations, the sum of all the fractions were less than 5%.

**Laboratory Triplicates** - Acceptable

The frequency of analysis for laboratory triplicates were met for TO, grain size and percent solids. The percent relative standard deviations (%RSDs) were all less than 15%.

**Matrix Spike (MS) Analysis** - Acceptable

The frequency of analyses and recovery criteria were met for the TOC MS analysis. The spike recovery was 81%.

**Field Duplicates** - Not Applicable

The field duplicate samples were not identified in the chain-of-custody documents.

**Overall Assessment**

All of the samples were analyzed in accordance with the sampling and analysis plan specifications. Data results are acceptable and can be used for all purposes.

## Holding Time Summary

| | | Date of Analysis | |
|---|---|---|---|
| Sample Number | Collection Date | Percent Solids | TOC |
| 96364550 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364551 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364552 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364565 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364566 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364567 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364568 | 09/05/96 | 02/28/97 | 03/03/97 |
| 96364570 | 09/05/96 | 02/28/97 | 03/03/97 |

DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

R - The data are unusable for all purposes.

N - 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.

UJ - The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

RECEIVED
APR 16 1997
ROY F. WESTON, INC.
SEATTLE OPERATIONS

April 15, 1997

Attn of: OEA-095

MEMORANDUM

Subject: Data Validation Report for Polychlorinated Dioxins (PCDD) and Polychlorinated Dibenzofurans (PCDF) Analysis of a Sediment Sample from Pacific Sound Resources Site

From: Ginna Grepo-Grove, Chemist
Quality Assurance & Data Unit, OEA

To: Sally Thomas, RPM
Office of Environmental Cleanup

CC: Roger McGinnis, Roy F. Weston, Inc.

The quality assurance (QA) review of one sediment sample (96382545) collected from the above referenced site has been completed. This sample was analyzed for PCDD/PCDF in accordance with the USEPA Method 1613B by Maxim Technologies, Inc. of St. Paul, MN.

**DATA QUALIFICATIONS**

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Project Sampling and Analysis Plan, USEPA Method 1613B - "Tetra through Octa-chlorinated Dioxins and Furans by Isotope Dilution High Resolution Gas Chromatography/ High Resolution Mass Spectrometry (HRGC/HRMS) and the USEPA CLP National Functional Guidelines for Organic Data Review (2/94).

The conclusions presented herein are based on the information provided for the review.

Printed on Recycled Paper

**Holding Time** - Acceptable

The sample was archived and frozen upon laboratory receipt on 9/21/96. The sample was extracted on 3/4-7/97 and the analysis was performed on 3/12/97. The holding time was met. None of the data were qualified on this basis.

**Instrument Performance** - Acceptable

A VG Model 70SE high resolution mass spectrometer equipped with HP5890 gas chromatograph was used in all of the analyses. GC/MS performance standards were analyzed at the beginning and at the end of each analytical sequence. The frequency of analysis of the performance check standard was met. The mass spectrometer was operated in the electron impact ionization mode with a minimum resolving power of 10,000; the exact mass of m/z 380.9760 was within 5 ppm, each lock-mass is within 10% of full scale and the signal-to-noise (S/N) ratio is ≥10%. All of the applicable technical acceptance criteria were met by the instrument before and after each analytical sequence.

**Initial Calibrations** - Acceptable

An initial calibration was performed for each of the columns. The initial calibrations met the method specified acceptance criteria with percent relative standard deviations (%RSDs) that were less than 20% for both native and labeled compounds in both columns. All of the ion abundance ratios, S/N ratios and retention times were within the control limits.

**Retention Time Window and Isomer Specificity Check** - Acceptable

The frequency of analysis, the retention times and resolution as expressed by the percent valley criteria were met. The % valley between 2,3,7,8-tetrachlorodibenzodioxin (TCDD) and the closest tetrachlorodibenzofuran (TCDF) isomer was less than 25%. The retention times for all of the polychlorinated dibenzofuran and dibenzodioxin homologues were established and properly labeled from the first to the last eluters. All of the ion abundance and S/N ratios were within the method specified control limits.

**Continuing Calibrations** - Acceptable

The continuing calibration verification standards (CCVs) met the criteria for frequency of analysis, the ion abundance ratios, the retention time, the chromatographic resolution, the S/N ratios and the percent difference (%D). None of the data were qualified on this basis.

**Compound Quantitation and Detection Limits**

All of the samples were analyzed at the method required quantitation limits. The detected 2,3,7,8-TCDF isomers were confirmed on a second column.

**Blanks** - Acceptable

The frequency of analysis of laboratory blank was met. Background levels of the target compounds were less than the method detection limits. None of the data were qualified on this basis.

**Analytical Sequence** - Acceptable

All of the standards, blanks, samples and QC samples were analyzed in accordance with the method-specified analytical sequence.

**Surrogate Recoveries**

Surrogates were not required by the method. However, a clean-up recovery standard (2,3,7,8-TCDD-Cl34) was added to the sample and gave a recovery of 60%. None of the data were qualified on this basis.

**Laboratory Control Sample (LCS)** - Acceptable

One spiked reagent blank water was analyzed for LCS analysis. All of the applicable technical acceptance criteria for the LCS analyses were met. The recoveries range from 97% - 118%. None of the data were qualified on this basis.

**Matrix Spike/Matrix Spike Duplicate (MS/MSD)** - Not Performed

**Internal Standards** - Acceptable

The internal standard recoveries ranged from 63% -170%. None of the data were qualified on this basis.

**Compound Identification** - Acceptable

All of the detected compounds met the ion abundance ratios, the signal-to-noise (S/N) ratios and the retention times criteria specified by the method. None of the data were qualified on this basis.

**Laboratory Contact**

The laboratory was not contacted for this review.

**Overall Assessment**

All of the samples were analyzed in accordance with the method specifications. All of the data are acceptable and can be used for all purposes.

DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

R - The data are unusable for all purposes.

N - 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.

UJ - The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OE-095

October 30, 1996

**MEMORANDUM**

SUBJECT: Data Validation Report for Percent Solids and Total Organic Carbon (TOC) Analysis of Samples from Pacific Sound Resources Site

FROM: Ginna Grepo-Grove, Chemist
Office of Environmental Assessment

TO: Sally Thomas, RPM
Office of Environmental Clean-up

CC: Roger McGinniss
Roy F. Weston, Inc.

The quality assurance (QA) review of 89 sediment samples collected from the above referenced site has been completed. These sample were analyzed for total organic carbon (TOC) and percent solids in accordance with the method specifications of the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96). The percent solids and TOC determinations were performed by Analytical Resources, Inc. Of Seattle, WA. The following samples were reviewed in this report:

| | | | | |
|---|---|---|---|---|
| 96382524 | 96382551 | 96392724 | 96392705 | 96404921 |
| 96382525 | 96382535 | 96392725 | 96392706 | 96404922 |
| 96382527 | 96382537 | 96392726 | 96404950 | 96404923 |
| 96382528 | 96382543 | 96392727 | 96404951 | 96404924 |
| 96382530 | 96382541 | 96392728 | 96404952 | 96404955 |
| 96382532 | 96382546 | 96392729 | 96404953 | 96404956 |
| 96382536 | 96382545 | 96392731 | 96404954 | 96404957 |
| 96382538 | 96392707 | 96392732 | 96404910 | 96404958 |
| 96382539 | 96392708 | 96392733 | 96404911 | 96382529 |
| 96382540 | 96392709 | 96392734 | 96404912 | 96382531 |
| 96382526 | 96392710 | 96392735 | 96404913 | 96382533 |
| 96382542 | 96392711 | 96392736 | 96404914 | 96382534 |
| 96382544 | 96392712 | 96392737 | 96404915 | 96404959 |
| 96382547 | 96392719 | 96392738 | 96404916 | 96404905 |
| 96382548 | 96392720 | 96392701 | 96404917 | 96404906 |
| 96382549 | 96392721 | 96392702 | 96404918 | 96404907 |
| 96382550 | 96392722 | 96392703 | 96404919 | 96404908 |
| 96392723 | 96392704 | 96404920 | 96404909 | |

Printed on Recycled Paper

## DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96), EPA Method 160.3, TOC Method by Plumb, 1981, and the USEPA CLP National Functional Guidelines for Inorganic Data Review (2/94).

The conclusions presented herein are based on the information provided for the review.

**Holding Time** - Acceptable

All of the samples met the method and technical (40 CFR 136 water criteria) required holding times. The Holding Time Summary, listing the pertinent sample collection, laboratory receipt and analysis dates is attached at the end of this validation report.

**Instrument Calibration** - Acceptable

The analytical balance used for both TOC and percent solids determinations were monitored and calibrated by the laboratories daily. The balances were documented to be accurate up to 0.1 mg..

**Initial Calibrations** - Acceptable

Initial calibrations for TOC analyses were performed at the beginning of each analytical sequence. The initial calibration standard recoveries were acceptable and within the range of 90-110%.

**Continuing Calibrations** - Acceptable

All of the continuing calibration verification standards (CCVs) for TOC analyses met the criteria for frequency of analysis and the recovery criteria of 90-110%.

**Detection Limits** - Acceptable

All of the samples analyses were at the percent detection limits required by the sampling plan. All of the reported results were within the calibration linear range and were adjusted for sample amount and percent moisture. The TOC results were corrected for system blank values.

**Blanks** - Acceptable

The frequency of analysis of laboratory blanks was met. All of the TOC results were corrected for system blank values.

**Laboratory Control Sample (LCS)** - Acceptable

The frequency of analysis of the LCS and the recovery criteria were met. The TOC recoveries ranged from 97 - 105%.

**Standard Reference Material (SRM)** - Acceptable

For each TOC analytical sequence, a standard reference material (NBS2704) was analyzed. The frequency of analysis and recovery criteria for SRMs were met.

**Laboratory Triplicates** - Acceptable

The frequency of analysis and percent relative standard deviations (%RSDs) for laboratory triplicates were met for both analyses. The %RSDs were all less than 15%.

**Matrix Spike/Duplicate (MS/MSD) Analyses** - Acceptable

The frequency of analyses and recovery criteria were met for all TOC analyses. The recoveries ranged from 79 - 107% and the relative percent differences (RPDs) ranged from 2 - 14%.

**Field Duplicates** - Not Applicable

The field duplicate samples were not identified in the chain-of-custody documents.

**Overall Assessment**

All of the samples were analyzed in accordance with the sampling and analysis plan specifications. Data results are acceptable and can be used for all purposes.

## Holding Time Summary

| | | | Date of Analyses | |
|---|---|---|---|---|
| Sample Number | Collection Date | Laboratory Receipt | Percent Solids | TOC |
| 96382524 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382525 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382527 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382528 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382530 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382532 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382536 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382538 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382540 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382542 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382544 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382547 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382548 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382549 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382550 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382551 | 09/18/96 | 09/19/96 | 09/24/96 | 10/02/96 |
| 96382526 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382535 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382537 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382541 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382543 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382545 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382546 | 09/20/96 | 09/23/96 | 09/24/96 | 09/26/96 |
| 96382529 | 09/19/96 | 09/20/96 | 09/24/96 | 09/26/96 |
| 96382531 | 09/19/96 | 09/20/96 | 09/24/96 | 09/26/96 |
| 96382533 | 09/19/96 | 09/20/96 | 09/24/96 | 09/26/96 |

## Holding Time Summary

| | | | Date of Analyses | |
|---|---|---|---|---|
| Sample Number | Collection Date | Laboratory Receipt | Percent Solids | TOC |
| 96382534 | 09/19/96 | 09/20/96 | 09/24/96 | 09/26/96 |
| 96392707 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392708 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392709 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392710 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392711 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392712 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392719 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392720 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392721 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392722 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392723 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392724 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392725 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392726 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392727 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392728 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392729 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392731 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392732 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392733 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392734 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392735 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392736 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |

## Holding Time Summary

| | | | Date of Analyses | |
|---|---|---|---|---|
| Sample Number | Collection Date | Laboratory Receipt | Percent Solids | TOC |
| 96392737 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392738 | 09/27/96 | 09/27/96 | 10/07/96 | 10/10/96 |
| 96392701 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96392702 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96392703 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96392704 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96392705 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96392706 | 09/27/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404950 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404951 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404952 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404953 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404954 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404910 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404911 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404912 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404913 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404914 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404915 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404916 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404917 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404918 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404919 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404920 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |

## Holding Time Summary

| | | | Date of Analyses | |
|---|---|---|---|---|
| Sample Number | Collection Date | Laboratory Receipt | Percent Solids | TOC |
| 96404921 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404922 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404923 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404924 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404955 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404956 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404957 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404958 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404959 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404905 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404906 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404907 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404908 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |
| 96404909 | 10/01/96 | 10/01/96 | 10/08/96 | 10/11/96 |

DATA QUALIFIERS

U - The analyte was not detected at or above the reported result.

J - The analyte was positively identified. The associated numerical result is an estimate.

R - The data are unusable for all purposes.

N - 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.

UJ - The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 10 LABORATORY**
7411 Beach Dr. East
Port Orchard, Washington 98366

March 28, 1997

MEMORANDUM

SUBJECT: Report of Data Validation of Polychlorinated Biphenyls' Results for the Pacific Sound Resources Project Sample 96382545

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Sally Thomas, Project Officer
USEPA

CC: Nancy Musgrove, Roy F. Weston

RECEIVED
MAR 31 1997
ROY F. WESTON INC.
SEATTLE OPERATIONS

The following is a QA data validation report of the polychlorinated biphenyls (PCBs) analyses' results for a sediment sample collected for the Pacific Sound Resources project. This sample was stored frozen from the time of receipt by the laboratory. The sample was analyzed by the USEPA Region 10 Laboratory ESAT Team located in Manchester, WA using a modified SW846 Method 8081. The analyses' results were delivered as ESAT document number ESW10-0-1462 under Technical Direction Form 3202. This report covers the sample listed above.

The project code for this sample is TEC-666B and the account number is 10PTFA10M2.

Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in the project's analysis plan, USEPA SW846 Method 8081, and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

I. Holding Times:

The sample was collected on 09/21/96 and was stored frozen from the time of receipt by the laboratory. Extractions were not performed until 03/04/97, however, since the sample was frozen during storage the holding time was judged to be acceptable. Extracts were analyzed within 40 days from the time of

Printed on Recycled Paper

preparation. No qualifiers were applied based on the holding times.

II. Initial Calibration:

Three- and five-point initial calibrations for PCB 1260, 1254, and 1242 were performed just prior to the sample analyses. Correlation coefficients for calibration curves were ≥0.995. Single point calibrations was performed for PCBs 1016, 1221, 1232, and 1248 for detection and identification purposes. Single point calibration was also used to determine matrix spike recoveries for 9638254581/S2.

The baseline noise for one of the columns (E-channel) was excessively high such that detection and quantitation for the low level PCB standards were questionable. The other column (F-channel) baseline noise was normal. Quantitation limits were based on the F-channel responses. The detection of PCB 1221 at 200 pg was questionable on both columns but was detectable at 400 pg; therefore, the quantitation limit for this PCB was increased.

III. Continuing Calibration:

The continuing calibration check standards met the criteria for frequency of analysis. The % differences (%Ds) between the measured and true values were ≤15% for PCB 1254. The last continuing calibration check standard resulted with %Ds >15% to the positive for PCBs 1242, 1260, and the surrogates. This was not judged to be significant since PCBs 1242 and 1260 were not detected in the sample and blanks. The surrogate recoveries were determined from analyses earlier in the analytical sequence. Therefore, no qualifiers were applied based on the continuing calibration checks.

IV. Blanks: Acceptable

A method blank pair was prepared and analyzed with the sample extraction batch. PCBs were not detected. No qualifiers were applied based on the blanks.

V. Surrogates:

The project's analysis plan and the Functional Guidelines specifications for surrogate recoveries were applied. Recoveries met the applied criteria. No qualifiers were applied based on the surrogates.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD): Acceptable

An MS/MSD analysis was performed using sample 96382545 (S1/S2). The MS/MSD criteria stated in the project plan for PCB 1242 (30-133% recovery, ≤30% RPD) along with 50-150% recovery, ≤50% RPD for PCB 1260 were applied. The recoveries met the applied criteria. No qualifiers were applied based on the matrix spikes.

VII. PCB Identification:

All detected PCBs were compared to standards for pattern matching in the chromatograms from both dissimilar columns. The E-channel chromatographic pattern for PCB 1254 was judged to be present in sample 96382545, however, the correlation between results for the quantitation peaks was poor. The F-channel chromatographic pattern for this PCB was not distinguishable for this sample despite repeated extract clean-up attempts. Mass spectral confirmation by GC/ITD was attempted but not achieved for this PCB and sample, probably due to the low concentration. As a conservative measure, the PCB 1254 result for sample 96382545 was reported as non-detected at the higher of the two detected results.

VIII. Compound Quantitation: Acceptable

The initial calibration functions were used to calculate results. Quantitation limits were checked against calibration and the sample size extracted.

IX. Reference Sample: Acceptable

The Sequim Bay reference sample (SEQUIM) was extracted and analyzed with the sample. The PCB 1254 result from this analysis was within two standard deviations of the calculated average for this reference sample. No criteria for the Sequim Bay reference sample have been established yet at this time.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in the project's analysis plan and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding

sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

RECEIVED
MAR 2 0 1997
ROY F. WESTON, INC.
SEATTLE OPERATIONS

IN REPLY
REFER TO: OEA-095

March 14, 1997

MEMORANDUM

SUBJECT: Pacific Sound Resources Mercury Analysis, Data Validation
Sample No.: 96382545
Project Code: TEC-666B
Account Code: 96T10PTFA10M2LA00

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Sally Thomas, Project Manager
Office of Environmental Cleanup

cc: Isa Chamberlain, Work Assignment Manager, USEPA, Region 10

The following is a quality assurance review of CVAAS mercury analysis of one sediment sample from the Pacific Sound Resources site. The analyses were performed following USEPA and laboratory guidelines by the ESAT Team at the USEPA Manchester Environmental Laboratory, Port Orchard, WA. This quality assurance review was conducted for sample 96382545.

**Data Qualifications**

The following comments refer to the ESAT performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILMO3.0,* the *Manchester Environmental Laboratory Quality Assurance Manual, rev. 5/88,* and the QA plan. The recommendations presented herein are based on the information provided for the review.

**1.0 Timeliness**

The holding time for mercury in water is 28 days. The water holding time was used to evaluate data for this sediment sample. The sample was collected on 9/21/96 and archived (but not frozen) until notification to analyze was received from the EPA. On 02/03/97, the sample was prepped for mercury analysis. The mercury data was qualified, `J', estimated, due to exceedence of holding time.

Printed on Recycled Paper

**2.0 Sample Preparation** - Acceptable

The sample was prepped for CVAAS analysis on 02/03/97. All sample preparation was in accordance with Manchester Laboratory protocols. No qualification was made based on sample preparation.

**3.0 Calibration** - Acceptable

The sample was analyzed by CVAAS on 02/03/97. Initial calibration included one blank and four standards. The calibration curve was linear with a correlation coefficient greater than 0.995.

The calibration was performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

**4.0 Reference Control Samples/Calibration Verification** - Acceptable

Reference control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. Acceptable control limits of recovery for all metals analyses are 80-120%. All recoveries met the acceptance criteria for control samples and no qualifiers were made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%.

All CVAAS calibration verification samples met the recovery criteria. Calibration verification samples were analyzed after every ten samples. No qualification was made based on CVAAS calibration verification.

**5.0 Blanks** - Acceptable

A procedural blank was prepared with the sample to show potential contamination from the analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank. No qualification was made based on the procedural blank.

No qualification was made based on CVAAS continuing calibration blank analyses.

**6.0 ICP-AES Interference Check Sample** - Not applicable

ICP-AES was not used for the analysis of this sample.

**7.0 Duplicate Analysis** - Acceptable

Duplicate analysis was performed on sample 96382545 for CVAAS. All results above the required detection limit were within the $\pm$IDL criterion. No qualification was made on the basis of duplicate

analysis.

**8.0 Field Duplicate Analysis** - Not Applicable

Field duplicate analysis was not indicated in the field collection documentation.

**9.0 Matrix Spike Analysis** - Acceptable

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on measurement methods. Matrix spike recovery must be within the limits of 75 - 125% for un-spiked sample results less than four times the spike amount.

Matrix spike analysis was done on sample 96382545 for CVAAS. All matrix spike recoveries were within the specified limits. No qualification was made based on matrix spike analysis.

**10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC** - Not Applicable

GFAAS was not used for the analysis of this sample.

**11.0 ICP-AES and ICP-MS Serial Dilution** - Not Applicable

ICP-AES and ICP-MS were not used for thee analysis of this sample.

**12.0 Detection Limits** - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached.

Practical Quantitation Limit (PQL) samples are required to demonstrate a linear calibration curve near the PQL. PQL standards were run at the required frequency. There is no current functional guidelines criteria for PQL recovery, therefore no data was qualified based on PQL recovery.

**13.0 Overall Assessment of the Data**

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*. Overall, 100% of the data was qualified due exceeding the technical holding time.

Definitions for the National Functional Guidelines qualifiers are attached.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OE-095

December 30, 1996

**MEMORANDUM**

SUBJECT: Data Validation Report for Grain Size Analysis of Samples from Pacific Sound Resources Site

FROM: Ginna Grepo-Grove, Chemist
Office of Environmental Assessment

TO: Sally Thomas, RPM
Office of Environmental Clean-up

CC: Roger McGinnis, Roy F. Weston, Inc.

The quality assurance (QA) review of thirty-five (35) sediment samples collected from the above referenced site has been completed. These sample were analyzed for grain size in accordance with the method specifications of the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96). The grain size analyses were performed by Soil Technology, Inc. of Bainbridge , WA. The following samples were reviewed in this report:

| | | |
|---|---|---|
| 96382524 | 96382525 | 96382526 |
| 96382527 | 96382528 | 96382529 |
| 96382530 | 96382531 | 96382532 |
| 96382533 | 96382534 | 96382535 |
| 96382536 | 96382537 | 96382538 |
| 96382539 | 96382540 | 96382541 |
| 96382542 | 96382543 | 96382544 |
| 96382545 | 96382546 | 96382547 |
| 96382548 | 96404905 | 96404906 |
| 96404907 | 96404908 | 96404909 |
| 96404925 | 96404926 | 96404927 |
| 96404928 | 96404929 | |

Samples 96382549, 96382550 and 96382551 were archived.

**DATA QUALIFICATIONS**

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Sampling and Analysis Plan for Pacific Sound Resources (PSR) Offshore Unit (4/96), the Puget Sound Estuary Protocols

Printed on Recycled Paper

(Conventional Sediment Variables Particle Size, March 1986), EPA, US Army Corps of Engineers "Dredge Material Testing Manual", February, 1981 and the USEPA CLP National Functional Guidelines for Inorganic Data Review (2/94).

The conclusions presented herein are based on the information provided for the review.

**Holding Time** - Acceptable

All of the samples met the method and technical (40 CFR 136 water criteria) required holding times. The Holding Time Summary, listing the pertinent sample collection, laboratory receipt and analysis dates is attached at the end of this validation report.

**Instrument Calibration** - Acceptable

The analytical balance used for the analyses were monitored and calibrated by the laboratory daily. The balance was documented to be accurate up to 0.1 mg..

**Laboratory Control Sample (LCS)** - Acceptable

For grain size determinations, the sum of all the fractions were less than 5%.

**Duplicate Analyses** - Acceptable

Sample 96382525 and 96404944 were utilized for duplicate analysis. The frequency of analysis and the relative percent differences (RPDs) between duplicate results were within 10% for both QC samples.

**Overall Assessment**

All of the samples were analyzed in accordance with the sampling and analysis plan specifications. Data results are acceptable and can be used for all purposes.

## Holding Time Summary

| Sample Number | Collection Date | Date of Lab Receipt | Grain Size Analysis |
|---|---|---|---|
| 96382524 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382525 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382526 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382527 | 09/19/96 | 10/01/96 | 10/04-09/96 |
| 96382528 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382529 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382530 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382531 | 09/19/96 | 10/01/96 | 10/04-09/96 |
| 96382532 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382533 | 09/19/96 | 10/01/96 | 10/04-09/96 |
| 96382534 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382535 | 09/20/96 | 10/01/96 | 10/04-09/96 |
| 96382536 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382537 | 09/20/96 | 10/01/96 | 10/04-09/96 |
| 96382538 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382539 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382540 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382541 | 09/21/96 | 10/01/96 | 10/04-09/96 |
| 96382542 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382543 | 09/20/96 | 10/01/96 | 10/04-09/96 |
| 96382544 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382545 | 09/21/96 | 10/01/96 | 10/04-09/96 |
| 96382546 | 09/21/96 | 10/01/96 | 10/04-09/96 |
| 96382547 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96382548 | 09/18/96 | 10/01/96 | 10/04-09/96 |
| 96404905 | 10/01/96 | 10/04/96 | 10/04-09/96 |

## Holding Time Summary

| Sample Number | Collection Date | Date of Receipt | Grain Size Analysis |
|---|---|---|---|
| 96404906 | 10/01/96 | 10/04/96 | 10/04-09/96 |
| 96404907 | 10/01/96 | 10/04/96 | 10/04-09/96 |
| 96404908 | 10/01/96 | 10/04/96 | 10/04-09/96 |
| 96404909 | 10/01/96 | 10/04/96 | 10/04-09/96 |
| 96404925 | 10/03/96 | 10/04/96 | 10/04-09/96 |
| 96404926 | 10/03/96 | 10/04/96 | 10/04-09/96 |
| 96404927 | 10/03/96 | 10/04/96 | 10/04-09/96 |
| 96404928 | 10/03/96 | 10/04/96 | 10/04-09/96 |
| 96404929 | 10/03/96 | 10/04/96 | 10/04-09/96 |

DATA QUALIFIERS

| | | |
|---|---|---|
| U | - | The analyte was not detected at or above the reported result. |
| J | - | The analyte was positively identified. The associated numerical result is an estimate. |
| R | - | The data are unusable for all purposes. |
| N | - | 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. |
| UJ | - | The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample. |

# APPENDIX E.1

# PHASE 2 WATER DATA VALIDATION REPORT

JENNIFER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

RECEIVED
NOV 25 1996
ROY F. WESTON, INC.
SEATTLE OPERATIONS

November 14, 1996

MEMORANDUM

SUBJECT: Report of Data Validation of Semivolatiles' Results for the Pacific Sound Resources Project Samples 96404968, 96404969, 96404970, 96404971, 96404972, 96404973, 96404974, 96404975, and 96404976

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Sally Thomas, Project Officer
USEPA

CC: Nancy Musgrove, Roy F. Weston

The following is a QA data validation report of the semivolatiles analyses' results for water samples collected for the Pacific Sound Resources project. The analyses were performed at the USEPA Region 10 Laboratory using a modified SW846 Method 8270B. This report covers the samples listed above.

The project code for these samples is TEC-666B and the account number is 10PTFA10M2.

## Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in USEPA SW846 Method 8270B and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

## I. Holding Times:

The holding time for the extraction of water samples is seven days from the date of sampling. The holding time for extracts is 40 days. Sample 96404968 was received by the laboratory one day past the holding time maximum and was extracted on the day of receipt. The reported results for this sample were qualified J if detected and UJ if non-detected.

Printed on Recycled Paper

II. GC/MS Tuning and Performance: Acceptable

The tuning summary agreed with the raw data. All decafluorotriphenylphosphine ion abundance met criteria. All sample analyses were preceded by a tune less than 12 hours prior to analysis. No data qualifiers were required on the basis of the tuning data.

III. Initial Calibration: Acceptable

An eight-point initial calibration was performed on 08/28/96 for the target compounds. All percent relative standard deviations (%RSDs) met the criteria of $\leq$30%. All average RRFs met the criteria of $\geq$0.05. Correlation coefficients for calibration curves were $\geq$0.99.

IV. Continuing Calibration:

The continuing calibration check standard met the criteria for frequency of analysis and RRT windows for all target compounds and surrogates. The RRFs were $\geq$0.05 and the recoveries for the target compounds met the criteria of 75-125% except for the following:

10/31/96 Samples 96404968 and 96404969.

3B-coprostanol resulted with a RRF <0.05. The associated results for this compound were qualified J if detected and UJ if non-detected.

V. Blanks:

Method blank pairs (BW6283A/BW6283DA, BW6290/BW6290D, and BW6296/BW6296D) were prepared and analyzed with each sample extraction batch. The highest amounts between the method blanks were used to evaluate the sample results. Target compounds detected in the samples were reported without qualification if the sample result area integration exceeded five times that of the blanks. Detected sample results were qualified U if the area integration was below this criterion. The sample concentration or the laboratory quantitation limit (QL), whichever is greater, was reported as the qualified result. Tentatively identified compounds found in the blanks were deleted from the sample results.

Phthalates detected at trace levels in the samples were qualified U even if not detected in the associated blanks as a conservative measure. These compounds are common laboratory contaminants.

VI. Surrogates: Acceptable

The SW846 Method 8270B and the Functional Guidelines specifications for surrogate recoveries were applied. The surrogate recoveries met the applied criteria. No qualifiers were applied based on the surrogate recoveries.

VII. Matrix Spike/Matrix Spike Duplicate (MS/MSD):

An MS/MSD analysis was not performed using a sample from this set.

VIII. Internal Standard Performance: Acceptable

The retention time variations of all internal standards were within 30 seconds of the continuing calibration standards. The %area of all the internal standards fell within the specified 50% to 200% of the continuing calibration standards. No qualifiers were applied based on the internal standards' response.

IX. TCL Compound Identification: Acceptable

All detected TCL compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

X. Compound Quantitation:

Some target compounds were detected in this sample set at levels below the lowest calibration concentration of the initial calibration curve. Since the Practical Quantitation Limit is based on this lowest initial calibration standard, these values were assigned the J qualifier.

XI. Tentatively Identified Compounds: Acceptable

Spectra for all tentatively identified compounds met criteria for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in the USEPA SW846 Method 8270B and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, revision 12/94.

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

# APPENDIX E.1

# PHASE 3 SEDIMENT DATA VALIDATION REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

RECEIVED
NOV 1 4 1997
ROY F WESTON, INC.
SEATTLE OPERATIONS

November 10, 1997

MEMORANDUM

SUBJECT: Report of Data Validation of Polynuclear Aromatic Hydrocarbons' Results for the Pacific Sound Resources Project Samples 97312365, 97312366, 97312367, 97312368, 97312370, 97312371, 97312372, and 97312379

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Karen Keeley, Project Officer
USEPA

CC: Nancy Musgrove, R.F. Weston

The following is a QA data validation report of the polynuclear aromatic hydrocarbons (PAHs) analyses' results for archived sediment samples collected for the Pacific Sound Resources project. The samples were analyzed by the USEPA Region 10 Laboratory ESAT Team located in Manchester, WA using a modified USEPA Method 8270B. Silica-gel column clean-up was performed on the sample extracts to achieve lower sample quantitation levels for PAHs. The analyses' results were delivered as ESAT document number ESW10-1-1529 under Technical Direction Form 3275. This report covers the samples listed above.

The project code for these samples is TEC-666E and the account number is 97T10PFAX10M2.

## Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in USEPA SW846 Method 8270B and the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (2/94).

### I. Holding Times: Acceptable

The samples were stored frozen at the laboratory for 70 days before extraction. This was judged acceptable. Extracts were analyzed within 40 days from the time of preparation. No data qualifiers were required on the basis of the holding times.

Printed on Recycled Paper

II. GC/MS Tuning and Performance: Acceptable

The tuning summary agreed with the raw data. All decafluorotriphenylphosphine ion abundance met criteria. All sample analyses were preceded by a tune less than 12 hours prior to analysis. No data qualifiers were required on the basis of the tuning data.

III. Initial Calibration: Acceptable

An eight-point initial calibration was performed on 10/19/97. Average relative response factors (RRFs) met the criteria of ≥0.05. All percent relative standard deviations (%RSDs) of the RRFs met the criteria of ≤30%. Correlation coefficients were ≥0.99. No data qualifiers were required on the basis of the initial calibration.

IV. Continuing Calibration: Acceptable

The continuing calibration check standard met the criteria for frequency of analysis and RRT windows for all target compounds and surrogates. The RRFs were ≥0.05 and the accuracy for the target compounds met the criteria of 75-125%. No data qualifiers were required on the basis of the continuing calibrations.

V. Blanks:

Method blanks were prepared and analyzed with each sample extraction batch. Target compounds detected in the samples were reported without qualification if the sample result area integration exceeded five times that of the blanks for the target compounds. Detected sample results were qualified U if the area integration was below these criteria. The sample concentration or the sample quantitation limit, whichever is greater, was reported as the qualified result.

VI. Surrogates: Acceptable

The USEPA Method 8270B specifications for surrogate recoveries were applied. The surrogates 2-fluorobiphenyl, pyrene-d10, and terphenyl-d14 were used to evaluate the sample results. A 50-150% recovery criteria were applied toward pyrene-d10. The surrogate recoveries met the applied criteria. No data qualifiers were required on the basis of the surrogates.

VII. Matrix Spike/Matrix Spike Duplicate (MS/MSD):

An MS/MSD analysis was performed using sample 97312367 (S1/S2). The MS/MSD criteria described in the CLP Statement of Work and the Region 10 acceptance ranges (50-150% recovery, ≤50% relative percent difference, RPD) were applied. Recoveries for phenanthrene, fluoranthene, pyrene, and benzo(b)fluoranthene were not measurable due to the spiking level being too low relative to the native amounts. All other recoveries met the applied criteria, therefore, no qualifiers were applied based on the MS/MSD results.

VIII. Internal Standard Performance: Acceptable

The retention time variations of all internal standards were within 30 seconds of the continuing calibration standards. The %area of all the internal standards fell within the specified 50% to 200% of the continuing calibration standards. No qualifiers were applied based on the internal standards.

IX. Target Compound Identification: Acceptable

All detected target compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

X. Compound Quantitation: Acceptable

Calculations were based on the initial calibration. Sample quantitation limits were adjusted appropriately as according to sample amounts and calibration data. Detected results below the sample quantitation limits were qualified J.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in USEPA SW846 Method 8270B and the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (2/94). All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions

arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

DATA QUALIFIERS

| | | |
|---|---|---|
| U | - | The analyte was not detected at or above the reported result. |
| J | - | The analyte was positively identified. The associated numerical result is an estimate. |
| 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 $3 \times 10^6$. |
| R | - | The data are unusable for all purposes. |
| N | - | 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. |
| UJ | - | The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample. |
| NAF | - | Not analyzed for. |
| NAR | - | No analytical result. |
| * | - | The analyte was present in the sample. (Visual aid to locate detected compounds on the report sheet.) |

Roy F. Weston, Inc.
Suite 5700
700 5th Avenue
Seattle, Washington 98104-5057
206-521-7600 • Fax 206-521-7601

# MEMORANDUM

DATE: 15 October 1997

TO: Karen Keeley, WAM, U.S. EPA, Region X

FROM: Jennifer M. Baier, Environmental Chemist, WESTON, Seattle
Roger McGinnis, Senior Environmental Chemist, WESTON, Seattle

SUBJECT: QA of Case T312 (Total Organic Carbon)
Site: Puget Sound Resources (PSR)

WORK ASSIGN NO.: 46-23-0JZZ

DOC. CONTROL NO.: 4000-31-01-AABL

WORK ORDER NO.: 4000-31-01-4500-05

cc: Bruce Woods, TPO, U.S. EPA, Region X
Nancy Musgrove, Project Manager, WESTON, Seattle (memo only)
Dena Hughes, Site Manager, WESTON, Seattle

The quality assurance review of 15 samples, Case T312, collected from PSR has been completed. The sediment samples were analyzed at low level for total organic carbon by Analytical Resources, Inc., of Seattle, Washington. The samples were numbered:

| | | | | |
|---|---|---|---|---|
| 97312350 | 97312351 | 97312352 | 97312353 | 97312354 |
| 97312355 | 97312356 | 97312357 | 97312358 | 97312359 |
| 97312360 | 97312361 | 97312362 | 97312363 | 97312364 |

Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control specifications outlined in the laboratory technical specifications. The review follows the format described in the U.S. EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA OSWER 9240.1-05-01, February 1994).

1. Holding Times

All samples met holding time criteria.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

2. Calibration

   a. Initial and Continuing Calibration

      Initial and continuing calibration frequencies and QC criteria were met.

3. Instrument Detection Limits

   Instrument detection limits are equal to or less than the project-required detection limits (PRDL).

4. Laboratory Method Blanks

   No analytes were detected in laboratory method blanks.

5. Laboratory Control Sample

   The recoveries were within the established control limits for soil.

6. Laboratory Duplicate Sample Analysis

   All relative percent differences (RPD) between analytical results were within the QC limit of 35 percent.

7. Spiked Sample Analysis

   Matrix spike recoveries for all analytes met QC criteria of 75 to 125 percent.

8. Laboratory Contact

   No laboratory contact was required.

Data Assessment

Upon consideration of the data qualifications noted above, the data are ACCEPTABLE for use except where flagged with data qualifiers that modify the usefulness of the individual values.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Data Qualifiers

U - The material was analyzed for, but was not detected.

UJ - The analyte was not detected. The associated quantitation limit is an estimate because quality control criteria were not met.

J - The analyte was positively identified, but the associated numerical value is an estimated quantity because quality control criteria were not met or because concentrations reported were less than the CRDL or lowest calibration standard.

R - Quality control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Roy F. Weston, Inc.
Suite 5700
700 5th Avenue
Seattle, Washington 98104-5057
206-521-7600 • Fax 206-521-7601

# MEMORANDUM

DATE: 18 November 1997

TO: Karen Keeley, WAM, U.S. EPA, Region X

FROM: Jennifer M. Baier, Environmental Chemist, WESTON, Seattle JMB
Roger McGinnis, Senior Environmental Chemist, WESTON, Seattle

SUBJECT: QA of Case: T312II (Total Organic Carbon (TOC))
Site: Puget Sound Resources (PSR)

WORK ASSIGNMENT NO: 46-37-0M2L

DOC. CONTROL NO.: 4000-031-001-AABM

WORK ORDER NO.: 4000-031-001-4500-02

cc: Bruce Woods, TPO, U.S. EPA, Region X
Nancy Musgrove, Project Manager, WESTON, Seattle (memo only)
Dena Hughes, Site Manager, WESTON, Seattle

The quality assurance review of 8 samples, Case T312II collected from PSR has been completed. The sediment samples were analyzed at low level for TOC by Analytical Resources, Inc. The samples were numbered:

| | | | |
|---|---|---|---|
| 97312365 | 97312366 | 97312367 | 97312368 |
| 97312370 | 97312371 | 97312372 | 97312379 |

Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control specifications outlined in the laboratory technical specifications. The review follows the format described in the U.S. EPA Contract Laboratory Program *National Functional Guidelines for Organic Data Review* (EPA OSWER Directive 9240.1-05, February 1994).

1. Timeliness

All samples were analyzed within the holding time limit.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.



Click to WESTON On The Web http://www.rfweston.com

2. Detection Limits—Acceptable

Instrument detection limits were not provided by the laboratory. However, all analyses met project required quantitation limits.

3. Calibration

a. Initial Calibration

Initial calibration frequencies and QC criteria were met. The calibration curve for atomic absorption metals and mercury had a correlation coefficient of 0.995.

b. Continuing Calibration Verification

All continuing calibration results met control limits of 85 to 115 percent recovery (percent R) of the true values.

4. Blanks

a. Laboratory Method Blanks

Laboratory method blank frequency criteria were met. No analytes were detected in the blanks.

b. Field Blanks

No field blanks are associated with this sample delivery group.

5. Matrix Spike, Matrix Spike Duplicate, and Laboratory Control Sample

All matrix spike (MS), matrix spike duplicate (MSD), and laboratory control sample (LCS) percent recoveries met QC guidelines of 75 - 125%. All relative percent differences between the MS and MSD recoveries were within QC guidelines of <40%.

6. Laboratory Replicate Analysis

The laboratory replicate relative percent difference was below the QC limit of 40% for all analytes.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

7. Field Duplicate Analysis

No field duplicate samples were associated with this sample delivery group.

8. Sample Analysis

No unusual problems were noted.

9. Laboratory Contact

No laboratory contact was required.

Data Assessment

Upon consideration of the data qualifications noted above, the data are ACCEPTABLE for use except where flagged with data qualifiers that modify the usefulness of the individual values.

Data Qualifiers

U - The compound was analyzed for, but was not detected.

UJ - The compound was analyzed for, but was not detected. The associated quantitation limit is an estimate because quality control criteria were not met.

J - The analyte was positively identified, but the associated numerical value is an estimated quantity because quality control criteria were not met or because concentrations reported are less then CRDL or lowest calibration standard.

R - Quality control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 10 LABORATORY**
7411 Beach Dr. East
Port Orchard, Washington 98366

September 16, 1997

MEMORANDUM

SUBJECT: Report of Data Validation of Polynuclear Aromatic Hydrocarbons' Results for the Pacific Sound Resources Project Samples 97312350, 97312351, 97312352, 97312353, 97312354, 97312355, 97312356, 97312357, 97312358, 97312359, 97312360, 97312361, 97312362, 97312363, and 97312364

FROM: Gerald H. Dodo, Chemist
USEPA

TO: Karen Keeley, Project Officer
USEPA

CC: Nancy Musgrove, R.F. Weston

The following is a QA data validation report of the polynuclear aromatic hydrocarbons (PAHs) analyses' results for sediment samples collected for the Pacific Sound Resources project. The samples were analyzed by the USEPA Region 10 Laboratory ESAT Team located in Manchester, WA using a modified USEPA Method 8270B. Silica-gel column clean-up were performed on the sample extracts to achieve lower sample quantitation levels for PAHs. The analyses' results were delivered as ESAT document number ESW10-1-1391 under Technical Direction Form 3255. This report covers the samples listed above.

The project code for these samples is TEC-666D and the account number is 97T10PFAX10M2.

Data qualifications

The following comments refer to laboratory performance meeting the Quality Control specifications outlined in USEPA SW846 Method 8270B and the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (2/94).

I. Holding Times: Acceptable

The recommended holding time for the extraction of sediment samples is 14 days from the date of sampling. The holding time for extracts is 40 days. All samples were extracted and analyzed

Printed on Recycled Paper

within holding times. No data qualifiers were required on the basis of the holding times.

II. GC/MS Tuning and Performance: Acceptable

The tuning summary agreed with the raw data. All decafluorotriphenylphosphine ion abundance met criteria. All sample analyses were preceded by a tune less than 12 hours prior to analysis. No data qualifiers were required on the basis of the tuning data.

III. Initial Calibration: Acceptable

An eight-point initial calibration was performed on 04/14/97. Average relative response factors (RRFs) met the criteria of $\geq$0.05. All percent relative standard deviations (%RSDs) of the RRFs met the criteria of $\leq$30%. Correlation coefficients were $\geq$0.99. No data qualifiers were required on the basis of the initial calibration.

IV. Continuing Calibration:

The continuing calibration check standard met the criteria for frequency of analysis and RRT windows for all target compounds and surrogates. The RRFs were $\geq$0.05 and the accuracy for the target compounds met the criteria of 75-125% except for the following:

09/08/97 Samples 97312352, 97312359, 97312361, 97312362, Reanalyses with Higher Extract Dilution for Samples 97312350, 97312351, 97312352, 97312356, 97312357, 97312358, 97312359, 97312361, 97312362, and 97312363.

9H-Carbazole resulted with <75% accuracy. The associated results for this compound were qualified J if detected and UJ if non-detected.

09/15/97 Sample 97312364 and Reanalysis with Higher Extract Dilution for Sample 97312364.

9H-Carbazole resulted with <75% accuracy. The associated results for this compound were qualified J if detected and UJ if non-detected.

V. Blanks:

Method blanks were prepared and analyzed with each sample extraction batch. Target compounds detected in the samples were reported without qualification if the sample result area integration exceeded five times that of the blanks for the target

compounds. Detected sample results were qualified U if the area integration was below these criteria. The sample concentration or the sample quantitation limit, whichever is greater, was reported as the qualified result.

VI. Surrogates:

The USEPA Method 8270B specifications for surrogate recoveries were applied. The surrogates 2-fluorobiphenyl, pyrene-d10, and terphenyl-d14 were used to evaluate the sample results. A 50-150% recovery criteria were applied towards pyrene-d10. The blank OBS7223A1 resulted with 45.8% recovery for pyrene-d10. No qualifiers were applied towards the sample results based on this recovery since all other blank and sample analyses resulted with acceptable recoveries.

VII. Matrix Spike/Matrix Spike Duplicate (MS/MSD):

MS/MSD analyses were performed using sample 97312352 (S1/S2). The MS/MSD criteria described in the CLP Statement of Work and the Region 10 acceptance ranges (50-150% recovery, ≤50% relative percent difference, RPD) were applied. Recoveries for naphthalene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(ghi)perylene were not measurable due to the spiking level being too low relative to the native amounts. All other recoveries met the applied criteria, therefore, no qualifiers were applied based on the MS/MSD results.

VIII. Internal Standard Performance: Acceptable

The retention time variations of all internal standards were within 30 seconds of the continuing calibration standards. The %area of all the internal standards fell within the specified 50% to 200% of the continuing calibration standards. No qualifiers were applied based on the internal standards.

IX. Target Compound Identification: Acceptable

All detected target compounds' relative retention times were within acceptable limits of the related standards in the continuing calibration standard. Criteria were met for mass spectral ion matching and ion abundance matching or the mass spectra were judged acceptable.

X. Compound Quantitation: Acceptable

Calculations were based on the initial calibration. Sample quantitation limits were adjusted appropriately as according to sample amounts and calibration data. Detected results below the sample quantitation limits were qualified J.

Overall Assessment for the Case

The usefulness of the data is based on the criteria outlined in USEPA SW846 Method 8270B and the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (2/94). All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

In general, all unqualified data can be used without restriction. The usefulness of qualified data should be treated according to the severity of the qualifier. Should questions arise regarding the qualification of data and its relation to the usefulness, the reader is encouraged to contact the Region 10 laboratory.

A total of 1.7% of the sample results was qualified based on this review.

DATA QUALIFIERS

| | | |
|---|---|---|
| U | - | The analyte was not detected at or above the reported result. |
| J | - | The analyte was positively identified. The associated numerical result is an estimate. |
| 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 $3 \times 10^6$. |
| R | - | The data are unusable for all purposes. |
| N | - | 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. |
| UJ | - | The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample. |
| NAF | - | Not analyzed for. |
| NAR | - | No analytical result. |
| * | - | The analyte was present in the sample. (Visual aid to locate detected compounds on the report sheet.) |

# APPENDIX E.2

# SURFACE SEDIMENT LABORATORY ACUTE TOXICITY TESTS

# APPENDIX E.2

# DATA VALIDATION REPORT FOR PSR MARINE SEDIMENTS UNIT SURFACE SEDIMENT LABORATORY ACUTE TOXICITY TESTS

## E.2.1 INTRODUCTION

Toxicity test data for the two acute bioassays conducted by Parametrix, Inc., for Roy F. Weston, Inc. (WESTON) were reviewed by WESTON to (1) ensure that all tests were conducted in accordance with Puget Sound Estuary Program (PSEP) protocols (1995), Puget Sound Dredge Disposal Analysis (PSDDA) guidelines, and laboratory standard operating procedures (SOPs), and (2) evaluate the overall validity and usefulness of the test results. The following two acute bioassays were conducted on 12 surface (0 to 10 cm) sediment samples collected during the Phase 2 investigations of the PSR Marine Sediments Unit (MSU):

- 10-day amphipod (*Ampelisca abdita*) test.
- 48- to 96-hour echinoderm (*Dendraster excentricus*) larval test.

Parametrix provided a complete summary report of the bioassay results, including copies of the following:

- Description of methods and materials, including summarized test conditions.
- Summary tables of test results.
- Summary tables of ammonia (total) and sulfide data.
- Test setup records.
- Daily water quality monitoring records.
- Daily emergence records for the amphipod test.
- Positive control (reference toxicant) data and organism-specific laboratory control charts.
- Test breakdown records (amphipod survival and echinoderm larval counts).
- Sediment chain-of-custody forms.
- Laboratory analysis records for ammonia (total) and sulfide.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

WESTON personnel (N. Musgrove) conducted an informal on-site audit of Parametrix's laboratory facility on 4 October 1996.

At the time of the audit, the echinoderm bioassay had been completed, so only the setup for the amphipod mortality and clam mortality and growth bioassays were ongoing. All tests appeared to be conducted according to the protocols specified in WESTON's Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPjP). The amphipod test chambers were in a temperature-controlled water bath and daily observations of test conditions and organism response (emergence) were being recorded.

The clam test chambers were randomized within aquaria that received a low flow exchange of water over time. Aquaria were set up in a temperature-controlled environment chamber. Conditions within each aquarium were checked daily.

Acclimation and selection of clams was discussed. The main criteria for selection of individual clams used in the test was stated to be individuals that were healthy (based on closed valves and active filtration through siphon) and of an equivalent size.

Whether or not the clams were to be purged prior to shucking and submittal for chemical analyses, WESTON instructed Parametrix not to purge before processing; sediment contribution to tissue results will be treated as an uncertainty in the human health risk assessment.

## E.2.2 INVESTIGATION AND TESTING DESIGN

As part of the Phase 2 field investigations, a total of 12 surface sediment samples were collected by WESTON and Biomarine Enterprises between 12 and 21 September 1996 for bioassay testing. Of the 12 samples, three were collected to represent background or reference conditions for comparisons with site data. Two of these background stations were located in Elliott Bay (offshore of Magnolia and Alki beach) and the third in Carr Inlet (southern Puget Sound).

Both bioassays were initiated on 26 September 1996, thereby meeting or occurring prior to the specified maximum sediment holding time of 14 days. In accordance with the specified protocols, daily monitoring of water quality conditions (i.e., temperature, pH, dissolved oxygen, and salinity) and measurements of total ammonia and sulfide concentrations in overlying water (at test initiation and termination) were conducted. Results of the comparisons of the measured conditions with the water quality performance standards specified in the Phase 2 SAP Addendum (WESTON, 1996) are presented in **Sections E.2.4.2.1 and E.2.5.2.1.**

## E.2.3 CONTROL AND REFERENCE SEDIMENT

As described in the Phase 2 SAP Addendum (WESTON, 1996), PSEP protocols (1995) specify two types of biological effects test controls—negative and positive. In addition, reference

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

sediments are required to be concurrently tested with each batch of site samples to provide a site-specific basis for comparison of potentially toxic and nontoxic conditions.

### *E.2.3.1 Negative Controls*

Negative controls consist of clean sediment or seawater collected outside of a given study area; the observed responses in these controls are used to assess the relative health of the test organisms. For the amphipod bioassay, the negative control consisted of sediment collected by Brezina and Associates of Dillon Beach, California, from San Francisco Bay, which was also the location at which the test organisms were collected. The negative control for the echinoderm larval bioassay consisted of natural seawater collected from the National Marine Fisheries Service laboratory in Mukilteo, Washington. The performance criteria for the negative controls are specified also follows:

- Amphipod mean mortality < 10 percent and individual replicate mortality < 20 percent.
- Echinoderm larval mean effective mortality < 30 percent.

The performance of the PSR negative controls relative to these criteria is described in **Sections E.2.4.2.2 and E.2.5.2.2.**

### *E.2.3.2 Positive Controls*

Positive controls involve the use of a reference toxicant to evaluate the relative sensitivity of test organisms for each test series to ensure comparability of the resulting data. $LC_{50}$ or $EC_{50}$ values (i.e., concentrations at which 50 percent of the test organisms die or exhibit deleterious sublethal responses) are calculated using observed reference toxicant responses. PSEP protocols specify that at least one treatment should give a partial response below the $LC_{50}$ (or $EC_{50}$) and one above the $LC_{50}$ (or $EC_{50}$).

Cadmium chloride was used as the positive control for both bioassays. As reported in the PSEP protocols (1995), the $LC_{50}$ for *A. abdita* using data from the U.S. Army Corps of Engineers (COE) DAIS database is 0.49 ± 0.42 mg/L cadmium. An $EC_{50}$ of 10.1 ± 6.5 mg/L cadmium (using the COE DAIS database) is reported in PSEP for *D. excentricus*. The performance of the PSR positive controls relative to these reported ranges is described in **Sections E.2.4.2.3 and E.2.5.2.3.**

### *E.2.3.3 Reference Sediment*

As described in **Section E.2.2**, reference or background sediment was collected from three locations identified as BK01 (Magnolia), BK04 (Alki) and CARR (Carr Inlet). Along with the previously sampled Elliott Bay locations (initially chemically and physically characterized during Phase 1 sampling), the Carr Inlet station was selected to match as closely as possible the range of

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

grain sizes observed at site stations (based on a field sieving technique) to control for potential effects due to physical rather than chemical differences. Actual laboratory grain size data were as follows:

- BK01 (Magnolia): 9 percent fines; 91 percent sand.
- BK04 (Alki): 21 percent fines; 76 percent sand; 3 percent gravel.
- CARR (Carr Inlet): 49 percent fines (field screening results only).

The performance criteria for reference sediments are specified also follows:

- Amphipod mean mortality < 25 percent.
- Echinoderm larval mean effective mortality < 35 percent.

The performance of the PSR reference sediments relative to these criteria is described in **Section E.2.4.2.4 and E.2.5.2.4**.

## E.2.4 AMPHIPOD BIOASSAY

### *E.2.4.1 Methods*

The amphipod bioassay appeared to be conducted in accordance with the methods specified in the PSEP protocols (1995). No deviations from the specified protocols were documented.

### *E.2.4.2 Results*

#### E.2.4.2.1 Test Conditions

Test conditions for the amphipod bioassays were generally within the PSEP-specified ranges described in the Phase 2 SAP Addendum (WESTON, 1996), with the following minor deviations:

- The salinity of the overlying water (30 ppt) for sample A250 (Station EB104) exceeded the specified test condition (28 ± 1 ppt) by 1 ppt on the second day of the test. Subsequently, the salinity was adjusted to 28 ppt through the addition of 20 mL of deionized water.
- The salinity of the overlying water (30 ppt) for all samples exceeded the specified test condition (28 ± 1 ppt) by 1 ppt on the fifth day of the test. Subsequently, all salinities were adjusted to 28 ppt through the addition of 20 mL of deionized water per test chamber.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- The salinity of the overlying water (30 ppt) for samples A265 (Station CARR), A210 (Station EB49), A245 (Station EB87), A255 (Station EB106), and A2546 (BK03) exceeded the specified test condition (28 ± 1 ppt) by 1 ppt on the eighth day of the test. Subsequently, all salinities were adjusted to 28 ppt through the addition of 20 mL of deionized water per test chamber.

None of the above deviations are considered to be significant with respect to potential impacts to test results. Review of the ammonia and sulfide data for all samples also did not suggest any potential deleterious effects from these substances, with total ammonia values ranging from <0.01 to 2.2 mg/L and sulfide from <0.003 to 0.005 mg/L. A median total ammonia $LC_{50}$ for *A. abdita* has been reported as 49.8 mg/L total ammonia (Kohn et al., 1994).

E.2.4.2.2 Negative Control Performance

The negative control exhibited a mean mortality of 9 percent and individual replicate mortalities no greater than 20 percent, thereby meeting the specified performance criterion.

E.2.4.2.3 Positive Control Performance

The calculated $LC_{50}$ for the reference toxicant test was 0.50 ± 0.07 mg/L cadmium, which was within the laboratory's control limits of 0.19 to 0.89 mg/L and corresponded with the $LC_{50}$ reported by PSEP for *A. abdita*.

E.2.4.2.4 Reference Sediment Performance

None of the three reference sediments tested met the specified performance criterion. Average mortalities for the reference sediments ranged from 36 percent (Carr Inlet ) to 68 percent (Magnolia), thereby exceeding the performance standard by 11 to 43 percent.

E.2.4.2.5 Data Transcription and Endpoint Calculation

A 100 percent quality assurance (QA) check of data transcription from the laboratory raw data sheets to summary tables was performed; no errors were observed. A 100 percent QA check of all calculated endpoints presented in the summary tables was also conducted; with the exception of standard deviation results presented as "population" rather than "sample" statistics, no errors were noted. Any statistical evaluations of the amphipod endpoint that require the use of a standard deviation term will be based on the "sample" statistic.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## E.2.5 ECHINODERM LARVAL BIOASSAY

### *E.2.5.1 Methods*

The echinoderm bioassay appeared to be conducted in accordance with the methods specified in the PSEP protocols (1995). No deviations from the specified protocols were documented.

### *E.2.5.2 Results*

#### E.2.5.2.1 Test Conditions

Test conditions for the echinoderm larval bioassays were generally within the PSEP-specified ranges described in the Phase 2 SAP Addendum (WESTON, 1996), with the following minor deviation:

- The salinity of the overlying water (30 ppt) for all samples exceeded the specified test condition (28 ± 1 ppt) by 1 ppt on the second and final day of the test.

These deviations are not considered to be significant with respect to potential impacts to test results.

Review of the ammonia and sulfide data for overlying water for all samples also did not suggest any potential deleterious effects from these substances, with total ammonia values ranging from <0.01 to 0.18 mg/L and sulfide not detected (i.e., <0.003 mg/L). The total ammonia values were converted to unionized ammonia using an equation based on temperature, pH, and salinity (as reported by the Washington State Department of Ecology Environmental Investigation and Lab Services Program for NPDES permitting) for comparison with the proposed testing criterion of 0.014 mg/L unionized ammonia and false positive threshold of 0.04 mg/L unionized ammonia (PSEP, 1995). Detected concentrations of unionized ammonia in test sediments ranged from 0.0001 to 0.0013 mg/L, which did not exceed the proposed criteria.

#### E.2.5.2.2 Negative Control Performance

The negative control exhibited a mean effective mortality (i.e., mortality plus abnormality) of 19.1 percent, thereby meeting the specified performance criterion.

#### E.2.5.2.3 Positive Control Performance

The calculated $EC_{50}$ for the reference toxicant test was 8.71 mg/L cadmium, which was within the laboratory's control limits of 2.2 to 15.6 mg/L and the $EC_{50}$ range reported by PSEP for *D. excentricus*.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

E.2.5.2.4 Reference Sediment Performance

None of the three reference sediments tested met the specified performance criterion. Average effective mortalities for the reference sediments ranged from 37 percent (Carr Inlet) to 75 percent (Magnolia). The sediments from Carr Inlet exceeded the performance standard by only 2 percent; the Alki and Magnolia reference sediments exceeded the performance criterion by 29 and 40 percent, respectively.

E.2.5.2.5 Data Transcription and Endpoint Calculation

A 100 percent QA check of data transcription from the laboratory raw data sheets to summary tables was performed; no errors were observed. A 100 percent QA check of all calculated endpoints presented in the summary tables was also conducted and no errors were noted.

Negative effective mortality was observed for some replicates, specifically:

- Station EB49 (Sample 96382526): replicates E206, E209, and E210 (all test chambers).
- Station EB60 (Sample 96382529): replicates E211 (both test chambers), E213 (test chamber 2), and E214 (test chamber 1).
- Station EB77 (Sample 96382533): replicates E221 and E224 (all test chambers).
- Station EB80 (Sample 96382534): replicate E226 (both test chambers).
- Station EB85 (Sample 96382535): replicate E231 (test chamber 1).
- Station EB106 (Sample 96382543): replicate E246 (test chamber 2).

Negative effective mortality occurs when the number of normal surviving embryos in the test chamber at the end of the test exceeds the number of normal embryos anticipated to be present based on the final seawater control count of normal embryos. The data therefore suggest either inaccurate control counts or over-inoculation of some test sediment chambers. Inaccurate control counts could bias the data in either direction (i.e., either over- or under-estimate toxicity); over-inoculation could result in an under-estimate of toxicity. For the purposes of calculating average effective mortality results for each station, all negative effective mortality results were treated as zero.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## E.2.6 QUALITY ASSURANCE SUMMARY

The test conditions and negative and positive control results for the amphipod and echinoderm larval bioassays indicated that all results are valid and generally of high quality. It is unlikely that the minor deviations in salinity that occurred over the course of the tests had any impact on the bioassay results. The echinoderm larval data for stations with replicates exhibiting negative effective mortality are useable, but should be qualified as the results may represent over- or under-estimates of toxicity.

The failure of the reference sediments to meet performance criteria for either bioassay is unclear, given the observed test conditions and that positive and negative control responses were within specified limits. *A. abdita* is reportedly tolerant of a wide range of grain sizes (Ecology, 1995), and although the reference sediments were relatively coarse-grained, none of the samples tested contained more than 20 percent gravel, above which a grain size reference sediment is suggested to evaluate nontreatment effects (PSEP, 1995). In addition, the failure of these reference sediments to meet the performance criterion specified for the echinoderm larval test, for which grain size effects do not appear to be at issue unless testing sediments with relatively high percent fines (PSEP, 1995), would suggest some other cause(s).

Further review of additional test-related parameters, such as water quality measurements of ammonia and sulfide and laboratory chemical results for the background stations, were inconclusive in identifying any factors that may have contributed to the reference sediment failures. Per Ecology (1997) guidance, it is acceptable to substitute control data (that meet control performance standards) for failed reference samples.

## E.2.7 REFERENCES

Ecology (Washington State Department of Ecology). 1997. Selection of Negative Control Sediments and Use of Control Sediments as Reference Sediments. Review Draft. DMMP Clarification Paper/SMS Draft Technical Information Memorandum. Submitted at 1997 SMARM. 1 April.

Ecology. 1995. Review of Sediment Management Standards Bioassay Protocols. Publication No. 95-318. Produced for Ecology's Environmental Review/Sediment Section by M. Stinson, Environmental Investigations and Laboratory Services Program, Olympia, WA. 1995.

Kohn, N.P., J.Q. Word, D.K. Niyogi, L.T. Ross, T. Dillion, and D.W. Moore. 1994. Acute Toxicity of Ammonia to Four Species of Marine Amphipod. Marine Environmental Research 38 (1994), p. 1-15.

PSEP (Puget Sound Estuary Program). 1995. Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments. Prepared for U.S. Environmental Protection

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Agency, Region X, Office of Puget Sound, Seattle, WA and Puget Sound Water Quality Authority, Olympia, WA. Revised July.

WESTON (Roy F. Weston, Inc.). 1996. Sampling and Analysis Plan, Draft Phase 2 Addendum, Pacific Sound Resources (PSR) Offshore Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. August.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# APPENDIX E.2

# SURFACE SEDIMENT LABORATORY CLAM GROWTH BIOASSAY AND BIOACCUMULATION STUDY

# APPENDIX E.2

# DATA VALIDATION REPORT FOR PSR MARINE SEDIMENTS UNIT SURFACE SEDIMENT LABORATORY CLAM GROWTH BIOASSAY AND BIOACCUMULATION STUDY

## E.2.1 INTRODUCTION

Data for the 28-day clam (*Macoma nasuta*) growth bioassay and tissue bioaccumulation study conducted by Parametrix, Inc. for WESTON were reviewed by WESTON to (1) ensure that the test was conducted in accordance with guidance provided by the PSDDA program, which is based on the draft Inland Testing Manual (EPA and DOA, 1994) and EPA guidance for conducting bedded sediment bioassays (1993), as well as laboratory standard operating procedures (SOPs), and (2) evaluate the overall validity and usefulness of the test results. The clam bioassay and bioaccumulation study was conducted on 11 surface (0 to 10 cm) sediment samples collected during the Phase 2 investigations of the PSR MSU.

Parametrix provided a complete summary report of the bioassay results, including copies of the following:

- Description of methods and materials, including summarized test conditions.
- Summary tables of test results.
- Summary tables of ammonia (total) and sulfide data.
- Test setup records.
- Daily water quality monitoring records.
- Daily clam survival records.
- Initial and final length and weight measurements for each test organism.
- Sediment chain-of-custody forms.
- Laboratory analysis records for ammonia (total) and sulfide.

WESTON personnel (N. Musgrove) conducted an informal on-site audit of Parametrix's laboratory facility on 4 October 1996. See **Appendix E.2, Surface Sediment Laboratory Acute Toxicity Tests (Section E.2.1)** for results.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

After completion of the growth bioassay, surviving clams were shucked and body tissues homogenized (by station) for chemical analyses. In accordance with the Sampling and Analysis Plan (SAP) Phase 2 Addendum (WESTON, 1996), surviving clams were not purged prior to shucking. On 6 November 1996, homogenized tissue samples were submitted to the following laboratories for chemical analyses:

- EPA Manchester Environmental Laboratory—metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and percent lipids.
- Maxim Technologies—dioxins/furans.

Validation of all chemical data was performed by EPA. A quality assurance summary of these chemical data is provided in **Appendix E, Section E.1 (Phase 2 Sediment and Tissue Data Validation Report)**.

## E.2.2 INVESTIGATION DESIGN

As part of the Phase 2 field investigations, a total of 11 surface sediment samples was collected by WESTON between 18 and 21 September 1996 for the clam toxicity and bioaccumulation study. Of the 11 samples, two were collected from Elliott Bay (offshore of Magnolia and Alki beach) to represent background or reference conditions for comparisons with site data. With the exception of Carr Inlet, which was not sampled for the growth and bioaccumulation study, the samples collected for the clam study were co-located with those selected for the acute bioassays (see Appendix E, Section E.2, Surface Sediment Laboratory Acute Toxicity Tests).

## E.2.3 TEST CONDITIONS

The clam bioassay and bioaccumulation test was initiated on 3 October 1996, thereby meeting the 14 day sediment holding time for all samples except the one collected on 18 September (Sample 96382526), which exceeded the holding time by one day. This slight exceedance is not anticipated to have affected the overall quality of the data for that sample. In addition, the laboratory holding time specified for the test organisms (4 to 14 days) was also met, as the clam specimens were collected by A.K. Siewers from Elkhorn Slough in Monterey, California on 28 and 29 September 1996.

In accordance with EPA guidance (1993), water quality measurements (i.e., pH, dissolved oxygen, salinity, and temperature) were conducted daily and interstitial salinity was measured at the beginning of the test. Although sulfide and ammonia analyses were optional, these parameters were measured every seven days. Water quality conditions were also monitored during test organism transport and holding to ensure that test specimens were not unduly stressed prior to test initiation. Results of the comparisons of the measured conditions in PSR test

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

samples with the water quality performance standards specified in the SAP Phase 2 Addendum (WESTON, 1996) are described in **Section E.2.6.1.**

## E.2.4 CONTROL AND REFERENCE SEDIMENT

PSDDA guidance (EPA and DOA, 1994) specifies the use of a negative control and concurrent testing of reference sediment.

### *E.2.4.1 Negative Controls*

Negative controls consist of clean sediment collected outside of a given study area. The observed responses in the controls are used to assess the relative health of the test organisms and the exposure system (e.g., mortality of control organisms would suggest initially stressed organisms, contamination in the system, or unacceptable control sediment). The concentrations of contaminants measured in tissues of clams exposed to control sediment provide a measure of "global background" contamination, as well as a means of assessing the overall acceptability of the specimens selected for testing (EPA, 1993). The negative control for the clam growth and bioaccumulation study consisted of sediment collected by A.K. Siewers from Elkhorn Slough in Monterey County, California, which was also the location at which the test organisms were collected.

The performance criterion for negative controls was specified as follows:

- Mean mortality < 10 percent.

The performance of the PSR negative controls relative to this criterion is described in **Section E.2.6.2.**

### *E.2.4.2 Reference Sediment*

As described in **Section E.2.2**, reference or background sediment was collected from two locations identified as BK01 (Magnolia) and BK03 (Alki). The background stations were selected to match as closely as possible the range of sediment physical characteristics (e.g., grain size) at site stations to control for any potential effects due to physical rather than chemical differences.

The performance criterion for reference sediments was specified as follows:

- Mean mortality < 10 percent.

The performance of the PSR reference sediments relative to this criterion is described in **Section E.2.6.3.**

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## E.2.5 TEST ORGANISM ACCEPTABILITY

EPA guidance (1993) specifies several criteria for test organism acceptability, including size requirements, mortality limits during holding, and control clam tissue concentrations below area background.

### *E.2.5.1 Size Requirements*

As specified in the EPA guidance document (1993), the length of the largest clam should be no greater than 1.5 times larger than the smallest clam. In addition, the clams should be no larger than 10 grams at test initiation (Boese, 1995). This size limit ensures that the clams are in a growth phase and will potentially bioaccumulate contaminants during the 28-day test. The results of the comparisons of the PSR test organisms with these size requirements are provided in **Section E.2.6.4.1.**

### *E.2.5.2 Mortality Limits During Holding*

No more than 3 percent mortality of test organisms is permitted within 48 hours prior to test initiation (ASTM, 1984). The performance of the test organisms during the laboratory holding period is described in **Section E.2.6.4.2.**

### *E.2.5.3 Control Tissue Concentrations*

The concentrations of contaminants in control clam tissues are used as an indicator of test organism acceptability (EPA, 1993). Concentrations of contaminants measured in control tissues are compared with representative values for Puget Sound (as provided in EPA, 1993) to determine organism acceptability. If contaminants are measured in control tissues at concentrations exceeding these "background" values, the results for those chemicals must be flagged and concentrations of those same contaminants as measured in clams exposed to site-related sediments must then be interpreted in light of the control concentrations. The results of the comparisons of control tissue contaminant concentrations with Puget Sound values are provided in **Section E.2.6.4.3.**

## E.2.6 TESTING METHODS

The clam bioassay and bioaccumulation test appeared to be conducted in accordance with the guidance provided by the Puget Sound Dredge Disposal Analysis (PSDDA) program (EPA and DOA, 1994). A minor deviation in the recommended sediment depths for testing was observed, but was not anticipated to have affected overall data quality. Specifically, test sediment should be at least 2 cm and preferably 3 to 5 cm in depth to allow the organisms to bury; Parametrix conducted the test using 7 cm of sediment per beaker.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## E.2.7 TEST RESULTS

### *E.2.7.1 Test Conditions*

All water quality measurements were within acceptable ranges.

### *E.2.7.2 Negative Control Performance*

The negative control exhibited a mean mortality of 2 percent, thereby meeting the specified performance criterion.

### *E.2.7.3 Reference Sediment Performance*

No mortalities were observed in clams exposed to reference sediments, thereby meeting the specified performance criterion.

### *E.2.7.4 Organism Acceptability*

#### E.2.7.4.1 Size Requirements

Review of the laboratory data sheets indicated that clams tested in nearly 30 percent of the test tanks exceeded the length requirement (i.e., the length of the largest clam was greater than 1.5 times the length of the smallest clam). These exceedances were documented as follows:

- Control: tanks 8 and 15.
- BK01 (Sample 96382545): tank 7.
- BK03 (Sample 96382546): tank 18.
- EB49 (Sample 96382526): tank 32.
- EB60 (Sample 96382529): tank 34.
- EB67 (Sample 96382531): tank 16.
- EB77 (Sample 96382533): tanks 22 and 26.
- EB104 (Sample 96382541): tank 3.

The clam length ratios for these tanks ranged from 1.52 to 1.59.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Approximately 10 percent of the clams used by Parametrix exceeded the EPA recommended size; the average weight of organisms exceeding 10 grams was 11.3 grams. Test organisms exceeding the recommended 10 gram limit were present in 78 percent of the tanks used in the bioaccumulation test. These exceedances were documented as follows:

- Control: tanks 8 and 15.
- BK01 (Sample 96382545): tanks 7 and 11.
- BK04 (Sample 96382546): tanks 13 and 18.
- EB49 (Sample 96382526): tanks 12, 24, and 32.
- EB60 (Sample 96382529): tanks 28 and 34.
- EB67 (Sample 96382531): tank 2 and 16.
- EB77 (Sample 96382533): tanks 4, 22, and 26.
- EB80 (Sample 96382534): tanks 9, 20, and 31.
- EB85 (Sample 96382535): tanks 33 and 36.
- EB87 (Sample 96382537): tanks 1, 10, and 35.
- EB104 (Sample 96382541): tanks 3, 21, and 19.
- EB106 (Sample 96382543): tank 27.

Given that a majority of test organisms exhibited weight loss over the duration of the exposure period, the exceedances in clam weights for a relatively small proportion of the test organisms does not appear to be the sole contributor to the observed negative growth rate results. Rather than the test organisms not being in a growth phase, it is possible that the clams closed-up and did not feed in response to environmental stressors (e.g., measured or unmeasured chemicals or other environmental stressors within the test sediments). However, given the low mortality rates (i.e., no more than two percent or one clam per station), it is unlikely that the organisms were highly stressed.

E.2.7.4.2 Mortality Limits During Holding

Mortalities during holding did not exceed the performance criterion; only 3 of the 1,000 test organisms (0.003 percent) received from A.K. Siewers died during holding (Henderson, personal communication, 1997).

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

E.2.7.4.3 Control Tissue Concentrations

Contaminants of concern were not detected in the PSR control clam tissues; however, comparisons of detection limits with the Puget Sound "representative" tissue concentrations (as presented in EPA, 1993) indicated that some control sample detection limits were slightly elevated above the Puget Sound values, as follows:

- The detection limit for individual PAHs in control tissues was 26.4 µg/kg; Puget Sound representative values for individual and total PAHs range from <0.05 to 17 µg/kg.

- The detection limit for PCBs in control tissues was 10 µg/kg; Puget Sound representative values for PCBs range from <2 to 10 µg/kg.

Given these minor differences, no impacts to overall data usability or interpretation are anticipated.

E.2.7.4.4 Data Transcription and Endpoint Calculation

A 100 percent quality assurance (QA) check of data transcription from the laboratory raw data sheets to the summary tables was performed. Only one transcription error was observed, as follows:

- EB80 (Sample 96382534), Tank 31—The time final weights for replicates 18 and 19 appear to have been transcribed incorrectly (i.e., reversed). Consequently, the correct weight growth rate for Replicate 18 equals 0 mg/ind-day (rather than 0.171 mg/ind-day), and the weight growth rate for Replicate 19 equals -0.004 mg/ind/day (rather than -0.175 mg/ind/day).

A 100 percent QA check of all calculated endpoints presented in the summary tables was also conducted. Only one statistical error was observed, as follows:

- EB77 (Sample 96382533)—The mean weight growth rate was incorrectly reported as -0.001; the corrected mean growth rate for this station is -0.002.

All evaluations of the clam growth rate data will be conducted based on the corrected values.

## E.2.8 QUALITY ASSURANCE SUMMARY

The test conditions, negative control, and reference sediment results for the clam bioaccumulation test indicated that all results are valid and generally of high quality. It is unlikely that the minor test deviations in holding times and exceedances of the clam length and weight performance criteria had any significant impact on the bioassay results. Because

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

detection limits for contaminants of concern in control samples were slightly higher than Puget Sound representative values (as cited in EPA, 1993), it is possible that some contaminants could have been present in the control samples at concentrations slightly higher than Puget Sound values. However, given the minor differences in detection limits versus Puget Sound data, no impacts to overall data usability are anticipated.

## E.2.9 REFERENCES

ASTM. 1994. Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs. ASTM, Philadelphia, PA.

Boese, B. 1995. Bioaccumulation Team, U.S. Environmental Protection Agency, Newport, Oregon. Personal communication with L. Saban, Roy F. Weston, Inc., Seattle, WA. 2 February.

Henderson, D. 1997. Project Manager, Parametrix Inc., Kirkland, WA. Personal communication with R. Sturim, Roy F. Weston, Inc., Seattle, WA. 2 January.

EPA (U.S. Environmental Protection Agency). 1993. Guidance Manual: Bedded Sediment Bioaccumulation Tests. EPA/600/R-93/183.

EPA and DOE (U.S. Environmental Protection Agency and Department of the Army). 1994. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Draft Testing Manual (Inland Testing Manual). U.S. EPA, Office of Water, Office of Science and Technology, Washington, D.C. and Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. June.

WESTON (Roy F. Weston, Inc.). 1996. Sampling and Analysis Plan Phase 2 Addendum, Pacific Sound Resources (PSR), Offshore Sediments Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. November.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# APPENDIX E.2

# BENTHIC INFAUNAL DATA

# APPENDIX E.2

# DATA VALIDATION REPORT FOR PSR MARINE SEDIMENTS UNIT BENTHIC INFAUNAL DATA

## E.2.1 INTRODUCTION

Benthic infaunal enumeration and taxonomic identification data provided to WESTON by Marine Taxonomic Services, Ltd. were reviewed by WESTON to (1) ensure that all sorting and taxonomic identification QA/QC procedures were conducted in accordance with PSEP protocols (Tetra Tech, 1987) and (2) evaluate the overall validity and usefulness of the benthic results. Benthic infaunal samples were collected from 11 stations during the Phase 2 investigations of the PSR MSU.

Marine Taxonomic Services provided electronic and hard-copy raw and summarized benthic data, including copies of the following:

- Invertebrate species checklist, documenting all species collected in the site and reference samples.
- Sorting QA report, documenting counts for all QA/QC re-sorts and whether re-sorts met the recommended removal criterion.
- Bulk sample QA report, documenting the taxonomic re-identification of a subset of samples.
- Voucher collection report, identifying those species that were retained as part of the reference collection.
- Voucher collection QA report, verifying the taxonomic identifications and any resulting changes to the database.
- Replicate species-level data, organized by station and major taxonomic group.

## E.2.2 INVESTIGATION DESIGN

As part of the Phase 2 field investigations, a total of 11 stations were sampled for sediment by WESTON and Biomarine Enterprises between 12 and 21 September 1996 for benthic infaunal analysis. Of the 11 stations, two were collected from Elliott Bay (offshore of Magnolia and Alki beach) to represent background or reference conditions for comparison with site data. Five replicates were collected at each station for benthic analysis, for a total of 55 samples. The samples collected for the benthic evaluation were co-located with those selected for the laboratory acute and chronic bioassays.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## E.2.3 SAMPLE PROCESSING PROCEDURES

### *E.2.3.1 Sample Sorting*

PSEP protocol recommends that at least 20 percent of each sample be re-sorted for QA/QC purposes. Re-sorting is defined in the PSEP protocol as the examination of a sample or subsample that has been sorted once and is considered free of organisms; this re-sorting is to be conducted by an individual other than the one who sorted the original sample. If more than 5 percent of the organisms in a given sample are missed by the original sorter (i.e., a 95 percent removal criterion is not met), then PSEP recommends that the sample be re-sorted.

### *E.2.3.2 Taxonomic Identification*

In accordance with PSEP protocol, identifications should be to the lowest taxonomic level possible, and each species identification should be checked against a reference specimen from a verified reference collection. PSEP protocol also recommends that 5 percent of all samples identified by one taxonomist be re-identified by another taxonomist who is also qualified to identify organisms in that major taxonomic group. According to PSEP protocol, species identifications by each taxonomist can reasonably be expected to be accurate for at least 95 percent of the total number of species.

## E.2.4 REPORTING

In accordance with PSEP protocol, data for each replicate sample should be reported as numbers of individuals per sample.

## E.2.5 SAMPLING RESULTS

### *E.2.5.1 Sorting Efficiency*

Review of the sorting QA report indicated that all sample re-sorts met the criterion of 95 percent removal; therefore, no additional re-sorting was required. It should be noted that the values presented as in the sorting QA report as "Total # of Org. Found" were based on sorters' estimates and do not reflect the confirmed counts of the taxonomists (i.e., these values do not represent final replicate abundances).

## E.2.6 Taxonomic Verification

Species identifications were conducted by the following expert taxonomists:

- Polychaetes: Howard Jones; verified by R. Eugene Ruff.
- Molluscs: Susan Weeks; verified by Alan Fukiyama.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

- Crustaceans: Don Cadien; verified by Tony Phillips.
- Miscellaneous taxa: F. Scott McEuen.

As part of the taxonomic QA process, three samples initially identified by each taxonomist were re-identified by another taxonomist, except for miscellaneous taxa, for which no other qualified taxonomist was available for verification. Given that each taxonomist identified a total of 11 samples (one major taxa group per station sampled), the re-identification of three samples per taxonomist exceeded the PSEP-recommended minimum re-identification rate of 5 percent.

Review of the voucher collection QA report indicated that the individual taxonomists has species identification accuracy rates as follows:

- Susan Weeks [molluscs] - 93 percent.
- Howard Jones [polychaetes] - 94 percent.
- Don Cadien [crustaceans] - 100 percent.

The accuracy rates for the mollusc and polychaete identifications were slightly below the 95 percent accuracy rate identified as possible in the PSEP protocols. However, given the overall results, the species-level identifications were considered to be accurate and the resulting data of high quality and reliable for use.

Further review of the voucher collection QA report indicated that a subset of the "global changes," which indicate those species IDs that should be changed throughout the data set based on the results of the taxonomic verifications, were not performed within the electronic database. Clarification regarding the required changes was provided by Howard Jones of Marine Taxonomic Services (Jones, 1997), as follows:

- *Aphelochaeta* sp. 2 was to have been globally changed to *Cirratulidae* sp. Indet.; samples 2537E (EB87, Rep. E) and 2545D (BK01, Rep. D) therefore require this additional change in the database.
- The global change of *Isocirrus longiceps* to *Euclymeninae* sp. Juv. was incorrectly represented in the QA report; this change was to have been a local change only [i.e., changed only for sample 2545A (BK01, Rep. A)]; no additional revisions to the database required.
- The global change of *Lepidasthenia berkeleyae* to *Lepidasthenia longicirrata* was incorrectly represented in the QA report; this change was to have been a local change

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

only [i.e., changed only for sample 2545A (BK01, Rep. A)]; no additional revisions to the databased required.

- *Praxillella* sp. Indet. was to have been globally changed to *Praxillella pacifica*; samples 2529C (EB60, Rep. C) and 2533D (EB77, Rep. D) therefore require this additional change in the database.

All other species ID changes indicated in the voucher collection QA report to have occurred were confirmed as part of WESTON's validation.

### *E.2.6.1 Reporting*

As required, species-level data were reported as numbers of individuals per replicate. Replicate and station-specific total and major taxonomic group abundance and richness were calculated using the data provided in the electronic deliverable. Of note, the calculated abundance values differed slightly from those presented in the Phase 2 Technical Memorandum (WESTON, 1997a) as a result of final verification of all species present.

## E.2.7 QUALITY ASSURANCE SUMMARY

The overall accuracy of sample sorting and species identifications indicated that the data are valid and of high quality for use. Only minor errors were noted regarding species IDs that should have been changed in the original database; these errors were subsequently corrected and are reflected in the raw data presented in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**).

## E.2.8 SUITABILITY OF BACKGROUND STATIONS FOR COMPARISONS WITH SITE DATA

The chemical, physical, and biological data collected from the two Elliott Bay background stations sampled for benthic infauna [Magnolia (BK01) and Alki (BK04)] were reviewed to determine the suitability of these background stations for use in the comparisons with site-related benthic data. The evaluation included comparisons of background station chemical data with SMS chemical criteria, and habitat characteristics (e.g., grain size) and community structure information (e.g., major taxa and species-level abundance and richness data and classification results) with similar data collected from benthic sampling locations in the MSU.

### *E.2.8.1 Chemical Results*

Results of the chemical sampling at the two Elliott Bay background locations indicated that polychlorinated biphenyls (PCBs) were the only contaminant present at a concentration exceeding its sediment quality standards (SQS) chemical criterion, occurring in the sample collected at the Alki background location (BK04). However, it was considered unlikely that the

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

composition of the benthic community at this background area was influenced by the measured PCB concentration (28,000 µg/kg total organic carbon [TOC]), as the detected value was substantially lower than the apparent effects threshold (AET) for PCBs as set by benthos (65,000 µg/kg TOC). Therefore, both Elliott Bay background stations appeared to be suitable for comparisons with MSU stations based on sediment chemical results alone.

### *E.2.8.2 Habitat Characteristics*

Habitat characteristics, such as water depth and sediment grain size and TOC content, can strongly influence benthic community structure. Recent work conducted by WESTON and Striplin Environmental Associates (**SEA, 1996**) has suggested that of these factors, grain size (as measured by percent fines or the fraction of silts plus clays) is the main factor influencing benthic community composition. Water depth and TOC tend to be strongly correlated with grain size, but appear to have less overall influence. Based on this information, WESTON focused on evaluating the similarities in substrate composition among the two Elliott Bay background stations and the MSUs stations as a primary means of determining the suitability of either of the background area for site-specific comparisons. A summary of the percent fines data for each of the stations evaluated, as well as TOC and station depth, are provided in **Table E-1**.

Substrates at the Magnolia background station (BK01) were primarily composed of sands, with only 9 percent fine-grained material. The Alki background station (BK04) was more fine-grained, at 21 percent silt and clay. Although lower in fines content than the MSU stations (which ranged from 27 to 73 percent fines), the Alki background station was a closer match to the site than the Magnolia station. Further review of the grain size distributions of these samples indicated that the Magnolia background location was characterized by a higher relative proportion of medium to coarse sands (43 percent) than the Alki background station, as well as the majority of the MSU benthic sampling locations. Based on these data, it was determined that the Alki background station represented the best match to the MSU, and should therefore be used in all direct comparisons of benthic infaunal data.

### *E.2.8.3 Benthic Community Composition*

To further support the selection of background station BK04 as appropriate for comparisons with site-related data, the composition of the benthic community at this location was compared with both BK01 and the MSU benthic sampling stations. Community metrics evaluated included abundance, richness, presence of sensitive taxa, and classification analyses [data are located in the Ecological and Human Health Risk Assessment Technical Memorandum (**Appendix K**)].

The total abundance of organisms collected at BK04 was slightly lower than the value observed at the other background station, as well as the MSU stations; however, total richness at background station BK04 was within the range of that observed at the PSR site. Based on relative total abundance of the major taxonomic groups (crustaceans, molluscs, and polychaetes),

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

background station BK04 was very similar to the site stations, all of which were relatively dissimilar from background Station BK01. Higher abundances of sensitive taxa were present at both background stations than at the MSU stations, but the classification analyses indicated that station BK04 was a better match with the site than BK01, at 61 percent similarity as opposed to only 35 percent similarity. These results further supported the selection of Elliott Bay background station BK04 as the most suitable for comparison with the site.

## E.2.9 REFERENCES

Jones, H. 1997. Marine Taxonomic Services, Ltd., Newport, OR. Personal Communication with D. Hughes, Roy F. Weston, Inc., Seattle, WA. 10 June.

SEA (Striplin Environmental Associates, Inc). 1996. Development of Reference Value Ranges for Benthic Infauna Assessment Endpoints in Puget Sound. Final Report. Prepared for Washington State Department of Ecology, Sediment Management Unit, Olympia, WA. 30 January.

Tetra Tech. 1987. Recommended Protocols for Sampling and Analyzing Subtidal Benthic Macroinvertebrate Assemblages in Puget Sound. Final Report TC 3991-04. Prepared for U.S. Environmental Protection Agency Region X, Office of Puget Sound, Seattle, WA. Tetra Tech, Inc., Bellevue, WA. January.

WESTON. 1997a. Phase 2 Technical Memorandum, Pacific Sound Resources (PSR), Marine Sediments Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, Washington. Roy F. Weston, Inc., Seattle, WA. April.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Table E-1—Habitat Characteristics at Marine Sediments Unit and Elliott Bay Background Benthic Sampling Locations**

| Station | Fines Content (%) | TOC Content (%) | Depth (m MLLW) |
|---|---|---|---|
| **Elliott Bay Background** | | | |
| BK01 (Magnolia) | 9 | 2.4 | -60 |
| BK04 (Alki) | 21 | 0.7 | -55 |
| **Marine Sediments Unit** | | | |
| EB49 | 73 | 2.2 | -13 |
| EB60 | 46 | 1.2 | -38 |
| EB67 | 43 | 1.7 | -52 |
| EB77 | 28 | 1.5 | -46 |
| EB80 | 46 | 2.2 | -61 |
| EB85 | 27 | 1.8 | -50 |
| EB87 | 45 | 2.2 | -16 |
| EB104 | 39 | 2.2 | -31 |
| EB106 | 63 | 1.3 | -13 |

# APPENDIX F

# SEDIMENT CHEMICAL DATA SCREENING PROCEDURES

# APPENDIX F

# SEDIMENT CHEMICAL DATA SCREENING PROCEDURES

## F.1 COMPARISONS WITH SEDIMENT EFFECTS-BASED CHEMICAL CRITERIA

### F.1.1 Normalization to TOC Content

Sediment chemical data were initially compared with Washington State Sediment Management Standard (SMS) Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) chemical criteria, when available, to evaluate the nature and extent of contaminated sediment. For comparisons to the state standards, all nonionic/nonpolar organic chemicals must be normalized to percent total organic carbon (TOC) content. This normalization is conducted by dividing the dry-weight concentration of a given chemical by the decimal fraction of TOC measured in the sample. However, the SMS TOC-normalized criteria are generally only effective at predicting adverse effects in sediments with TOC content greater than 0.5 percent. Also, in cases where high TOC (greater than 3 to 4 percent) may be due to some anthropogenic contribution (e.g., oils, organic sludges, or wood debris), TOC normalization may not be appropriate. Because wood debris and petroleum products were observed in some sediment samples collected during the RI activities, TOC content was reviewed on a sample-by-sample basis to determine the appropriateness of normalizing the organic data.

The results of this review suggested that samples with TOC content greater than 4 percent were potentially anthropogenically enriched. Therefore, concentrations of nonionic/nonpolar organic chemicals for these samples (as well as those with TOC content less than 0.5 percent) were compared with Apparent Effects Threshold (AET) criteria, which are the functional equivalent of the SQS and CSL chemical criteria, only they are expressed on a dry-weight basis. The lowest AET (LAET) was used as the equivalent of the SQS, and the second-lowest AET (2LAET) was used in place of the CSL. It is important to note that for regulatory purposes, TOC-normalized exceedances of SMS criteria (based on normalized data) take precedence over dry-weight exceedances of AET values, where both are available.

**Table F-1** provides a summary of those samples for which nonionic/nonpolar organic chemical results were compared with AETs based on station-specific TOC content outside the range appropriate for normalization. Nonionic/nonpolar organic chemical data for all other samples were compared with SMS TOC-normalized screening criteria.

### F.1.2 Calculation of Chemical Group Sums

In some cases, comparisons with the SMS and AET criteria required the calculation of group sums (i.e., total LPAHs, total HPAHs, total benzofluoranthenes, and total PCBs). In such cases, sums were calculated based on detected values only, or, if all group constituents were undetected,

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

the maximum detection limit among the individual compounds was selected as representative of the sum of the compounds. Other SMS requirements followed in the calculation of group sums included the following:

- Total LPAH was represented by the sum of the detected concentrations of acenapthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.

- Total HPAH was represented by the sum of the detected concentrations of benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, total benzofluoranthenes (sum of the "b," "j," and "k" isomers), chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene.

- Total PCB was represented by the sum of all detected PCB Aroclor mixtures (e.g., Aroclor 1254 plus Aroclor 1260).

### F.1.3 Treatment of Replicate Data

Where replicate sediment data were available, the maximum detected value (or detection limit, if undetected) in either sample was selected on a chemical-specific basis for presentation and screening. All TOC-normalization and compound totaling procedures occurred prior to this cropping of replicate values.

### F.1.4 Derivation of Exceedance Ratios

Following TOC-normalization (where appropriate) and all of the data treatment rules described above regarding compound totaling and treatment of non-detects, sediment exceedance ratios (ERs) of chemical criteria were calculated for discussing the magnitude of chemical concentrations. These ERs were derived by dividing the measured concentration of a given chemical by its CSL or 2LAET chemical criterion. Average chemical-specific ERs for surface and subsurface sediment intervals were also calculated using only ERs greater than 1.0 and are presented in the main body of the RI.

## F.2 COMPARISONS WITH BACKGROUND CONCENTRATIONS

SMS chemical criteria are not available for dioxins and furans; therefore, to preliminarily evaluate the extent of potential risks associated with exposures to these chemicals in surface sediments, comparisons with Elliott Bay background concentrations were conducted. Background screening levels for dioxins/furans [based on 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) equivalents, described below] were derived by averaging the detected values that were measured during Phase 1 and Phase 2 sampling at each of the background sampling stations. The site data were then compared with these average background concentrations to determine where exceedances of background values occurred.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

EPA's recommended toxicity equivalents approach for addressing potential risks associated with complex mixtures of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs and PCDFs) was used in the evaluation of the surface sediment dioxin and furan data. The approach is based on the use of toxicity equivalency factors (TEFs), which result in the expression of congener-specific concentrations in terms of 2,3,7,8-TCDD equivalents (**EPA 1989**). This approach required multiplying dioxin and furan congener concentrations by their respective TEFs and then summing the congener results to obtain the total 2,3,7,8-TCDD equivalents in each sample. For consistency with the approach to data summing used in the SMS, sums were calculated using detected values only. The TEFs used in the calculations are presented in **Table F-2**.

## F.3 REFERENCES

EPA (U.S. Environmental Protection Agency). 1989. Update of Toxicity Equivalency Factors (TEFs) for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs/CDFs). Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, D.C. February.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## Table F-1—Stations for which chemical data were compared with AETs

| Station | WESTON Sample ID | TOC (%) |
|---|---|---|
| **Surface Sediment** | | |
| EB04 | SD1-EB04-0000 | 0.47 |
| EB09 | SD1-EB09-0000 | 6.00 |
| EB13 | SD1-EB13-0000 | 7.50 |
| EB28 | SD1-EB28-0000 | 0.35 |
| EB34 | SD1-EB34-0000 | 4.20 |
| EB37 | SD1-EB37-0000 | 4.90 |
| EB94 | SD2-EB94-0000 | 0.33 |
| **Shallow Subsurface Sediment** | | |
| EB03 | SD2-EB03-0040-CC | 0.47 |
| EB12 | SD2-EB12-0040 | 7.10 |
| EB13 | SD2-EB13-0000A | 4.10 |
| EB27 | SD2-EB27-0160 | 0.34 |
| EB32 | SD2-EB32-0160 | 0.47 |
| EB41 | SD2-EB41-0040 | 0.48 |
| EB41 | SD2-EB41-0080 | 0.23 |
| EB42 | SD2-EB42-0040 | 0.30 |
| EB66 | SD2-EB66-0080 | 0.24 |
| EB66 | SD2-EB66-0120 | 0.21 |
| EB66 | SD2-EB66-0160 | 0.33 |
| EB113 | SD2-EB113-0000A | 12.00 |
| EB113 | SD2-EB113-0040 | 18.00 |
| EB15 | SD2-EB15-0080 | 0.38 |
| EB15 | SD2-EB15-0160 | 0.39 |
| EB49 | SD2-EB49-0120 | 0.26 |
| EB49 | SD2-EB49-0160 | 0.34 |
| EB72 | SD2-EB72-0080 | 0.31 |

## Table F-2—2,3,7,8-TCDD Toxicity Equivalency Factors (TEFs) for Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Dibenzofurans (PCDFs) (EPA 1989)

| Compound | TEF |
|---|---|
| **Dibenzodioxins** | |
| 2,3,7,8-TCDD | 1.00 |
| 1,2,3,7,8-PeCDD | 0.50 |
| 1,2,3,6,7,8-HxCDD | 0.10 |
| 1,2,3,7,8,9-HxCDD | 0.10 |
| 1,2,3,4,7,8-HxCDD | 0.10 |
| 1,2,3,4,6,7,8-HpCDD | 0.01 |
| 1,2,3,4,6,7,8,9-OCDD | 0.001 |
| **Dibenzofurans** | |
| 2,3,7,8-TCDF | 0.10 |
| 1,2,3,7,8-PeCDF | 0.05 |
| 2,3,4,7,8-PeCDF | 0.50 |
| 1,2,3,6,7,8-HxCDF | 0.10 |
| 1,2,3,7,8,9-HxCDF | 0.10 |
| 1,2,3,4,7,8-HxCDF | 0.10 |
| 2,3,4,6,7,8-HxCDF | 0.10 |
| 1,2,3,4,6,7,8-HpCDF | 0.01 |
| 1,2,3,4,7,8,9-HpCDF | 0.01 |
| 1,2,3,4,6,7,8,9-OCDF | 0.001 |

T: Tetra
Pe: Penta
Hx: Hexa
Hp: Hepta
O: Octa

# APPENDIX G

# PHASE 2 ARCHIVED SAMPLE AND PHASE 3 LABORATORY RESULTS

# APPENDIX G

# PHASE 2 ARCHIVED SAMPLE AND PHASE 3 LABORATORY RESULTS

## G.1 PHASE 2 ARCHIVED SAMPLE RESULTS

During the Phase 2 field investigation, a sediment reconnaissance effort was conducted to further define the outward extent of surface sediment chemical contamination in the Marine Sediments Unit. As part of the reconnaissance, surface sediment samples were collected from a number of locations predominantly seaward of the chemical exceedance area that had been previously defined using Phase 1 surface sediment chemical data; the collected samples were submitted for field rapid immunoassay screening of carcinogenic PAHs or archived for potential future laboratory analysis. In addition, the deepest subsurface sediment core intervals collected at approximately 50 percent of the coring stations sampled during the Phase 2 field effort were archived for potential future laboratory analysis, pending review of the chemical data for the shallower intervals.

Following completion of the Phase 2 surface and subsurface sediment chemical data evaluation conducted as part of the preparation of the Phase 2 Technical Memorandum (**WESTON 1997**), it was determined that a subset of these archived samples required laboratory analysis to further refine the areal and vertical extent of chemical contamination in the Marine Sediments Unit. Specifically, the following archived samples were submitted for laboratory analysis:

Surface (0 to 10 cm) Sediment Samples

| | |
|---|---|
| SD2-EB52-0000 | SD2-EB98-0000 |
| SD2-EB61-0000 | SD2-EB99-0000 |
| SD2-EB89-0000 | SD2-EB101-0000 |
| SD2-EB94-0000 | SD2-EB102-0000 |
| SD2-EB95-0000 | SD2-EB103-0000 |
| SD2-EB96-0000 | |

Shallow (0 to 20 feet bgs) Subsurface Sediment Core Samples

| | |
|---|---|
| SD2-EB15-0080 | (8 to 12 ft bgs interval) |
| SD2-EB15-0120 | (12 to 16 ft bgs interval) |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

SD2-EB15-0160 (16 to 20 ft bgs interval)

SD2-EB49-0120 (12 to 16 ft bgs interval)

SD2-EB49-0160 (16 to 20 ft bgs interval)

SD2-EB72-0080 (8 to 12 ft bgs interval)

Samples were submitted for laboratory total organic carbon (TOC) and polycyclic aromatic hydrocarbon (PAH) analyses. The field sample records documenting the Phase 2 sampling event are provided in **Appendix B**. Data validation and overall data quality are described in **Section 4** of the RI report and in **Appendix E (Section E.1)**. The following subsections provide detailed evaluations of the resulting chemical data; the sample-specific results of all laboratory analyses are included in the data summaries presented in **Appendix D**. In addition, the figures presented in **Section 5** of the RI and **Appendix H** include depictions of the archived Phase 2 surface sediment chemical results. The results of the analyses of archived subsurface sediment core intervals were incorporated into **Figures 5-15** and **5-16** in the RI report.

### G.1.1 Surface Sediment Results

#### *G.1.1.1 TOC*

The TOC content of the archived Phase 2 samples ranged from 0.33 to 1.4 percent, with the majority (82 percent) of these stations characterized by a TOC content between 1 and 2 percent. The measured TOC values were similar to those observed at nearby offshore stations. The one station characterized by a TOC content less than 0.5 percent (Station EB94) is located offshore of the former Lockheed property, and was the shallowest of the archived samples.

#### *G.1.1.2 PAHs*

LPAHs

Each of the individual LPAHs were detected in each of the 11 Phase 2 archived surface sediment samples that were submitted for analysis (**Table G-1**). Of these individual LPAHs, all except acenaphthylene and anthracene were detected at concentrations exceeding SQS or LAET chemical criteria; however, only naphthalene and acenaphthene were also detected at concentrations in excess of their respective CSL or 2LAET chemical criteria. The CSL exceedances were limited to stations EB89 and EB103, which are located northeast of the Upland Unit at depths between approximately -44 and -52 meters MLLW.

Concentrations of total LPAHs exceeded SQS or LAET criteria in 4 (36 percent) of the Phase 2 archived samples that were submitted for analysis (**Table G-1**): EB89, EB96, EB98, and EB103. The concentration measured at Station EB103 also exceeded the CSL chemical criterion for total LPAHs.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

HPAHs

Each of the individual HPAHs were detected in each of the 11 Phase 2 archived surface sediment samples that were submitted for analysis (**Table G-1**). Of these individual HPAHs, only fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene were detected at concentrations greater than their respective SQS or LAET chemical criteria, and except for fluoranthene, these exceedances all occurred in sediment collected from Station EB98 (located north of the Upland Unit at an approximate depth of -64 m MLLW). The SQS-based exceedance for fluoranthene was observed at Station EB103. None of the detected concentrations of individual HPAHs exceeded CSL or 2LAET chemical criteria.

Concentrations of total HPAHs exceeded SQS or LAET chemical criteria only in sediment collected from Station EB98; the total concentration measured at this location did not exceed CSL or 2LAET chemical criteria.

### G.1.2 Subsurface Sediment Results

*G.1.2.1 TOC*

Each of the archived Phase 2 shallow subsurface core samples was characterized by a TOC content of less than one percent, ranging from 0.26 to 0.72 percent. Lower TOC values in subsurface sediments (relative to surface sediments) were also observed in the sediment core samples that were initially analyzed during Phase 2.

*G.1.2.2 PAHs*

Individual LPAHs and HPAHs were detected in the archived Phase 2 shallow subsurface core samples submitted for analysis; however, these organic compounds were not observed at concentrations exceeding SMS or AET chemical screening values.

## G.2 PHASE 3 SAMPLE RESULTS

Following evaluation of the results of the archived Phase 2 surface sediment samples, it was determined that additional sampling was necessary to establish the outermost extent of PAH contamination in surface sediments associated with the Marine Sediments Unit. A third phase (Phase 3) of sampling was implemented and a total of 23 of the 31 surface sediment samples collected at Phase 3 locations were analyzed for TOC and SVOCs; the other 8 samples remain archived. The samples submitted for chemical analyses were as follows:

| | | |
|---|---|---|
| SD3-EB115-0000 | SD3-EB123-0000 | SD3-EB131-0000 |
| SD3-EB116-0000 | SD3-EB124-0000 | SD3-EB132-0000 |
| SD3-EB117-0000 | SD3-EB125-0000 | SD3-EB133-0000 |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | | |
|---|---|---|
| SD3-EB118-0000 | SD3-EB126-0000 | SD3-EB135-0000 |
| SD3-EB119-0000 | SD3-EB127-0000 | SD3-EB136-0000 |
| SD3-EB120-0000 | SD3-EB128-0000 | SD3-EB137-0000 |
| SD3-EB121-0000 | SD3-EB129-0000 | SD3-EB144-0000 |
| SD3-EB122-0000 | SD3-EB130-0000 | |

The field sample records documenting the Phase 3 sampling event are provided in **Appendix B**. Phase 3 station coordinates are summarized in **Table G-2**. Data validation and overall data quality are described in **Section 4** of the RI report and in **Appendix E (Section E.1)**. The following subsections provide detailed evaluations of the resulting chemical data; the sample-specific results of all laboratory analyses are included in the data summaries presented in **Appendix D**. In addition, the figures presented in **Section 5** of the RI and **Appendix H** include depictions of the Phase 3 surface sediment chemical results.

### G.2.1 TOC

The TOC content of the Phase 3 samples ranged from 0.76 to 2.8 percent, with the majority of these stations (87 percent) characterized by a TOC content between 0.5 and 2.0 percent, similar to the results of previous sampling within the Marine Sediments Unit. The three stations with TOC content greater than this range (EB115, EB116, and EB120) are located near the former Lockheed property to the east of the Upland Unit.

### G.2.2 SVOCs

#### *G.2.2.1 PAHs*

LPAHs

Each of the individual LPAHs were detected in each of the 23 Phase 3 surface sediment samples analyzed (**Table G-3**). Of these individual LPAHs, all but acenaphthylene were detected at concentrations exceeding SQS chemical criteria, and all except acenaphthylene and anthracene occurred at concentrations in excess of CSL chemical criteria. However, the CSL exceedances were limited to three stations: EB115, EB122, and EB126. The average CSL ERs for the individual LPAHs ranged from 1.1 (acenaphthene) to 2.4 (fluorene).

Concentrations of total LPAHs exceeded SQS chemical criteria in sediment collected from 5 (22 percent) of the Phase 3 stations analyzed (**Table G-3**). The CSL chemical criterion was also exceeded at only one of these stations (EB115), with an ER of 2.1. Station EB115 is located offshore of a pier associated with the former Lockheed property.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

HPAHs

Each of the individual HPAHs were detected in each of the 23 Phase 3 surface sediment samples analyzed (**Table G-3**). Of these individual HPAHs, all but pyrene were detected at concentrations exceeding SQS chemical criteria; however, only benzo(a)anthracene, total benzofluoranthenes, and benzo(a)pyrene were also detected at concentrations in excess of their respective CSL chemical criteria. These CSL exceedances were limited to Station EB115, and the measured concentrations were only slightly greater than their respective criteria (i.e., CSL ERs ranged from 1.04 to 1.2).

Concentrations of total HPAHs exceeded SQS chemical criteria in sediment collected from 4 (17 percent) of the Phase 3 stations analyzed: EB115, EB116, EB121, and EB126 (**Table G-3**). However, none of these stations were characterized by total HPAH concentrations in excess of the CSL chemical criterion.

Dibenzofuran

Dibenzofuran was detected in each of the 23 Phase 3 surface sediment samples analyzed, exceeding its SQS chemical criterion in 61 percent of these samples (**Table G-3**). However, only the detected concentration at Station EB115 also exceeded the CSL chemical criterion for this organic compound.

## G.3 REFERENCES

WESTON (Roy F. Weston, Inc.). 1997. Phase 2 Technical Memorandum, Pacific Sound Resources Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. April.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## Table G-1—Summary Statistics for Phase 2 Archived Surface Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding | | Frequency of Exceedance | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | Screening Criteria | | of Screening Criteria (%) | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET | CSL/2LAET | SQS/LAET | CSL/2LAET | |
| **PAHs (ug/kg)** | | | | | | | | | | | | | | |
| Naphthalene | 11 | 11 | 100 | 60 | 4,420 | EB103 | 44,714 | 401,818 | EB103 | 6 | 1 | 55 | 9 | 2.36 |
| Acenaphthylene | 11 | 11 | 100 | 10 | 109 | EB96 | 2,900 | 9,818 | EB95 | 0 | 0 | 0 | 0 | -- |
| Acenaphthene | 11 | 11 | 100 | 20 | 932 | EB103 | 14,750 | 84,727 | EB103 | 9 | 2 | 82 | 18 | 1.27 |
| Fluorene | 11 | 11 | 100 | 21 | 823 | EB103 | 15,667 | 74,818 | EB103 | 7 | 0 | 64 | 0 | -- |
| Phenanthrene | 11 | 11 | 100 | 96 | 3,830 | EB103 | 56,250 | 348,182 | EB103 | 5 | 0 | 45 | 0 | -- |
| Anthracene | 11 | 11 | 100 | 42 | 818 | EB98 | 20,857 | 68,167 | EB98 | 0 | 0 | 0 | 0 | -- |
| Total LPAH | 11 | 11 | 100 | 248 | 10,756 | EB103 | 165,900 | 977,818 | EB103 | 4 | 1 | 36 | 9 | 1.25 |
| Fluoranthene | 11 | 11 | 100 | 164 | 1,870 | EB103 | 64,643 | 170,000 | EB103 | 1 | 0 | 9 | 0 | -- |
| Pyrene | 11 | 11 | 100 | 187 | 3,970 | EB96 | 94,286 | 318,182 | EB103 | 0 | 0 | 0 | 0 | -- |
| Benzo(a)anthracene | 11 | 11 | 100 | 61 | 1,170 | EB98 | 18,500 | 97,500 | EB98 | 0 | 0 | 0 | 0 | -- |
| Chrysene | 11 | 11 | 100 | 100 | 2,930 | EB98 | 25,571 | 244,167 | EB98 | 1 | 0 | 9 | 0 | -- |
| Total Benzofluoranthenes | 11 | 11 | 100 | 177 | 2,255 | EB98 | 58,429 | 187,917 | EB98 | 0 | 0 | 0 | 0 | -- |
| Benzo(a)pyrene | 11 | 11 | 100 | 84 | 1,070 | EB98 | 28,571 | 89,167 | EB98 | 0 | 0 | 0 | 0 | -- |
| Indeno(1,2,3-cd)pyrene | 11 | 11 | 100 | 45 | 491 | EB98 | 12,929 | 40,917 | EB98 | 1 | 0 | 9 | 0 | -- |
| Dibenz(a,h)anthracene | 11 | 11 | 100 | 4.2 | 56 | EB103 | 1,029 | 5,551 | EB102 | 0 | 0 | 0 | 0 | -- |
| Benzo(g,h,i)perylene | 11 | 11 | 100 | 46 | 481 | EB98 | 12,857 | 40,083 | EB98 | 1 | 0 | 9 | 0 | -- |
| Total HPAH | 11 | 11 | 100 | 869 | 13,589 | EB98 | 316,814 | 1,132,408 | EB98 | 1 | 0 | 9 | 0 | -- |
| 2-Methylnaphthalene | 11 | 11 | 100 | 16 | 698 | EB103 | 12,333 | 63,455 | EB103 | 1 | 0 | 9 | 0 | -- |

--: Not applicable.

<: Not detected at dry-weight detection limit shown.

[a]Average ERs calculated using only those individual ERs >1.0.

## Table G-2—Phase 3 Surface Sediment Sampling Station Coordinates

| Station | Date | GPS Time | Mudline Depth (m MLLW) | NAD 1983 WA State Plane (N) | | NAD 1983 Decimal Minutes | |
|---|---|---|---|---|---|---|---|
| | | | | Northing | Easting | Latitude | Longitude |
| EB115 | 29-Jul-97 | 1013 | -7.4 | 217270.1 | 1262309 | 47 35.119'N | 122 21.934'W |
| EB116 | 29-Jul-97 | 1026 | -8.8 | 217495.7 | 1262277 | 47 35.156'N | 122 21.943'W |
| EB117 | 29-Jul-97 | 1043 | -11.6 | 217672.6 | 1262552 | 47 35.186'N | 122 21.877'W |
| EB118 | 29-Jul-97 | 1105 | -12.4 | 217852.6 | 1262979 | 47 35.217'N | 122 21.774'W |
| EB119 | 29-Jul-97 | 1118 | -14.7 | 217914.2 | 1263247 | 47 35.228'N | 122 21.709'W |
| EB120 | 29-Jul-97 | 1129 | -26.6 | 218148.4 | 1262783 | 47 35.265'N | 122 21.823'W |
| EB121 | 29-Jul-97 | 1141 | -43.5 | 218381.0 | 1262401 | 47 35.302'N | 122 21.917'W |
| EB122 | 29-Jul-97 | 1153 | -50.3 | 218553.9 | 1262269 | 47 35.330'N | 122 21.950'W |
| EB123 | 29-Jul-97 | 1205 | -58.2 | 218771.7 | 1262018 | 47 35.365'N | 122 22.012'W |
| EB124 | 29-Jul-97 | 1217 | -64.1 | 219024.3 | 1261854 | 47 35.406'N | 122 22.053'W |
| EB125 | 29-Jul-97 | 1315 | -70.5 | 219097.3 | 1261543 | 47 35.417'N | 122 22.129'W |
| EB126 | 29-Jul-97 | 1329 | -73.4 | 218958.9 | 1261170 | 47 35.393'N | 122 22.219'W |
| EB127 | 29-Jul-97 | 1347 | -70.8 | 218661.0 | 1260864 | 47 35.343'N | 122 22.292'W |
| EB128 | 29-Jul-97 | 1407 | -59.2 | 218325.8 | 1260594 | 47 35.287'N | 122 22.356'W |
| EB129 | 29-Jul-97 | 1420 | -55.2 | 217959.1 | 1260690 | 47 35.227'N | 122 22.331'W |
| EB130 | 29-Jul-97 | 1439 | -43.1 | 218493.7 | 1262543 | 47 35.321'N | 122 21.883'W |
| EB131 | 29-Jul-97 | 1454 | -48.1 | 218683.8 | 1262461 | 47 35.352'N | 122 21.904'W |
| EB132 | 29-Jul-97 | 1510 | -54.0 | 218858.4 | 1262246 | 47 35.380'N | 122 21.957'W |
| EB133 | 29-Jul-97 | 1525 | -62.0 | 219271.4 | 1261962 | 47 35.447'N | 122 22.028'W |
| EB134 | 30-Jul-97 | 0952 | -73.1 | 219340.8 | 1261532 | 47 35.457'N | 122 22.133'W |
| EB135 | 30-Jul-97 | 1004 | -76.5 | 219166.6 | 1261121 | 47 35.427'N | 122 22.232'W |
| EB136 | 30-Jul-97 | 1020 | -72.9 | 218833.7 | 1260740 | 47 35.371'N | 122 22.323'W |
| EB137 | 30-Jul-97 | 1035 | -59.8 | 218505.0 | 1260454 | 47 35.316'N | 122 22.391'W |
| EB138 | 30-Jul-97 | 1050 | -35.7 | 218424.2 | 1262978 | 47 35.311'N | 122 21.777'W |
| EB139 | 30-Jul-97 | 1103 | -46.6 | 218791.4 | 1262862 | 47 35.371'N | 122 21.807'W |
| EB140 | 30-Jul-97 | 1113 | -50.5 | 219033.5 | 1262612 | 47 35.410'N | 122 21.869'W |
| EB141 | 30-Jul-97 | 1123 | -52.3 | 219385.6 | 1262335 | 47 35.467'N | 122 21.938'W |
| EB142 | 30-Jul-97 | 1134 | -67.2 | 219676.4 | 1261777 | 47 35.513'N | 122 22.075'W |
| EB143 | 30-Jul-97 | 1201 | -80.9 | 219632.9 | 1261217 | 47 35.504'N | 122 22.211'W |
| EB144 | 30-Jul-97 | 1213 | -78.7 | 219178.8 | 1260813 | 47 35.428'N | 122 22.307'W |
| EB145 | 30-Jul-97 | 1226 | -68.6 | 218915.8 | 1260281 | 47 35.383'N | 122 22.435'W |

MLLW: Mean lower low water

## Table G-3—Summary Statistics for Phase 3 Surface Sediment COCs

| Constituent | # of Stations Analyzed | # of Detected Values | Frequency of Detection (%) | Detected Concentrations | | | | | | # of Stations Exceeding Screening Criteria | | Frequency of Exceedance of Screening Criteria (%) | | Average CSL/2LAET ER[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dry-Weight | | | TOC-Normalized | | | | | | | |
| | | | | Minimum | Maximum | Location of Maximum | Minimum | Maximum | Location of Maximum | SQS/LAET | CSL/2LAET | SQS/LAET | CSL/2LAET | |
| **PAHs (ug/kg)** | | | | | | | | | | | | | | |
| Naphthalene | 23 | 23 | 100 | 38 | 5,650 | EB126 | 3,324 | 332,353 | EB126 | 6 | 2 | 26 | 9 | 1.53 |
| Acenaphthylene | 23 | 23 | 100 | 13 | 260 | EB115 | 676 | 12,381 | EB115 | 0 | 0 | 0 | 0 | -- |
| Acenaphthene | 23 | 23 | 100 | 30 | 1,340 | EB115 | 1,448 | 63,810 | EB115 | 13 | 1 | 57 | 4 | 1.11 |
| Fluorene | 23 | 23 | 100 | 45 | 4,030 | EB115 | 2,133 | 191,905 | EB115 | 8 | 1 | 35 | 4 | 2.42 |
| Phenanthrene | 23 | 23 | 100 | 207 | 13,600 | EB115 | 9,857 | 647,619 | EB115 | 6 | 1 | 26 | 4 | 1.34 |
| Anthracene | 23 | 23 | 100 | 65 | 12,100 | EB115 | 4,552 | 576,190 | EB115 | 1 | 0 | 4 | 0 | -- |
| Total LPAH | 23 | 23 | 100 | 444 | 33,980 | EB115 | 21,990 | 1,618,095 | EB115 | 5 | 1 | 22 | 4 | 2.07 |
| Fluoranthene | 23 | 23 | 100 | 401 | 20,000 | EB115 | 19,095 | 952,381 | EB115 | 7 | 0 | 30 | 0 | -- |
| Pyrene | 23 | 23 | 100 | 337 | 17,300 | EB115 | 16,048 | 823,810 | EB115 | 0 | 0 | 0 | 0 | -- |
| Benzo(a)anthracene | 23 | 23 | 100 | 136 | 6,630 | EB115 | 11,714 | 315,714 | EB115 | 1 | 1 | 4 | 4 | 1.16 |
| Chrysene | 23 | 23 | 100 | 262 | 9,000 | EB115 | 16,238 | 428,571 | EB115 | 2 | 0 | 9 | 0 | -- |
| Total Benzofluoranthenes | 23 | 23 | 100 | 351 | 9,920 | EB115 | 27,333 | 472,381 | EB115 | 2 | 1 | 9 | 4 | 1.04 |
| Benzo(a)pyrene | 23 | 23 | 100 | 157 | 5,480 | EB115 | 12,857 | 260,952 | EB115 | 2 | 1 | 9 | 4 | 1.24 |
| Indeno(1,2,3-cd)pyrene | 23 | 23 | 100 | 91 | 1,360 | EB115 | 6,190 | 64,762 | EB115 | 4 | 0 | 17 | 0 | -- |
| Dibenz(a,h)anthracene | 23 | 23 | 100 | 43 | 325 | EB115 | 2,543 | 15,476 | EB115 | 2 | 0 | 9 | 0 | -- |
| Benzo(g,h,i)perylene | 23 | 23 | 100 | 88 | 1,360 | EB115 | 5,238 | 64,762 | EB115 | 5 | 0 | 22 | 0 | -- |
| Total HPAH | 23 | 23 | 100 | 1,904 | 71,375 | EB115 | 117,257 | 3,398,810 | EB115 | 4 | 0 | 17 | 0 | -- |
| 2-Methylnaphthalene | 23 | 23 | 100 | 24 | 777 | EB116 | 1,119 | 34,083 | EB122 | 0 | 0 | 0 | 0 | -- |
| **OTHER SVOCs (ug/kg)** | | | | | | | | | | | | | | |
| Dibenzofuran | 23 | 23 | 100 | 40 | 1,390 | EB115 | 1,895 | 66,190 | EB115 | 14 | 1 | 61 | 4 | 1.14 |
| 2-Chloronaphthalene | 23 | 0 | 0 | <7.2 | <11.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | 23 | 18 | 78 | 13 | 851 | EB115 | -- | -- | -- | -- | -- | -- | -- | -- |

--: Not applicable.

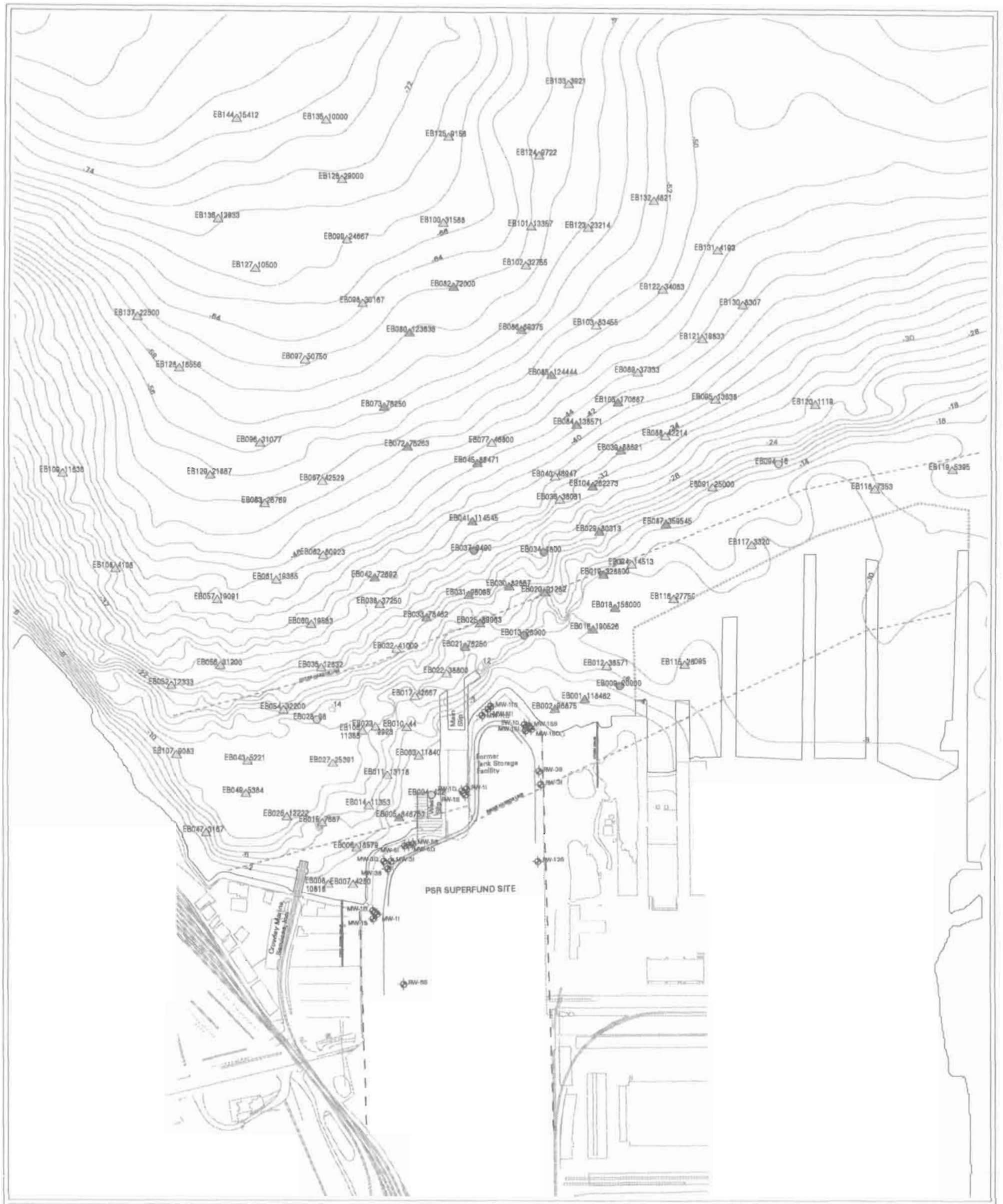
<: Not detected at dry-weight detection limit shown.

[a]Average ERs calculated using only those individual ERs >1.0.

## APPENDIX H

## INDIVIDUAL PAH CONTAMINANT DISTRIBUTION FIGURES


| Figure | Title |
|---|---|
| H-1 | Exceedance of 2-Methylnaphthalene in Surface Sediment |
| H-2 | Exccedance of Acenaphthene in Surface Sediment |
| H-3 | Exccedance of Acenaphthylene in Surface Sediment |
| H-4 | Exceedance of Anthracene in Surface Sediment |
| H-5 | Exceedance of Fluorene in Surface Sediment |
| H-6 | Exceedance of Naphthalene in Surface Sediment |
| H-7 | Exceedance of Phenanthrene in Surface Sediment |
| H-8 | Exceedance of Benzo(a)anthracene in Surface Sediment |
| H-9 | Exceedance of Benzo(a)pyrene in Surface Sediment |
| H-10 | Exceedance of Benzo(g,h,i)perylene in Surface Sediment |
| H-11 | Exceedance of Total Benzofluoranthene in Surface Sediment |
| H-12 | Exceedance of Chrysene in Surface Sediment |
| H-13 | Exceedance of Dibenz(a,h)anthracene in Surface Sediment |
| H-14 | Exceedance of Fluoranthene in Surface Sediment |
| H-15 | Exceedance of Indeno(1,2,3-cd)pyrene in Surface Sediment |
| H-16 | Exceedance of Pyrene in Surface Sediment |




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

NOTES

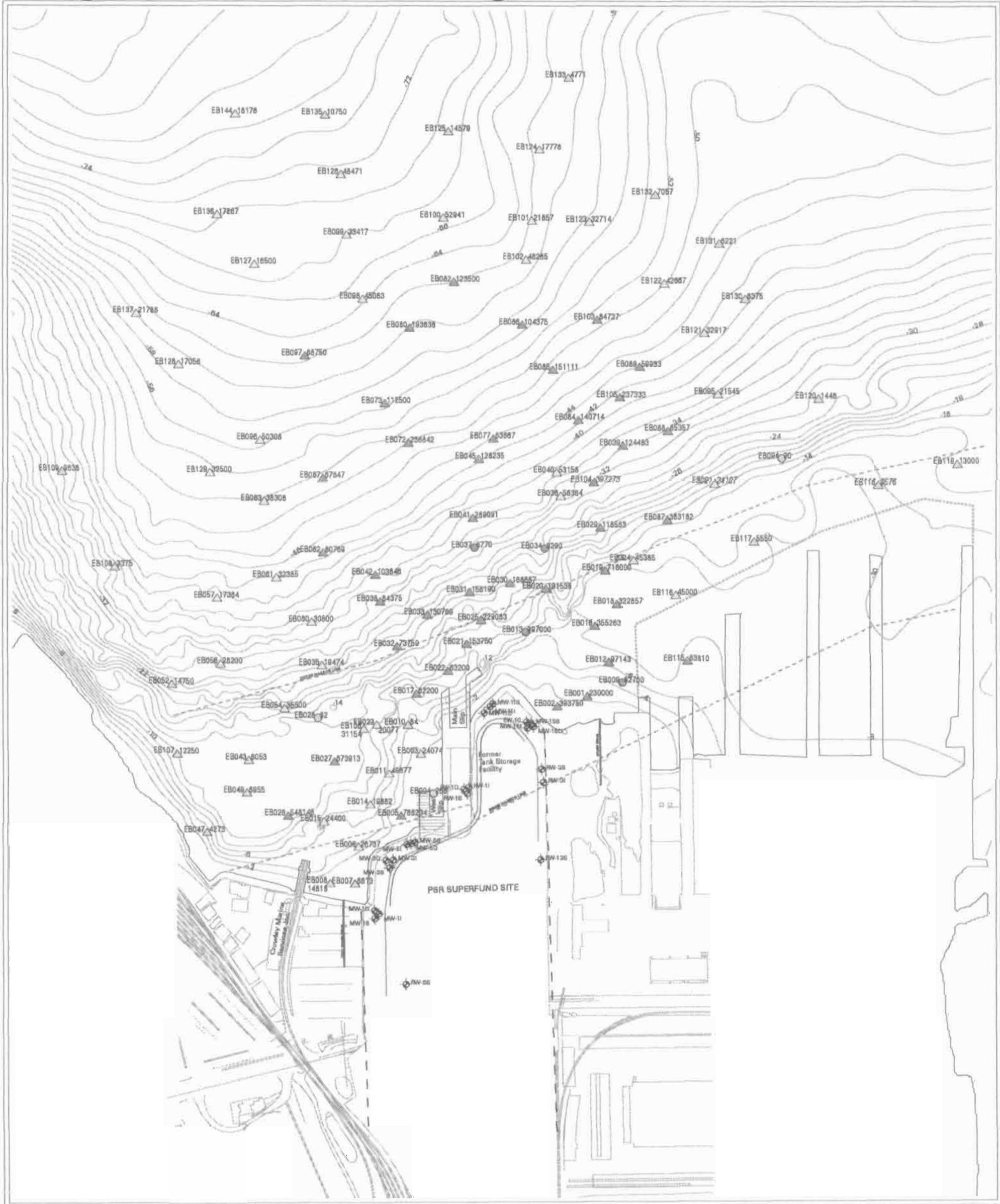
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 670 ug/kg
   2LAET: 1,400 ug/kg
   SQS TOC Normalized: 38,000 ug/kg OC
   CSL TOC Normalized: 64,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:08 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: DAM

# PSR Marine Sediments Unit Exceedance of 2-Methylnaphthalene in Surface Sediment

Figure H-1




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

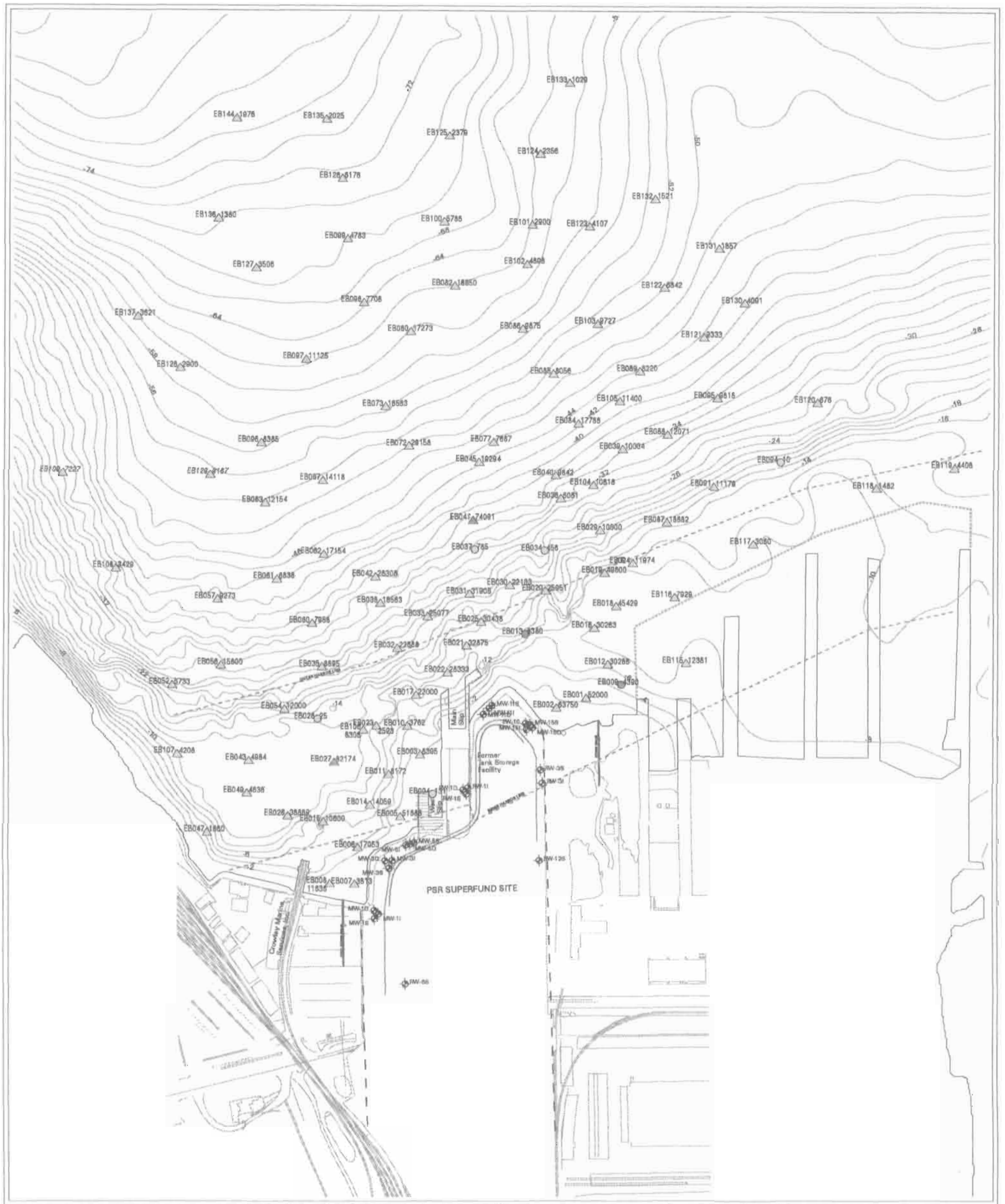
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
LAET: 500 ug/kg
2LAET: 730 ug/kg
SQS TOC Normalized: 16,000 ug/kg OC
CSL TOC Normalized: 57,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:13 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Acenaphthene in Surface Sediment

Figure H-2



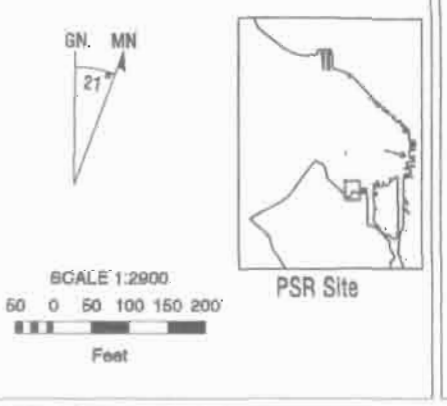

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL




NOTES

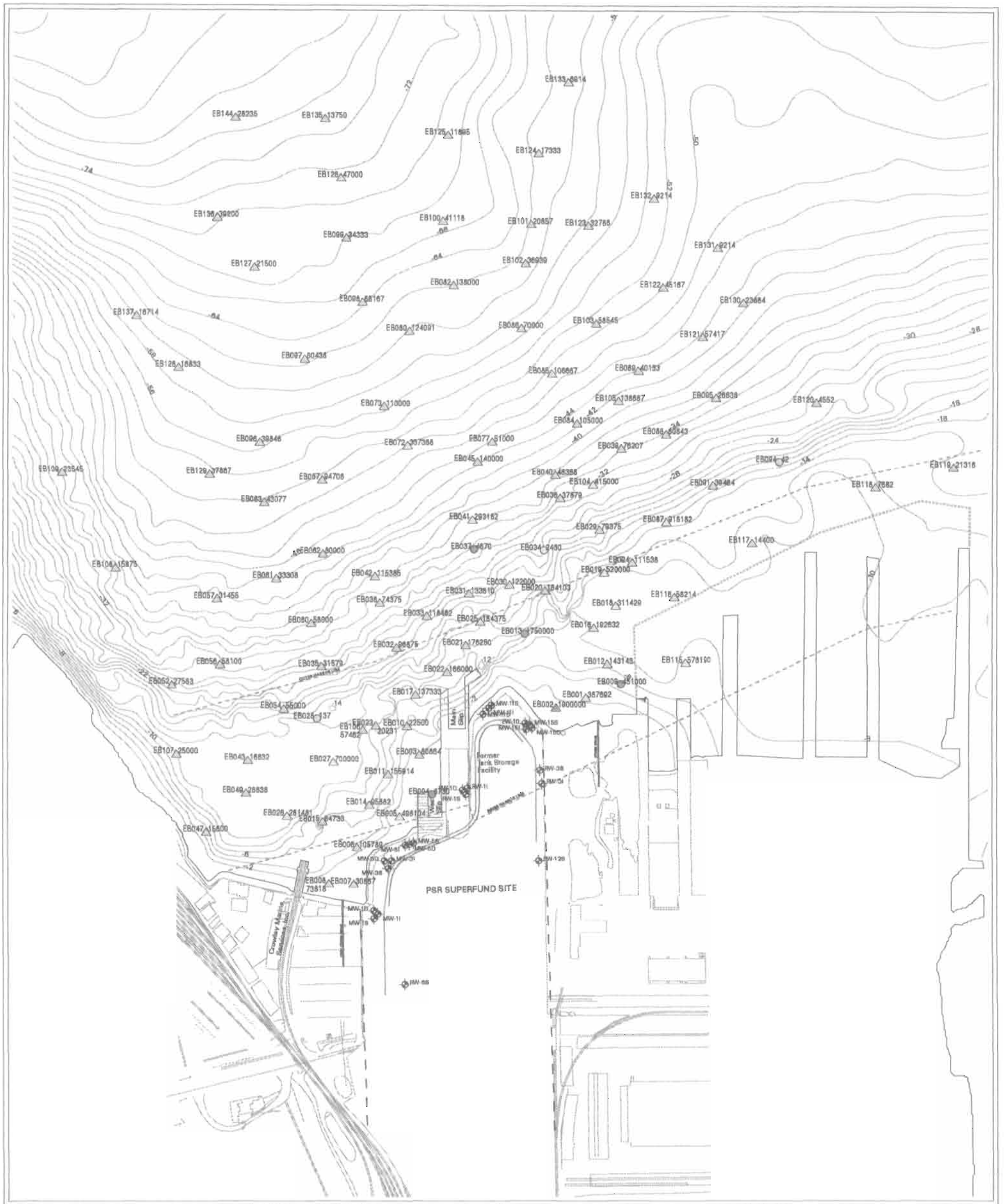
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 1,300 ug/kg
   2LAET: 1,300 ug/kg
   SQS TOC Normalized: 66,000 ug/kg OC
   CSL TOC Normalized: 66,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:18 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Acenaphthylene in Surface Sediment

Figure H-3




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN 21°

SCALE 1:2000

50 0 50 100 150 200

Feet

PSR Site

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 960 ug/kg
   2LAET: 4,400 ug/kg
   SQS TOC Normalized: 220,000 ug/kg OC
   CSL TOC Normalized: 1,200,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:22 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Anthracene in Surface Sediment

Figure H-4

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN

21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 540 ug/kg
   2LAET: 1,000 ug/kg
   SQS TOC Normalized: 23,000 ug/kg OC
   CSL TOC Normalized: 79,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:26 AM
JOB NUMBER: 98-01842
VIEW FILE: default.view

CHECKED BY: DRH

APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Fluorene in Surface Sediment

Figure

H-5

**SYMBOL EXPLANATION**

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

**NOTES**

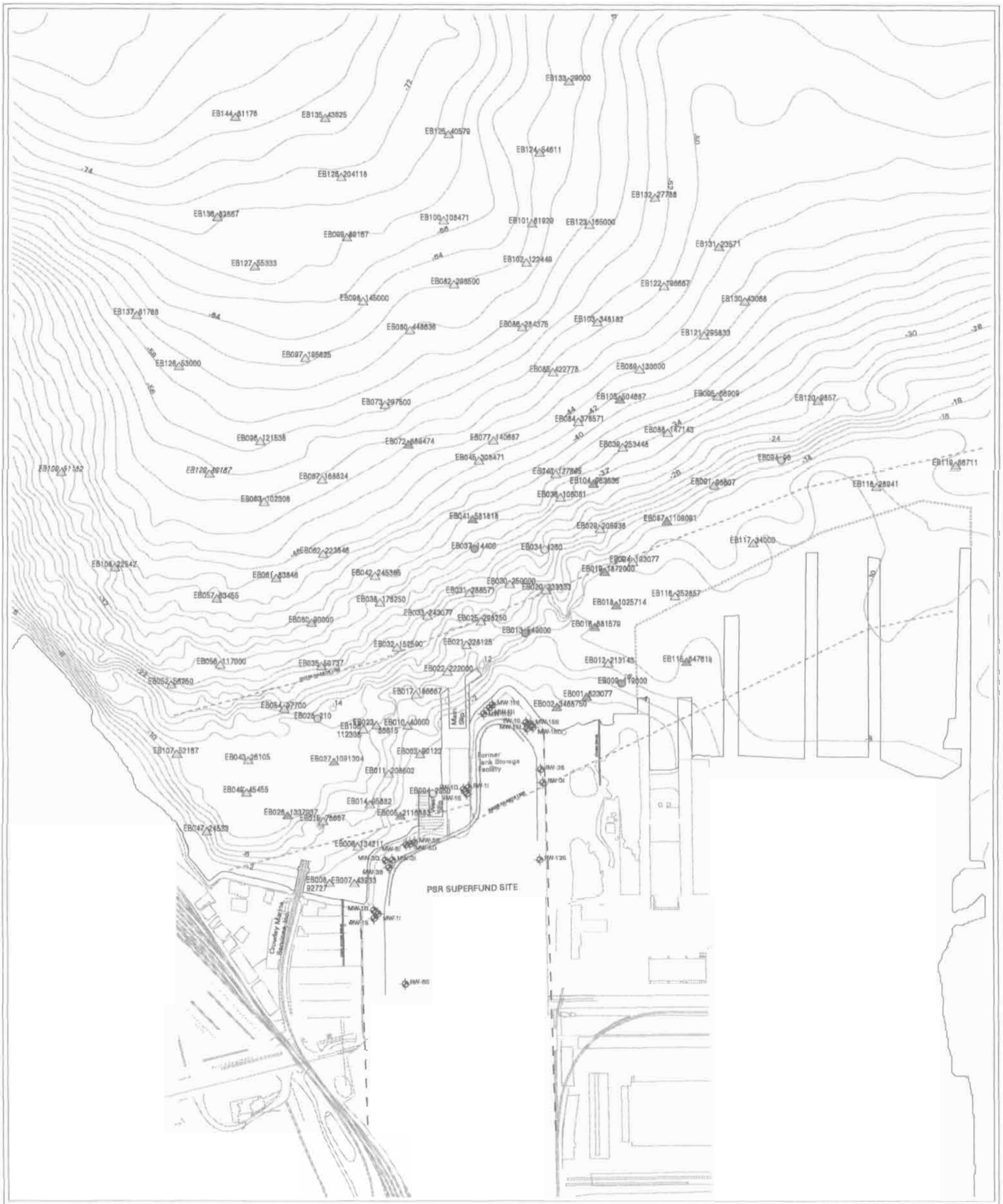
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 2,100 ug/kg
   2LAET: 2,400 ug/kg
   SQS TOC Normalized: 99,000 ug/kg OC
   CSL TOC Normalized: 170,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:31 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DKH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Naphthalene in Surface Sediment

Figure H-6




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

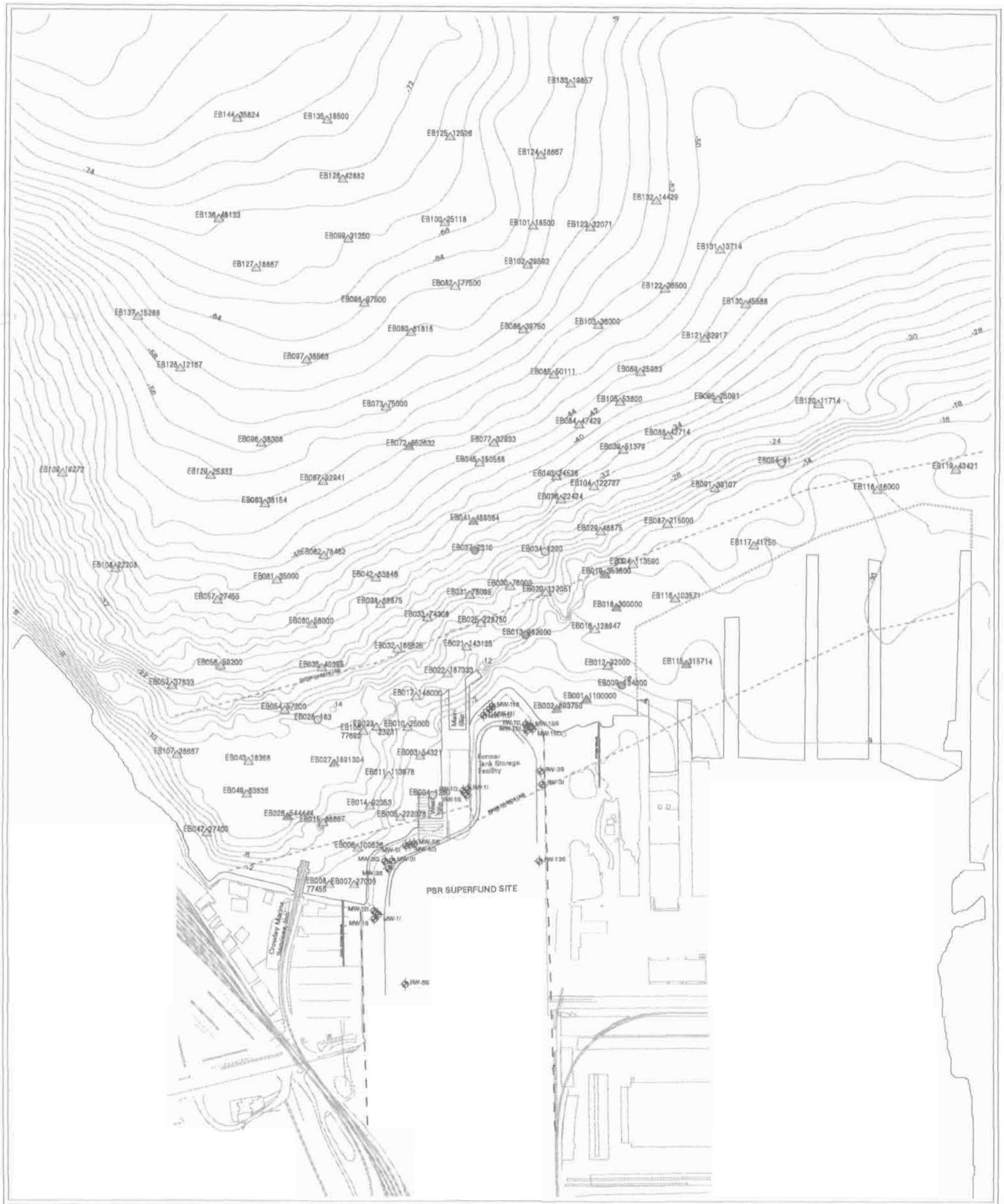
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 1,500 ug/kg
   2LAET: 5,400 ug/kg
   SQS TOC Normalized: 100,000 ug/kg OC
   CSL TOC Normalized: 480,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:36 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DCH
APPROVED BY: WAM

# PSR Marine Sediments Unit Exceedance of Phenanthrene in Surface Sediment

Figure H-7




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN

21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
LAET: 1,300 ug/kg
2LAET: 1,600 ug/kg
SQS TOC Normalized: 110,000 ug/kg OC
CSL TOC Normalized: 270,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:40 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Benzo(a)anthracene in Surface Sediment

Figure H-8

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 1,600 ug/kg
   2LAET: 3,000 ug/kg
   SQS TOC Normalized: 99,000 ug/kg OC
   CSL TOC Normalized: 210,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:44 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view

CHECKED BY: DCH

APPROVED BY: WAM

# PSR Marine Sediments Unit Exceedance of Benzo(a)pyrene in Surface Sediment

Figure H-9

SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 670 ug/kg
   2LAET: 720 ug/kg
   SQS TOC Normalized: 31,000 ug/kg OC
   CSL TOC Normalized: 78,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:50 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Benzo(g,h,i)perylene in Surface Sediment

Figure H-10

## SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

GN MN 27°

SCALE 1:2900

50 0 50 100 150 200

Feet

## NOTES

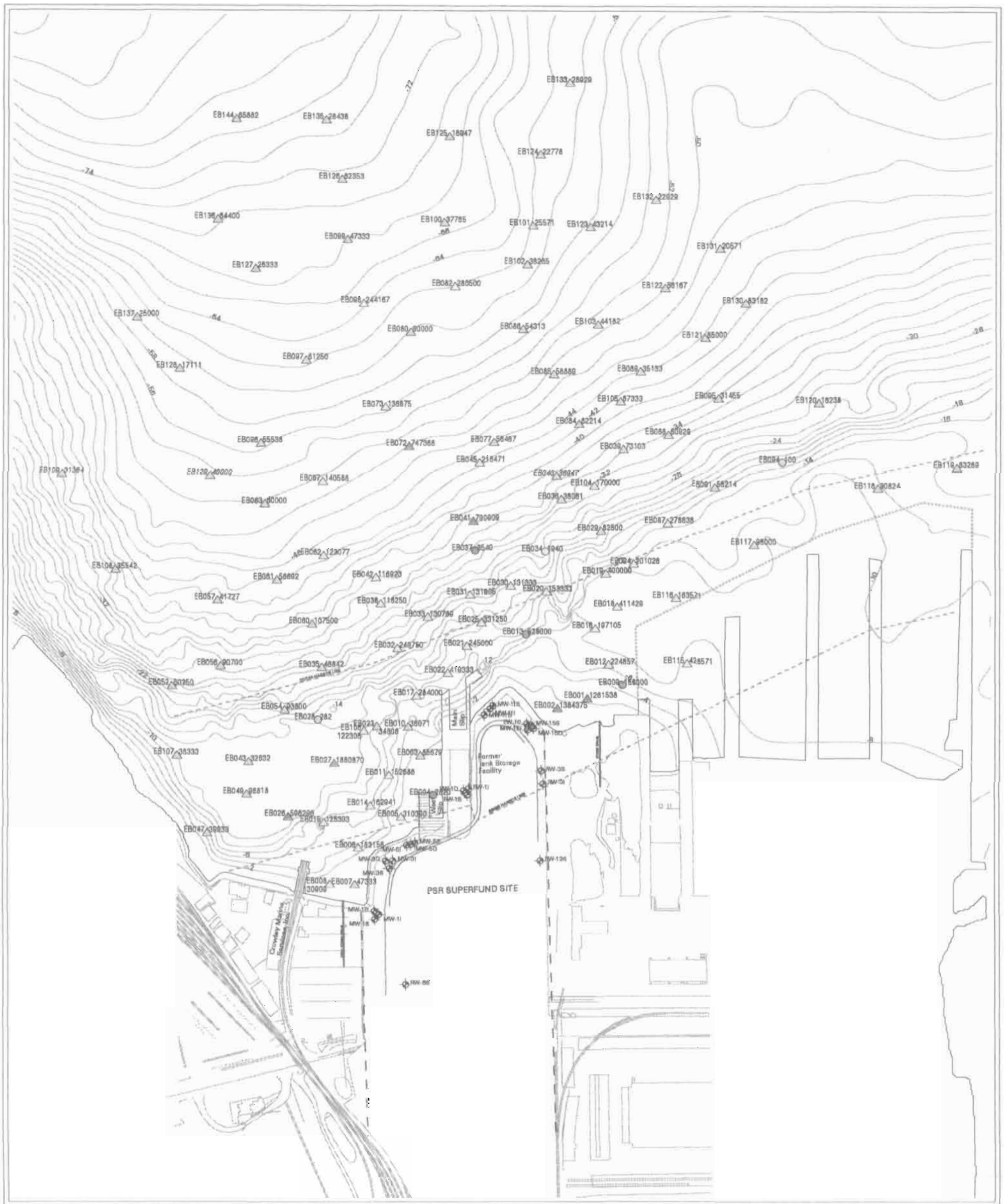
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 3,200 ug/kg
   2LAET: 3,600 ug/kg
   SQS TOC Normalized: 230,000 ug/kg OC
   CSL TOC Normalized: 450,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:56 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DRH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Total Benzofluoranthene in Surface Sediment

Figure H-11




## SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN

21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

## NOTES

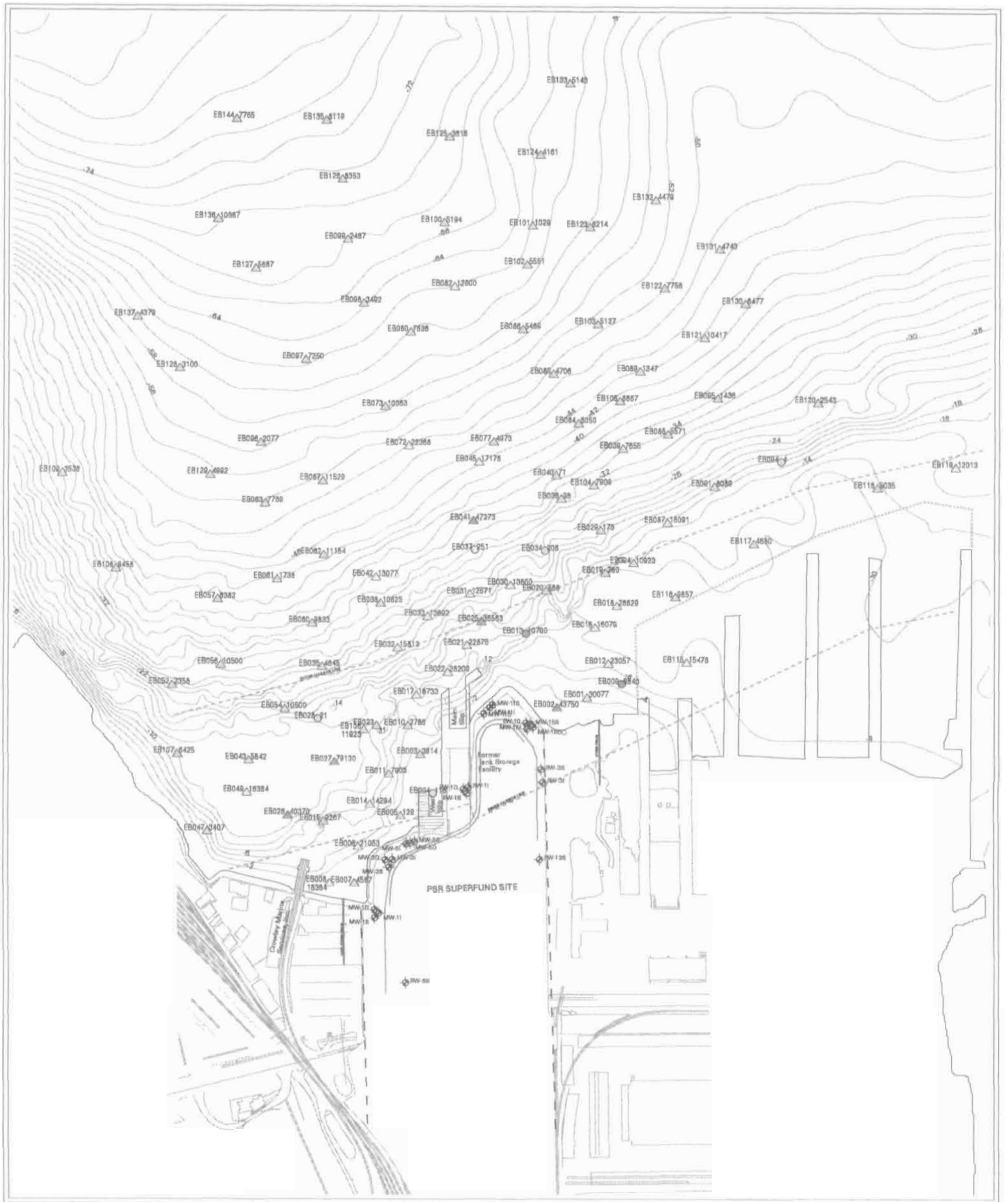
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 1,400 ug/kg
   2LAET: 2,800 ug/kg
   SQS TOC Normalized: 110,000 ug/kg OC
   CSL TOC Normalized: 460,000 ug/kg OC

WESTON

DATE: April 13, 1998 10:59 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DKH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Chrysene in Surface Sediment

Figure H-12




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

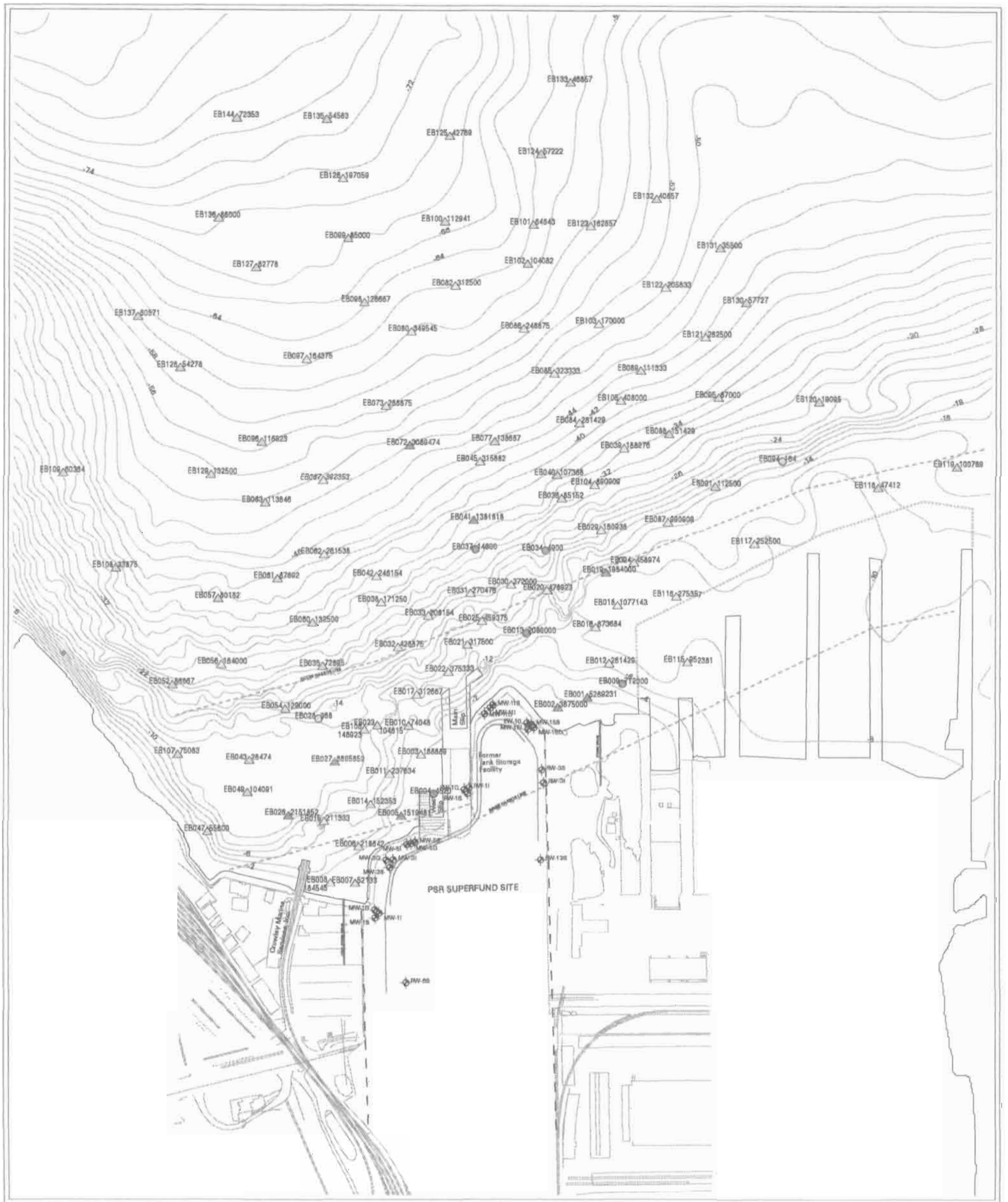
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 230 ug/kg
   2LAET: 540 ug/kg
   SQS TOC Normalized: 12,000 ug/kg OC
   CSL TOC Normalized: 33,000 ug/kg OC

WESTON

DATE: April 13, 1998 11:03 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DCH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Dibenz(a,h)anthracene in Surface Sediment

Figure H-13




SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN

21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

NOTES

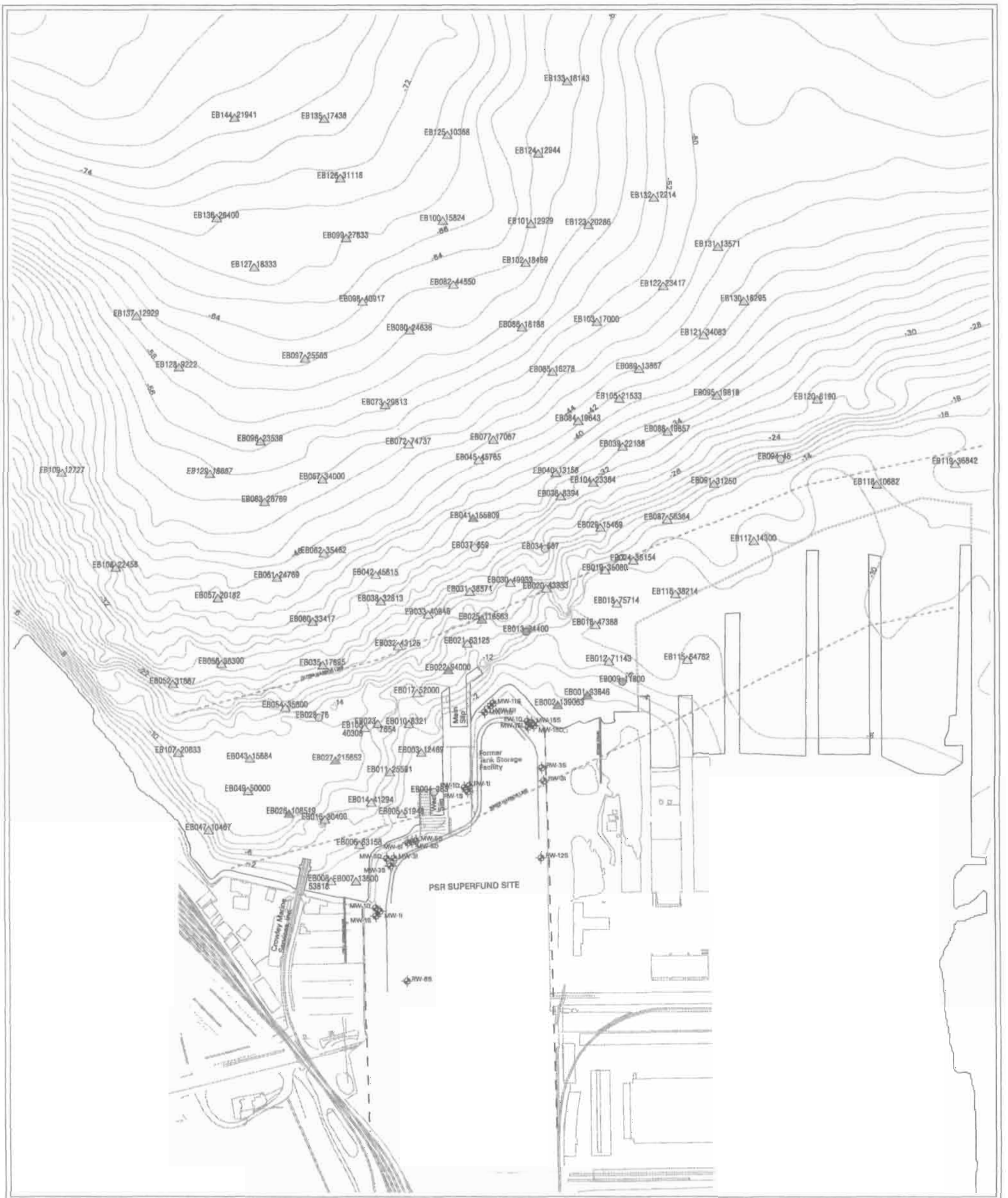
1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 1,700 ug/kg
   2LAET: 2,500 ug/kg
   SQS TOC Normalized: 160,000 ug/kg OC
   CSL TOC Normalized: 1,200,000 ug/kg OC

WESTON

DATE: April 13, 1998 11:07 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Fluoranthene in Surface Sediment

Figure H-14




## SYMBOL EXPLANATION

DRY WEIGHT VALUES

- Below LAET
- Above LAET
- Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- Below TOCN SQS
- Above TOCN SQS
- Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

PSR Site

## NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 600 ug/kg
   2LAET: 690 ug/kg
   SQS TOC Normalized: 34,000 ug/kg OC
   CSL TOC Normalized: 88,000 ug/kg OC

WESTON MANAGERS ENGINEERS/CONSULTANTS

DATE: April 13, 1998 11:11 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DPH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Indeno(1,2,3-cd)pyrene in Surface Sediment

Figure H-15

## SYMBOL EXPLANATION

DRY WEIGHT VALUES

- ○ Below LAET
- ○ Above LAET
- ● Above 2LAET

TOTAL ORGANIC CARBON (TOC) NORMALIZED VALUES

- △ Below TOCN SQS
- △ Above TOCN SQS
- ▲ Above TOCN CSL

GN MN 21°

SCALE 1:2900

50 0 50 100 150 200

Feet

## NOTES

1) See Figure 1-3 for site feature notes and global symbols. See Section 4.4 for symbol interpretation information.
2) All concentrations in ug/kg or ug/kg OC.
3) U - Analyte not detected. Value shown is dry-weight sample detection limit.
4) Reference concentrations:
   LAET: 2,600 ug/kg
   2LAET: 3,300 ug/kg
   SQS TOC Normalized: 1,000,000 ug/kg OC
   CSL TOC Normalized: 1,400,000 ug/kg OC

WESTON

DATE: April 13, 1998 11:15 AM
JOB NUMBER: 98-0184
VIEW FILE: default.view
CHECKED BY: DEH
APPROVED BY: NAM

# PSR Marine Sediments Unit Exceedance of Pyrene in Surface Sediment

Figure H-16

# APPENDIX I

# GROUNDWATER TRANSPORT OF DISSOLVED CREOSOTE CONSTITUENTS

# APPENDIX I

# GROUNDWATER TRANSPORT OF DISSOLVED CREOSOTE CONSTITUENTS

This appendix is provided in support of the analysis of the potential for groundwater transport of dissolved creosote constituents to contribute to surface sediment contamination (**Section 3**). This analysis is based on the use of BIOSCREEN, and EPA fate and transport model.

## BIOSCREEN

BIOSCREEN is an easy-to-use screening model which simulates remediation through natural attenuation (RNA) of dissolved hydrocarbons. The software, programmed in the MS Excel® spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate advection, dispersion, adsorption, aerobic decay and anaerobic reactions BIOSCREEN includes three different model types:

1. Solute transport without decay,

2. Solute transport with biodegradation modeled as a first order decay process (simple, lumped-parameter approach),

3. Solute transport with biodegradation modeled as an "instantaneous" biodegradation reaction (approach used by BIOPLUME models).

BIOSCREEN was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division at Brooks Air Force Base by Groundwater Services, Inc., Houston, Texas.

The BIOSCREEN Natural Attenuation Software is based on the Domenico (1987) three-dimensional analytical solute transport model. The original model assumes a fully-penetrating vertical plane source, perpendicular to groundwater flow, to simulate the release of organics to moving groundwater. In addition, the Domenico solution accounts for the effects of advective transport, three-dimensional dispersion, adsorption, and first-order decay. In BIOSCREEN, the Domenico solution has been adapted to provide three different model types representing (i) transport with no decay, (ii) transport with first order decay, and (iii) transport with "instantaneous" biodegradation reaction.

## BIOSCREEN Model Types

The software allows the user to see results from three different types of groundwater transport models, all based on the Domenico solution:

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

1. Solute transport with no decay. This model is appropriate for predicting the movement of conservative (non-degrading) solutes such as chloride. The only attenuation mechanisms are dispersion in the longitudinal, transverse, and vertical directions, and adsorption of contaminants to the soil matrix.

2. Solute transport with first order decay. With this model, the solute degradation rate is proportional to the solute concentration. The higher the concentration, the higher the degradation rate. This is a conventional method for simulating biodegradation in dissolved hydrocarbon plumes. Modelers using the first-order decay model typically use the first-order decay coefficient as a calibration parameter, and adjust the decay coefficient until the model results match field data. With this approach, uncertainties in a number of parameters (e.g., dispersion, sorption, biodegradation) are lumped together in a single calibration parameter.

3. Solute transport with "instantaneous" biodegradation reaction. Modeling work conducted by GSI indicate first-order expressions may not be as accurate for describing natural attenuation processes as the instantaneous reaction assumption (Connor et al. 1994). Biodegradation of organic contaminants in groundwater is more difficult to quantify using a first-order decay equation because electron acceptor limitations are not considered. A more accurate prediction of biodegradation effects may be realized by incorporating the instantaneous reaction equation into a transport model. This approach forms the basis for the BIOSCREEN instantaneous reaction model.

## BIOSCREEN INPUT PARAMETERS

**Parameter** **Seepage Velocity (Vs)**

**Units** ft/yr

**Description** Actual interstitial groundwater velocity, equaling Darcy velocity divided by effective porosity.

**Typical Values** 0.5 to 200 ft/yr

**Source of Data** Calculated by multiplying hydraulic conductivity by hydraulic gradient and dividing by effective porosity. Actual site data be used for hydraulic conductivity and hydraulic gradient data parameters; effective porosity can be estimated.

**How to Enter Data** (1) Enter directly or (2) Fill in values for hydraulic conductivity, hydraulic gradient, and effective porosity as described below and have BIOSCREEN calculate seepage velocity.

**Parameter** **Hydraulic Conductivity (K)**

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Units** cm/sec

**Description** Horizontal hydraulic conductivity of the saturated porous medium.

**Typical Values**

| | |
|---|---|
| Clays: | <1x10-6 cm/s |
| Silts: | 1x10-6 - 1x10-3 cm/s |
| Silty sands: | 1x10-5 - 1x10-1 cm/s |
| Clean sands: | 1x10-3 - 1 cm/s |
| Gravels: | > 1 cm/s |

**Source of Data** Pump tests or slug tests at the site.

**How to Enter Data** Enter directly. If seepage velocity is entered directly, this parameter is not needed in BIOSCREEN.

**Parameter** **Hydraulic Gradient (i)**

**Units** ft/ft

**Description** The slope of the potentiometric surface. In unconfined aquifers, this is equivalent to the slope of the water table.

**Typical Values** 0.0001 - 0.05 ft/ft

**Source of Data** Calculated by constructing potentiometric surface maps using static water level data from monitoring wells and estimating the slope of the potentiometric surface.

**How to Enter Data** Enter directly. If seepage velocity is entered directly, this parameter is not needed in BIOSCREEN.

**Parameter** **Effective Porosity (n)**

**Units** unitless

**Description** Dimensionless ratio of the volume of interconnected voids to the bulk volume of the aquifer matrix. Note that "total porosity" is the ratio of all voids (included non-connected voids) to the bulk volume of the aquifer matrix. Difference between total and effective porosity reflect lithologic controls on pore structure. In unconsolidated sediments coarser than silt size, effective porosity can be less than total porosity by 2-5% (e.g. 0.28 vs, 0.30)

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Typical Values**

**Values for Effective Porosity:**

| | |
|---|---|
| Clay | 0.01 - 0.20 |
| Sandstone | 0.005 - 0.10 |
| Silt | 0.01 - 0.30 |
| Unfract. Limestone | 0.001- 0.05 |
| Fine Sand | 0.10 - 0.30 |
| Fract. Granite | 0.00005 - 0.01 |
| Medium Sand | 0.15 - 0.30 |
| Coarse Sand | 0.20 - 0.35 |
| Gravel | 0.10 - 0.35 |

**Source of Data**

Typically estimated. One commonly used value for silts and sands is an effective porosity of 0.25. The ASTM RBCA Standard (ASTM 1995) includes a default value of 0.38 (to be used primarily for unconsolidated deposits).

**How to Enter Data**

Enter directly. Note that if seepage velocity is entered directly, this parameter is still needed to calculate the retardation factor and plume mass.

**Parameter**

**Longitudinal Dispersivity (alpha x)**
**Transverse Dispersivity (alpha y)**
**Vertical Dispersivity (alpha z)**

**Units**

ft

**Description**

Dispersion refers to the process whereby a plume will spread out in a longitudinal direction (along the direction of groundwater flow), transversely (perpendicular to groundwater flow), and vertically downwards due to mechanical mixing in the aquifer and chemical diffusion. Selection of dispersivity values is a difficult process, given the impracticability of measuring dispersion in the field. However, simple estimation techniques based on the length of the plume or distance to the measurement point ("scale") are available from a compilation of field test data. Note that researchers indicate that dispersivity values can range over 2-3 orders of magnitude for a given value of plume length or distance to measurement point (Gelhar et al. 1992). In BIOSCREEN, dispersivity is used as the primary calibration parameter. The software code has been written so that vertical dispersion is modeled in the downward direction only.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Typical Values** Typical dispersivity relationships as a function of Lp (plume length or distance to measurement point in ft) are provided below. BIOSCREEN is programmed with some commonly used relationships representative of typical and low-end dispersivities:

Longitudinal Dispersivity

Alpha x = (Xu and Eckstein 1995) (Lp in ft)

Transverse Dispersivity

Alpha y = 0.10 alpha x

(Based on high reliability points from Gelhar et al. 1992)

Vertical Dispersivity when plume thickness is of the same size as aquifer thickness =

Alpha z = very low (i.e., 1e-99 ft) (Based on conservative estimate)

Other commonly used relationships include:

Alpha x = 0.1 Lp (Pickens and Grisak 1981)
Alpha y = 0.33 alpha x (ASTM 1995) (EPA 1986)
Alpha z = 0.05 alpha x (ASTM 1995)
Alpha z = 0.025 alpha x to 0.1 alpha x (EPA 1986)

**Source of Data** Typically estimated using the relationships provided above.

**How to Enter Data** 1) Enter directly or 2) Fill in value of the estimated plume length and have BIOSCREEN calculate the dispersivities.

**Parameter** **Estimated Plume Length (Lp)**

**Units** ft

**Description** Estimated length of the existing or hypothetical groundwater plume being modeled. This is a key parameter as it is generally used to estimate the dispersivity terms (dispersivity is difficult to measure and field data are rarely collected).

**Typical Values** For BTEX plumes, 50 - 500 ft. For chlorinated solvents, 50 to 1000 ft.

**Source of Data** To simulate an actual plume length or calibrate to actual plume data, enter the actual length of the plume. If trying to predict the maximum extent of plume migration, use one of the two methods below. (1) Use seepage velocity, retardation factor, and simulation time to estimate plume length. While this may underestimate the plume length for a non-degrading solute, it may overestimate the plume length for either the first-order decay model

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| | or instantaneous reaction model if biodegradation is significant.<br>(2) Estimate a plume length, run the model, determine how long the plume is predicted to become (this will vary depending on the type of kinetic expression that is used), reenter this value, and then rerun the model. Note that considerable time and effort can be expended trying to adjust the estimated plume length term to match exactly the predicted modeling length. In practice, most modelers make the assumption that dispersivity values are not very precise, and therefore select ball-park values based on estimated plume lengths that are probably ± 25% of the actual plume length used in the simulations. Note that BIOSCREEN is very sensitive to the dispersion estimates, particularly for the instantaneous reaction model. |
| **How to Enter Data** | Enter directly. If dispersivity data are entered directly, this parameter is not needed in BIOSCREEN. |
| **Parameter** | **Retardation Factor (R)** |
| **Units** | unitless |
| **Description** | The rate at which dissolved contaminants moving through an aquifer can be reduced by sorption of contaminants to the solid aquifer matrix. The degree of retardation depends on both aquifer and constituent properties. The retardation factor is the ratio of the groundwater seepage velocity to the rate that organic chemicals migrate in the groundwater. A retardation value of 2 indicates that if the groundwater seepage velocity is 100 ft/yr, then the organic chemicals migrate at approximately 50 ft/yr. BIOSCREEN simulations using the instantaneous reaction assumption at sites with retardation factors greater than 6 should be performed with caution and verified using a more sophisticated model such as BIOPLUME III. |
| **Typical Values** | 1 to 2 (for BTEX in typical shallow aquifers) |
| **Source of Data** | Usually estimated from soil and chemical data using variables described below ($r_b$ = bulk density, n = porosity, $K_{oc}$ = octanol-water partition coefficient, $K_d$ = distribution coefficient, and $f_{oc}$ = fraction organic carbon on uncontaminated soil) with the following expression: where In some cases, the retardation factor can be estimated by comparing the length of a plume affected by adsorption (such as the benzene plume) with the length of plume that is not affected by adsorption (such as chloride). Most plumes do not have both types of contaminants, so it is more common to use the estimation technique. |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| **How to Enter Data** | (1) Enter directly or (2) Fill in the estimated values for bulk density, partition coefficient, and fraction organic carbon as described below and have BIOSCREEN calculate the retardation factor. |
| **Parameter** | **Soil Bulk Density (rho b, rb)** |
| **Units** | kg/L or g/cm3 |
| **Description** | Bulk density, in kg/L, of the aquifer matrix (related to porosity and pure solids density). |
| **Typical Values** | Although this value can be measured in the lab, in most cases estimated values are used. A default value of 1.7 kg/L is used frequently. |
| **Source of Data** | Either from an analysis of soil samples at a geotechnical lab or more commonly, application of estimated values such as 1.7 kg/L. |
| **How to Enter Data** | Enter directly. If the retardation factor is entered directly, this parameter is not needed in BIOSCREEN. |
| **Parameter** | **Organic Carbon Partition Coefficient (Koc)** |
| **Units** | (mg/kg) / (mg/L) or (L/kg) or (mL/g) |
| **Description** | Chemical-specific partition coefficient between soil organic carbon and the aqueous phase. Larger values indicate greater affinity of contaminants for the organic carbon fraction of soil. This value is chemical specific and can be found in chemical reference books. Note that many users of BIOSCREEN will be simulating BTEX as a single constituent. In this case, either an average value for the BTEX compounds can be used, or it can be assumed that all of the BTEX compounds have the same mobility as benzene (the constituent with the highest potential risk to human health). |
| **Typical Values** | Benzene 38 L/kg<br>Ethylbenzene 95 L/kg<br>Toluene 135 L/kg<br>Xylene 240 L/kg (ASTM 1995) |
| **Source of Data** | Chemical reference literature or relationships between $K_{oc}$ and solubility or $K_{oc}$ and the octanol-water partition coefficient ($K_{ow}$). |
| **How to Enter Data** | Enter directly. If the retardation factor is entered directly, this parameter is not needed in BIOSCREEN. |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| **Parameter** | **Fraction Organic Carbon ($f_{oc}$)** |
| **Units** | unitless |
| **Description** | Fraction of the aquifer soil matrix comprised of natural organic carbon in uncontaminated areas. More natural organic carbon means higher adsorption of organic constituents on the aquifer matrix. |
| **Typical Values** | 0.0002 - 0.02 |
| **Source of Data** | The fraction organic carbon value should be measured if possible by collecting a sample of aquifer material from an uncontaminated zone and performing a laboratory analysis (e.g. ASTM Method 2974-87 or equivalent). If unknown, a default value of 0.001 is often used (e.g., ASTM 1995). |
| **How to Enter Data** | Enter directly. If the retardation factor is entered directly, this parameter is not needed in BIOSCREEN. |
| **Parameter** | **First-Order Decay Coefficient (lambda)** |
| **Units** | 1/yr |
| **Description** | Rate coefficient describing first-order decay process for dissolved constituents. The first-order decay coefficient equals 0.693 divided by the half-life of the contaminant in groundwater. In BIOSCREEN, the first-order decay process assumes that the rate of biodegradation depends only on the concentration of the contaminant and the rate coefficient. For example, consider 3 mg/L benzene dissolved in water in a beaker. If the half-life of the benzene in the beaker is 728 days, then the concentration of benzene 728 days from now will be 1.5 mg/L (ignoring volatilization and other losses).Considerable care must be exercised in the selection of a first-order decay coefficient for each constituent in order to avoid significantly over-predicting or under-predicting actual decay rates. Note that the amount of degradation that occurs is related to the time the contaminants spend in the aquifer, and that this parameter is not related to the time it takes for the source concentrations to decay by half. |
| **Typical Values** | 0.1 to 36 yr-1 (see half-life values) |
| **Source of Data** | Optional methods for selection of appropriate decay coefficients are as follows: Literature Values: Various published references are available listing decay half-life values for hydrolysis and biodegradation (e.g., see |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Howard et al. 1991). Note that many references report the half-lives; these values can be converted to the first-order decay coefficients using k = 0.693 / t1/2 (see dissolved plume half-life).Calibrate to Existing Plume Data: If the plume is in a steady-state or diminishing condition, BIOSCREEN can be used to determine first-order decay coefficients that best match the observed site concentrations. One may adopt a trial-and-error procedure to derive a best-fit decay coefficient for each contaminant. For still-expanding plumes, this steady-state calibration method may over-estimate actual decay-rate coefficients and contribute to an under-estimation of predicted concentration levels.

**How to Enter Data** (1) Enter directly or (2) Fill in the estimated half-life values as described below and have BIOSCREEN calculate the first-order decay coefficients.

**Parameter** **Dissolved Plume Half-Life (t1/2)**

**Units** years

**Description** Time, in years, for dissolved plume concentrations to decay by one half as contaminants migrate through the aquifer. Note that the amount of degradation that occurs is related to the time the contaminants spend in the aquifer, and that the degradation IS NOT related to the time it takes for the source concentrations to decay by half. Modelers using the first-order decay model typically use the first-order decay coefficient as a calibration parameter, and adjust the decay coefficient until the model results match field data. With this approach, uncertainty in a number of parameters (e.g., dispersion, sorption, biodegradation) are lumped together in a single calibration parameter. Considerable care must be exercised in the selection of a first-order decay coefficient for each COC in order to avoid significantly over-predicting or under-predicting actual decay rates.

**Typical Values**

| | |
|---|---|
| Benzene | 0.02 to 2.0 yrs |
| Toluene | 0.02 to 0.17 |
| Ethylbenzene | 0.016 to 0.62 yrs |
| Xylene | 0.038 to 1 yrs |

(from ASTM 1995)

**Source of Data** Optional methods for selection of appropriate decay coefficients are as follows: Literature Values: Various published references are available listing decay half-life values for hydrolysis and biodegradation (e.g., see Howard et al. 1991). Calibrate to Existing Plume Data: If the plume is in a steady-state or diminishing condition, BIOSCREEN can be used to determine first-order decay coefficients that best match the observed site

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| | concentrations. One may adopt a trial-and-error procedure to derive a best-fit decay coefficient for each contaminant. For expanding plumes, this steady-state calibration method may over-estimate actual decay-rate coefficients and contribute to an under-estimation of predicted concentration levels. |
| **How to Enter Data** | Enter directly. If the first-order decay coefficient is entered directly, this parameter is not needed in BIOSCREEN. |
| **Parameter** | **Delta Oxygen (O2)** |
| **Units** | mg/L |
| **Description** | This parameter, used in the instantaneous reaction model, is one component of the total biodegradation capacity of the groundwater as it flows through the source zone and contaminant plume. The model assumes that 3.14 mg of oxygen are required to consume 1 mg of dissolved hydrocarbons (Wiedemeier, Wilson, et al., (1995). Note that this parameter is used for the instantaneous reaction model, which is only appropriate for readily biodegradable compounds such as BTEX and probably not appropriate for more recalcitrant compounds such as the chlorinated solvents. |
| **Typical Values** | Typical values: Median = 5.8 mg/L Maximum = 12.7 mg/L Minimum = 0.4 mg/L |
| **Source of Data** | Enter the average background concentration of oxygen minus the lowest observed concentration of oxygen in the source area. BIOSCREEN automatically applies the utilization factor used to compute a biodegradation capacity. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Delta Nitrate (NO3)** |
| **Units** | mg/L |
| **Description** | This parameter, used in the instantaneous reaction model, is one component of the total biodegradation capacity of the groundwater as it flows through the source zone and contaminant plume. The model assumes that 4.9 mg of nitrate are required to consume 1 mg of BTEX (Wiedemeier, Wilson, et al. 1995). Note that this parameter is used for the instantaneous reaction model, which is appropriate only for readily |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

biodegradable compounds such as BTEX that degrade according to the assumed BIOSCREEN utilization factors, and is not appropriate for more recalcitrant compounds such as the chlorinated solvents.

**Typical Values** Typical values: Median = 6.3 mg/L Maximum = 69.7 mg/L Minimum = 0 mg/L

**Source of Data** Enter the average background concentration of nitrate minus the lowest observed concentration of nitrate in the source area. BIOSCREEN automatically applies the utilization factor to compute a biodegradation capacity.

**How to Enter Data** Enter directly.

**Parameter** **Observed Ferrous Iron (Fe)**

**Units** mg/L

**Description** This parameter, used in the instantaneous reaction model, is one component of the total biodegradation capacity of the groundwater as it flows through the source zone and contaminant plume. Ferrous iron is a metabolic by-product of the anaerobic reaction where solid ferric iron is used as an electron acceptor. The model assumes that 21.8 mg of ferrous iron represents the consumption of 1 mg of BTEX (Wiedemeier, Wilson, et al. 1995). Note that this parameter is used for the instantaneous reaction model, which is appropriate only for readily biodegradable compounds such as BTEX that degrade according to the assumed BIOSCREEN utilization factors, and is not appropriate for more recalcitrant compounds such as the chlorinated solvents. Because ferrous iron reacts with the sulfide produced from the reduction of sulfate, some or most of the ferrous iron may not be observed during groundwater sampling. Some researchers suspect that the observed ferrous iron concentration is much less (10% or less) than the actual amount of ferrous iron that has been generated due to the sorption of ferrous iron onto the aquifer matrix (Lovely 1995). If this is the case, then the value used for this parameter should be much higher than the observed maximum concentration of ferrous iron in the aquifer.

**Typical Values** Typical values: Median = 16.6 mg/L Maximum = 599.5 mg/L Minimum = 0 mg/L

**Source of Data** Enter the average observed concentration, in mg/L, of ferrous (dissolved) iron found in the source area (approximately the area where ferrous iron

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| | has been observed in monitoring wells). BIOSCREEN automatically applies the utilization factor to compute a biodegradation capacity. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Delta Sulfate (SO4)** |
| **Units** | mg/L |
| **Description** | This parameter, used in the instantaneous reaction model, is one component of the total biodegradation capacity of the groundwater as it flows through the source zone and contaminant plume. The model assumes that 4.7 mg of sulfate are required to consume 1 mg of BTEX (Wiedemeier, Wilson, et al. 1995). Note that this parameter is used for the instantaneous reaction model, which is appropriate only for readily biodegradable compounds such as BTEX that degrade according to the assumed BIOSCREEN utilization factors, and is not appropriate for more recalcitrant compounds such as the chlorinated solvents. |
| **Typical Values** | Typical values: Median = 24.6 mg/L Maximum = 109.2 mg/L Minimum = 0 mg/L |
| **Source of Data** | Enter the average background concentration of sulfate minus the lowest observed concentration of sulfate in the source area. BIOSCREEN then computes a biodegradation capacity. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Observed Methane (CH4)** |
| **Units** | mg/L |
| **Description** | This parameter, used in the instantaneous reaction model, is one component of the total biodegradation capacity of the groundwater as it flows through the source zone and contaminant plume. Methane is a metabolic by-product of methanogenic activity. The model assumes that 0.78 mg of methane represents the consumption of 1 mg of BTEX (Wiedemeier, Wilson, et al. 1995). Note that this parameter is used for the instantaneous reaction model, which is appropriate only for readily biodegradable compounds such as BTEX that degrade according to the assumed BIOSCREEN utilization factors, and is not appropriate for more recalcitrant compounds such as the chlorinated solvents. |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| **Typical Values** | Typical values: Median = 7.2 mg/L Maximum = 48.4 mg/L Minimum = 0.0 mg/L |
| **Source of Data** | Enter the average observed concentration, in mg/L, of methane found in the source area (approximately the area where methane is observed in monitoring wells). BIOSCREEN automatically computes a biodegradation capacity. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Model Area Length and Width (L and W)** |
| **Units** | ft |
| **Description** | Physical dimensions of the rectangular area to be modeled. If one is interested in concentrations at some particular point along the centerline of the plume (a common approach for most risk assessments), enter this value in the "Modeled Area Length" box and see the results by clicking on the "Run Centerline" button, which begins the centerline model. If one are interested in more accurate mass calculations, make sure most of the plume is within the zone delineated by the Modeled Area Length and Width. Find the mass balance results using the "Run Array" button. |
| **Typical Values** | 10 to 1000 ft |
| **Source of Data** | Values should be slightly larger than the final plume dimensions or should extend to the point of concern. If only the centerline output is used, the plume width parameter has no effect on the results. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Simulation Time (t)** |
| **Units** | years |
| **Description** | Time for which concentrations are to be calculated. For steady-state simulations, enter a large value (i.e., 1000 years would be sufficient for most sites). |
| **Typical Values** | 1 to 1000 years |
| **Source of Data** | To match an existing plume, estimate the time between the original release and the date the field data were collected. To predict the maximum extent |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

| | |
|---|---|
| | of plume migration, increase the simulation time until the plume no longer increases in length. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Source Thickness In Saturated Zone (z)** |
| **Units** | ft |
| **Description** | The Domenico (1987) model assumes a vertical plane source with constant concentration. For many fuel spill sites the thickness of this source zone is only 5 - 20 ft as petroleum fuels are LNAPLs (light non-aqueous phase liquids) that float on the water table. Therefore, the residual source zones that are slowly dissolving, creating the dissolved BTEX plume, are typically restricted to the upper part of the aquifer. |
| **Typical Values** | 5-50 ft |
| **Source of Data** | This value is usually determined by evaluating groundwater data from wells near the source zone screened at different depths. If this type of information is not available, then one could estimate the amount of water table fluctuation that has occurred since the time of the release and use this value as the source zone thickness (equating to the smear zone). Otherwise, a simple assumption of 10 feet would probably be appropriate for many petroleum release sites. Note that if DNAPLs are present at the site (e.g., a chlorinated solvent site) larger source zone thicknesses would probably be required. |
| **How to Enter Data** | Enter directly. |
| **Parameter** | **Source Zone Width** |
| **Units** | ft |
| **Description** | The Domenico (1987) model assumes a vertical plane source of constant concentration. BIOSCREEN expands the simple one source-zone approach by allowing up to five source zones with different concentrations. This allows one to account for spatial variations in the source area. |
| **Typical Values** | 10 - 200 ft |
| **Source of Data** | To define a varying source concentration across the site: (1) Draw a line perpendicular to the groundwater flow direction in the source zone. The |

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

source zone is typically defined as being the area with contaminated soils having high concentrations of sorbed organics, free-phase NAPLs, or residual NAPLs. If the source zone covers a large area, it is best to choose the most downgradient or widest point in the source area to draw the perpendicular-to-flow line. (2) Divide the line into 1, 3, or 5 zones. A total of 5 zones is shown on the input screen. (3) Determine the width and corresponding average concentration of Zones 1, 2, and 3. Typically Zone 3 will contain the highest concentration. Note that the model assumes the source zone is symmetrical and will automatically define source zones 4 and 5 to be identical to Zones 2 and 1. Therefore, it is not necessary to specify all 5 zones. For simpler problems, you can either use three zones to define varying source concentrations across the site (enter information in Zones 2 and 3, and the model will define Zone 4) or just use a single zone (enter data for Zone 3 only). (4) Enter the width and source concentration into the appropriate zones on the spreadsheet For example, if a total source width of 100 ft. is divided into five zones, enter 20 ft for each zone width. Enter the average concentration observed across each zone.

**How to Enter Data** Enter directly.

**Parameter** **Source Zone Concentration**

**Units** mg/L

**Description** BIOSCREEN requires source zone concentrations that correspond to the source zone width data (see previous page). Suggested rules of thumb regarding how to handle multiple constituents are: (1) If the maximum plume length is desired, model lumped constituents (such as BTEX). If a risk assessment is being performed, data on individual constituents are needed. (2) If lumped constituents are being modeled (BTEX all together), use either average values for the chemical-specific data ($K_{oc}$ and lambda) or the worst-case values (e.g., use the lowest of the Koc and lambda from the group of constituents being modeled) to overestimate concentrations. Most modeling will be performed assuming that the ratio of BTEX at the edge of the plume is the same as at the source. For more detailed modeling studies, the following rules of thumb help account for different rates of reaction among the BTEX compounds: If the site is dominated by aerobic degradation (most of the biodegradation capacity is from oxygen, a relatively rare occurrence) assume that the benzene will degrade first and that the dissolved material at the edge of the plume is primarily TEX. If the site is dominated by nitrate utilization (most of the biodegradation capacity is from nitrate, a relatively rare occurrence)

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

assume that benzene will degrade last and that the dissolved material at the edge of the plume is primarily benzene. If the site is dominated by sulfate reduction (most of the biodegradation capacity is due to sulfate utilization, a more common occurrence) assume that the benzene will degrade at the same rate as the TEX constituents and that the dissolved material at the edge of the plume is a mixture of BTEX. If the site is dominated by methane production (most of the biodegradation capacity is due to methanogenesis, a more common occurrence) assume that benzene will degrade last and that the dissolved material at the edge of the plume is primarily benzene. (3) If individual constituents are being modeled with the instantaneous reaction assumption, note that the total biodegradation capacity must be reduced to account for electron acceptor utilization by other constituents present in the plume. For example, in order to model benzene as an individual constituent using the instantaneous reaction model in a BTEX plume containing equal source concentrations of benzene, toluene, ethylbenzene and xylene, the amount of oxygen, nitrate, sulfate, iron, and methane should be reduced by 75% to account for utilization by toluene, ethylbenzene, and xylene.

**Typical Values** 0.010 to 120 mg/L

**Source of Data** Source area monitoring well data.

**How to Enter Data** Enter directly.

**Parameter** **Source Half-Life (Value Calculated by Model)**

**Units** years

**Description** The Domenico (1987) model assumes the source is infinite, i.e. the source concentrations are constant. In BIOSCREEN, however, an approximation for a declining source concentration has been added. Note that this is an experimental relationship, and it should be applied with caution. The declining source term is based on the following assumptions: There is a finite mass of organics in the source zone present as a free-phase or residual NAPL. The NAPL in the source zone dissolves slowly as fresh groundwater passes through. The change in source zone concentration can be approximated as a first-order decay process. For example, if the source zone concentration "half-life" is ten years and the initial source zone concentration is 1 mg/L, then the source zone concentration will be 0.5 mg/L after 10 years, and 0.25 mg/L after 20 years. Note that the assumption that dissolution is a first-order process is only an approximation, and that source attenuation is best described by first order

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

decay when concentrations are relatively low (< 1 mg/L). For more information on dissolution, see Newell et al.(1994). The source half-life IS NOT related to lambda, the biodegradation half-life for dissolved constituents. Lambda is used to calculate the amount of biodegradation of dissolved organics after they leave the source zone and travel through the plume area. The source half-life is related to the rate of dissolution occurring in the source zone and describes the change in source concentrations over time. The BIOSCREEN software automatically calculates the source zone concentration half-life if the user enters a best estimate for the mass of dissolvable organics zone (soluble organic constituents sorbed on the soil, residual NAPLs, and free product) in the source. The half-life of the dissolution process can be approximated if one knows the mass of dissolvable organics in the source zone (in mg or kg), the flow rate through the source zone, and the average concentration of dissolved organics that leave the source zone. The equation is based on integrating the concentration vs. time relationship (first order decay) and using the relationship that the mass in the source zone over time is proportional to the source concentration over time.

**Typical Values** 1 to 10,000 years

**Source of Data** Calculated by model from soluble mass in NAPL and soil (see below), source concentrations, and groundwater velocity.

**How to Enter Data** Calculated directly by model. Change by changing soluble mass.

**Parameter** **Soluble Mass in NAPL, Soil**

**Units** kg

**Description** The best estimate of dissolvable organics in the source zone is obtained by adding the mass of dissolvable organics on soils, free-phase NAPLs, and residual NAPLs. This quantity is used to estimate the rate that the source zone concentration declines. Note that this is an experimental and unverified model that should be applied with care (the model probably underpredicts removal rate).For gasoline or JP-4 spills, BTEX is usually assumed to comprise the bulk of dissolvable organics in the source zone. To simulate a declining source, use the method described below. For constant-source simulations, either enter a very large number for soluble mass in the source zone (e.g., 1,000,000 kg) or type "Infinite".

**Typical Values** 0.1 to 100,000 kg

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Source of Data** This information will most likely come from either: (1) Estimates of the mass of spilled fuel (remember to convert the total mass of spilled fuel to the dissolvable mass; for example BTEX represents only 5-15% of the total mass of gasoline). (2) Integration of maps showing contaminated soil zones (data in mg/kg) and/or NAPL zones (usually product thickness). The user should estimate the volume of contaminated soil, convert to kg of contaminated soil, and multiply by the average soil concentration. To make the estimate more accurate, the user might have to divide the soil into different zones of soil concentrations, into unsaturated vs. saturated soil, and/or into different depths. (One standard approach is to divide into a vertically averaged unsaturated zone map and a vertically averaged saturated zone map.) If the user is making estimates from NAPL data, remember the thickness of product in a aquifer is only 10-50% of the actual product thickness in the well (Bedient et al. 1994).Note that the data is to be entered in kg, and the model will convert the results to estimate the source half-life. An example is provided below assuming a bulk density of 1.7 kg/L (e.g., 100 ft2 x 20 ft x 28.3 L/ft3 x 1.7 kg/L x 600 mg/Kg x 10-6 kg/mg = 58 kg):

**How to Enter Data** Enter directly.

## REFERENCES

American Society for Testing and Materials, 1995, "Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites," ASTM E-1739-95, Philadelphia, PA.

Bedient, P. B., H.S. Rifai, and C.J. Newell, 1994. Groundwater Contamination: Transport and Remediation, Prentice-Hall.

Connor, J.A., C.J. Newell, J.P. Nevin, and H.S. Rifai, 1994. "Guidelines for Use of Groundwater Spreadsheet Models in Risk-Based Corrective Action Design," National Ground Water Association, Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in Ground Water Conference, Houston, Texas, November 1994, pp. 43-55.

Domenico, P.A. 1987. An Analytical Model for Multidimensional Transport of a Decaying Contaminant Species. Journal of Hydrology, 91 (1987) 49-58.

Domenico, P.A. and F. W. Schwartz, 1990. Physical and Chemical Hydrogeology, Wiley, New York, NY.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Gelhar, L.W., C. Welty, and K.R. Rehfeldt, 1992. A Critical Review of Data on Field-Scale Dispersion in Aquifers. Water Resources Research, Vol. 28, No. 7, pg 1955-1974.

Howard, P. H., R. S. Boethling, W. F. Jarvis, W. M. Meylan, and E. M. Michalenko, 1991. Handbook of Environmental Degradation Rates, Lewis Publishers, Inc., Chelsea, MI.

Newell, C. J., R. L. Bowers, and H. S. Rifai, 1994. "Impact of Non-Aqueous Phase Liquids (NAPLs) on Groundwater Remediation," American Chemical Society Symposium on Multimedia Pollutant Transport Models, Denver, Colorado, August 1994.

Pickens, J.F., and G.E. Grisak, 1981. "Scale-Dependent Dispersion in a Stratified Granular Aquifer," J. Water Resources Research, Vol. 17, No. 4, pp. 1191-1211.

U.S. Environmental Protection Agency, 1986, Background Document for the Ground Water Screening Procedure to Support 40 CFR Part 269 - Land Disposal. EPA/530-SW-86-047, January 1986.

Wiedemeier, T. H., Wilson, J. T., Kampbell, D. H, Miller, R. N., and Hansen, J.E., 1995. "Technical Protocol for Implementing Intrinsic Remediation With Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater (Draft)", Air Force Center for Environmental Excellence, April, 1995.

Xu, Moujin and Y. Eckstein, 1995, "Use of Weighted Least-Squares Method in Evaluation of the Relationship Between Dispersivity and Scale," Journal of Ground Water, Vol. 33, No. 6, pp. 905-908.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# POTENTIAL GROUNDWATER CONTRIBUTION TO SEDIMENT CONTAMINATION

Groundwater Quality and Chemical Data

Groundwater Monitoring Well 1S

Groundwater Monitoring Well 1I

Groundwater Monitoring Well 1D

Groundwater Monitoring Well 1S

Groundwater Monitoring Well 3S

Groundwater Monitoring Well 3I

Groundwater Monitoring Well 3D

Groundwater Monitoring Well 5D

Groundwater Monitoring Well 11S

Groundwater Monitoring Well 11I

Groundwater Monitoring Well 11D

Groundwater Monitoring Well 15S

Groundwater Monitoring Well 15I

Groundwater Monitoring Well 15D

DNAPL-PAH Chemical Properties

## PSR Upland: Stats for Groundwater Monitor Well "1S", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| Naphthalene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8 | 0 |
| Acenaphthylene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 2.3 | 0 |
| Acenaphthene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8 | 0 |
| Fluorene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0 |
| Phenanthrene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.65 | 0 |
| Anthracene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.65 | 0 |
| Total LPAH | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 2.3 | 0 |
| Fluoranthene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0 |
| Pyrene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.27 | 0 |
| Benzo(a)anthracene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.013 | 0 |
| Chrysene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.15 | 0 |
| Benzo(b)fluoranthene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.018 | 0 |
| Benzo(k)fluoranthene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.017 | 0 |
| Total Benzofluoranthene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.018 | 0 |
| Benzo(a)pyrene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.023 | 0 |
| Indeno(1,2,3-cd)pyrene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.043 | 0 |
| Dibenz(a,h)anthracene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.03 | 0 |
| Benzo(g,h,i)perylene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.075 | 0 |
| Total HPAH | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.27 | 0 |

## PSR Upland: Stats for Groundwater Monitor Well "1I", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0 |
| Naphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Acenaphthylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Acenaphthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Fluorene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Phenanthrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Total LPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |
| Benzo(a)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2565 | 1.794 |
| Chrysene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.325 | 1.43 |
| Benzo(b)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(k)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2565 | 1.7833 |
| Total Benzofluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(a)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2615 | 1.7674 |
| Indeno(1,2,3-cd)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2715 | 1.7142 |
| Dibenz(a,h)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.265 | 1.7488 |
| Benzo(g,h,i)perylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2875 | 1.6292 |
| Total HPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |

## PSR Upland: Stats for Groundwater Monitor Well "1D", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0 |
| Naphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Acenaphthylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Acenaphthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Fluorene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Phenanthrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Total LPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |
| Benzo(a)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2565 | 1.794 |
| Chrysene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.325 | 1.43 |
| Benzo(b)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(k)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2585 | 1.7833 |
| Total Benzofluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(a)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2615 | 1.7674 |
| Indeno(1,2,3-cd)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2715 | 1.7142 |
| Dibenz(a,h)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.265 | 1.7488 |
| Benzo(g,h,i)perylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2875 | 1.6292 |
| Total HPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |

## PSR Upland: Stats for Groundwater Monitor Well "3S", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0.5 |
| Naphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.8833 | 1.516 |
| Acenaphthylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4333 | 3.2922 |
| Acenaphthene | 3 | 1 | 33.3 | 0 | 0 | 0.95 | 0.95 | RA4MW-3S-796 | 0.7833 | 1.1991 |
| Fluorene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2783 | 0.6187 |
| Phenanthrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.38 | 0.5552 |
| Anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3867 | 0.5521 |
| **Total LPAH** | 3 | 1 | 33.3 | 0 | 0 | 0.95 | 0.95 | RA4MW-3S-796 | 0.8667 | 1.4279 |
| Fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2833 | 0.621 |
| Pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2567 | 0.6119 |
| Benzo(a)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1783 | 0.6481 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2167 | 0.6303 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1767 | 0.6488 |
| Benzo(k)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.18 | 0.6475 |
| Total Benzofluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.18 | 0.6475 |
| Benzo(a)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1833 | 0.646 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1887 | 0.6442 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1883 | 0.6443 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1983 | 0.6389 |
| Total HPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2933 | 0.609 |

## PSR Upland: Stats for Groundwater Monitor Well "3I", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 1 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0 |
| Naphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Acenaphthylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Acenaphthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.15 | 5.2541 |
| Fluorene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Phenanthrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.575 | 1.0486 |
| Total LPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4 | 7.0826 |
| Fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.355 | 1.2705 |
| Pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |
| Benzo(a)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2585 | 1.794 |
| Chrysene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.325 | 1.43 |
| Benzo(b)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(k)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2585 | 1.7833 |
| Total Benzofluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.259 | 1.7807 |
| Benzo(a)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2615 | 1.7674 |
| Indeno(1,2,3-cd)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2715 | 1.7142 |
| Dibenz(a,h)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.265 | 1.7488 |
| Benzo(g,h,i)perylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2875 | 1.6292 |
| Total HPAH | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.385 | 1.1111 |

## PSR Upland: Stats for Groundwater Monitor Well "3D", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0.5 |
| Naphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.8833 | 1.516 |
| Acenaphthylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4333 | 3.2922 |
| Acenaphthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.7667 | 1.156 |
| Fluorene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2783 | 0.6187 |
| Phenanthrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.38 | 0.5552 |
| Anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3867 | 0.5521 |
| Total LPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4333 | 3.2922 |
| Fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2633 | 0.621 |
| Pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2567 | 0.6119 |
| Benzo(a)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1783 | 0.6481 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2167 | 0.8303 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1767 | 0.6488 |
| Benzo(k)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.18 | 0.8475 |
| Total Benzofluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.18 | 0.6475 |
| Benzo(a)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1833 | 0.646 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1867 | 0.6442 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1883 | 0.6443 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1983 | 0.6389 |
| Total HPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2933 | 0.609 |

## PSR Upland: Stats for Groundwater Monitor Well "5D", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| Semi-Volatile Organic Compounds (ug/l) | | | | | | | | | | |
| 2-Methylnaphthalene | 3 | 3 | 100.0 | 0 | 0 | 6.4 | 38 | RA4MW-5D-796 | 19.1333 | 47.2349 |
| Naphthalene | 3 | 3 | 100.0 | 0 | 0 | 42 | 150 | RA4MW-5D-796 | 81.3333 | 181.9404 |
| Acenaphthylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.4333 | 3.2922 |
| Acenaphthene | 3 | 3 | 100.0 | 0 | 0 | 13 | 30 | RA4MW-5D-796 | 20.6667 | 35.2016 |
| Fluorene | 3 | 3 | 100.0 | 0 | 0 | 17 | 48 | RA4MW-5D-796 | 30 | 57.1314 |
| Phenanthrene | 3 | 3 | 100.0 | 0 | 0 | 50 | 190 | RA4MW-5D-796 | 102.3333 | 231.1263 |
| Anthracene | 3 | 3 | 100.0 | 0 | 0 | 3.9 | 38 | RA4MW-5D-796 | 17.9667 | 48.0017 |
| Total LPAH | 3 | 3 | 100.0 | 0 | 0 | 144 | 456 | RA4MW-5D-796 | 252.3 | 549.9007 |
| Fluoranthene | 3 | 3 | 100.0 | 0 | 0 | 6.2 | 140 | RA4MW-5D-796 | 51.5333 | 180.708 |
| Pyrene | 3 | 3 | 100.0 | 0 | 0 | 3.2 | 49 | RA4MW-5D-796 | 18.9 | 62.8597 |
| Benzo(a)anthracene | 3 | 2 | 66.7 | 0 | 0 | 0.14 | 16 | RA4MW-5D-796 | 5.5467 | 20.8115 |
| Chrysene | 3 | 2 | 66.7 | 0 | 0 | 0.16 | 15 | RA4MW-5D-796 | 5.22 | 19.5017 |
| Benzo(b)fluoranthene | 3 | 2 | 66.7 | 0 | 0 | 0.011 | 6.3 | RA4MW-5D-796 | 2.2703 | 8.1681 |
| Benzo(k)fluoranthene | 3 | 1 | 33.3 | 0 | 0 | 3 | 3 | RA4MW-5D-796 | 1.17 | 3.8735 |
| Total Benzofluoranthene | 3 | 2 | 66.7 | 0 | 0 | 0.011 | 9.3 | RA4MW-5D-796 | 3.2703 | 12.0833 |
| Benzo(a)pyrene | 3 | 2 | 66.7 | 0 | 0 | 0.013 | 4.5 | RA4MW-5D-796 | 1.671 | 5.8217 |
| Indeno(1,2,3-cd)pyrene | 3 | 1 | 33.3 | 0 | 0 | 1 | 1 | RA4MW-5D-796 | 0.5083 | 1.3303 |
| Dibenz(a,h)anthracene | 3 | 1 | 33.3 | 0 | 0 | 0.88 | 0.88 | RA4MW-5D-796 | 0.465 | 1.1959 |
| Benzo(g,h,i)perylene | 3 | 1 | 33.3 | 0 | 0 | 0.63 | 0.63 | RA4MW-5D-796 | 0.39 | 0.9126 |
| Total HPAH | 3 | 3 | 100.0 | 0 | 0 | 9.724 | 236.31 | RA4MW-5D-796 | 88.3113 | 305.3257 |

## PSR Upland: Stats for Groundwater Monitor Well "11S", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0.5 |
| Naphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.1633 | 2.2835 |
| Acenaphthylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8167 | 3.7615 |
| Acenaphthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.0667 | 2.1892 |
| Fluorene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3133 | 0.5864 |
| Phenanthrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.49 | 0.7688 |
| Anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.4933 | 0.7632 |
| Total LPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8167 | 3.7615 |
| Fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3183 | 0.5852 |
| Pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3017 | 0.6128 |
| Benzo(a)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1793 | 0.6476 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2417 | 0.6241 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1793 | 0.6475 |
| Benzo(k)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1823 | 0.6463 |
| Total Benzofluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1827 | 0.6461 |
| Benzo(a)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.186 | 0.6446 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1927 | 0.6414 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1933 | 0.6414 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0.6337 |
| Total HPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3383 | 0.5753 |

## PSR Upland: Stats for Groundwater Monitor Well "11I", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0.5 |
| Naphthalene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.1833 | 2.2835 |
| Acenaphthylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8167 | 3.7615 |
| Acenaphthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.0667 | 2.1892 |
| Fluorene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3133 | 0.5864 |
| Phenanthrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.49 | 0.7688 |
| Anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.4933 | 0.7632 |
| Total LPAH | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.8167 | 3.7615 |
| Fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3183 | 0.5852 |
| Pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3017 | 0.6128 |
| Benzo(a)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1793 | 0.6476 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2417 | 0.6241 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1793 | 0.6475 |
| Benzo(k)fluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.01 | 0.01 | RA4MW-11I-796 | 0.1757 | 0.6492 |
| Total Benzofluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.01 | 0.01 | RA4MW-11I-796 | 0.176 | 0.6491 |
| Benzo(a)pyrene | 3 | 1 | 33.3 | 0 | 0 | 0.01 | 0.01 | RA4MW-11I-796 | 0.1777 | 0.6484 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1927 | 0.6414 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1933 | 0.6414 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0.6337 |
| Total HPAH | 3 | 1 | 33.3 | 0 | 0 | 0.02 | 0.02 | RA4MW-11I-796 | 0.2633 | 0.6681 |

## PSR Upland: Stats for Groundwater Monitor Well "11D", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 1 | 1 | 100.0 | 0 | 0 | 270 | 270 | RA4MW-11D-495 | 270 | 0 |
| Naphthalene | 2 | 2 | 100.0 | 0 | 0 | 2100 | 3900 | RA4MW-11D-495 | 3000 | 8682.6 |
| Acenaphthylene | 2 | 1 | 50.0 | 0 | 0 | 48 | 48 | RA4MW-11D-795 | 25.25 | 168.8935 |
| Acenaphthene | 2 | 2 | 100.0 | 0 | 0 | 64 | 150 | RA4MW-11D-495 | 107 | 378.502 |
| Fluorene | 2 | 2 | 100.0 | 0 | 0 | 40 | 85 | RA4MW-11D-495 | 62.5 | 204.565 |
| Phenanthrene | 2 | 2 | 100.0 | 0 | 0 | 39 | 70 | RA4MW-11D-495 | 54.5 | 152.367 |
| Anthracene | 2 | 1 | 50.0 | 0 | 0 | 6.5 | 6.5 | RA4MW-11D-795 | 4.5 | 17.128 |
| Total LPAH | 2 | 2 | 100.0 | 0 | 0 | 2297.5 | 4205 | RA4MW-11D-495 | 3251.25 | 9273.2275 |
| Fluoranthene | 2 | 1 | 50.0 | 0 | 0 | 3.2 | 3.2 | RA4MW-11D-795 | 2.85 | 5.0599 |
| Pyrene | 2 | 1 | 50.0 | 0 | 0 | 1.4 | 1.4 | RA4MW-11D-795 | 1.95 | 5.4227 |
| Benzo(a)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.2608 | 9.0854 |
| Chrysene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.375 | 8.4783 |
| Benzo(b)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.285 | 9.0628 |
| Benzo(k)fluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.2643 | 9.0668 |
| Total Benzofluoranthene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.265 | 9.0628 |
| Benzo(a)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.2693 | 9.0402 |
| Indeno(1,2,3-cd)pyrene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.285 | 8.9565 |
| Dibenz(a,h)anthracene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.275 | 9.0097 |
| Benzo(g,h,i)perylene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 1.3125 | 8.8104 |
| Total HPAH | 2 | 1 | 50.0 | 0 | 0 | 4.6 | 4.6 | RA4MW-11D-795 | 3.55 | 10.1797 |

## PSR Upland: Stats for Groundwater Monitor Well "15S", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semi-Volatile Organic Compounds (ug/l)** | | | | | | | | | | |
| 2-Methylnaphthalene | 2 | 2 | 100.0 | 0 | 0 | 20 | 150 | RA4MW-15S-595 | 85 | 495.41 |
| Naphthalene | 3 | 3 | 100.0 | 0 | 0 | 1400 | 2400 | RA4MW-15S-795 | 2000 | 2892.0747 |
| Acenaphthylene | 3 | 3 | 100.0 | 0 | 0 | 2.7 | 95 | RA4MW-15S-795 | 33.6 | 123.2446 |
| Acenaphthene | 3 | 3 | 100.0 | 0 | 0 | 180 | 240 | RA4MW-15S-595 | 213.3333 | 264.8373 |
| Fluorene | 3 | 3 | 100.0 | 0 | 0 | 110 | 110 | RA4MW-15S-796 | 110 | 110 |
| Phenanthrene | 3 | 3 | 100.0 | 0 | 0 | 110 | 120 | RA4MW-15S-796 | 113.3333 | 123.0667 |
| Anthracene | 3 | 3 | 100.0 | 0 | 0 | 8.5 | 35 | RA4MW-15S-796 | 21.5 | 43.8496 |
| Total LPAH | 3 | 3 | 100.0 | 0 | 0 | 1888.1 | 2916 | RA4MW-15S-795 | 2491.7667 | 3396.9539 |
| Fluoranthene | 3 | 3 | 100.0 | 0 | 0 | 12 | 27 | RA4MW-15S-796 | 17.6667 | 31.3972 |
| Pyrene | 3 | 3 | 100.0 | 0 | 0 | 6.3 | 8 | RA4MW-15S-796 | 6.8667 | 8.5213 |
| Benzo(a)anthracene | 3 | 1 | 33.3 | 0 | 0 | 0.18 | 0.18 | RA4MW-15S-795 | 0.31 | 0.5936 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5417 | 0.8836 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2483 | 0.6383 |
| Benzo(k)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2808 | 0.6675 |
| Total Benzofluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2817 | 0.6661 |
| Benzo(a)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3033 | 0.6804 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.32 | 0.6516 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.3583 | 0.772 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.4133 | 0.7421 |
| Total HPAH | 3 | 3 | 100.0 | 0 | 0 | 18.3 | 35 | RA4MW-15S-796 | 24.5933 | 39.8978 |

n/a - Criteria not available

## PSR Upland: Stats for Groundwater Monitor Well "15I", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| Semi-Volatile Organic Compounds (ug/l) | | | | | | | | | | |
| 2-Methylnaphthalene | 2 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.5 | 0.5 |
| Naphthalene | 3 | 3 | 100.0 | 0 | 0 | 58 | 160 | RA4MW-15I-795 | 116 | 204.3752 |
| Acenaphthylene | 3 | 3 | 100.0 | 0 | 0 | 1.1 | 57 | RA4MW-15I-795 | 29.3667 | 76.4956 |
| Acenaphthene | 3 | 3 | 100.0 | 0 | 0 | 99 | 170 | RA4MW-15I-795 | 136.3333 | 196.4204 |
| Fluorene | 3 | 3 | 100.0 | 0 | 0 | 35 | 59 | RA4MW-15I-795 | 45.3333 | 66.1408 |
| Phenanthrene | 3 | 3 | 100.0 | 0 | 0 | 23 | 48 | RA4MW-15I-795 | 34.3333 | 55.6802 |
| Anthracene | 3 | 3 | 100.0 | 0 | 0 | 2.6 | 7.4 | RA4MW-15I-796 | 4.5333 | 8.8027 |
| Total LPAH | 3 | 3 | 100.0 | 0 | 0 | 275.7 | 497.6 | RA4MW-15I-795 | 365.9 | 562.5152 |
| Fluoranthene | 3 | 3 | 100.0 | 0 | 0 | 3.1 | 9.3 | RA4MW-15I-796 | 5.4333 | 11.1188 |
| Pyrene | 3 | 3 | 100.0 | 0 | 0 | 1.7 | 2.4 | RA4MW-15I-795 | 1.9667 | 2.6049 |
| Benzo(a)anthracene | 3 | 1 | 33.3 | 0 | 0 | 0.22 | 0.22 | RA4MW-15I-796 | 0.2443 | 0.6564 |
| Chrysene | 3 | 1 | 33.3 | 0 | 0 | 0.28 | 0.28 | RA4MW-15I-796 | 0.31 | 0.6083 |
| Benzo(b)fluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.24 | 0.24 | RA4MW-15I-796 | 0.2527 | 0.6594 |
| Benzo(k)fluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.09 | 0.09 | RA4MW-15I-796 | 0.2023 | 0.6413 |
| Total Benzofluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.33 | 0.33 | RA4MW-15I-796 | 0.2827 | 0.6948 |
| Benzo(a)pyrene | 3 | 1 | 33.3 | 0 | 0 | 0.11 | 0.11 | RA4MW-15I-796 | 0.211 | 0.6393 |
| Indeno(1,2,3-cd)pyrene | 3 | 1 | 33.3 | 0 | 0 | 0.03 | 0.03 | RA4MW-15I-796 | 0.191 | 0.6423 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1933 | 0.6414 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0.6337 |
| Total HPAH | 3 | 3 | 100.0 | 0 | 0 | 4.8 | 12.07 | RA4MW-15I-796 | 7.7233 | 14.1942 |

## PSR Upland: Stats for Groundwater Monitor Well "15D", All Sampling Rounds - PAHs Only

| Constituent | Number of Samples Analyzed | Number of Detections | Detection Frequency (%) | Number of Exceedances | Number of Detected Exceedances | Minimum Detected Value | Maximum Detected Value | Sample Number of Maximum Detected Value | Arithmetic Mean | Upper 95% Confidence Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| Semi-Volatile Organic Compounds (ug/l) | | | | | | | | | | |
| 2-Methylnaphthalene | 2 | 2 | 100.0 | 0 | 0 | 37 | 43 | RA4MW-15D-595 | 40 | 58.942 |
| Naphthalene | 3 | 3 | 100.0 | 0 | 0 | 100 | 180 | RA4MW-15D-595 | 140 | 207.4345 |
| Acenaphthylene | 3 | 2 | 66.7 | 0 | 0 | 5.5 | 6.3 | RA4MW-15D-796 | 4.1 | 9.3991 |
| Acenaphthene | 3 | 3 | 100.0 | 0 | 0 | 52 | 60 | RA4MW-15D-595 | 55.3333 | 62.3521 |
| Fluorene | 3 | 3 | 100.0 | 0 | 0 | 41 | 43 | RA4MW-15D-795 | 42.3333 | 44.28 |
| Phenanthrene | 3 | 3 | 100.0 | 0 | 0 | 54 | 67 | RA4MW-15D-796 | 58.6667 | 70.8625 |
| Anthracene | 3 | 3 | 100.0 | 0 | 0 | 3.6 | 16 | RA4MW-15D-795 | 11.2 | 22.4233 |
| Total LPAH | 3 | 3 | 100.0 | 0 | 0 | 280.3 | 340.6 | RA4MW-15D-595 | 311.4667 | 362.382 |
| Fluoranthene | 3 | 3 | 100.0 | 0 | 0 | 6.6 | 16 | RA4MW-15D-795 | 12.5333 | 21.2369 |
| Pyrene | 3 | 3 | 100.0 | 0 | 0 | 3.6 | 4.5 | RA4MW-15D-796 | 4.1 | 4.8726 |
| Benzo(a)anthracene | 3 | 1 | 33.3 | 0 | 0 | 0.19 | 0.19 | RA4MW-15D-795 | 0.2383 | 0.6449 |
| Chrysene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.2417 | 0.6241 |
| Benzo(b)fluoranthene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1783 | 0.6475 |
| Benzo(k)fluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.01 | 0.01 | RA4MW-15D-796 | 0.1757 | 0.6492 |
| Total Benzofluoranthene | 3 | 1 | 33.3 | 0 | 0 | 0.01 | 0.01 | RA4MW-15D-796 | 0.176 | 0.6491 |
| Benzo(a)pyrene | 3 | 1 | 33.3 | 0 | 0 | 0.02 | 0.02 | RA4MW-15D-796 | 0.181 | 0.6467 |
| Indeno(1,2,3-cd)pyrene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1927 | 0.6414 |
| Dibenz(a,h)anthracene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.1933 | 0.6414 |
| Benzo(g,h,i)perylene | 3 | 0 | 0.0 | 0 | 0 | n/a | n/a | | 0.21 | 0.6337 |
| Total HPAH | 3 | 3 | 100.0 | 0 | 0 | 10.8 | 19.79 | RA4MW-15D-795 | 16.7067 | 25.3332 |

**Table I-1—DNAPL-PAH Chemical Properties**

| Chemical Compound | Koc (L/kg) | DNAPL Effective Solubility (mg/L)[1] | Maximum Observed Concentration (mg/L)[1] |
|---|---|---|---|
| Naphthalene | 1288 | 11.5 | 5.5 |
| Acenaphthene | 7080 | 0.13 | 0.4 |
| Fluorene | 12900 | 1.9 | 0.22 |
| Phenanthrene | 23950 | 1.6 | 0.21 |
| Pyrene | 123000 | 0.16 | 0.028 |
| Anthracene | 23440 | 1.29 | 0.038 |

[1]From RETEC Upland RI/FS (1997)

## BIOSCREEN INPUT AND OUTPUT

This section presents the BIOSCREEN input and output screens produced during model runs Each model run is represented by two pages. The first page is model input and the second page presents model output.

The output page shows the average concentration at the top of the saturated zone along the centerline of the plume at various distances from the source area based no degradation models. All concentrations are displayed in units of mg/L.

Models Runs are:

Napthalene Shallow Interval
Naphthelene Shallow Interval - Distance to Receptor 145 feet
Napthelene Shallow Interval - Initial Concentration 5.5 mg/L
Phenanthrene Shallow Interval
Acenaptthene Shallow Interval
Flourene Shallow Interval
Pyrene Shallow Interval
Anthacene Shallow Interval
Napthalene Intermediate Interval
Naphthelene Intermediate Interval - Distance to Receptor 300 feet
Napthelene Intermediate Interval - Initial Concentration 5.5 mg/L
Phenanthrene Intermediate Interval
Acenaptthene Intermediate Interval
Acenaptthene Intermediate Interval - Initial Concentration 0.4 mg/L
Acenaptthene Intermediate Interval - Distance to Receptor 300 feet
Fluorene Intermediate Interval
Fluorene Intermediate Interval - Initial Concentration 0.22 mg/L
Fluorene Intermediate Interval - Distance to Receptor 300 feet
Pyrene Intermediate Interval
Anthracene Intermediate Interval
Napthalene Deep Interval
Phenanthrene Deep Interval
Acenaptthene Deep Interval
Fluorene Deep Interval
Pyrene Deep Interval
Anthracene Deep Interval

## Summary of BIOSCREEN Input Parameters used for Groundwater Transport and Loading Analysis at the MSU

| | | Source Values | | | | Hydrogeology | | | Dispersion | | | Adsorption | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone | Chemical | Distance to Receptor (ft) | Source Concen. (mg/L) | Source Width (ft.) | Source Thickness (ft) | Hydraulic Conduct. (cm/sec) | Hydraulic Gradient (ft/ft) | Porosity (%) | Longitud. (ft) | Transverse (ft) | Vertical (ft) | Soil Bulk Density (kg/L) | Partition Coeff. (L/kg) | Fraction Organic Carbon (%) | Bio-degrad-ation |
| Shallow | Naphthalene | 55 | 11.5 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Naphthalene | 145 | 11.5 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Naphthalene | 55 | 5.5 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Phenanthrene | 55 | 1.6 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 23950 | 0.01 | NA |
| | Acenaphthene | 55 | 0.13 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 7080 | 0.01 | NA |
| | Fluorene | 55 | 1.9 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Pyrene | 55 | 0.16 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 123000 | 0.01 | NA |
| | Anthracene | 55 | 1.29 | 100 | 3 | 0.024 | 0.001 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 23440 | 0.01 | NA |
| Intermediate | Naphthalene | 200 | 11.5 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Naphthalene | 300 | 11.5 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Naphthalene | 200 | 5.5 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Naphthalene | 300 | 5.5 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Phenanthrene | 200 | 1.6 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 23950 | 0.01 | NA |
| | Acenaphthene | 200 | 0.13 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 7080 | 0.01 | NA |
| | Acenaphthene | 200 | 0.4 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 7080 | 0.01 | NA |
| | Acenaphthene | 300 | 0.13 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 7080 | 0.01 | NA |
| | Fluorene | 200 | 1.9 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Fluorene | 200 | 0.22 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Fluorene | 300 | 1.9 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Fluorene | 300 | 0.22 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Pyrene | 200 | 0.16 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 123000 | 0.01 | NA |
| | Anthracene | 200 | 1.29 | 100 | 3 | 0.014 | 0.004 | 0.45 | 5.5 | 2.0 | 1.0 | 1.7 | 23440 | 0.01 | NA |
| Deep | Naphthalene | 400 | 11.5 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 1288 | 0.01 | NA |
| | Phenanthrene | 400 | 1.6 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 23950 | 0.01 | NA |
| | Acenaphthene | 400 | 0.13 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 7080 | 0.01 | NA |
| | Fluorene | 400 | 1.9 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 12900 | 0.01 | NA |
| | Pyrene | 400 | 0.16 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 123000 | 0.01 | NA |
| | Anthracene | 400 | 1.29 | 100 | 3 | 0.0064 | 0.001 | 0.400 | 5.5 | 2.0 | 1.0 | 1.7 | 23440 | 0.01 | NA |

Notes:

Hydrogeology parameters based on data from the Upland RI (RETEC, 1997).

Source width, thickness and dispersion are assumed values.

Chemical properties based on literature values and data from Upland RI (RETEC, 1997).

Biodegradation not used in the model simulation.

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR
Naphthalene-Shallow
Run Name

**Data Input Instructions:**

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 49.7 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 1288 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L
W

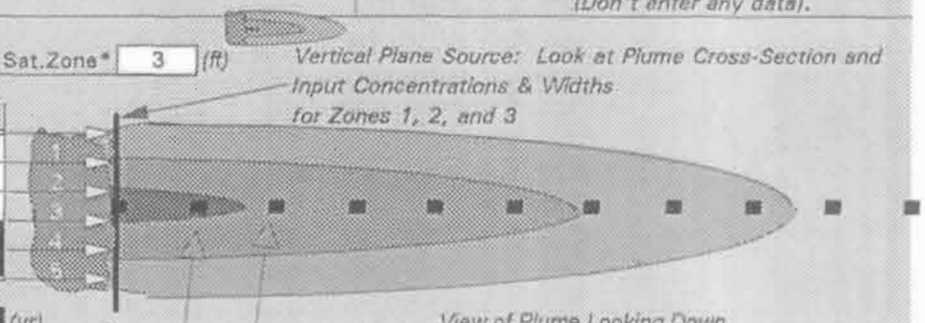
## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 11.5 |
| 0 | 0 |
| 0 | 0 |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

**Source Halflife (see Help):**

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

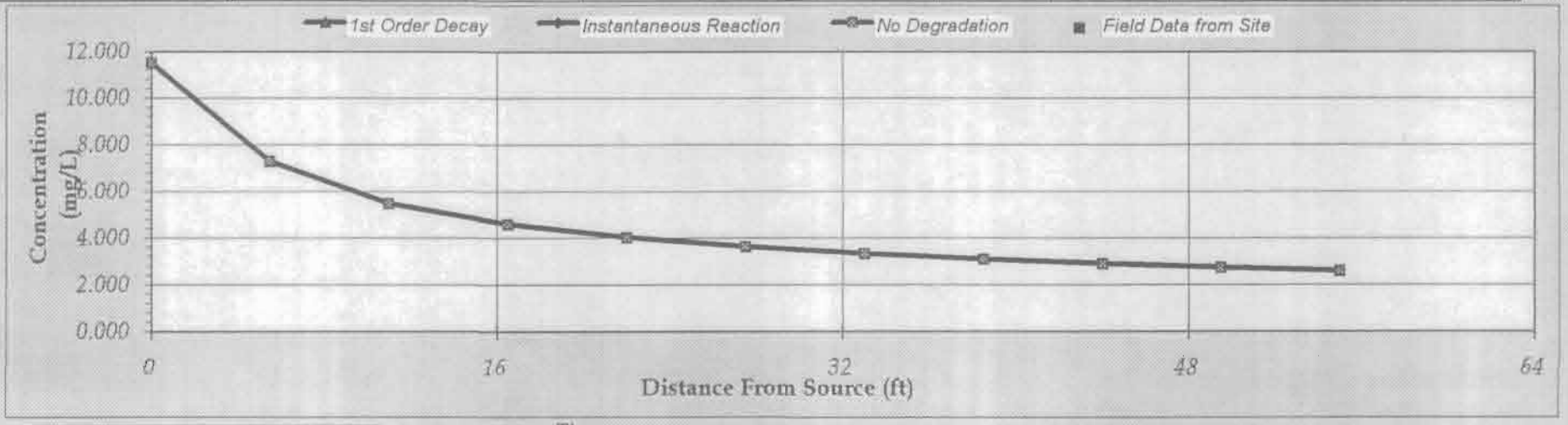
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 11.500 | 7.294 | 5.492 | 4.583 | 4.013 | 3.613 | 3.313 | 3.077 | 2.885 | 2.724 | 2.587 |
| 1st Order Decay | 11.500 | 7.294 | 5.492 | 4.583 | 4.013 | 3.613 | 3.313 | 3.077 | 2.885 | 2.724 | 2.587 |
| Inst. Reaction | 11.500 | 7.294 | 5.492 | 4.583 | 4.013 | 3.613 | 3.313 | 3.077 | 2.885 | 2.724 | 2.587 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation
Next Timestep
Prev Timestep

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Shallow Naphthalene 145' — *Run Name*

**Data Input Instructions:**

115 (or 0.02) — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | *Vs* | 55.2 | *(ft/yr)* |
| *or* | | *or* | |
| Hydraulic Conductivity | *K* | 2.4E-02 | *(cm/sec)* |
| Hydraulic Gradient | *i* | 0.001 | *(ft/ft)* |
| Porosity | *n* | 0.45 | *(-)* |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | *alpha x* | 5.5 | *(ft)* |
| Transverse Dispersivity* | *alpha y* | 2.0 | *(ft)* |
| Vertical Dispersivity* | *alpha z* | 1.0 | *(ft)* |
| *or* | | *or* | |
| Estimated Plume Length | *Lp* | 145 | *(ft)* |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | *R* | 49.7 | *(-)* |
| *or* | | *or* | |
| Soil Bulk Density | *rho* | 1.7 | *(kg/l)* |
| Partition Coefficient | *Koc* | 1288 | *(L/kg)* |
| FractionOrganicCarbon | *foc* | 1.0E-2 | *(-)* |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | *lambda* | 0.0E+0 | *(per yr)* |
| *or* | | *or* | |
| Solute Half-Life | *t-half* | 0.00 | *(year)* |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | *DO* | 0 | *(mg/L)* |
| Delta Nitrate* | *NO3* | 0 | *(mg/L)* |
| Observed Ferrous Iron* | *Fe2+* | 0 | *(mg/L)* |
| Delta Sulfate* | *SO4* | 0 | *(mg/L)* |
| Observed Methane* | *CH4* | 0 | *(mg/L)* |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 145 | *(ft)* |
| Modeled Area Width* | 100 | *(ft)* |
| Simulation Time* | 1000 | *(yr)* |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 *(ft)*

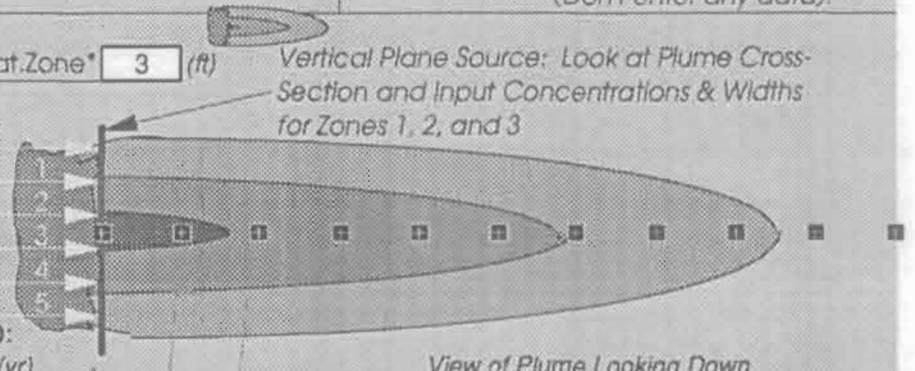
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 11.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | *(yr)* |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | *(Kg)* |

In Source NAPL, Soil




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter '0'*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 15 | 29 | 44 | 58 | 73 | 87 | 102 | 116 | 131 | 145 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** — **View Output**

**RUN ARRAY** — **View Output**

**Help**

Recalculate This Sheet

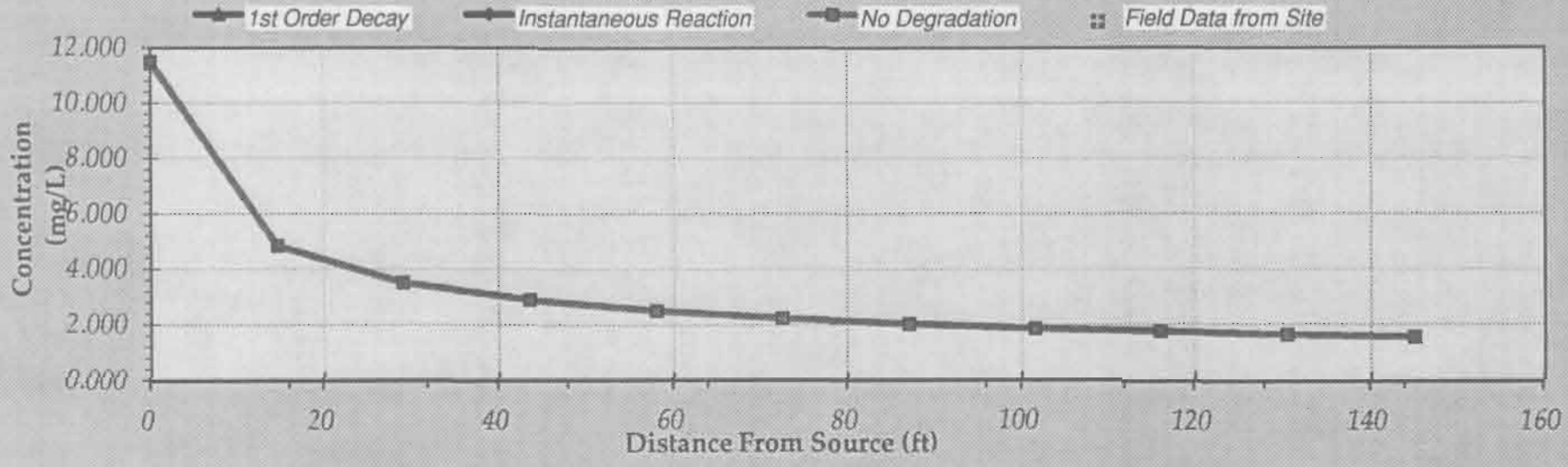
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW NAPHTHALENE (145') DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

*Distance from Source (ft)*

| TYPE OF MODEL | 0 | 15 | 29 | 44 | 58 | 73 | 87 | 102 | 116 | 131 | 145 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 11.500 | 4.859 | 3.523 | 2.901 | 2.521 | 2.255 | 2.054 | 1.893 | 1.759 | 1.646 | 1.547 |
| 1st Order Decay | 11.500 | 4.859 | 3.523 | 2.901 | 2.521 | 2.255 | 2.054 | 1.893 | 1.759 | 1.646 | 1.547 |
| Inst. Reaction | 11.500 | 4.859 | 3.523 | 2.901 | 2.521 | 2.255 | 2.054 | 1.893 | 1.759 | 1.646 | 1.547 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Shallow Naphthalene — *Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 49.7 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 1288 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

Source Thickness In Sat.Zone* 3 (ft)

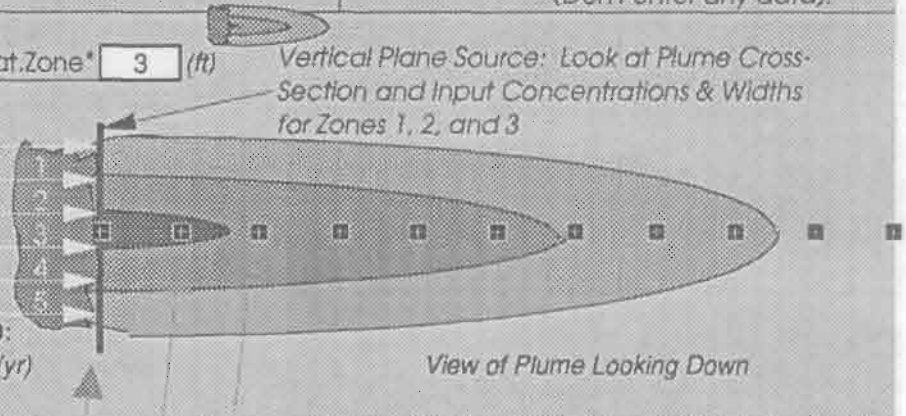
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 5.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass In Source NAPL, Soil | Infinite | (Kg) |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 6 | .0 |
| 11 | .0 |
| 17 | |
| 22 | |
| 28 | |
| 33 | .0 |
| 39 | |
| 44 | |
| 50 | .0 |
| 55 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

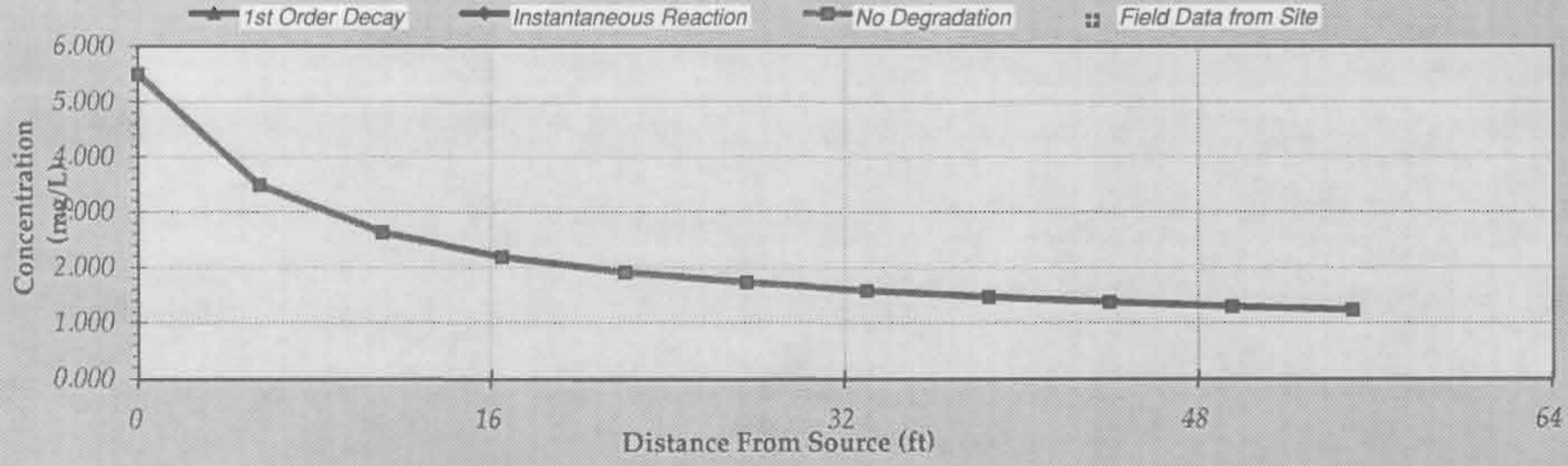
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 5.500 | 3.489 | 2.627 | 2.192 | 1.919 | 1.728 | 1.584 | 1.471 | 1.380 | 1.303 | 1.237 |
| 1st Order Decay | 5.500 | 3.489 | 2.627 | 2.192 | 1.919 | 1.728 | 1.584 | 1.471 | 1.380 | 1.303 | 1.237 |
| Inst. Reaction | 5.500 | 3.489 | 2.627 | 2.192 | 1.919 | 1.728 | 1.584 | 1.471 | 1.380 | 1.303 | 1.237 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR
Phenanthrene-Shallow
*Run Name*

*Data Input Instructions:*

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| *or* | | *or* | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | *or* | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 905.8 | (-) |
| *or* | | *or* | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23950 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | *or* | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

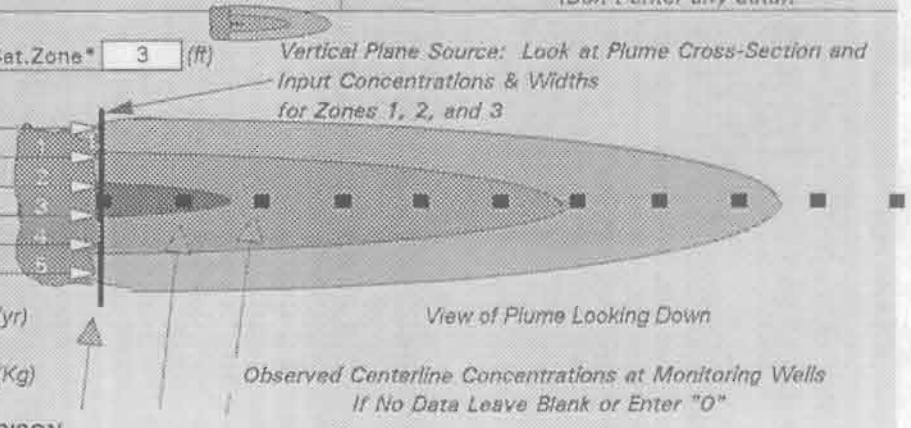
| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.6 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |

In Source NAPL, Soil

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*



*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

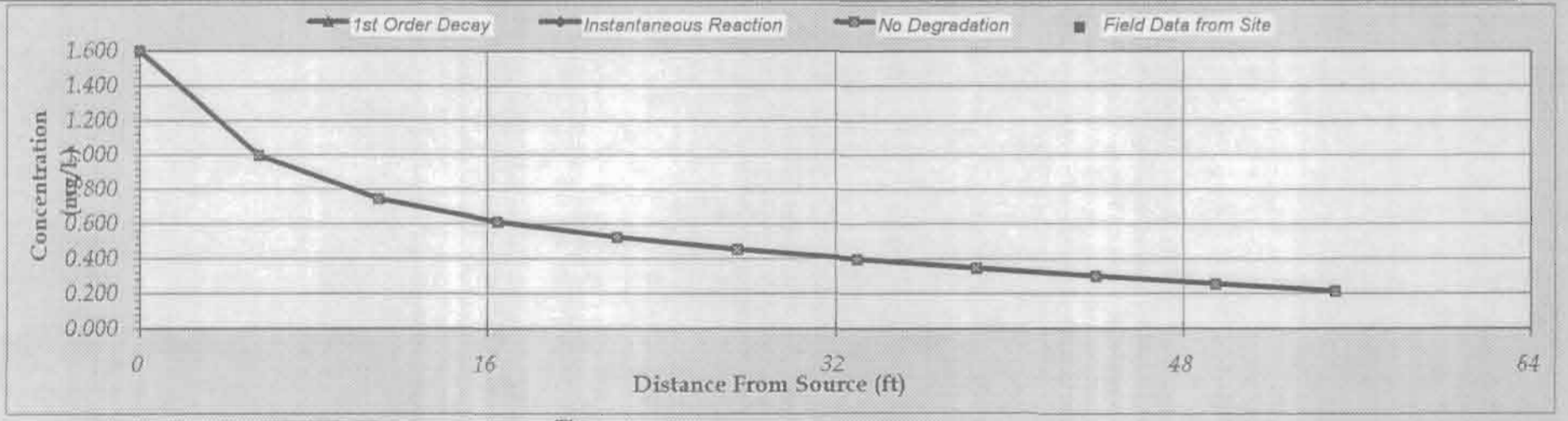
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW PHENANTHRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.600 | 0.998 | 0.744 | 0.610 | 0.521 | 0.453 | 0.396 | 0.345 | 0.298 | 0.254 | 0.213 |
| 1st Order Decay | 1.600 | 0.998 | 0.744 | 0.610 | 0.521 | 0.453 | 0.396 | 0.345 | 0.298 | 0.254 | 0.213 |
| Inst. Reaction | 1.600 | 0.998 | 0.744 | 0.610 | 0.521 | 0.453 | 0.396 | 0.345 | 0.298 | 0.254 | 0.213 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Next Timestep

Prev Timestep

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR

Acenaphthrne-Shallow

*Run Name*

*Data Input Instructions:*

115 → 1. Enter value directly....or

or

0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 2.4E+02 | (cm/sec) |
| Hydraulic Gradient | I | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 268.5 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 7080 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

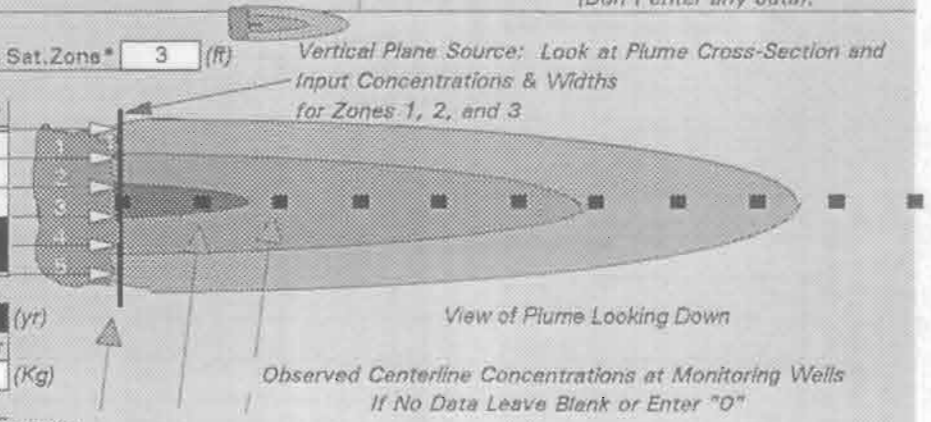
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.13 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

Recalculate This Sheet

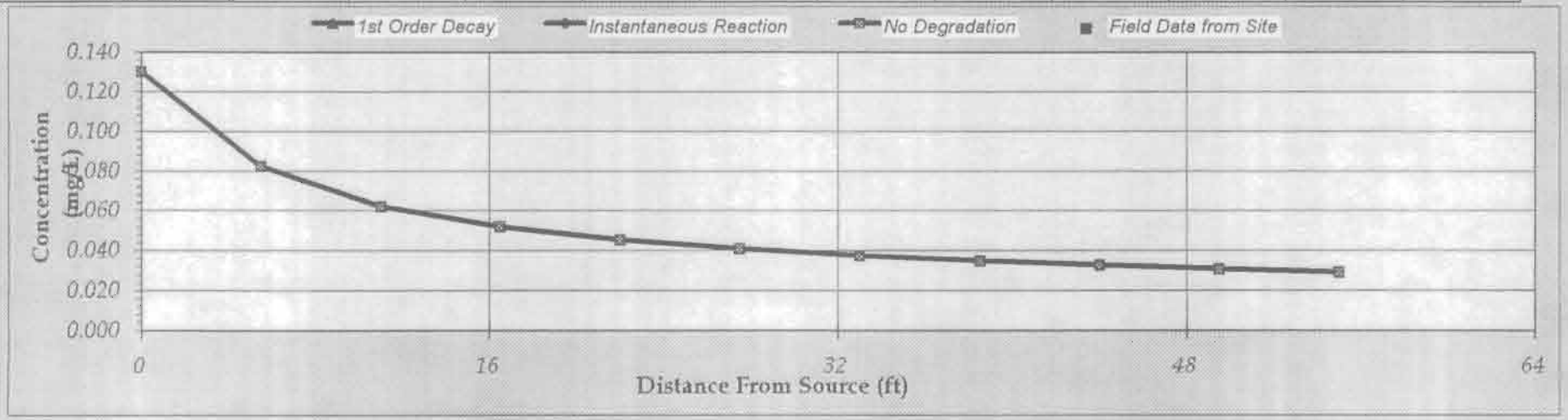
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW ACENAPHTHENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

*Distance from Source (ft)*

| TYPE OF MODEL | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.130 | 0.082 | 0.062 | 0.052 | 0.045 | 0.041 | 0.037 | 0.035 | 0.033 | 0.031 | 0.029 |
| 1st Order Decay | 0.130 | 0.082 | 0.062 | 0.052 | 0.045 | 0.041 | 0.037 | 0.035 | 0.033 | 0.031 | 0.029 |
| Inst. Reaction | 0.130 | 0.082 | 0.062 | 0.052 | 0.045 | 0.041 | 0.037 | 0.035 | 0.033 | 0.031 | 0.029 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation
Next Timestep
Prev Timestep

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR

Fluorene-Shallow

*Run Name*

**Data Input Instructions:**

115 → 1. Enter value directly....or

or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

0.02

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | I | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 488.3 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | | |
|---|---|---|---|
| Modeled Area Length* | 55 | (ft) | L → |
| Modeled Area Width* | 100 | (ft) | W ↓ |
| Simulation Time* | 1000 | (yr) | |

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

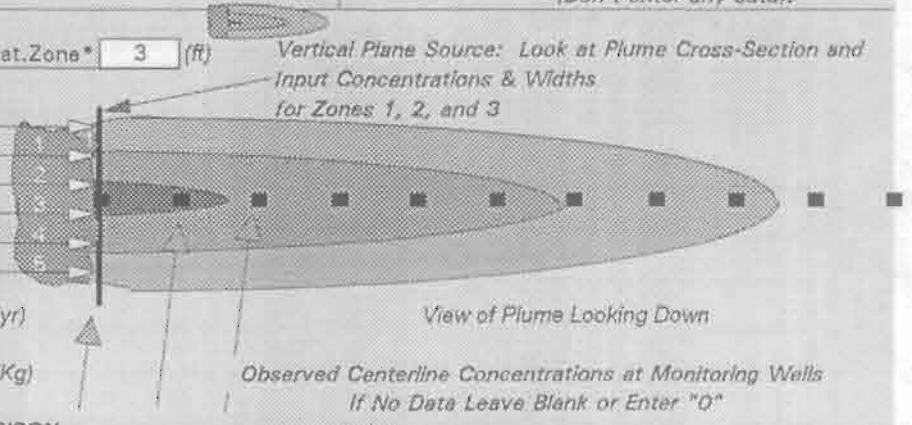
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.9 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

Recalculate This Sheet

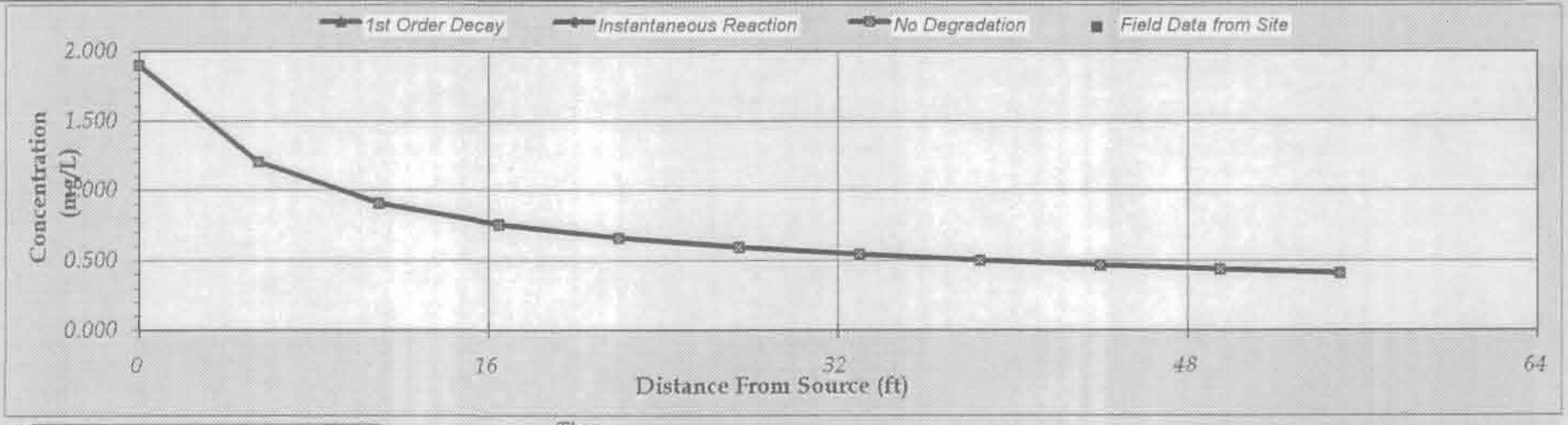
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

*Distance from Source (ft)*

| TYPE OF MODEL | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.900 | 1.204 | 0.906 | 0.755 | 0.660 | 0.592 | 0.541 | 0.500 | 0.465 | 0.434 | 0.406 |
| 1st Order Decay | 1.900 | 1.204 | 0.906 | 0.755 | 0.660 | 0.592 | 0.541 | 0.500 | 0.465 | 0.434 | 0.406 |
| Inst. Reaction | 1.900 | 1.204 | 0.906 | 0.755 | 0.660 | 0.592 | 0.541 | 0.500 | 0.465 | 0.434 | 0.406 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation
Next Timestep
Prev Timestep

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR

Pyrene-Shallow

*Run Name*

*Data Input Instructions:*

115 → 1. Enter value directly....or

or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

0.02

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 4647.7 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 123000 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

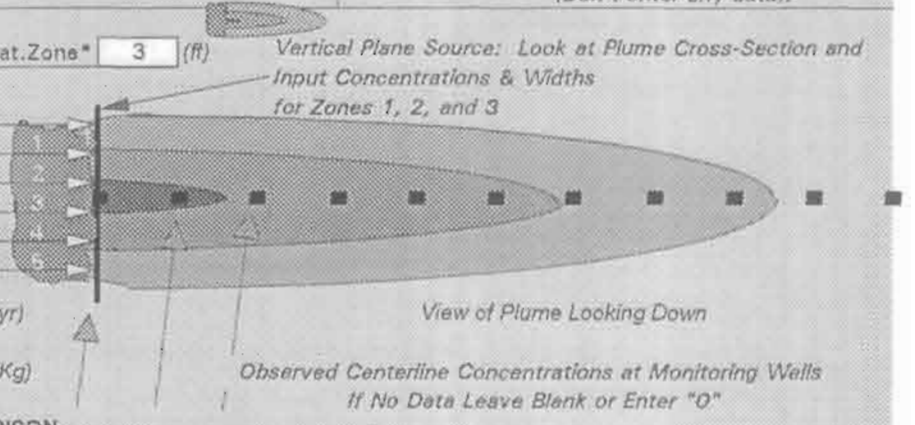
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.16 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

Recalculate This Sheet

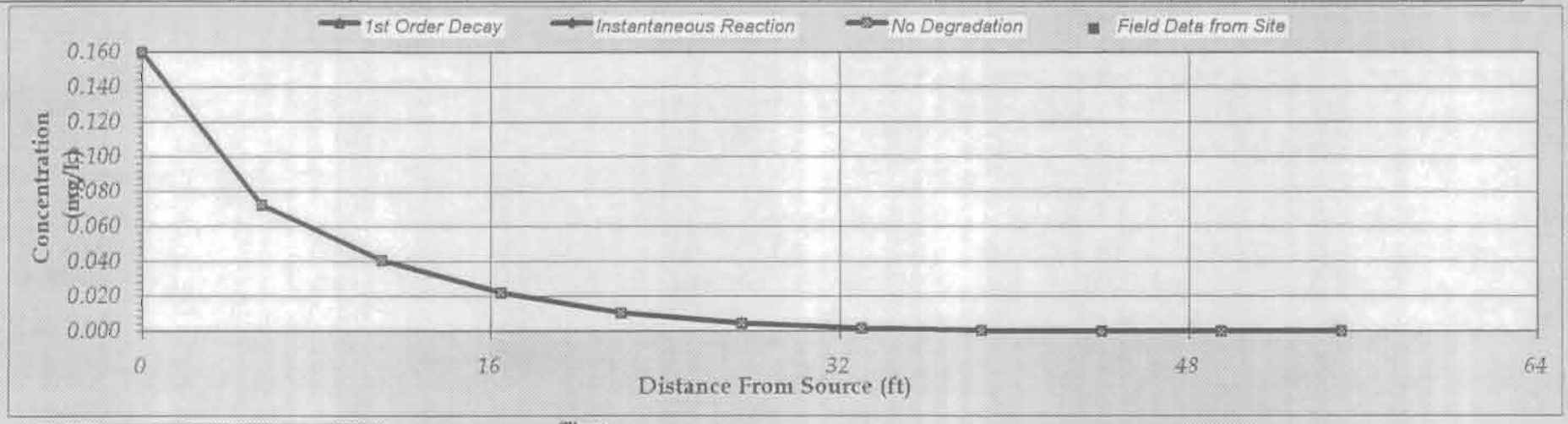
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW PYRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

*Distance from Source (ft)*

| TYPE OF MODEL | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.160 | 0.072 | 0.041 | 0.022 | 0.010 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 0.160 | 0.072 | 0.041 | 0.022 | 0.010 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 0.160 | 0.072 | 0.041 | 0.022 | 0.010 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation
Next Timestep
Prev Timestep

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR
Anthtracene-Shallow
Run Name

*Data Input Instructions:*
1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 55.2 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 2.4E-02 | (cm/sec) |
| Hydraulic Gradient | I | 0.001 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 55 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 886.5 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23440 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 55 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

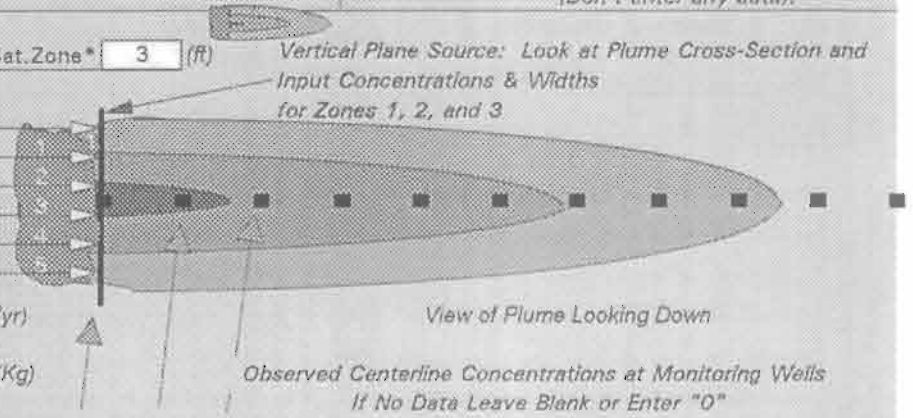
| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.29 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |

In Source NAPL, Soil

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*



*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dist. from Source (ft) | 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

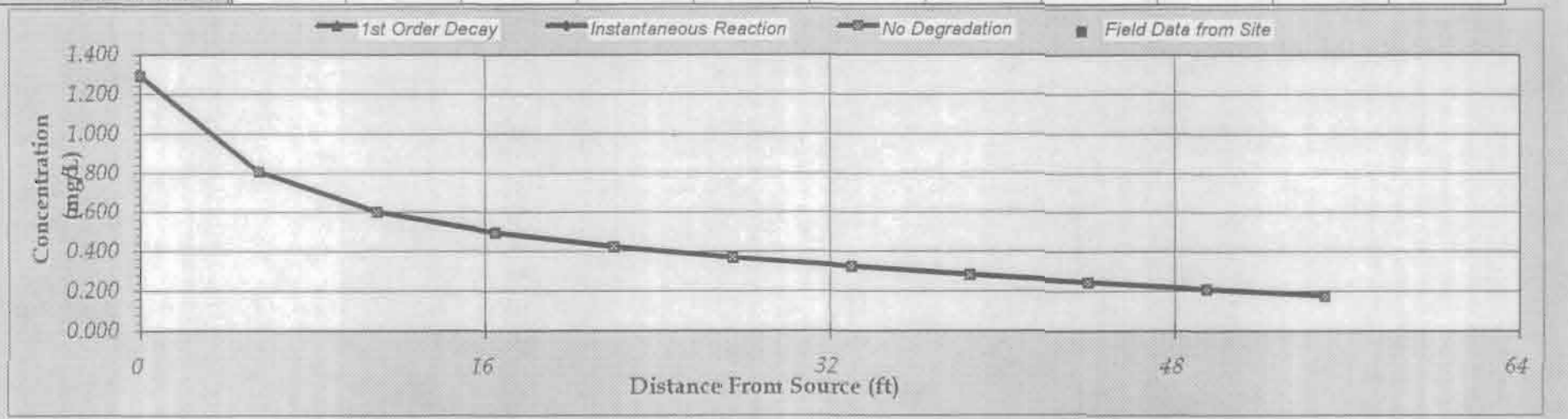
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## SHALLOW ANTHACENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 6 | 11 | 17 | 22 | 28 | 33 | 39 | 44 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.290 | 0.806 | 0.601 | 0.493 | 0.422 | 0.368 | 0.323 | 0.282 | 0.245 | 0.210 | 0.177 |
| 1st Order Decay | 1.290 | 0.806 | 0.601 | 0.493 | 0.422 | 0.368 | 0.323 | 0.282 | 0.245 | 0.210 | 0.177 |
| Inst. Reaction | 1.290 | 0.806 | 0.601 | 0.493 | 0.422 | 0.368 | 0.323 | 0.282 | 0.245 | 0.210 | 0.177 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation
Next Timestep
Prev Timestep

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Naphthalene
*Run Name*

**Data Input Instructions:**

115 (or 0.02) — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | *Vs* | 128.8 | *(ft/yr)* |
| *or* | | *or* | |
| Hydraulic Conductivity | *K* | 1.4E-02 | *(cm/sec)* |
| Hydraulic Gradient | *i* | 0.004 | *(ft/ft)* |
| Porosity | *n* | 0.45 | *(-)* |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | *alpha x* | 5.5 | *(ft)* |
| Transverse Dispersivity* | *alpha y* | 2.0 | *(ft)* |
| Vertical Dispersivity* | *alpha z* | 1.0 | *(ft)* |
| *or* | | *or* | |
| Estimated Plume Length | *Lp* | 200 | *(ft)* |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | *R* | 49.7 | *(-)* |
| *or* | | *or* | |
| Soil Bulk Density | *rho* | 1.7 | *(kg/l)* |
| Partition Coefficient | *Koc* | 1288 | *(L/kg)* |
| FractionOrganicCarbon | *foc* | 1.0E-2 | *(-)* |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | *lambda* | 0.0E+0 | *(per yr)* |
| *or* | | *or* | |
| Solute Half-Life | *t-half* | 0.00 | *(year)* |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | *DO* | 0 | *(mg/L)* |
| Delta Nitrate* | *NO3* | 0 | *(mg/L)* |
| Observed Ferrous Iron* | *Fe2+* | 0 | *(mg/L)* |
| Delta Sulfate* | *SO4* | 0 | *(mg/L)* |
| Observed Methane* | *CH4* | 0 | *(mg/L)* |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | *(ft)* |
| Modeled Area Width* | 100 | *(ft)* |
| Simulation Time* | 1000 | *(yr)* |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 *(ft)*

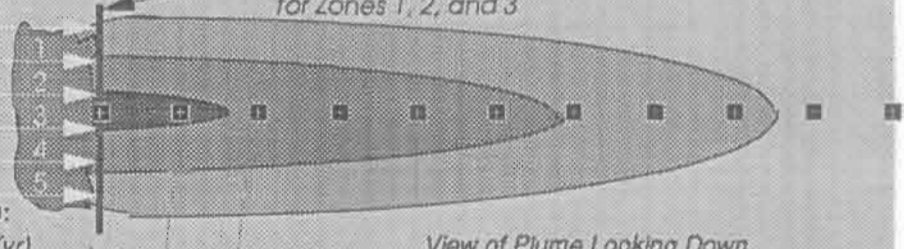
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 11.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | *(yr)* |
| Inst. React. | 1st Order | |
| Soluble Mass In Source NAPL, Soil | Infinite | *(Kg)* |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter '0'*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

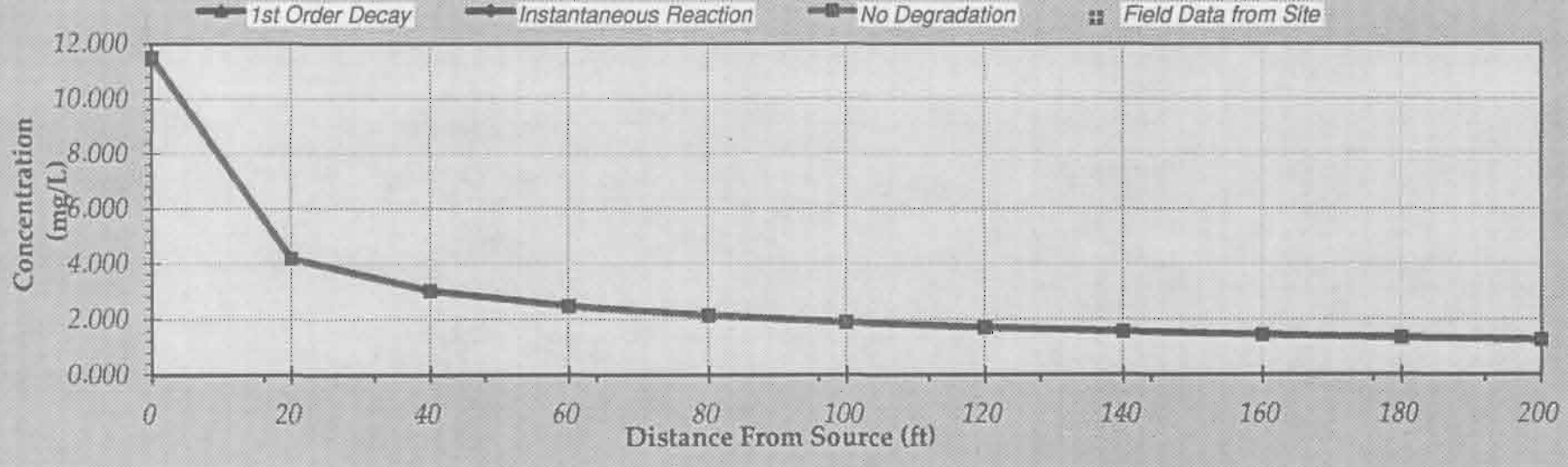
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 11.500 | 4.195 | 3.021 | 2.479 | 2.145 | 1.908 | 1.726 | 1.580 | 1.458 | 1.355 | 1.265 |
| 1st Order Decay | 11.500 | 4.195 | 3.021 | 2.479 | 2.145 | 1.908 | 1.726 | 1.580 | 1.458 | 1.355 | 1.265 |
| Inst. Reaction | 11.500 | 4.195 | 3.021 | 2.479 | 2.145 | 1.908 | 1.726 | 1.580 | 1.458 | 1.355 | 1.265 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Naphthalene
Run Name

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 300 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 49.7 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 1288 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 300 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L — W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

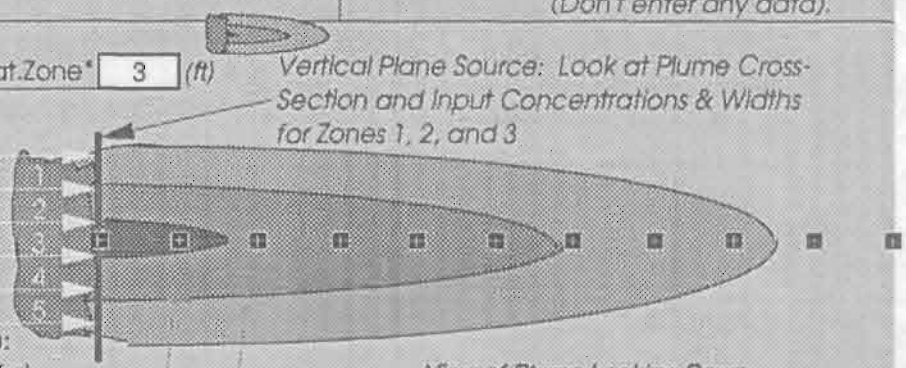
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 11.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 30 | .0 |
| 60 | .0 |
| 90 | |
| 120 | |
| 150 | |
| 180 | .0 |
| 210 | |
| 240 | |
| 270 | .0 |
| 300 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

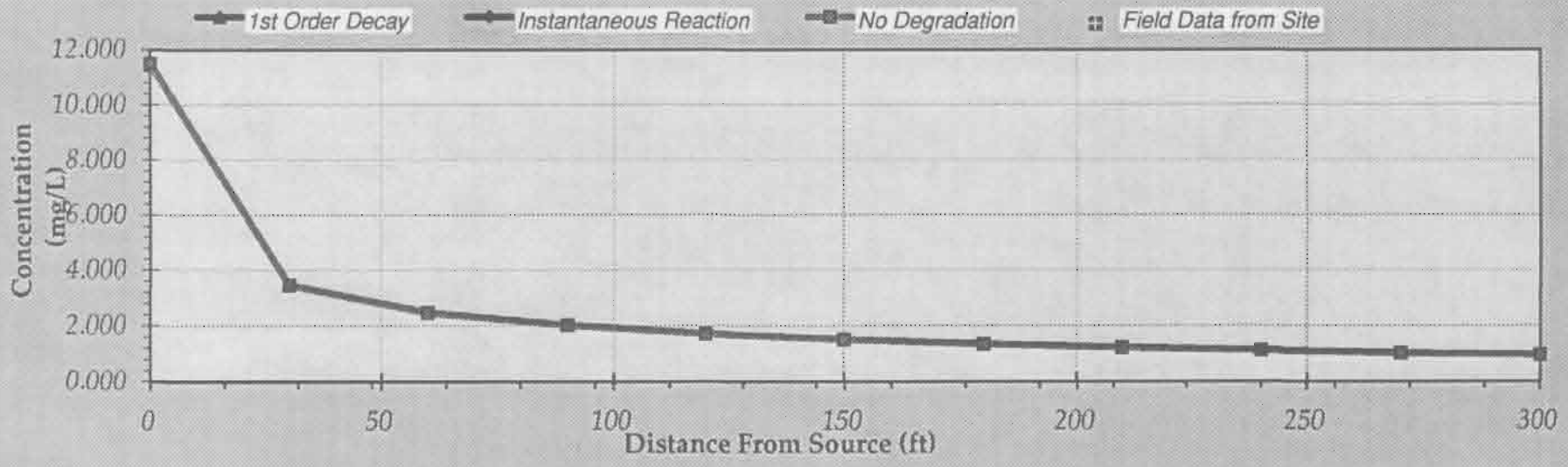
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 11.500 | 3.467 | 2.479 | 2.018 | 1.726 | 1.516 | 1.355 | 1.225 | 1.119 | 1.030 | 0.954 |
| 1st Order Decay | 11.500 | 3.467 | 2.479 | 2.018 | 1.726 | 1.516 | 1.355 | 1.225 | 1.119 | 1.030 | 0.954 |
| Inst. Reaction | 11.500 | 3.467 | 2.479 | 2.018 | 1.726 | 1.516 | 1.355 | 1.225 | 1.119 | 1.030 | 0.954 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate Naphthalene (Run Name)

**Data Input Instructions:**
1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | *or* | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | *or* | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 49.7 | (-) |
| *or* | | *or* | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 1288 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | *or* | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

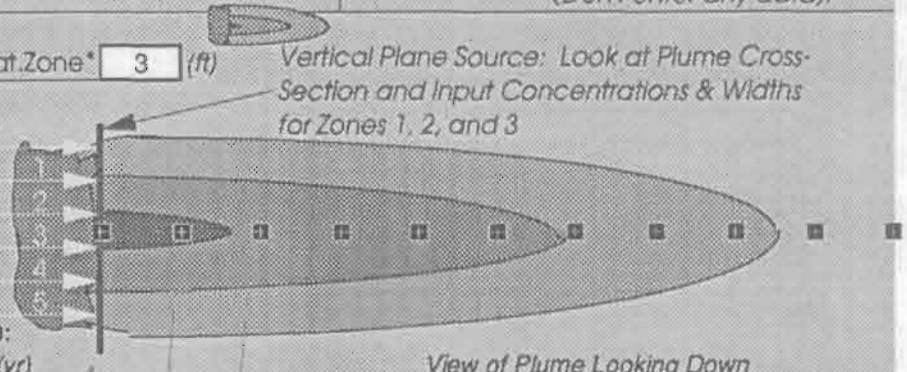
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 5.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass In Source NAPL, Soil | Infinite | (Kg) |




Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

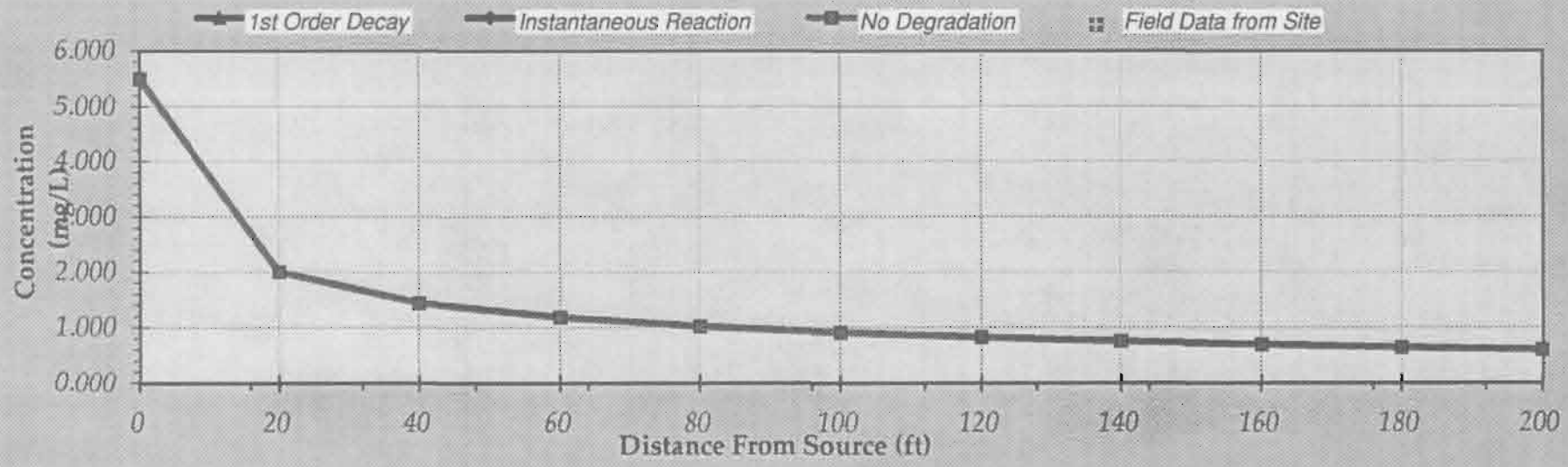
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE OF MODEL | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
| No Degradation | 5.500 | 2.006 | 1.445 | 1.185 | 1.026 | 0.913 | 0.826 | 0.755 | 0.697 | 0.648 | 0.605 |
| 1st Order Decay | 5.500 | 2.006 | 1.445 | 1.185 | 1.026 | 0.913 | 0.826 | 0.755 | 0.697 | 0.648 | 0.605 |
| Inst. Reaction | 5.500 | 2.006 | 1.445 | 1.185 | 1.026 | 0.913 | 0.826 | 0.755 | 0.697 | 0.648 | 0.605 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Naphthalene
*Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | *Vs* | 128.8 | *(ft/yr)* |
| *or* | | or | |
| Hydraulic Conductivity | *K* | 1.4E-02 | *(cm/sec)* |
| Hydraulic Gradient | *i* | 0.004 | *(ft/ft)* |
| Porosity | *n* | 0.45 | *(-)* |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | *alpha x* | 5.5 | *(ft)* |
| Transverse Dispersivity* | *alpha y* | 2.0 | *(ft)* |
| Vertical Dispersivity* | *alpha z* | 1.0 | *(ft)* |
| *or* | | or | |
| Estimated Plume Length | *Lp* | 300 | *(ft)* |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | *R* | 49.7 | *(-)* |
| *or* | | or | |
| Soil Bulk Density | *rho* | 1.7 | *(kg/l)* |
| Partition Coefficient | *Koc* | 1288 | *(L/kg)* |
| FractionOrganicCarbon | *foc* | 1.0E-2 | *(-)* |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | *lambda* | 0.0E+0 | *(per yr)* |
| *or* | | or | |
| Solute Half-Life | *t-half* | 0.00 | *(year)* |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | *DO* | 0 | *(mg/L)* |
| Delta Nitrate* | *NO3* | 0 | *(mg/L)* |
| Observed Ferrous Iron* | *Fe2+* | 0 | *(mg/L)* |
| Delta Sulfate* | *SO4* | 0 | *(mg/L)* |
| Observed Methane* | *CH4* | 0 | *(mg/L)* |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 300 | *(ft)* |
| Modeled Area Width* | 100 | *(ft)* |
| Simulation Time* | 1000 | *(yr)* |

L, W

## 6. SOURCE DATA

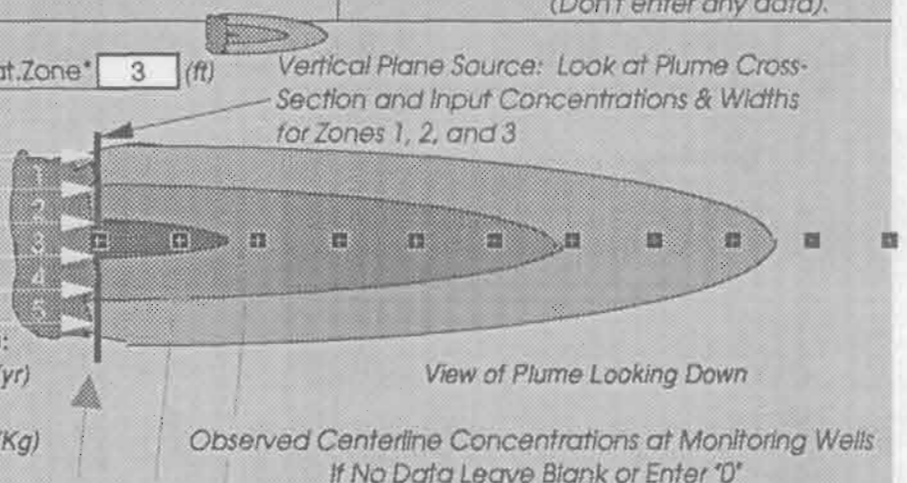
Source Thickness in Sat.Zone* 3 *(ft)*

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 5.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | *(yr)* |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | *(Kg)* |
| In Source NAPL, Soil | | |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 30 | .0 |
| 60 | .0 |
| 90 | |
| 120 | |
| 150 | |
| 180 | .0 |
| 210 | |
| 240 | |
| 270 | .0 |
| 300 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

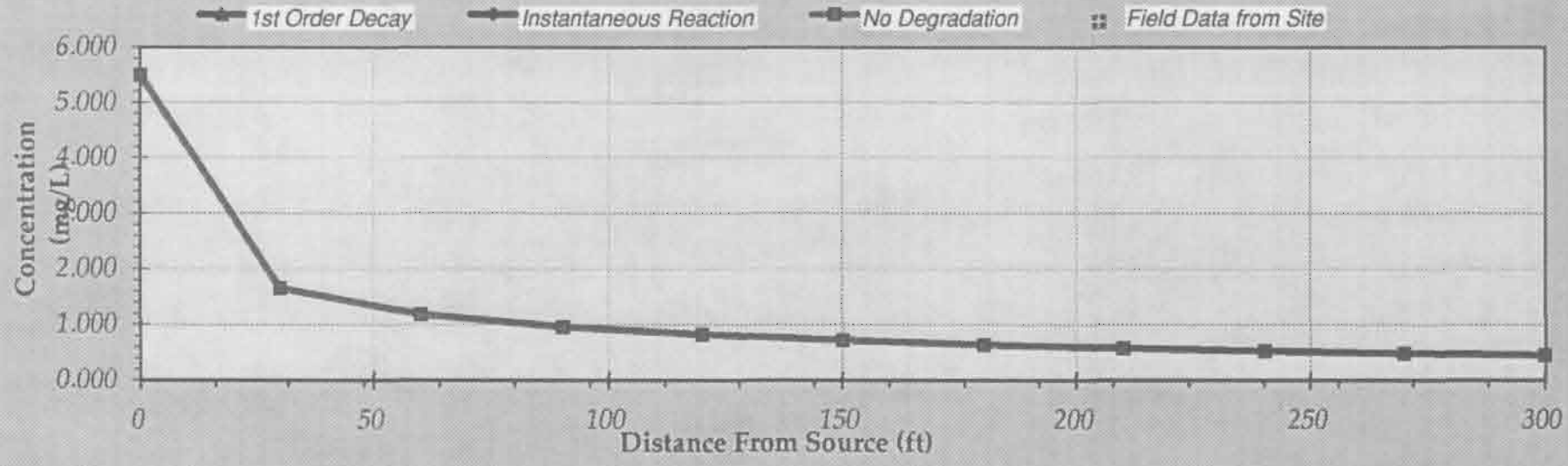
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE OF MODEL | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
| No Degradation | 5.500 | 1.658 | 1.185 | 0.965 | 0.826 | 0.725 | 0.648 | 0.586 | 0.535 | 0.493 | 0.456 |
| 1st Order Decay | 5.500 | 1.658 | 1.185 | 0.965 | 0.826 | 0.725 | 0.648 | 0.586 | 0.535 | 0.493 | 0.456 |
| Inst. Reaction | 5.500 | 1.658 | 1.185 | 0.965 | 0.826 | 0.725 | 0.648 | 0.586 | 0.535 | 0.493 | 0.456 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR - Intermediate
Phenanthrene
Run Name

**Data Input Instructions:**

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 905.8 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23950 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L
W

## 6. SOURCE DATA

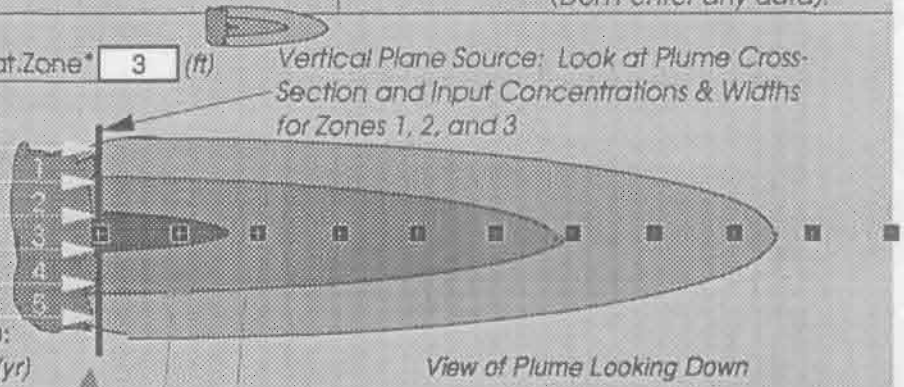
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.6 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

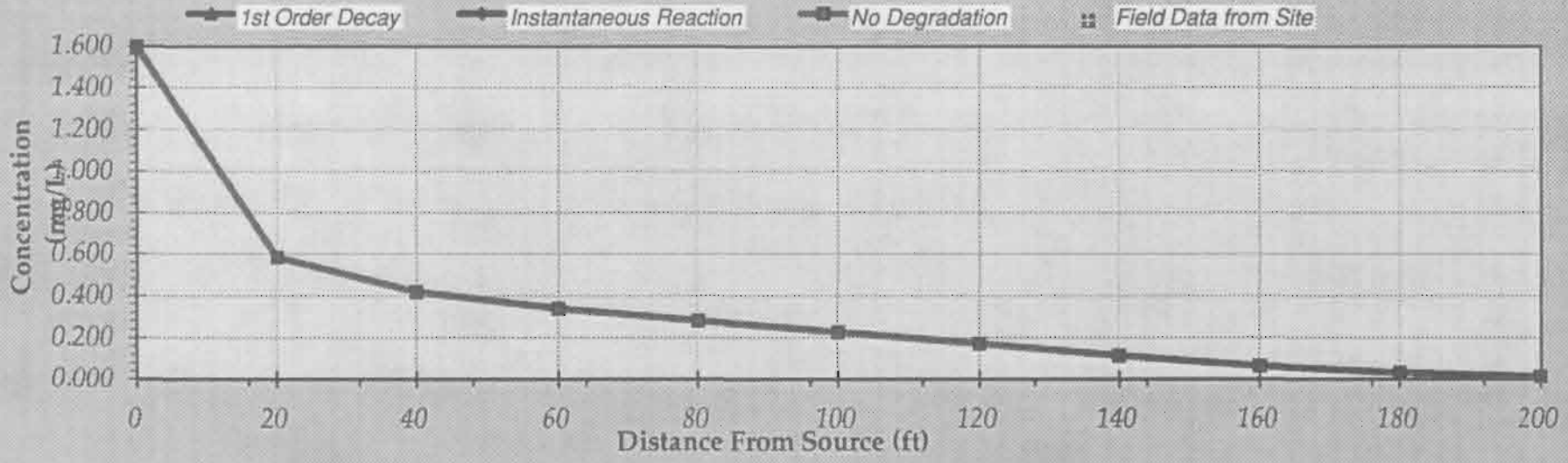
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE PHENANTHRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.600 | 0.583 | 0.418 | 0.338 | 0.281 | 0.227 | 0.171 | 0.115 | 0.066 | 0.032 | 0.013 |
| 1st Order Decay | 1.600 | 0.583 | 0.418 | 0.338 | 0.281 | 0.227 | 0.171 | 0.115 | 0.066 | 0.032 | 0.013 |
| Inst. Reaction | 1.600 | 0.583 | 0.418 | 0.338 | 0.281 | 0.227 | 0.171 | 0.115 | 0.066 | 0.032 | 0.013 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Acenaphthene
*Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | *Vs* | 128.8 | *(ft/yr)* |
| *or* | | or | |
| Hydraulic Conductivity | *K* | 1.4E-02 | *(cm/sec)* |
| Hydraulic Gradient | *i* | 0.004 | *(ft/ft)* |
| Porosity | *n* | 0.45 | *(-)* |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | *alpha x* | 5.5 | *(ft)* |
| Transverse Dispersivity* | *alpha y* | 2.0 | *(ft)* |
| Vertical Dispersivity* | *alpha z* | 1.0 | *(ft)* |
| *or* | | or | |
| Estimated Plume Length | *Lp* | 200 | *(ft)* |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | *R* | 268.5 | *(-)* |
| *or* | | or | |
| Soil Bulk Density | *rho* | 1.7 | *(kg/l)* |
| Partition Coefficient | *Koc* | 7080 | *(L/kg)* |
| FractionOrganicCarbon | *foc* | 1.0E-2 | *(-)* |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | *lambda* | 0.0E+0 | *(per yr)* |
| *or* | | or | |
| Solute Half-Life | *t-half* | 0.00 | *(year)* |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | *DO* | 0 | *(mg/L)* |
| Delta Nitrate* | *NO3* | 0 | *(mg/L)* |
| Observed Ferrous Iron* | *Fe2+* | 0 | *(mg/L)* |
| Delta Sulfate* | *SO4* | 0 | *(mg/L)* |
| Observed Methane* | *CH4* | 0 | *(mg/L)* |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | *(ft)* |
| Modeled Area Width* | 100 | *(ft)* |
| Simulation Time* | 1000 | *(yr)* |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 *(ft)*

Source Zones:

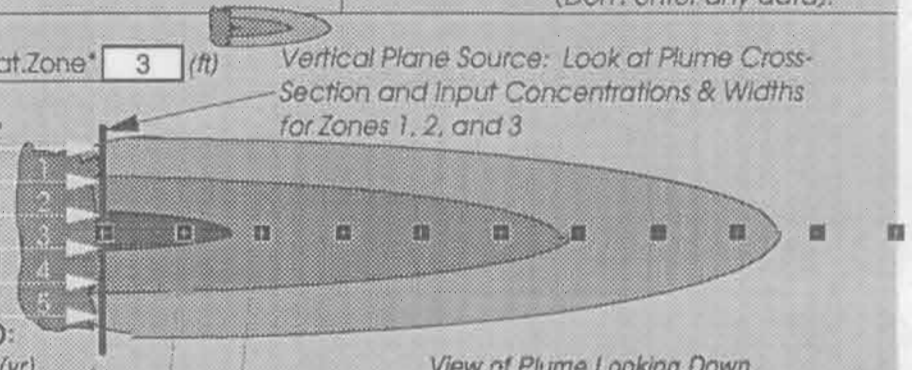
| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.13 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | *(yr)* |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | *(Kg)* |

In Source NAPL, Soil

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter '0'*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** — **View Output**

**RUN ARRAY** — **View Output**

**Help**

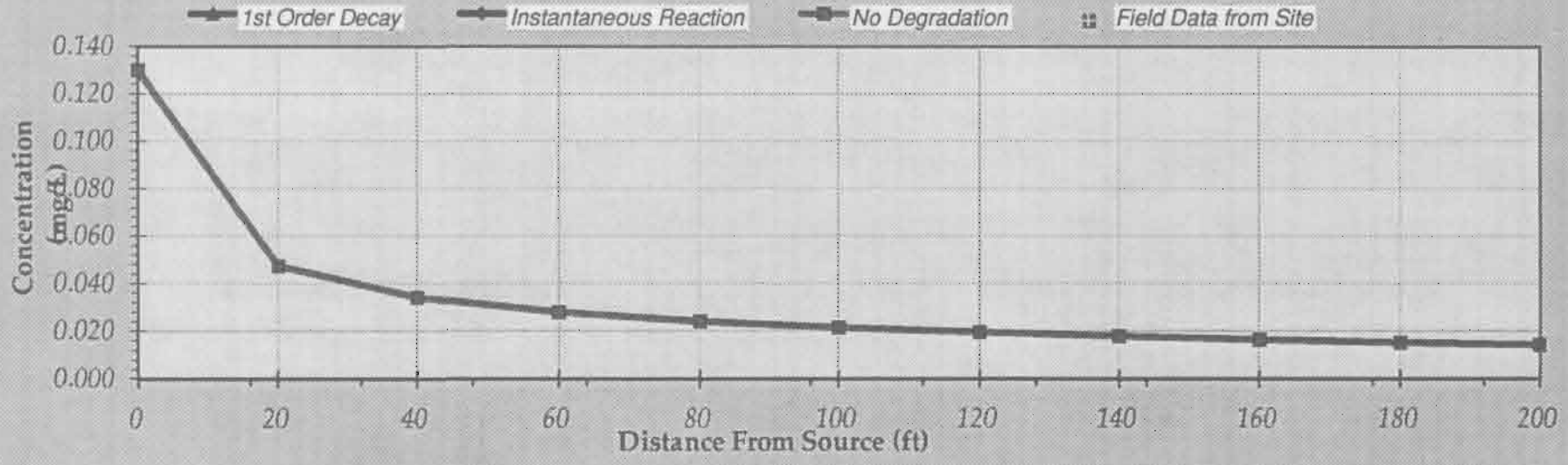
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE ACENAPHTHENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.130 | 0.047 | 0.034 | 0.028 | 0.024 | 0.022 | 0.020 | 0.018 | 0.016 | 0.015 | 0.014 |
| 1st Order Decay | 0.130 | 0.047 | 0.034 | 0.028 | 0.024 | 0.022 | 0.020 | 0.018 | 0.016 | 0.015 | 0.014 |
| Inst. Reaction | 0.130 | 0.047 | 0.034 | 0.028 | 0.024 | 0.022 | 0.020 | 0.018 | 0.016 | 0.015 | 0.014 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Acenaphthene
Run Name

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 268.5 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 7080 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

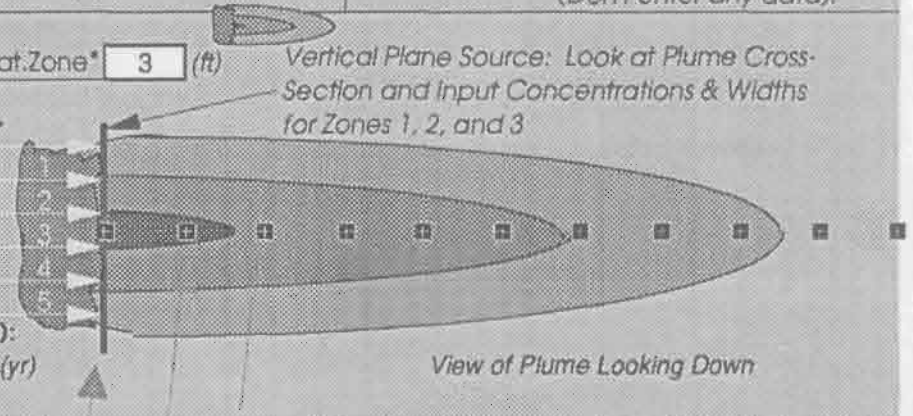
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.4 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| Inst. Reactions | 1st Order | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Soluble Mass in Source NAPL, Soil | Infinite | (Kg) |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

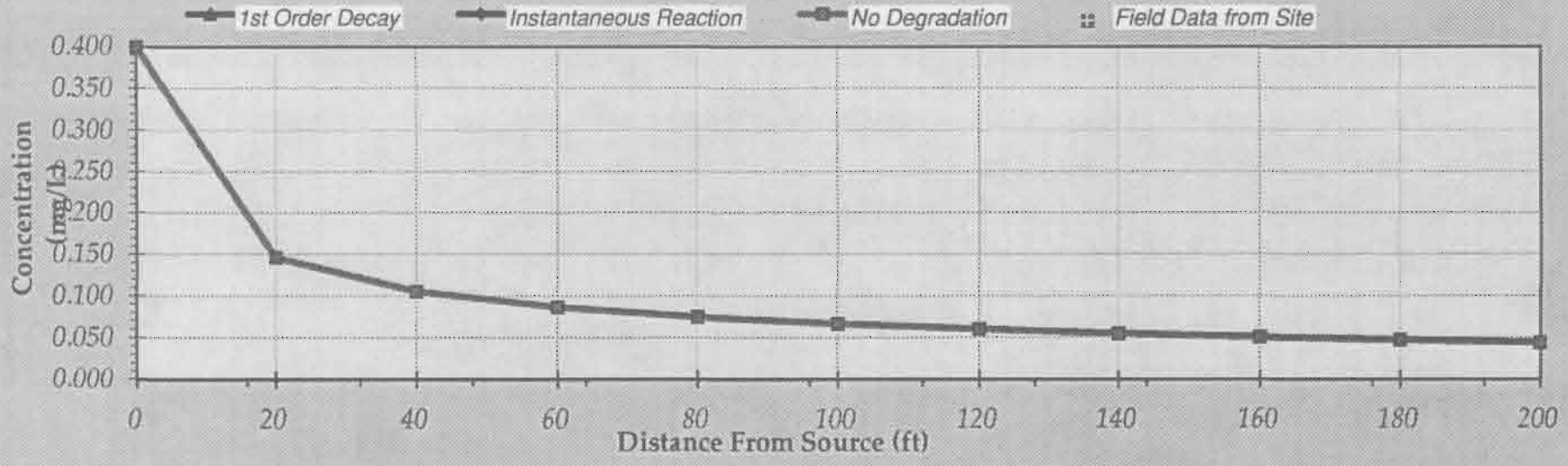
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE ACENAPHTHENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | *Distance from Source (ft)* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***TYPE OF MODEL*** | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
| No Degradation | 0.400 | 0.146 | 0.105 | 0.086 | 0.075 | 0.066 | 0.060 | 0.055 | 0.051 | 0.047 | 0.044 |
| 1st Order Decay | 0.400 | 0.146 | 0.105 | 0.086 | 0.075 | 0.066 | 0.060 | 0.055 | 0.051 | 0.047 | 0.044 |
| Inst. Reaction | 0.400 | 0.146 | 0.105 | 0.086 | 0.075 | 0.066 | 0.060 | 0.055 | 0.051 | 0.047 | 0.044 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Acenaphthene
*Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* ▸ Data used directly in model.

20 ▸ Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 300 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 268.5 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 7080 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 300 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

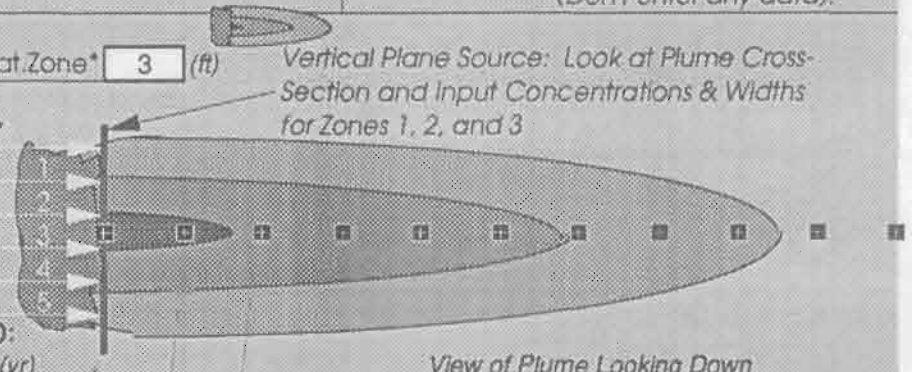
Source Thickness In Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.13 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

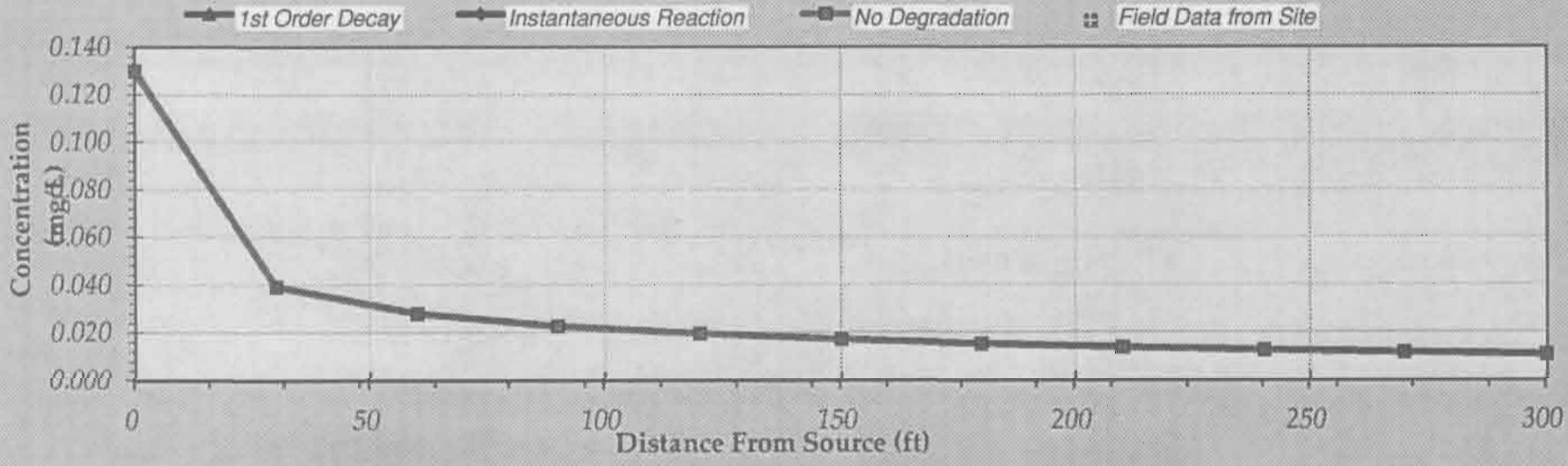
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE ACENAPHTHENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | *Distance from Source (ft)* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *TYPE OF MODEL* | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
| No Degradation | 0.130 | 0.039 | 0.028 | 0.023 | 0.020 | 0.017 | 0.015 | 0.014 | 0.013 | 0.012 | 0.011 |
| 1st Order Decay | 0.130 | 0.039 | 0.028 | 0.023 | 0.020 | 0.017 | 0.015 | 0.014 | 0.013 | 0.012 | 0.011 |
| Inst. Reaction | 0.130 | 0.039 | 0.028 | 0.023 | 0.020 | 0.017 | 0.015 | 0.014 | 0.013 | 0.012 | 0.011 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate Fluorene (Run Name)

**Data Input Instructions:**

115 (or 0.02) — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 488.3 | (-) |
| *or* | | | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

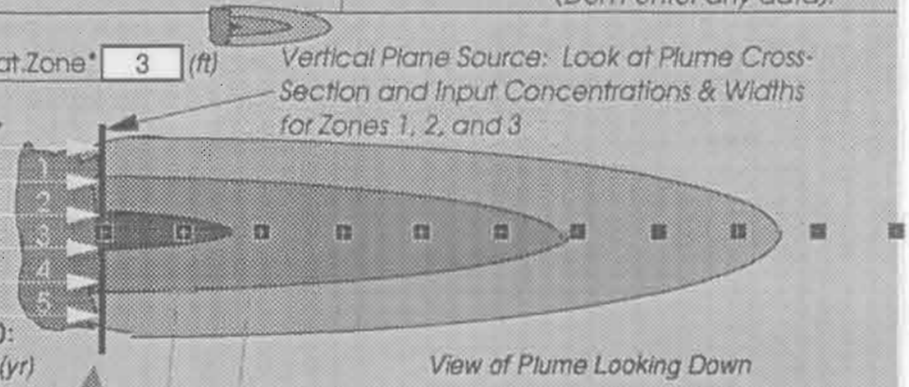
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.9 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 20 | .0 |
| 40 | .0 |
| 60 | |
| 80 | |
| 100 | |
| 120 | .0 |
| 140 | |
| 160 | |
| 180 | .0 |
| 200 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

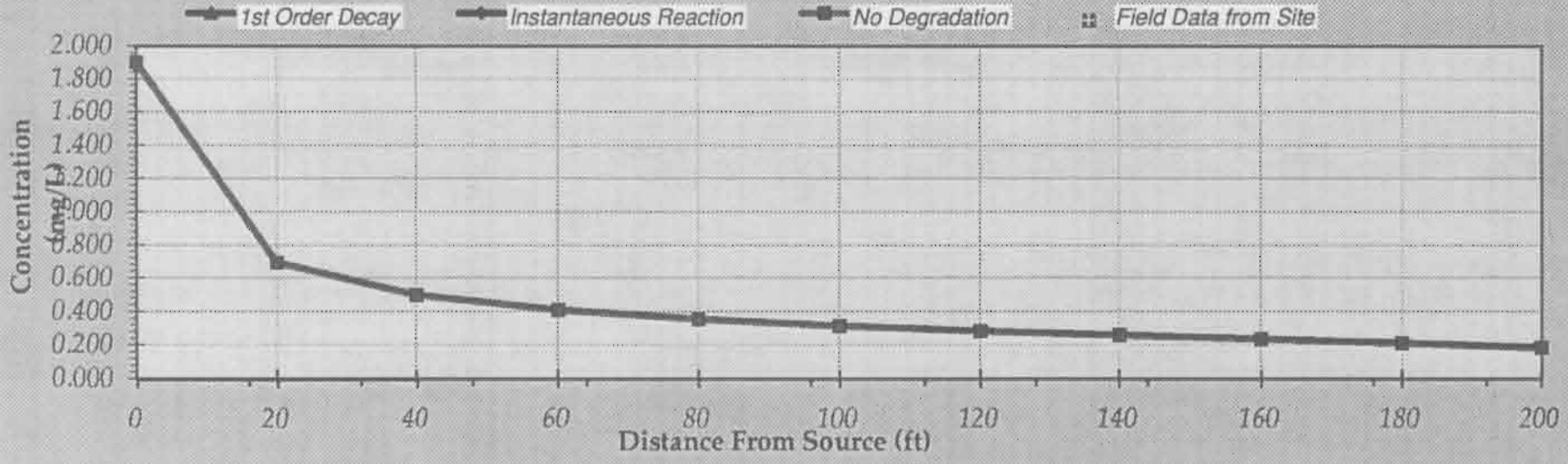
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE OF MODEL | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
| No Degradation | 1.900 | 0.693 | 0.499 | 0.409 | 0.354 | 0.315 | 0.284 | 0.258 | 0.234 | 0.210 | 0.184 |
| 1st Order Decay | 1.900 | 0.693 | 0.499 | 0.409 | 0.354 | 0.315 | 0.284 | 0.258 | 0.234 | 0.210 | 0.184 |
| Inst. Reaction | 1.900 | 0.693 | 0.499 | 0.409 | 0.354 | 0.315 | 0.284 | 0.258 | 0.234 | 0.210 | 0.184 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate Fluorene (Run Name)

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 300 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 488.3 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 300 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

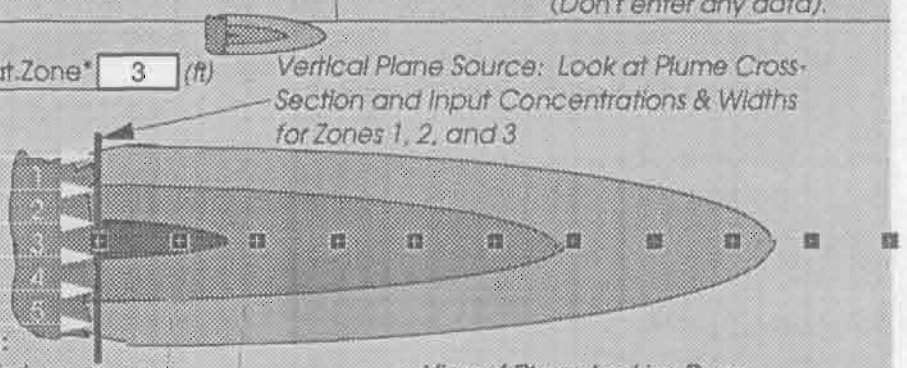
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.22 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |

In Source NAPL, Soil




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter '0'*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

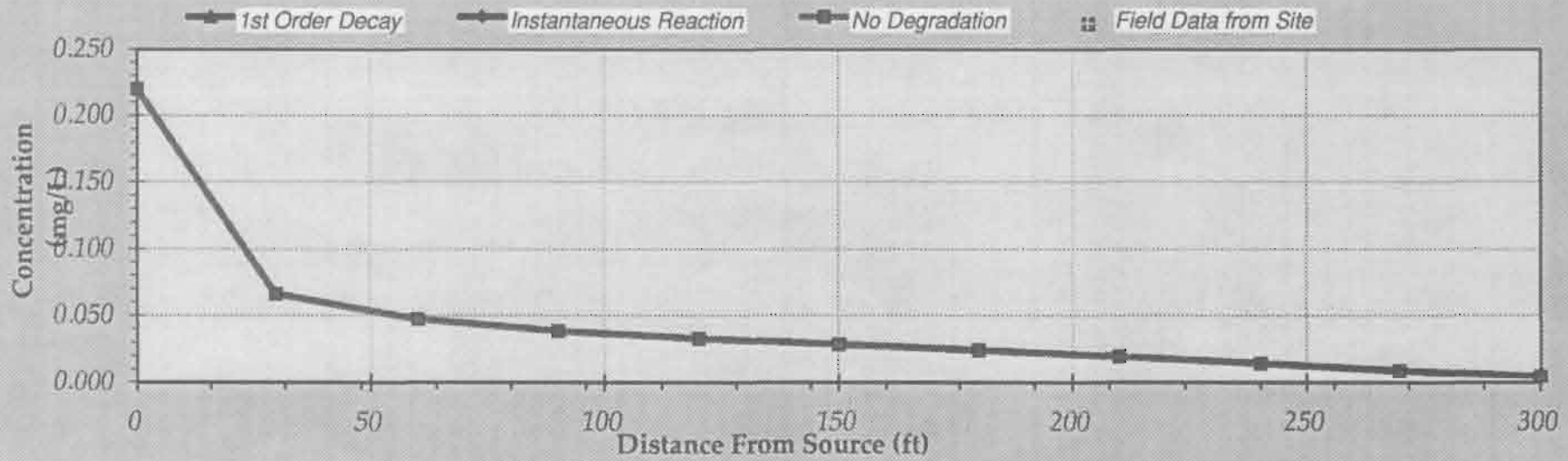
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE OF MODEL | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
| No Degradation | 0.220 | 0.066 | 0.047 | 0.039 | 0.033 | 0.029 | 0.024 | 0.020 | 0.014 | 0.009 | 0.005 |
| 1st Order Decay | 0.220 | 0.066 | 0.047 | 0.039 | 0.033 | 0.029 | 0.024 | 0.020 | 0.014 | 0.009 | 0.005 |
| Inst. Reaction | 0.220 | 0.066 | 0.047 | 0.039 | 0.033 | 0.029 | 0.024 | 0.020 | 0.014 | 0.009 | 0.005 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Fluorene
*Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 300 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 488.3 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 300 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

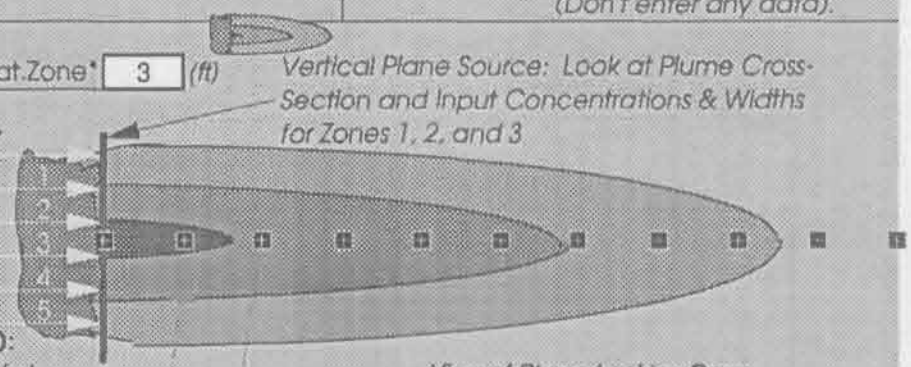
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.9 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 30 | .0 |
| 60 | .0 |
| 90 | |
| 120 | |
| 150 | |
| 180 | .0 |
| 210 | |
| 240 | |
| 270 | .0 |
| 300 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

**RUN CENTERLINE** — **View Output**

**RUN ARRAY** — **View Output**

**Help**

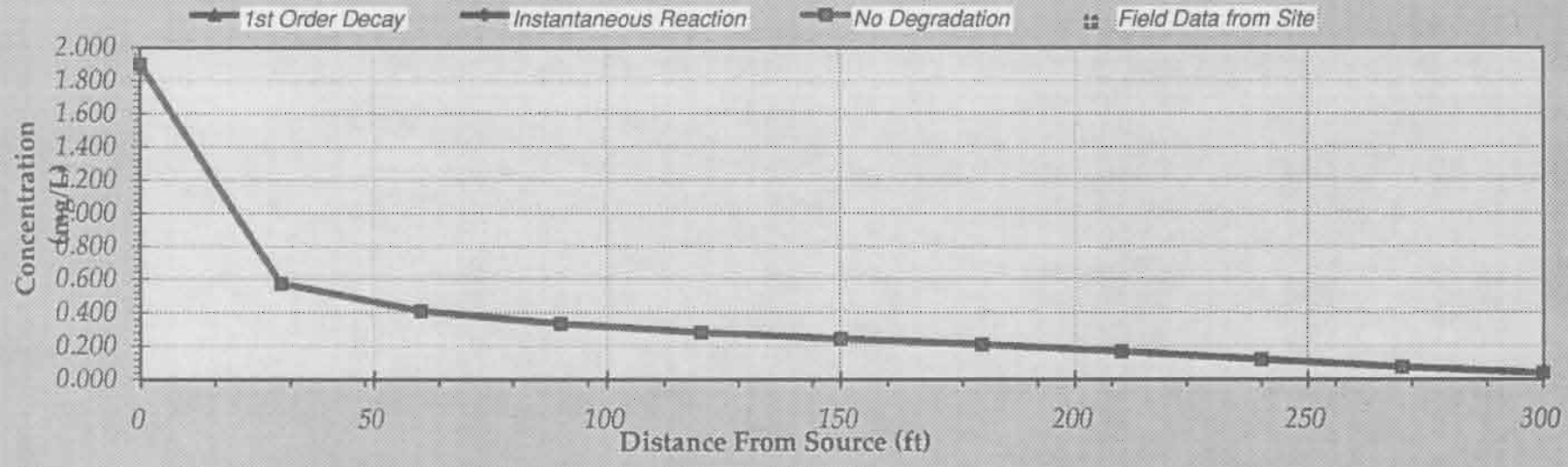
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.900 | 0.573 | 0.409 | 0.333 | 0.284 | 0.246 | 0.210 | 0.170 | 0.124 | 0.077 | 0.039 |
| 1st Order Decay | 1.900 | 0.573 | 0.409 | 0.333 | 0.284 | 0.246 | 0.210 | 0.170 | 0.124 | 0.077 | 0.039 |
| Inst. Reaction | 1.900 | 0.573 | 0.409 | 0.333 | 0.284 | 0.246 | 0.210 | 0.170 | 0.124 | 0.077 | 0.039 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

*PSR - Intermediate*
*Fluorene*
*Run Name*

*Data Input Instructions:*

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 488.3 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L
W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

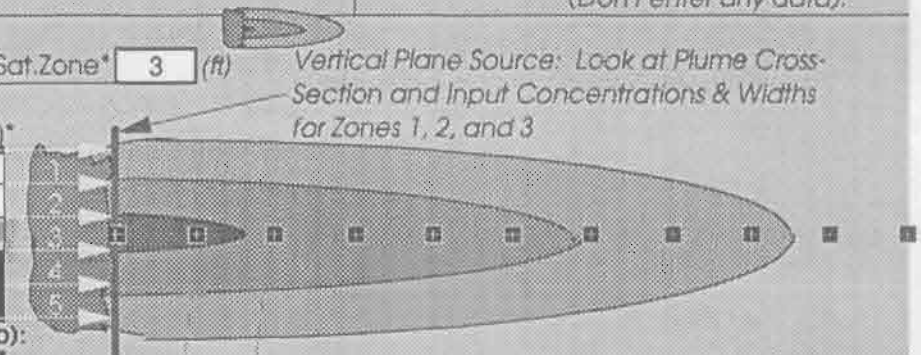
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.22 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

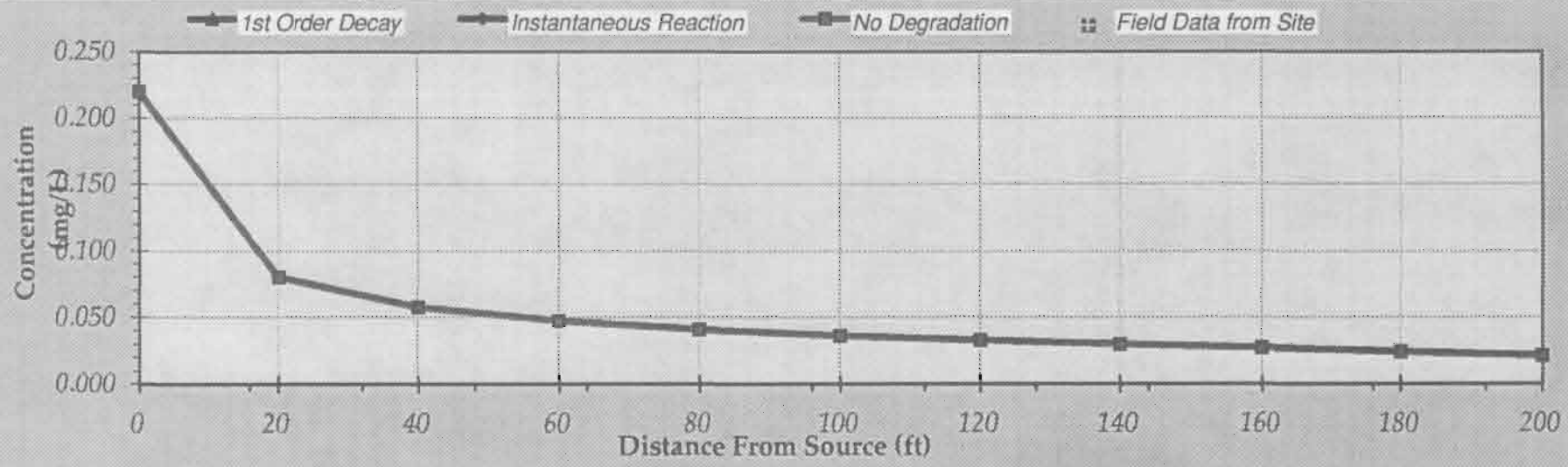
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.220 | 0.080 | 0.058 | 0.047 | 0.041 | 0.036 | 0.033 | 0.030 | 0.027 | 0.024 | 0.021 |
| 1st Order Decay | 0.220 | 0.080 | 0.058 | 0.047 | 0.041 | 0.036 | 0.033 | 0.030 | 0.027 | 0.024 | 0.021 |
| Inst. Reaction | 0.220 | 0.080 | 0.058 | 0.047 | 0.041 | 0.036 | 0.033 | 0.030 | 0.027 | 0.024 | 0.021 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR - Intermediate
Pyrene
Run Name

**Data Input Instructions:**

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 4647.7 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 123000 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L
W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

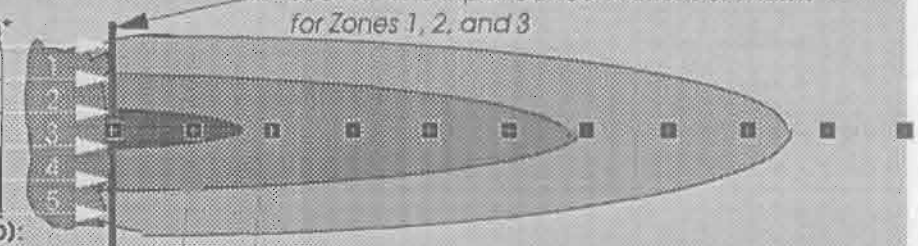
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.16 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells If No Data Leave Blank or Enter '0'*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

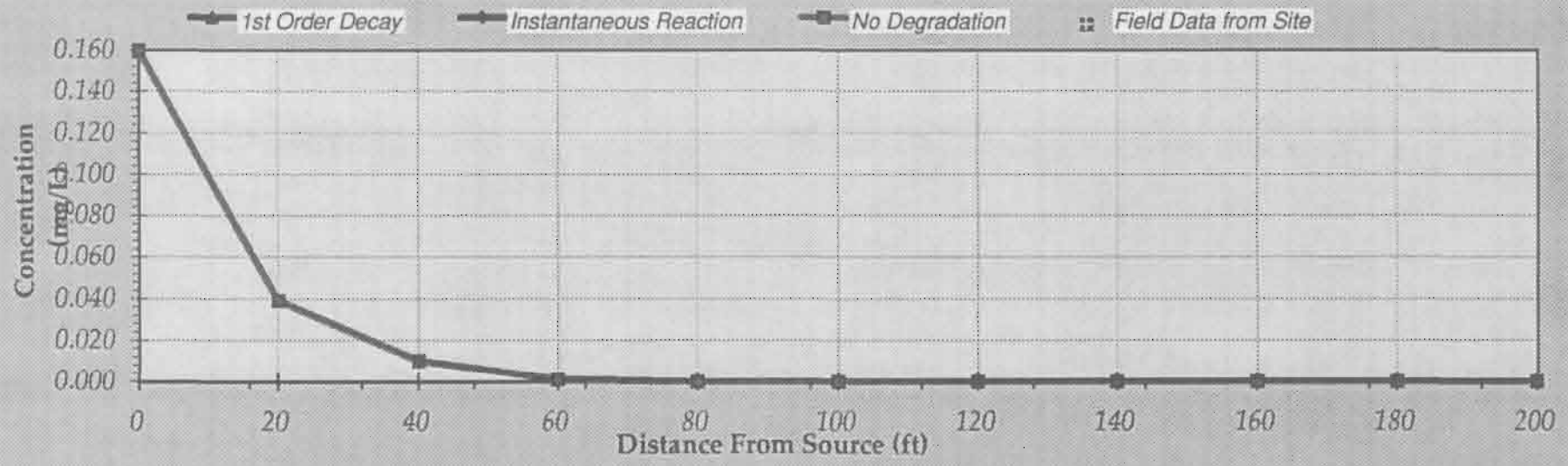
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE PYRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | Distance from Source (ft) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE OF MODEL | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
| No Degradation | 0.160 | 0.039 | 0.010 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 0.160 | 0.039 | 0.010 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 0.160 | 0.039 | 0.010 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Intermediate
Anthracene
Run Name

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 128.8 | (ft/yr) |
| *or* | | *or* | |
| Hydraulic Conductivity | K | 1.4E-02 | (cm/sec) |
| Hydraulic Gradient | i | 0.004 | (ft/ft) |
| Porosity | n | 0.45 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | *or* | |
| Estimated Plume Length | Lp | 200 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 886.5 | (-) |
| *or* | | *or* | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23440 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | *or* | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 200 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

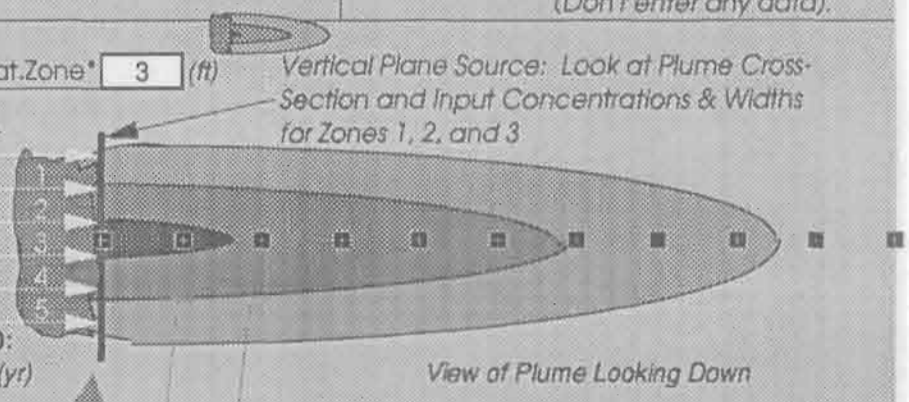
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.29 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 20 | .0 |
| 40 | .0 |
| 60 | |
| 80 | |
| 100 | |
| 120 | .0 |
| 140 | |
| 160 | |
| 180 | .0 |
| 200 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

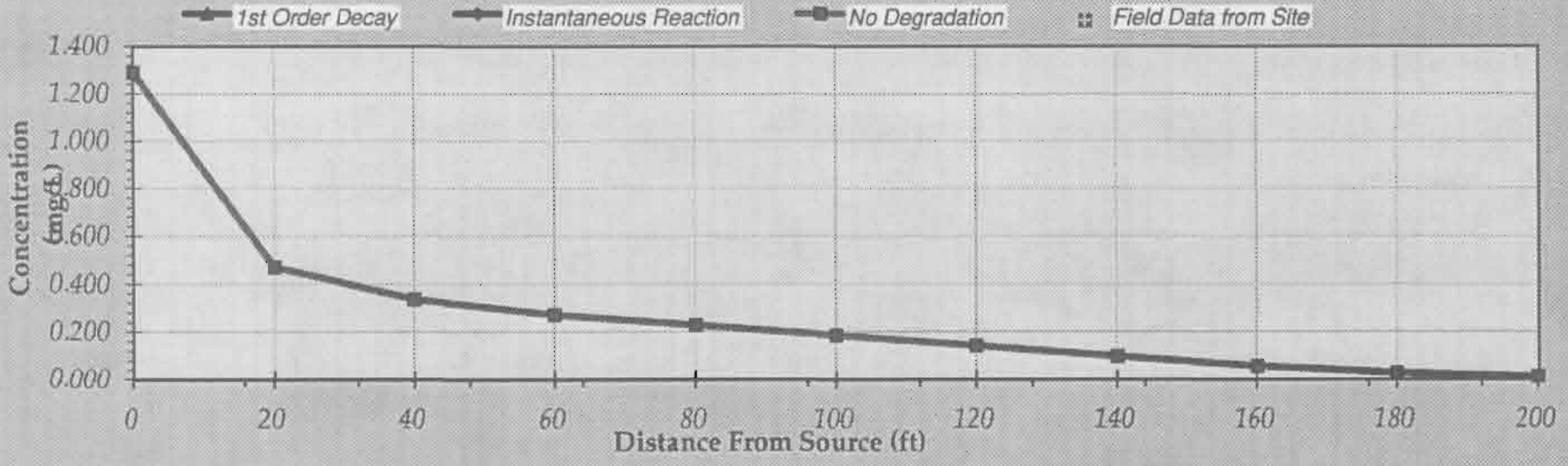
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## INTERMEDIATE ANTHRACENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| | *Distance from Source (ft)* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***TYPE OF MODEL*** | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
| No Degradation | 1.290 | 0.470 | 0.337 | 0.273 | 0.228 | 0.186 | 0.143 | 0.098 | 0.058 | 0.029 | 0.012 |
| 1st Order Decay | 1.290 | 0.470 | 0.337 | 0.273 | 0.228 | 0.186 | 0.143 | 0.098 | 0.058 | 0.029 | 0.012 |
| Inst. Reaction | 1.290 | 0.470 | 0.337 | 0.273 | 0.228 | 0.186 | 0.143 | 0.098 | 0.058 | 0.029 | 0.012 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Deep Naphthalene (Run Name)

**Data Input Instructions:**

115 (or 0.02) — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 55.7 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 1288 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

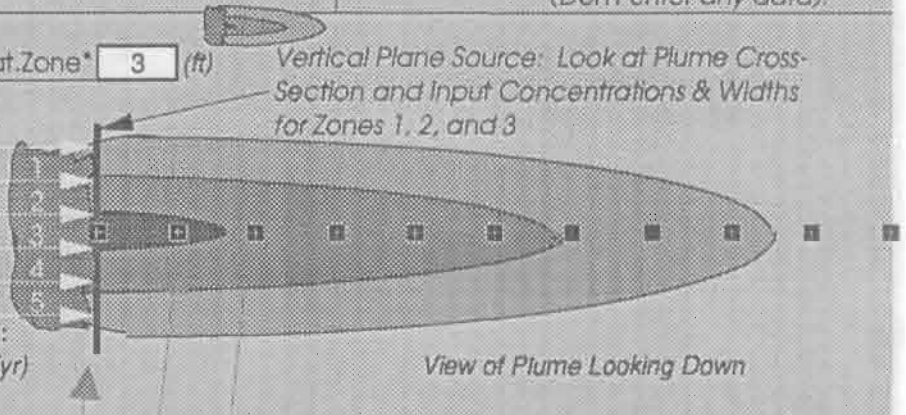
Source Thickness In Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 11.5 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass In Source NAPL, Soil | Infinite | (Kg) |




Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

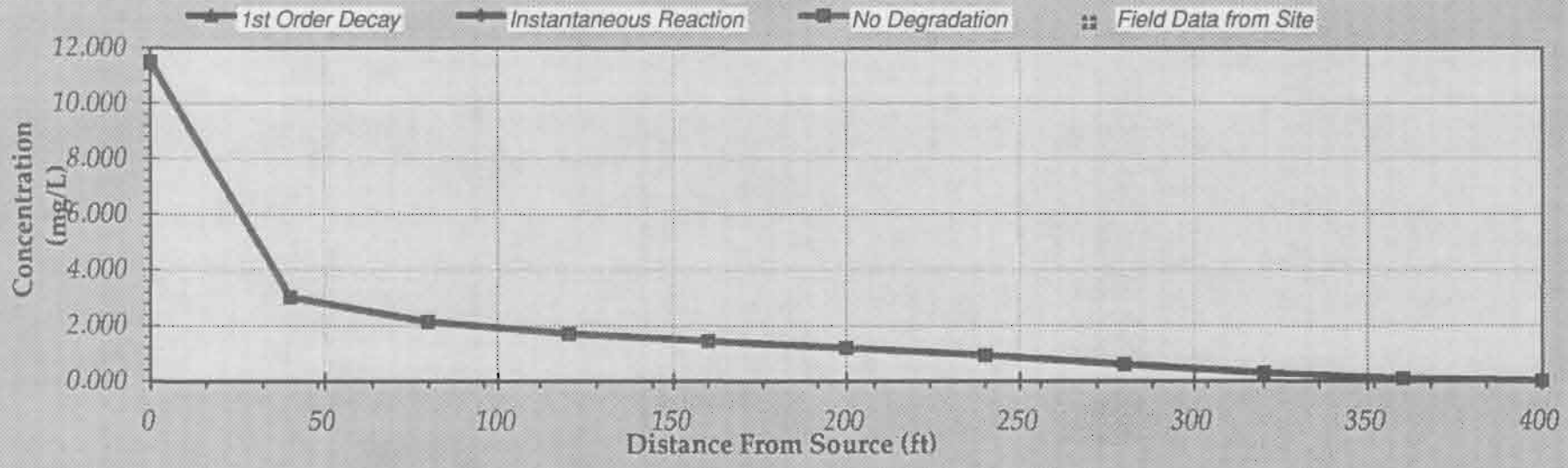
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP NAPHTHALENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 11.500 | 3.021 | 2.145 | 1.724 | 1.446 | 1.209 | 0.941 | 0.619 | 0.313 | 0.112 | 0.027 |
| 1st Order Decay | 11.500 | 3.021 | 2.145 | 1.724 | 1.446 | 1.209 | 0.941 | 0.619 | 0.313 | 0.112 | 0.027 |
| Inst. Reaction | 11.500 | 3.021 | 2.145 | 1.724 | 1.446 | 1.209 | 0.941 | 0.619 | 0.313 | 0.112 | 0.027 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Deep Phenanthrene — *Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 1018.9 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23950 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

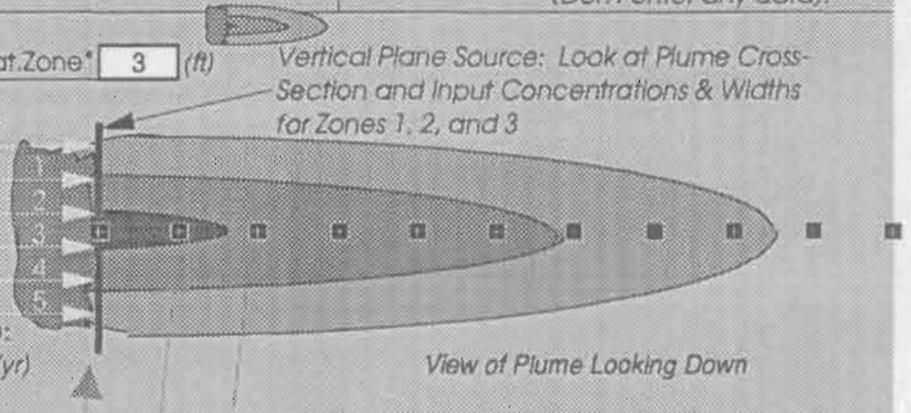
Source Thickness In Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.6 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass In Source NAPL, Soil | Infinite | (Kg) |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 40 | .0 |
| 80 | .0 |
| 120 | |
| 160 | |
| 200 | |
| 240 | .0 |
| 280 | |
| 320 | |
| 360 | .0 |
| 400 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

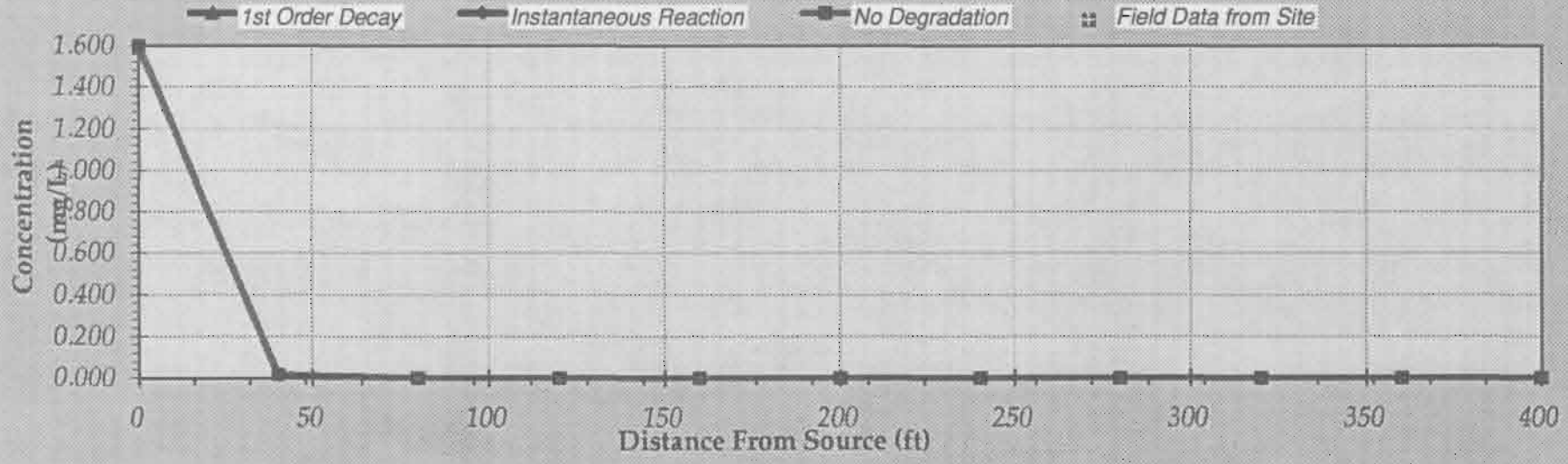
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP PHENANTHRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.600 | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 1.600 | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 1.600 | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Deep
Acenaphthene
*Run Name*

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly...or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 301.9 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 7080 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

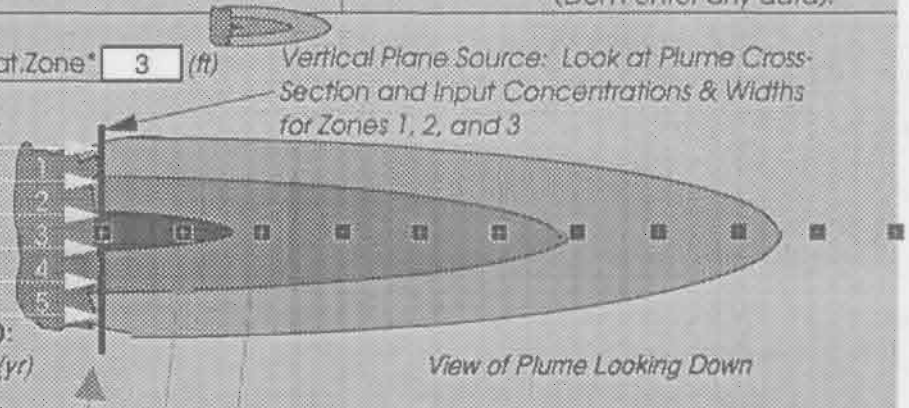
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.13 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

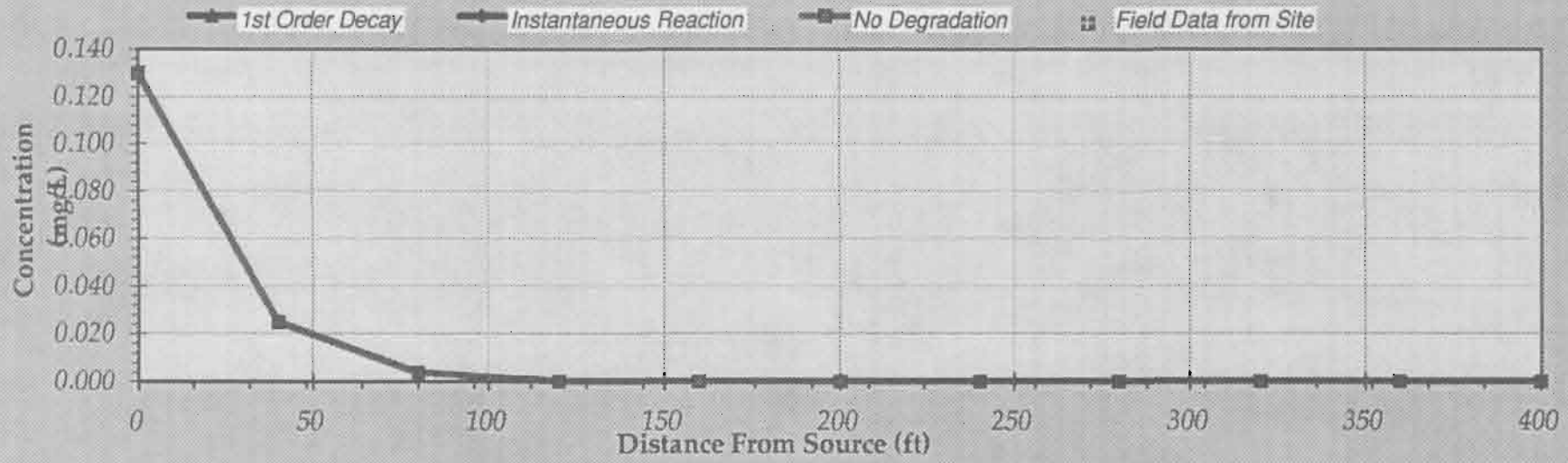
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP ACENAPHTHENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.130 | 0.025 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 0.130 | 0.025 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 0.130 | 0.025 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time:
1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence*

*Version 1.4*

PSR - Deep
Fluorene
Run Name

**Data Input Instructions:**

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| or | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| or | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 549.3 | (-) |
| or | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 12900 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| or | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L
W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

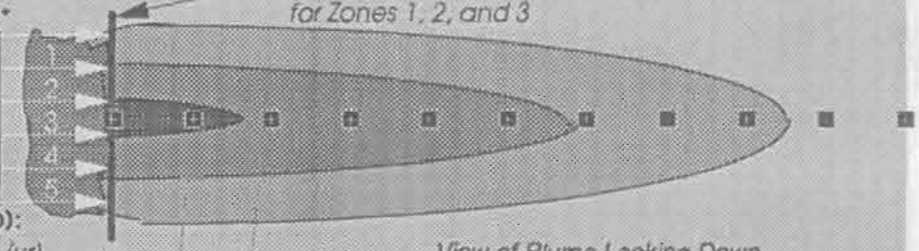
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.9 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |

*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*




*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |
| Dist. from Source (ft) | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

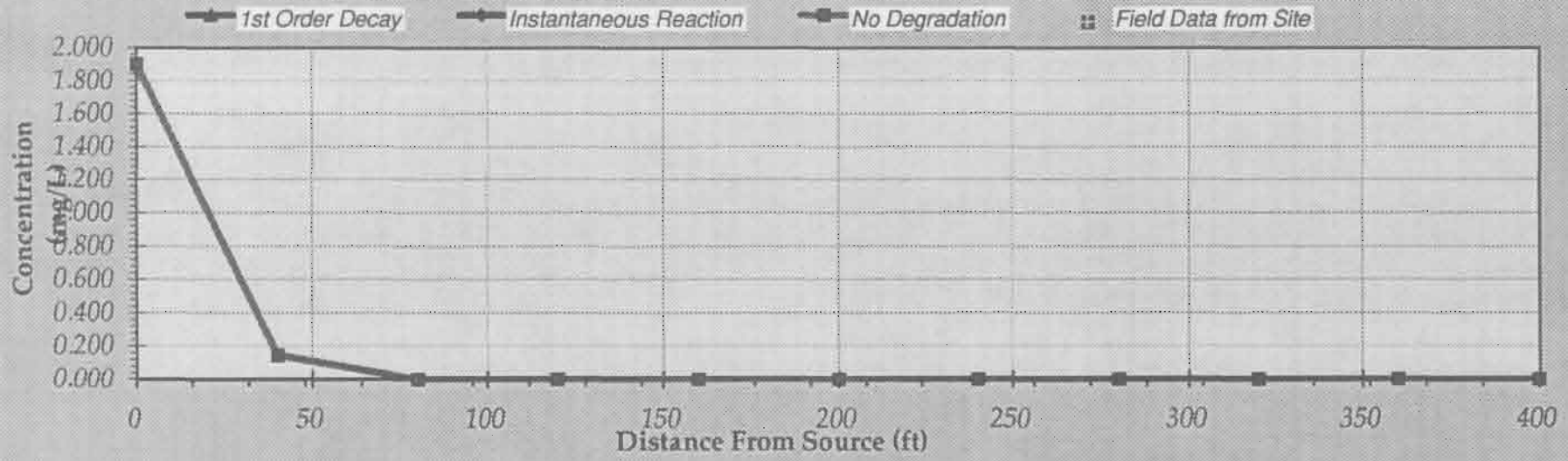
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP FLUORENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.900 | 0.147 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 1.900 | 0.147 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 1.900 | 0.147 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Deep Pyrene (Run Name)

**Data Input Instructions:**
115 or 0.02 — 1. Enter value directly... or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 5228.5 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 123000 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

L, W

## 6. SOURCE DATA

Source Thickness in Sat.Zone* 3 (ft)

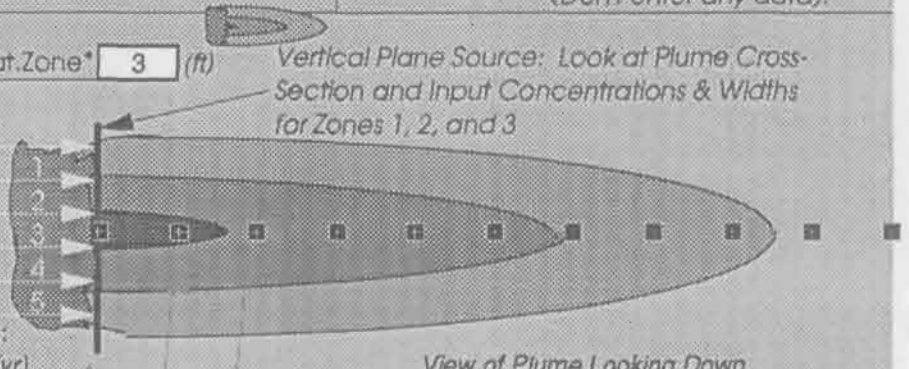
Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 0.16 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| Inst. React. | 1st Order | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Soluble Mass | Infinite | (Kg) |

In Source NAPL, Soil




Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentration (mg/L) | .0 | .0 | .0 | | | | .0 | | | .0 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

Recalculate This Sheet

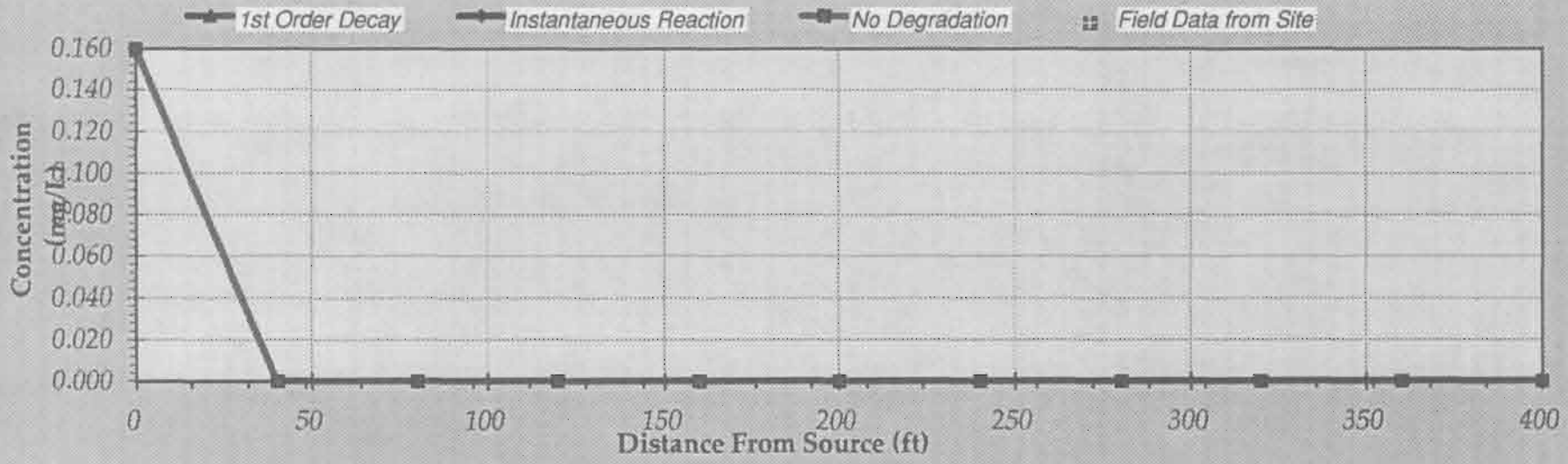
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP PYRENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

*Distance from Source (ft)*

| TYPE OF MODEL | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 0.160 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 0.160 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 0.160 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| *Field Data from Site* | | | | | | | | | | | |




Calculate Animation

Time:

1,000 Years

Return to Input

Recalculate This Sheet

# BIOSCREEN Natural Attenuation Decision Support System

*Air Force Center for Environmental Excellence* — *Version 1.4*

PSR - Deep Anthracene (Run Name)

**Data Input Instructions:**

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

## 1. HYDROGEOLOGY

| | | | |
|---|---|---|---|
| Seepage Velocity* | Vs | 16.6 | (ft/yr) |
| *or* | | or | |
| Hydraulic Conductivity | K | 6.4E-03 | (cm/sec) |
| Hydraulic Gradient | i | 0.001 | (ft/ft) |
| Porosity | n | 0.4 | (-) |

## 2. DISPERSION

| | | | |
|---|---|---|---|
| Longitudinal Dispersivity* | alpha x | 5.5 | (ft) |
| Transverse Dispersivity* | alpha y | 2.0 | (ft) |
| Vertical Dispersivity* | alpha z | 1.0 | (ft) |
| *or* | | or | |
| Estimated Plume Length | Lp | 400 | (ft) |

## 3. ADSORPTION

| | | | |
|---|---|---|---|
| Retardation Factor* | R | 997.2 | (-) |
| *or* | | or | |
| Soil Bulk Density | rho | 1.7 | (kg/l) |
| Partition Coefficient | Koc | 23440 | (L/kg) |
| FractionOrganicCarbon | foc | 1.0E-2 | (-) |

## 4. BIODEGRADATION

| | | | |
|---|---|---|---|
| 1st Order Decay Coeff* | lambda | 0.0E+0 | (per yr) |
| *or* | | or | |
| Solute Half-Life | t-half | 0.00 | (year) |
| ***or Instantaneous Reaction Model*** | | | |
| Delta Oxygen* | DO | 0 | (mg/L) |
| Delta Nitrate* | NO3 | 0 | (mg/L) |
| Observed Ferrous Iron* | Fe2+ | 0 | (mg/L) |
| Delta Sulfate* | SO4 | 0 | (mg/L) |
| Observed Methane* | CH4 | 0 | (mg/L) |

## 5. GENERAL

| | | |
|---|---|---|
| Modeled Area Length* | 400 | (ft) |
| Modeled Area Width* | 100 | (ft) |
| Simulation Time* | 1000 | (yr) |

## 6. SOURCE DATA

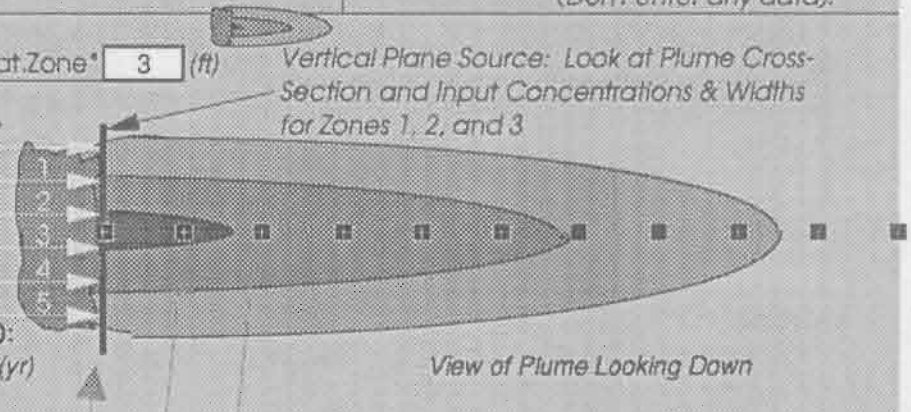
Source Thickness in Sat.Zone* 3 (ft)

Source Zones:

| Width* (ft) | Conc. (mg/L)* |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 100 | 1.29 |
| 0 | 0 |
| 0 | 0 |

Source Halflife (see Help):

| | | |
|---|---|---|
| Infinite | Infinite | (yr) |
| Inst. React. | 1st Order | |
| Soluble Mass | Infinite | (Kg) |
| In Source NAPL, Soil | | |




*Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3*

*View of Plume Looking Down*

*Observed Centerline Concentrations at Monitoring Wells*
*If No Data Leave Blank or Enter "0"*

## 7. FIELD DATA FOR COMPARISON

| Dist. from Source (ft) | Concentration (mg/L) |
|---|---|
| 0 | .0 |
| 40 | .0 |
| 80 | .0 |
| 120 | |
| 160 | |
| 200 | |
| 240 | .0 |
| 280 | |
| 320 | |
| 360 | .0 |
| 400 | |

## 8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

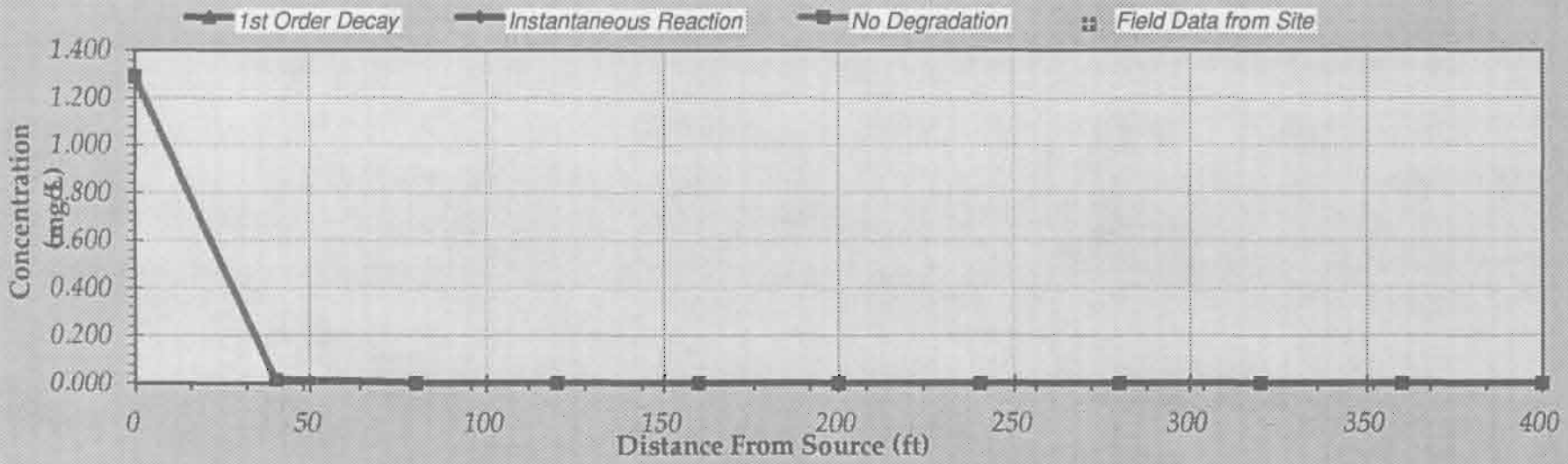
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

## DEEP ANTHRACENE DISSOLVED CONCENTRATION ALONG PLUME CENTERLINE

| TYPE OF MODEL | Distance from Source (ft) 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No Degradation | 1.290 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1st Order Decay | 1.290 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. Reaction | 1.290 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Field Data from Site | | | | | | | | | | | |




Calculate Animation

Time: 1,000 Years

Return to Input

Recalculate This Sheet

# APPENDIX J

# RESPONSE TO COMMENTS RECEIVED ON INTERIM DELIVERABLES

# APPENDIX J

## RESPONSE TO COMMENTS RECEIVED ON INTERIM DELIVERABLES

The responsiveness summary addresses comments received from various regulatory agencies on the Phase 1 Technical Memorandum (**WESTON, 1996a**), Phase 2 Technical Memorandum (**WESTON, 1997a**), and Ecological and Human Health Risk Assessment Technical Memorandum (**WESTON, 1997b**).

## PHASE 1 TECHNICAL MEMORANDUM

### DEPARTMENT OF ECOLOGY COMMENTS

1. **Table 3-2 and Section 4.4.1**. Background station BK02 appears to have been influenced by local anthropogenic sources for all three chemicals listed, compared to the other two. Perhaps these values should not be averaged with the other two. One possibility is to list BK01 and BK03 as "Puget Sound background" values and BK02 as "Elliott Bay nearshore background" values, as shoreline background values in Elliott Bay (to the extent that there are any unimpacted areas) may very well be higher than general values in Puget Sound. For context, these background values should also be compared to concentrations in Puget Sound reference areas (and/or to Elliott Bay background stations sampled around the PSDDA disposal site), to assist in determining their appropriateness and/or representativeness of background values.

   ***Response**: The selected locations were sampled to establish "background" concentrations of contaminations of concern in the urban bay environment in which the Marine Sediments Unit (MSU) is located. Background stations were selected to be similar in grain size and to approximate the depths sampled in the MSU. Background samples were collected near the downtown shoreline along Myrtle Edwards Park, off Magnolia Bluff and Duwamish Head. These areas represent urban influences on sediment quality, but are distant from any specific source, including the PSR site. Therefore, chemical data for all background locations were retained for use in evaluating the PSR site.*

2. **Section 4.4.2.1.1, Page 4-5**. In the final report, and to assist with remedial design, it would be helpful if analysis of these data were presented with respect to chemical signatures and sources of PAH (e.g., all creosote, or other petroleum fractions or sources mixed in?). This may also help in the selection of site units and remediation areas.

   ***Response**: Section 3 (Contaminant Fate and Transport) of the Remedial Investigation (RI) Report presents some chemical signature information. Overall the chemical*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

*signatures indicate creosote is present along with PAHs associated with No. 2 Diesel Fuel that was used as a carrier.*

3. **Section 4.4.2.3, Page 4-7**. Based on the distribution of data, it appears that PCBs, though present at levels of concern in some areas, may possibly not be associated with this site. The Longfellow Creek drainage should be evaluated based on PSR upland investigations to determine whether PCBs in that drainage could be related to the PSR site or are more likely to be associated with other upland sources (of which there are many).

***Response**: Data suggest that PCBs were discharged primarily from Longfellow Creek overflow drainage. There are no data that indicate the PSR upland facility was either a source of PCBs to the MSU or to Longfellow Creek. As part of a maintenance action in November 1996, the Port of Seattle removed all in-line sediments from the steel mill to the mouth of the Longfellow drainage, in addition to about 25 cubic yards of sediment at the mouth.*

4. **Section 4.4.2.4, Page 4-7**. The second sentence contradicts the third sentence. The presence of copper and mercury close to the eastern boundary of the site may also be more related to the Lockheed shipways directly adjacent to this area than to the PSR site. The two sites clearly overlap, providing further support for pursuing a comprehensive solution to both sites.

***Response**: A comprehensive solution for both the PSR and Lockheed facilities may be feasible, given the assumption that the timing of both projects will be similar and the cleanup alternative selected for the PSR site is reasonable to apply to the Lockheed facility.*

5. **Figure 5-1 and Section 5.2**. EB-9 and EB-18 had high concentrations of chemicals related to the PSR site and should be retained within the remediation area. Although a tentative boundary was drawn between the two sites, it was temporary pending a more detailed investigation of PSR-related contamination. It is the opinion of Ecology's Sediment Specialist that since the presence of heavy petroleum contamination will determine what remediation alternatives are possible, any areas with this type of contamination are best retained within the PSR site. A more appropriate boundary may be the westernmost boundary of the shipways at Lockheed, although the easternmost extent of petroleum contamination does not appear to have been defined.

***Response**: Stations EB09 and EB18 were characterized by PAH exceedances of 2LAET screening values; they are therefore currently included in the CSL/2LAET chemical exceedance area presented in the RI (see **Figure 5-14**). Furthermore, additional sampling was conducted east of these stations during the Phase 3 investigation to further define the easternmost extent of PAH contamination.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

6. **Page 6-1, first bullet**. The USGS data do not seem sufficiently certain to predict that offshore areas of exceedance will be limited to fill areas. From Figure 5-1, the correlation described is not apparent. Most areas outside the fill material have not been sampled, thus no predictions can be made of whether they might be contaminated. Of the few stations outside the fill that have been sampled, more stations than not are included in at least one of the boundaries. In addition, there is a large area of fill material west of the main slip that does not appear to be extensively contaminated. The assumption that there should be a correlation is based on an assumption that creosote present offshore was dumped there and did not migrate from the site, an assumption that has not been sufficiently tested by evaluation of subsurface sediments. If the assumption proves true, there is no reason that heavily contaminated sludges could not migrate to non-fill areas downgradient of their original location over the period of 80+ years that this site was in operation (as seen at many other sites).

   ***Response**: Subsurface sediment coring was conducted during the second phase of the RI field sampling program to evaluate the extent of subsurface sediment contamination. The results of the core sampling suggested that accumulations of contaminated material occurred primarily in those areas predicted by the USGS as representing non-native material (see **Section 2.1.6.5** of the RI); however, surficial contamination far exceeds USGS non-native material predictions. Additional surface sampling was conducted to establish the extent of contamination in areas outside the USGS "non-native fill" area and the results are reported in the RI (see **Section 5**).*

7. **Page 6-1, second bullet**. If we believe that Lockheed data can be used to define the easternmost extent of PSR contamination, that boundary should be shown rather than the one shown on Figure 5-1.

   ***Response**: The Lockheed data were collected primarily in nearshore areas between piers. The areas sampled are located within the boundary of the Lockheed potential cleanup area, which is being used to define the easternmost boundary of the PSR MSU (see **Figures 1-3 and 5-14** in the RI).*

8. **Page 6-1, 6-2, other data gaps**. Ecology concurs with and supports the "other data gaps" described in the last four bullets of Page 6-1 and first two paragraphs of Page 6-2. These are critical questions, and once answered, would trigger the next step, to design a remedy. The discussion in the text would benefit from a figure following the discussion, showing MW-5S, 5I, and 11D.

   ***Response**: The data gaps were addressed as part of the second and third phases of RI field sampling. In addition, the requested monitoring wells are depicted as part of the base map (**RI Figure 1-3**) for the RI figures presenting surface sediment contaminant distribution data [RI **Figures 5-1 through 5-16 and H-1 through H-16 (Appendix H)**.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

9. **Page 6-2, first bullet**. Screening for PAHs makes sense; however, phenols also appear to be a significant problem at the site, with an areal extent comparable to PAHs. One possibility would be to screen for PAHs as described, then run an 8270 analysis during Phase II sampling, which would provide information on both PAHs and phenols back.

   ***Response**: The second and third phases of RI sampling focused on field screening and laboratory-based PAH quantification. Phenolic compounds were not analyzed as they tended to co-occur with the PAH exceedances and most were below the SQS at the limits of the Phase 1 sampling area, while PAH exceedances tended to be very high. One exception was the area within the harbor lines and east of the site, where 2,4-methylphenol and phenol concentrations were elevated at several stations. Pentachlorophenol also was above the SMS standards within the Phase 1 sampling area, but exceedances were based on detection limits. Given the high solubility of phenolic compounds, it is unlikely that they would persist over time or with distance from source.*

10. **Page 6-2, second bullet, and third bullet, page 6-3**. To best locate these cores, hypothetical directions of PAH migration in sediments need to be postulated and described, based on the best information now available. At least two possible directions are apparent, based on PSR and Lockheed data. One is northeastward, through EB-9 toward Lockheed. Another is to the north, offshore of the tank farm near the shoreline.

    ***Response**: Shallow subsurface sediment cores were collected in the areas described above as part of the Phase 2 RI field sampling program (see **RI Figure 1-7**).*

## PHASE 2 TECHNICAL MEMORANDUM

### EPA COMMENTS (To Be Addressed in the RI)

11. **Section 2.1.2, Page 2-2**. Add a new paragraph describing the specific analyses performed for each of the three background stations (BK01, BK04, and Carr Inlet). Clarify that surface sediment chemical and conventional data are available for BK01 and BK04, but that the only sediment data available for the Carr Inlet station is a value of 49 percent fines based on field screening results (see Page A.1-3). The bioassay, benthic infauna, and/or clam bioaccumulation data available for each background station should also be described.

    ***Response**: Detailed descriptions of the physical, chemical, and biological sampling conducted at the above-referenced background stations are provided in **Sections 1.5.1.2** (Surface Sediment Sampling; Background Areas) and **1.5.3** (Sediment Bioassays and Benthic Community Evaluation) of the RI. In addition, RI **Table 1-1** provides a summary of the types of data available for each background sampling location.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

12. **Section 3.** Add an additional subsection that specifically describes how background stations were used for each different analysis. For example, the paragraph should list each of the three background stations, and for each station, the paragraph should describe how data from those stations were ultimately used in the evaluation of site-related sediments.

    For example, Phase 1 and Phase 2 surface sediment chemistry and conventional data are available for BK01 and BK04, and these data were used to calculate average background chemical concentrations for three bioaccumulative chemicals (i.e., PCBs, dioxins/furans, mercury), which were then used to calculate exceedance ratios above background for site-specific stations. It is understood that although the Phase 2 memorandum only included data for BK04, BK01 data will be presented in the upcoming Risk Assessment Technical Memorandum and will be used in the RI; thus, average background chemical concentrations for each of the three bioaccumulative chemicals will be re-calculated for the RI and chemical-specific exceedance ratios will be recalculated for each station.

    ***Response**: The average background concentrations for 2,3,7,8-TCDD, PCBs, and mercury were recalculated to include Phase 2 data for Station BK01 as part of the Ecological and Human Health Risk Assessment Technical Memorandum and are presented in that document (**Appendix K** of the RI). These revised background values were subsequently used in the RI in the calculations of chemical-specific background exceedance ratios (ERs). However, only the 2,3,7,8-TCDD background ERs are presented in the RI (see **Appendix F** and **D**), as the nature and extent of contamination for this chemical was based on comparisons with background. Recalculated background ERs are not presented in the RI for mercury or PCBs, as the magnitude and extent of contamination by these chemicals was evaluated based on comparisons with SMS and AET chemical criteria (rather than background).*

13. The text should clarify where station-specific exceedance ratios above background can be found (e.g., sections in text, figures, appendices), and how ERs were used (e.g., ERs were only used for comparison purposes in text).

    ***Response**: References to where background ERs can be located have been provided in the RI (see **Section 4.3.1**); **Appendix F** describes how ERs were used in the data evaluation procedure.*

14. This new subsection should also describe how background data were used in evaluating other biological effects data. For example, for bioassay analyses, bioassay data from BK01, BK04 and Carr Inlet were not used as comparisons with site data because of high mortality; for benthic community analyses, only biological data from BK04 were used for comparison to SMS criteria; and, for the laboratory clam bioassay comparisons, data from both BK01 and BK04 were used.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response:*** *A expanded description of the use of background data for biological endpoints was provided in the Risk Assessment Technical Memorandum (**Appendix K** in the RI Report).*

15. **Section 3.1.2.1, Page 3-3**. The final sentence regarding the substitution of control for reference in the evaluations of bioassay data should be revised to indicate that this approach is appropriate and consistent with Washington state regulations. Also, see EPA Comment on Appendix A.1 below.

***Response:*** *The reference to consistency with Washington State guidance was incorporated into the bioassay data validation reports presented in **Appendix E (Section E.2)** of the RI, where this issue is discussed.*

16. **Section 3.2.1, Page 3-4**. Based on station-specific TOC concentrations, this section describes circumstances under which the LAET was used as the equivalent of the SQS, and the 2LAET was used in place of the CSL. EPA requests that this section include a table that lists all Phase 1, 2, and 3 stations that were compared with LAET/2LAET criteria because TOC concentrations were "outside" the designated range. Also, tables in the text and appendices that show station-specific chemical concentrations, and refer to exceedances of SQS/LAET or CSL/2LAET criteria, should include notations as to which stations are compared to LAET/2LAET criteria (e.g., station labels could be marked with an asterisk if comparisons are made to LAET/2LAET criteria, or tables/figures could include a reference to the table that lists all stations with TOC concentrations that occurred "outside" the designated range and thus were compared to LAET/2LAET criteria).

***Response:*** *The TOC-normalization issue referenced above is discussed in **Appendix F** of the RI. This appendix includes a table listing all stations and associated samples that were compared with AETs based on TOC content outside of the range determined to be appropriate for normalization. In addition, footnotes have been added to all tables and appendices that present chemical comparisons with screening values to indicate which stations were compared with AETs (table footnotes) or the cross-reference to the table in **Appendix F** that provides that information (appendix footnotes).*

17. **Section 3.2.3.1, Page 3-6**. Text in this section refers to the "depiction" of exceedance ratios for PCB and 2,3,7,8-TCDD calculated based on comparisons with average background. The text should be revised because exceedance above background is only depicted for 2,3,7,8-TCDD (Figure 4-5).

***Response:*** *Only 2,3,7,8-TCDD (equivalent) data are compared with background for the purposes of evaluating nature and extent of contamination in the RI. Subsequently, only one figure is presented depicting this comparison, and the reference to a similar depiction for PCBs has been deleted.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

18. Text in Section 3.2.3.1 and in Appendix C.2.1.3 that refers to ERs for 2,3,7,8-TCDD, total PCBs, and mercury, should include a reference to Tables D.1-4 and D.1-5 that show actual data and ER values. It is understood that average background concentrations and associated ER values will be revised in the RI to incorporate BK01 data.

    ***Response**: As described in the response to comment #12, background values were recalculated to include the Phase 2 data for Station BK01, but the only background ERs calculated for the purposes of (and presented in) the RI were for 2,3,7,8-TCDD. The actual 2,3,7,8-TCDD data, as well as the background ERs for this chemical, are presented in the RI in **Appendix D**.*

19. **Section 3.2.3.2, Page 3-7, second bullet**. As noted by Ecology the actual rule criterion is 30 percent plus reference mortality. It is understood that WESTON correctly used the criterion in their evaluation.

    ***Response**: Comment noted; as indicated, the data were correctly interpreted in the ecological risk assessment (see **Appendix K** of the RI).*

20. **Section 4**. All text referring to average background ERs should be revised after average background values are recalculated using data from BK01 (Table 3-2).

    ***Response**: As described in the response to comment #12, background values were recalculated to include the Phase 2 data for Station BK01, and the ERs based on these background values were also revised accordingly [2,3,7,8-TCDD ERs are presented in **Section 5** and **Appendix D** of the RI.*

21. If comparisons of total PCBs and mercury sediment concentrations to average background concentrations are retained in the subsections of Section 4, each comparison should refer the reader to the appropriate table in the Appendix that shows chemical data (e.g., Table D.1-4) and exceedance ratios (e.g., Table D.1-5).

    ***Response**: **Section 5** of the RI describes the nature and extent of sediment contamination, and references readers to **Appendix D**, which includes a presentation of all chemical results for all site and background stations. Comparisons of concentrations of PCBs and mercury in MSU samples versus background samples were not retained as part of the discussion of nature and extent of contamination in the RI, as these contaminants were not considered to be site related.*

22. **Section 4.2.2.3**. In addition to a comparison to local background, this section should include a discussion of sediment quality guidelines for 2,3,7,8-TCDD (equiv.) that have been proposed in U.S. EPA (1993) using Lake Ontario data and a tissue-residue based approach for protection of ecological receptors (e.g., low risk and high risk values for fish at 60-100 ng/kg, mammals at 2.5-25 ng/kg, and birds at 21-210 ng/kg). Also, it would be

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

appropriate to indicate that Iannuzzi et al. (1995) found that sediment quality guidelines for TCDD derived from the background method inferred that TCDD concentrations in sediments would not exceed 1 to 10 ng/kg, based on currently accepted analytical methods. As described in Iannuzzi et al. (1995), the International Joint Commission, Great Lakes Science Advisory Board has proposed a sediment quality guideline of 10 ppt TCDD.

Iannuzzi, T.J., N.L. Bonnevie, and R.J. Wenning. 1995 An evaluation of current methods for developing sediment quality guidelines for 2,3,7,8-TCDD. Arch. Environ. Contam. Toxicol. 28:366-377.

EPA. 1993. Interim report on data and methods for assessment of 2,3,7,8-TCDD risks to aquatic life and associated wildlife. U.S. EPA ORD, Washington, DC. EPA/600/R-93/055.

***Response**: In **Section 5** of the RI, the 2,3,7,8-TCDD data for the MSU were compared with average Elliott Bay background concentrations (1.05 ng/kg-DW or 122.34 ng/kg-TOCN), as well as the Great Lakes proposed sediment quality guideline of 10 ppt (Iannuzzi et al, 1995). Given that the Elliott Bay dry-weight background concentration is less than the Great Lakes proposed sediment quality guideline (i.e., is more protective), no additional screening comparisons are proposed. Furthermore, it should be noted that the calculations of risk discussed in the Risk Assessment Technical Memorandum (see RI **Appendix K**) were based on effects levels rather than comparison to background.*

23. **Section 4.6, Page 4-11**. Section 4.6 should be revised using final benthic infauna data. The third paragraph of this section should be expanded to include a more thorough discussion of the appropriateness of using background station BK04 for SMS biological comparisons with the site. Specifically, the evaluation should describe the suitability of BK04 as an appropriate background station, including consideration of station depth, grain size, TOC, abundance (total and major taxonomic groups), richness, and classification analysis results. It is understood that these latter results are now available, as support for the upcoming Risk Assessment Technical Memorandum for the PSR Site.

***Response**: The detailed evaluation of the benthic infauna data is presented as part of the Ecological and Human Health Risk Assessment, which is provided as **Appendix K** of the RI. The final benthic infauna data set was used in the preparation of the Risk Assessment Technical Memorandum and an additional discussion of the suitability of Station BK04 as an appropriate benthic infauna background station was incorporated into the RI as part of the benthic data validation report (the only location in the RI in which these data are discussed), which is presented in **Appendix E (Section E.2)** of the RI.*

24. **Section 4.8, Page 4-12**. In addition to referring to the "whole body clam," the text should specifically state that clams were not purged prior to analysis.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response:*** *The whole body clam data are not specifically discussed as part of the RI. Instead,* ***Section 4.2.3*** *(Ecological Exposure Assessment; Clams) of the Ecological and Human Health Risk Assessment Technical Memorandum (****Appendix K*** *of the RI), which addresses these data, states that unpurged clams were evaluated.*

25. **Figure 4-5**. The notes should include a reference to the table in the RI that will show all data used to determine the Background Concentration (e.g., similar to Table 3-2), and a reference to the table in the RI appendix that will show the chemical concentrations (e.g., similar to Table D.1-4) and the exceedance ratios above background (e.g., similar to Table D.1-5).

***Response:*** *The requested references have been added to the figure in the RI depicting 2,3,7,8-TCDD exceedances of background (****Figure 5-10****).*

26. **Figures 4-11 through 4-15**. It appears that the "Notes" in each of these figures should be revised to be consistent with previous figures (i.e., using the note "see Figure 1-1 for site feature notes and global symbols").

***Response:*** *The notes for all figures have been reviewed and corrected, as necessary, in the RI report.*

27. **Figure 5-1**. Add numerical notations to the scale. Clarify that **individual** PAH exceedance **ratios** are based on exceedances of CSL and 2LAET. Provide a reference to the section of the text that describes circumstances under which either the CSL or 2LAET exceedance is plotted. Add a notation to each station label (e.g., an asterisk next to the station label in each box) to identify those stations that show 2LAET exceedances, or provide a reference to the table in the text that identifies those stations with TOC concentrations "outside" the designated range that led to comparisons to 2LAET criteria.

***Response:*** *This figure was prepared for data presentation purposes in the Phase 2 Technical Memorandum only and was not included in the RI. Therefore, it was not revised.*

28. **Figure 5-2**. Clarify that areas are based on **individual** PAH exceedances.

***Response:*** *See response to Comment 27.*

29. **Table 3-2**. Update the table with TOC-normalized TCDD data, data for BK01, and recalculate average chemical concentrations.

***Response:*** *The table in the RI presenting background 2,3,7,8-TCDD concentrations (****Table 4-2****) has been revised as requested.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

30. In the associated text, describe ERs above background based on TOC-normalized TCDD data, and provide a response to Comment 50 from Washington Department of Ecology. In light of Ecology's comment, it appears that the exceedance ratios above background for PCBs were described in the text, but were not ultimately used in defining cleanup areas or evaluating site-related risks, and thus, the appearance of "elevated" PCB concentrations at a background station may not really affect our data interpretation efforts at the site.

***Response**: PCBs are not being used in the identification of cleanup areas for the site nor are they being included in the risk assessment, based on the suggested interpretation of the data by Ecology.*

31. **Table 4-4**. The units for dioxins/furans are incorrectly shown as µg/kg - the correct units are **n**g/kg. The table should also be updated to include TOC-normalized values for total 2,3,7,8-TCDD (Equiv.). Currently, the table shows only dry-weight values for dioxins/furans.

***Response**: The table has been corrected and updated in the RI as requested (see **Table 5-1**).*

32. **Table 4-13**. This table should include a notation that background station BK04, not BK01, was used for SQS biological comparisons.

***Response**: A note will be added to Table 3-3 in the Risk Assessment Technical Memorandum (**Appendix K** of the RI) where background comparisons were actually conducted.*

33. **Appendix A.1**. This data validation report (or text discussion in Section 3.1.2) for the two acute toxicity tests should be modified to reflect results of WESTON's efforts to identify potential causes of the high mortality observed in each of the three background sediments.

EPA understands that WESTON evaluated water quality test measurements of ammonia and sulfide concentrations, sample grain size, and correlations between chemistry concentrations and bioassay results, but that WESTON was not able to identify any factors that could explain the reference failures. WESTON will also review recently received sediment data for Station BK01, as well as Station BK04, to determine whether those results suggest any toxicity (e.g., exceedances of SMS) that might have affected the observed toxicity.

As a note, EPA discussed the poor bioassay reference results with Teresa Michelsen, Washington Department of Ecology, on 25 June 1997. She indicated that she had reviewed the available information on the acute bioassay tests, and had not identified any

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

issues that should be pursued further by WESTON to identify potential factors that might have contributed to reference station failures. She also indicated that reference station failure is not uncommon, and that the state has often not been successful at identifying potential causes of failure. As noted above for these situations, it is appropriate and consistent with state regulations to use the control stations in lieu of reference stations. As appropriate, provide citations to correlation results (chemistry vs. bioassay) that will be presented in the upcoming Risk Assessment Technical Memorandum.

***Response**: The bioassay validation report, as presented in **Appendix E (Section E.2)** of the RI, has been updated to address the additional validation efforts described above.*

34. **Appendix A.1, Page A.1-3.** It appears that the first sentence of Section A.1.3.3 should refer to Station BK04 rather than BK03.

***Response**: The text was corrected as indicated [see **Appendix E (Section E.2)** of the RI].*

35. **Appendix C, Section C.2.1.3, Page C-4.** Text in this section indicates that Tables D.1-5 and D.1-5 present the results of the "screening against background." This text should be modified, because all data were "compared" against background but were not "screened" against background. It may be best for the text to clarify that all data for bioaccumulative chemicals were summarized in Table D.1-4, and then compared to average background values with ERs for all stations summarized in Table D.1-5.

***Response**: Discussions and tables in the RI regarding comparisons with background are limited to 2,3,7,8-TCDD and have been modified to address the comment (see RI **Sections 4.3.1 and 5.2.3, Table 4-2, and Appendix F)**.*

36. **Appendix D, Table D.1-**1. Add grain size, TOC, and sediment chemistry data for Station BK01. Laboratory grain size data are reported on Page A.1-3 for Station BK01 and TOC data were reported on Page 4-2. Verify that these are Phase 2 results.

***Response**: Physical and chemical data for all background stations have been verified and are presented in RI **Appendix D**.*

37. **Appendix D, Tables D.1-4 and D.1-5.** Modify the title of these tables to more accurately reflect information contained in the tables. For example, Table D.1-4 actually shows "Phase 2 surface sediment chemical concentrations for bioaccumulative chemicals (PCBs, mercury, dioxins/furans)."

***Response**: RI table headers have been updated and modified, as necessary (see **Appendix D**).*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

38. For Table D.1-5 exceedance ratios, are these the Ter's based on "average background" (per Table 3-2)? It appears that these values will be recalculated after incorporation of BK01 data.

***Response**: The ER data table (**Appendix D**) presented in the RI for the 2,3,7,8-TCDD comparison with background is based on the average background value, which includes the Phase 2 BK01 data.*

39. Update Table D.1-4 to include TOCN-normalized TCDD concentrations, and Table D.1-5 to include ERs above background for TOCN-normalized TCDD concentrations.

***Response**: The requested revisions have been incorporated into the RI data tables (**Appendix D**).*

40. **Appendices I and J**. The Phase 2 Technical Memorandum was revised on 23 July 1997 to include Appendices I and J, which consist of all shallow and deep boring logs. These boring logs were distributed to all addressees involved in the PSR Site. It is understood that these appendices will also be incorporated into the RI.

***Response**: Appendices I and J have been incorporated into the RI as **Appendix C**.*

**Additional Appendices to the RI**

41. All information pertaining to the use of the rapid immunoassay technique for CPAHs should be described in an appendix to the RI. The appendix should include the following information:

a) A brief discussion on how the immunoassay technique was used for PSR, including its overall usefulness for the site investigation (e.g., immunoassay data were used to assist in identifying locations for Phase 2 sediment sampling stations, but data were not used to define site boundaries.

b) Incorporation of all information presented in Section 1.1.1 of the Phase 2 Addendum (WESTON, November 1996), including Figures 1-1, 1-2, and 1-3 and Tables 1-1 and 1-2. Please clarify in Figure 1-2 that the comparison is based on laboratory and immunoassay test CPAH results for archived sediment samples from Phase 1.

c) A discussion of WESTON's evaluation of the Phase 2 immunoassay data presented in Table 1-2 of the Phase 2 Addendum, and whether Phase 2 results were different than Phase 1 results shown in Figure 1-2 of the Phase 2 Addendum. It appears that the Phase 2 Technical Memorandum includes a description of the immunoassay testing (Section 2.3.1.1; deviations from proposed testing requirements), but the memorandum does not actually present correlation analyses

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

of Phase 2 bulk sediment and immunoassay test CPAH results. This appendix should describe WESTON's approach for determining the usefulness of immunoassay results, and for deciding to submit archived Phase 2 sediment samples for bulk sediment PAH analysis. It appears that although immunoassay testing may be useful for evaluating CPAH contamination, it is not useful if extensive LPAH contamination is present.

***Response**: The above-requested information is presented in RI **Appendix A.***

**Additional Information to be Incorporated into the RI**

42. Results of the Phase 3 Sampling and Analysis Plan Addendum (WESTON, 10 July 1997), which are scheduled to be received at EPA on 10 September 1997, should be incorporated into all sections of the RI. The Phase 3 SAP was implemented in July 1997, and sediment samples were collected at 31 stations for PAH and TOC analyses (15 samples are being analyzed; based on those results, up to 16 archived samples may be analyzed).

***Response**: The results of the Phase 3 sampling effort have been incorporated into the RI, as requested.*

43. As stated on page 2-6 of the Phase 2 Technical Memorandum, sediment chemistry results for Station BK01 were inadvertently archived but results have been received from the laboratory and will be incorporated into the RI. A data validation report for those new data should be incorporated into the Data Validation appendices, and any necessary qualifications should be described in Section 3.1.1.1. Although page 2-6 indicates that grain size data were not available for BK01, grain size data are reported on pages 4-11 and A.1-3. Clarify that the grain size data reported for BK01 are from Phase 1 or Phase 2.

***Response**: All physical and chemical data for Station BK01 have been validated and incorporated into the RI. **Appendix E (Section E.1)** provides the results of the data validation review, and **Appendix G** provides a detailed evaluation of the sampling results.*

44. As stated on Page 3-3 of the Phase 2 Technical Memorandum, any corrections in abundances of benthic infauna data will be incorporated into text, tables, and figures of the RI.

***Response**: As previously discussed in the response to comment #23, the detailed evaluation of the benthic infauna data was presented as part of the Ecological and Human Health Risk Assessment, which is an appendix (**K**) to the RI. Accordingly, the final benthic infauna data set was used in the preparation of that technical memorandum (see RI **Appendix K**).*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## NOAA GENERAL COMMENTS

45. The results from the CPAH immunoassay screen showed a significantly high degree of correlation with laboratory results for the same sediment ($r^2 = 0.83$). Assuming that CPAHs are co-located with total PAHs, this screen should be adequate for identifying locations of primary concern. The results of the immunoassay screen were not presented in the revised Phase 2 SAP Addendum.

***Response**: As noted in the response to comment #41, all immunoassay data are presented in RI **Appendix A**. Also, please note that the immunoassay results were presented in Table 1-2 of the Phase 2 SAP Addendum (**WESTON, 1996b**).*

46. According to Figure 5-1, the extent of sediment PAH exceedances may continue to be undefined in certain areas, particularly to the north and northeast of the site. The following areas are noted where data may be lacking to determine exceedances:

- Northwest of sample EB080 (at the location of archived sample EB098)
- Northeast of samples EB082, EB086, EB085, EB105, and EB088 (at the location of archived samples EB101, EB102, EB103, EB089, and EB095
- Southeast of sample EB087

Although field immunoassay data may be available at locations offshore from the above noted locations, it may be desirable to analyze the archived samples to more accurately determine the offshore extent of contamination. At the very least, the field immunoassay data should be examined to determine if the values remain below screening criteria even when adjusted upwards for the percent error in immunoassay analyses relative to laboratory analyses.

***Response**: The offshore extent of surface sediment PAH contamination was determined as a result of the Phase 3 sampling. See also response to comment #42.*

47. Poor survival in the reference stations is a concern. TOC, grain size, and chemistry data may help to explain the poor survival. However, of the three reference stations, only BK01 and BK04 were analyzed for TOC, and only BK04 was analyzed for grain size and chemical parameters (BK01 was archived for potential future analyses). No supplemental analyses were conducted at the Carr Inlet station. The TOC data for BK01 and the grain size data for BK04 were both within the range found at the site, but TOC at BK04 (0.70) was lower than the range measured at the site during Phase 2. Concentrations of contaminants in the BK04 sample did not show exceedances of SMS/AET criteria for PAHs (total LPAHs at 0.64 mg/kg; total HPAHs at 1.3 mg/kg), but total PCBs (0.20 mg/kg; or 28.4 mg/kg - organic carbon normalized) did exceed SQS standards. This

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

concentration of PCBs would not appear to explain amphipod mortality. It is possible that other trace elements that were not analyzed for could be causing toxicity in BK04. These data gaps leave unknowns regarding the representativeness of the reference sample. Ideally, reference samples should be similar to the site samples physically (TOC and grain size), but should be from clean areas. However, in this study, the data gaps result in the inability to determine the appropriateness of the reference samples.

***Response**: The poor survival at the reference stations was a concern for the interpretation of the bioassay results. Because the reference sediments did not meet the performance criteria, the results for the control sediments were substituted for reference in all of the evaluations of the toxicity test data (in accordance with Washington State Department of Ecology guidance), thereby eliminating the concerns regarding the use of the reference sediments in the bioassay evaluations. This issue is briefly addressed in the RI in **Appendix E (Section E.2)** and discussed in detail in the Ecological and Human Health Risk Assessment Technical Memorandum (RI **Appendix K**).*

48. Table 4-4 of the Phase 2 document indicates that dioxins were normalized to TOC, but these data do not appear to be different than the data in the dry weight column. Although there are no SMS and AET screening criteria for dioxins, there is a sediment guideline published by EPA (1993) of 60 ng/kg 2,3,7,8-TCDD below which a low risk would be expected for fish. The maximum concentration of dioxin detected in sediment (26 ng/kg) did not exceed the EPA guideline.

***Response**: The MSU and background dioxin and furan data (expressed as 2,3,7,8-TCDD equivalents) were compared based on both dry-weight and TOC-normalized values (see RI **Table 4-2** for background concentrations and **Appendix D** for MSU concentrations). Per EPA direction, a lower proposed sediment screening value (than that proposed by the commentor) of 10 ng/kg 2,3,7,8-TCDD (for the Great Lakes) was also used in the evaluation of the dioxin data (see **Section 5.2.3** in the RI).*

49. It was concluded in the document that none of the site stations were identified as exceeding the SQS biological criterion, as all stations were characterized by major toxonomic group mean abundances greater than 50 percent of the background station (BK04) mean abundances. However, as previously noted, BK04 showed high mortality in the bioassays, and also had a relatively high percentage of polychaetes (39 percent) and low abundance. For these reasons, this comparison to the background station is questionable.

***Response**: The acceptability of Station BK04 as an appropriate reference location for comparison with MSU benthic data is discussed in detail in **Appendix E (Section E.2)** of the RI. The reason(s) for the mortality in the bioassays conducted using sediment from this location could not be explained based on a thorough review of the chemical and physical data. Furthermore, the only contaminant present at this station at a*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

*concentration exceeding its SQS screening criterion (PCBs) was not present at concentrations in excess of the benthic AET, suggesting non-toxic conditions for benthic infauna. As described in* ***Appendix E****, the physical characteristics of the station, combined with overall benthic community composition, further supported its use as an appropriate reference site for comparisons with the MSU. Therefore, it was retained for use.*

## DEPARTMENT OF ECOLOGY GENERAL COMMENTS

50. I share Chris Beaverson's concerns about the appropriateness of the reference stations. In particular, I am concerned with the chemical concentrations reported in Table 3-2. Based on these concentrations, neither BK02 nor BK04 should be included in the averages, since these contain clear outliers/elevated concentrations of several of the constituents of concern. My concern about BK02 was provided in the comments on the Phase 1 Tech Memo. With respect to BK04, the PCB SQS is exceeded, which is very inappropriate for a "background" station. The 90th percentile of Puget Sound-wide background for PCBs is 1.2 mg/kg OC-normalized, more in line with concentrations reported for BK01 and BK03. PSDDA data has also consistently showed concentrations lower than SQS in Elliott Bay background stations (PSDDA monitoring data for perimeter/background stations in Elliott Bay might be a better source of background data than these few stations). Once BK01 Phase 2 data are available, the average should be recalculated without BK02 or BK04.

***Response****: As described in the response to comment #1 on the Phase 1 Technical Memorandum, the selected stations were sampled to establish "background" concentrations of contaminants of concern in the urban bay environment in which the MSU is located. These locations were not necessarily intended to represent "clean" or "reference" conditions, but to provide a benchmark representative of urban conditions within the bay matching grain size characteristics and depths at the site. Given that the majority of the chemicals measured at these background stations did not exceed sediment screening values (see Section 5.3 of the RI), the selected stations were determined to be appropriate for use in the chemical comparisons of MSU data. Furthermore, as described in the response to comment #47, the reference stations were not used in the interpretation of the bioassay results, and, for the reasons discussed in the response to comment #49, Station BK04 was determined to be a suitable match with the site for use in the benthic community evaluations.*

51. **Page 3-7, second bullet**. The actual rule criterion is 30% plus reference mortality. I understand you used control mortality in lieu of an acceptable reference station, which is fine. The bioassay results presented here add weight to the chemical data in suggesting that the CSL boundaries of the site have not been identified in either the north or northeast direction from the site.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: Please see response to comment #19 regarding the interpretation of the bioassay data relative to the actual criterion. With regard to extent of contamination, the surface sediment chemical data collected during Phase 3 defined the outermost extent of CSL chemical contamination (see **Section 5** of the RI and **Figure 5-14**).*

52. For presentation purposes, it would help a lot if the station names could be larger. It's currently difficult to find stations referred to in the text on the figures. I would also like to have a figure showing the stations with product or sheens in the RI, rather than just on a table. Please include the shallow and deep boring logs in an RI appendix, rather than only in the site file.

***Response**: Figure constraints (i.e., size and number of data points) do not allow for an enlargement of station names. In addition, the RI provides only a summary of the observations of anthropogenic materials (see **Section 2.1.6.6**); therefore, no additional figures depicting this information were provided. Please also see the response to comment #40 regarding the coring logs.*

53. I don't know whether it is valid to look at mortality and reductions in growth in the clam "bioassay." This clam species was selected for its ability to bioaccumulate chemicals *without* exhibiting other adverse effects, which would otherwise make it difficult to interpret bioaccumulation data. Therefore, it is probably not appropriate to consider these mortality and growth results as a bioassay, since it is not a particularly sensitive species to these endpoints. Rather, the lack of effect in these endpoints can be considered evidence that the test met performance standards and the bioaccumulation data are valid.

***Response**: All organism responses measured as part of the bioassays, including the bioaccumulation test, provide some information regarding the effects of contaminant exposure. It is recognized that some organisms or endpoints will be more sensitive than others; however, all endpoints were evaluated in a preponderance of evidence approach.*

## CORPS OF ENGINEERS GENERAL COMMENTS

54. The large extent of contaminated sediments and the occurrence of free product in sediment cores indicates the possibility of subsurface transport mechanisms. NAPL could be discharging from nearshore seeps and flowing along the floor of the bay, or both NAPL and contaminated groundwater could be flowing through permeable sediments and exiting several hundred feel offshore. If any of these paths are active, remediation of offshore sediments could be difficult or impossible.

***Response**: Please see the Phase 2 Technical Memorandum Revisions (**WESTON, 1997c**) for a revised discussion of the presence of free product in subsurface cores (free product occurred in only one sample of one core). In addition, this information is used in the fate*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

*and transport section (Section 3) of the MSU RI to discuss the likelihood of DNAPL and groundwater transport to the bay.*

55. In order to identify possible contaminant transport paths and determine if they are still active, geologic units encountered in the offshore borings have to be identified and correlated with onshore data. This will require preparation of geologic sections using both offshore and onshore data. Some additional deep borings should be drilled to extend the geologic sections through the zone of contaminated sediments. A good strategy would be to locate an additional hole seaward of each of the three existing offshore deep core borings; this would allow three sections to be drawn, illustrating aquifers and aquitards which might control flow into the contaminated sediments.

***Response**: No additional borings will be conducted at the site at this time. For the purpose of supporting the RI and the FS, additional evaluations and modeling have been conducted as part of the Fate and Transport section of the RI report (see Section 3).*

56. If it appears likely that there is active flow of contaminated groundwater and NAPL into or through the offshore sediments, it will be important to estimate discharge rates. This can be done by analyzing existing onshore gradient and permeability data, surveying and monitoring any nearshore seepage areas, and possibly measuring offshore discharge with flux chambers or other devices. All of these alternatives need to be evaluated while proceeding with the RI.

***Response**: Tidal flux and groundwater discharge rates outside the slurry wall were included in the Upland RI report.*

57. The memorandum indicated that archived sediment from stations on the periphery of the sampled area will be analyzed for PAHs. This includes Stations EB052, 061, 096, 098, 099, 101, 102, 103, 089, 095, and 094. No additional surface sediment sampling should be proposed until data from these stations is generated and reviewed.

***Response**: The offshore extent of surface sediment PAH contamination was addressed as part of the Phase 3 sampling, the results of which are incorporated into the discussion of nature and extent of contamination in the RI (see **Section 5**). See also response to comment #42.*

58. Additional subsurface sampling and testing will need to occur at some point to refine volume estimates, especially in the vicinity of those stations that have shown significant contamination with depth. The area to the west and northwest of the main slip is especially in need of more subsurface investigation because of the conflicting results found at the stations there. Station EB027 had extremely elevated chemistry at depth; Stations EB032, 049 and 066 also had contaminated subsurface sediments. Yet Stations EB003 and 015, which are closer to shore, had relatively clean subsurface sediment.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

59. In contrast, the area to the east, northeast and north presents a more consistent picture, with contaminated subsurface sediment at nearshore stations and relatively uncontaminated subsurface sediment (beyond the top four feet) at deeper offshore stations. In this area subsurface sampling should be focused in the nearshore area.

***Response**: Refinement of volumes will occur prior to remedial design.*

60. The immunoassay data is not presented anywhere. Since the r-square value was said to be 0.83, graphical presentation of this data might prove useful in determining surface distribution of contaminants.

***Response**: The immunoassay data are presented, in total, in RI Appendix **A**. Also, please note that the immunoassay results referenced in the comment were presented in Table 1-2 of the Phase 2 SAP Addendum (**WESTON, 1996b**).*

61. Some useful information might be gleaned from analyzing the PAH composition at each station. For example, while 2-methylnaphthalene shows up at nearly every station to the north, northeast and east of the main slip, it is conspicuously absent on the west side of the main slip (with the exception of EB005). This may be an indication of independent sources or different transport mechanisms. Ratios of PAHs might also provide some useful clues to sources and transport mechanisms. 2Mnapth, Napth, Acenap and Fluor show up the most frequently and could be used for this analysis.

***Response**: PAH relative composition was evaluated and reported in the RI in **Section 3**, Fate and Transport.*

## CORPS OF ENGINEERS SPECIFIC COMMENTS

62. There is a discrepancy between Table 2-7 and Figures 4-7A/B regarding which archived samples from Station EB015 will be analyzed.

***Response**: All archived samples from Station EB015 were submitted for laboratory analyses; results are presented in **Appendix D** of the RI.*

63. Figures 4-7 and 4-8 present a good cross-sectional view of subsurface contamination. However, the spatial distribution of contaminated subsurface sediments is not presented anywhere. A map similar to Figure 5-1, showing both the surface exceedance ratios and the subsurface exceedance ratios either in tabular form or in bar charts (for each station) would be extremely useful.

64. Similarly, a map showing depth to sediment not exceeding CSL at each station would be useful. This data could be roughly contoured to provide a better spatial idea of the contaminated sediment prism to be remediated.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: **Figures 5-15** and **5-16** of the RI depict the maximum depths of SQS/LAET and CSL/2LAET contamination at each subsurface sediment coring location.*

65. Figure 5-1 is confusing in that there is no indication which stations have exceedance ratios based on CSLs (e.g., EB002) and which are based on 2LAETs (e.g., EB013). While we understand the regulatory context in which this figure was developed, for the purpose of looking at spatial distribution of contaminants it would be useful to have two additional figures, one with all stations compared to 2LAETs and one with all stations compared to CSLs. This figure also needs labels on the scale.

***Response**: The presentation format used in Figure 5-1 was not retained for use in the RI. The overall spatial extent of PAH contamination is displayed in the RI in **Figure 5-14**. Because these data are being used in a regulatory context to identify potential cleanup areas, the presentation format was not altered [i.e., the depicted data represent a mix of CSL and 2LAET exceedances based on whether it was determined to be appropriate to normalize the station-specific results to TOC (for comparisons with CSLs) given the station-specific TOC].*

66. Similarly, Figure 5-2 is based on the same mix of ratios. While relevant to the regulatory process, it may not provide a totally accurate picture of contaminant distribution. It would be useful to see two similar figures based on 2LAETs and CSLs respectively.

***Response**: Please see the above response to the comment #65 addressing Figure 5-1. In addition, it should be noted that very few surface sediment stations (approximately 5 percent) were characterized by TOC concentrations that required comparison to LAET and 2LAET values (see RI **Appendix F, Table F-1**). All stations with TOC content between 0.5 and 4 percent were compared with SQS and CSL chemical criteria.*

## ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT TECHNICAL MEMORANDUM

The Risk Assessment Technical Memorandum is provided in **Appendix K** of the MSU RI.

The following comments submitted by: Teresa Michelsen and Laura Weiss, Ecology

### GENERAL COMMENTS

67. **Overall Summary**. This is one of the best risk assessments I have seen for a sediment site. It was especially nice to see an accurate and comprehensive summary of the specific resources at risk, and the way that site-specific characteristics were reflected in how the contaminants and endpoints were selected. Only one type of risk that may be significant was not addressed, discussed in the comment below.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: No response required.*

68. **Effects of PAHs on Fish**. Somehow the effects of PAHs on English sole and other fish need to be addressed. NOAA research has clearly shown that PAHs have detrimental effects on bottom fish, probably related to intermediates formed during metabolization of these compounds. It is not appropriate to ignore this effect, since it may be one of the most significant risks at this site, due to the nature of the contamination. Sediment concentrations, rather than tissue concentrations, may be more helpful in evaluating the potential for these risks.

***Response**: There is a large body of evidence that supports the hypothesis that exposure to chlorinated organics (including PAHs) causes significant deleterious effects to fish. However, PAHs in fish tissues cannot be used to assess the level of exposure because these compounds are readily metabolized by vertebrate species. Similarly, the metabolic byproducts cannot be used to determine the original dose. Without this information, it is difficult to establish the link between sediment concentrations and degree of effects. WESTON requested information from NOAA to support an evaluation of contaminant effects on fish in this risk assessment; however, no information regarding a sediment threshold effects level or exposure concentrations that could be used to develop sediment criteria that would be protective of fish have been received.*

*The evidence from the literature would suggest that sediment concentrations causing effects to fish are likely several times to an order of magnitude lower than sediment concentrations considered to be protective of benthic invertebrates. Therefore, standards or screening values based on invertebrate communities may not protect fish. However, cleanup goals based on protection of human health from cancer typically result in very low target chemical concentrations in sediment. WESTON believes that protection of human health from carcinogenic effects also provides protection for ecological receptors such as fish because of the sensitivity of this endpoint.*

69. **Cleanup Areas**. Application of the quartile approach is inappropriate for areas exceeding ARARs (CSLs or $1x10^{-5}$ risk), as any such areas must be actively remediated. These boundaries should be clearly delineated in this report (and would form a more appropriate Area 1), and only areas outside those boundaries addressed as part of the residual risk assessment.

***Response**: The risk assessment has been revised and no longer contains a delineation of areas based on HI quartiles; however, it does include risks associated with the cleanup of SQS and CSL exceedance areas, as well as site-wide risks under current conditions.*

70. **Risks to Children**. Risks to children should be addressed in addition to adult risks.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: Risks to children were included in the risk calculations (Please see Tables 7-1 through 7-4).*

## SPECIFIC COMMENTS

71. **Executive Summary**. Please summarize Tables 7-1 and 7-2 here. It would be helpful to provide the reader with the "punchline" earlier.

***Response**: The revised Executive Summary includes information from Tables 7-1 and 7-2.*

72. **Page 2-2, Section 2.1.2**. A map illustrating features described in this section would be very useful.

***Response**: A map has been provided in the RI report and is referenced in the revised risk assessment.*

73. **Page 2-2, Section 2.1.3.1**. Are there any commercial fisheries in Elliott Bay?

***Response**: Commercial fishing could occur within Elliott Bay, but limited fish and shellfish stocks have reduced this activity. The Muckleshoots and Suquamish can exercise their treaty fishing rights for both fish and shellfish.*

74. **Page 2-10, second paragraph**. Since this site will require State concurrence, please recognize and discuss the MTCA risk ranges that will need to be adhered to ($<1x10^{-6}$ for individual chemicals, $<1x10^{-5}$ overall).

***Response**: This discussion has been included in the revised risk assessment and in Section 5 of the RI.*

75. **Page 2-11, fourth bullet**. The clam bioaccumulation test cannot be considered a bioassay. The species was selected for bioaccumulation studies because it is relatively insensitive to contamination. The mortality endpoint is considered a performance standard for the bioaccumulation test, not a bioassay endpoint.

***Response**: All organism responses measured as part of the bioassays, including the bioaccumulation test, provide some information regarding the effects of contaminant exposure. It is recognized that some organisms or endpoints will be more sensitive than others; however, all endpoints were evaluated in a preponderance of evidence approach.*

76. **Figure 2-2**. This should be updated based on comments on the groundwater RI report. Stringers of DNAPL are present beyond the slurry wall, and there may be pathways for dissolved and NAPL transport under the wall in some areas of the site.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response:*** *This figure has been revised.*

77. **Page 3-3, 3-4, equations**. PRGs should be calculated as OC-normalized values. This eliminates the need to determine and apply a site-wide average TOC in the equation, which may over or underestimate bioavailability at specific stations.

***Response:*** *PRGs are no longer being calculated for the site because of use of the State SMS to delineate problems areas at the site.*

78. **Page 3-4, 3-5, equation input parameters and Table 3-5**. The State would prefer that $f_{msu}$ and $f_{species}$ be set to 1 in all cases. Tribal studies show high site fidelity and many members fish only from a single area. In addition, use of these factors contains an implicit assumption that other fishing sites are not contaminated. In actuality, nearly every part of the Elliott Bay nearshore and lower Duwamish is contaminated, and setting these fractions less than one at every site may result in a cumulative risk to Elliott Bay fishermen of greater than the State standard. When dealing with risks to consumers of seafood that roam around the estuary, it is necessary to recognize the potential for cumulative risks; each site cannot be addressed in isolation. Comment also applies to Page 5-6, second paragraph.

***Response:*** *The ingestion rate used in the equation represents all the bottom fish or shellfish consumed by a tribal member, regardless of source. The fraction of fish ($f_{msu}$ or $f_{PS}$ in Table 5-1) was used to differentiate the amount of fish obtained from Puget Sound by a tribal consumer versus the amount of fish that came from other sources (grocery store, restaurant, other regions). Based on a weighted mean of both the Tulalip and Squaxin Tribes, only 20 percent of bottom fish is caught and consumed from Puget Sound and 67 percent of all shellfish consumed is from Puget Sound. Of those bottom fish ingested from Puget Sound, all were assumed to come from the site (i.e., $f_{species}$ was set at 1.0). However, for shellfish, $f_{species}$ was further modified to adjust for the species available for harvest at the site. In the MSU, no intertidal areas are present where shellfish could be harvested. However, based on the reconnaissance survey, shrimp are present and it was assumed that crab would also be present. Therefore, the shellfish ingestion rates derived from the Tulalip and Squaxin Tribal Seafood Consumption Study were adjusted to account for mobile shellfish only (i.e., no clams).*

79. **Page 3-6, Section 3.1.3**. The report states that it is using values representing no effects levels. If this is the case, it should be using the LAET or SQS as the screening value, not the 2LAET. On the equations, again, lipid-normalized and OC-normalized parameters (BSAFs, etc) should be used, eliminating the need to apply site-wide average TOCs and estimated lipid values.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: This section has been substantially revised and PRGs are no longer being calculated for identification of problem areas. Rather, the State SMS has been used to identify potential cleanup areas and determine the basis for residual risk calculations.*

80. **Tables 3-1, 3-7, and 3-9**. As stated above, risks from PAHs in sediments to fish and fish fry should be evaluated in some manner.

***Response**: Risks to fish and fish fry from PAHs could not be directly evaluated. WESTON believes that risks to fish are accounted for at the site by protection of human health. This issue is addressed in the uncertainty analysis. See also response to comment #68.*

81. **Figure 3-1, legend**. It is highly inappropriate to indicate "no cleanup proposed" for the green areas, since many of these areas exceed CSLs. The CSLs and $10^{-5}$ boundaries should be clearly marked on this figure and only areas outside of them designated for contingent (optional) cleanup based on the risk assessments.

***Response**: The revised figure reflects the SQS and CSL boundaries. The designation of "no cleanup proposed" has been removed.*

82. **Page 4-2, table of site-related contaminants**. Based on the pattern of data, I think that PCBs and mercury should be eliminated as clearly *not* site-related. Including these contaminants drives the risk assessments higher, which is not helpful at an already unmanageably large site.

***Response**: PCBs and mercury were removed from the calculation of risks due to site-related contaminants.*

83. **Page 4-5, fourth paragraph**. Has age been shown to correlate with lipid levels in clams? I have not seen any data suggesting such a relationship.

***Response**: Lipid/age correlations are unknown. However, there are seasonal changes in lipids due to reproductive cycles. It is likely that juvenile clams have different lipid content as a percent of body weight compared to adults.*

84. **Page 4-6, bullets**. Throughout this section, it appears that contaminants are being screened from some media but not others. That is a strange approach that confounds interpretation of the data set as a whole. Please use all the available data to select contaminants of concern that will be addressed in all media during the risk assessments. Also, it makes little sense to me to leave in some PAHs while taking out others, knowing that they all came from the same source and are clearly site-related. These should be retained for all media.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: EPA guidance calls for screening on a media-specific basis for each receptor because of differences in toxicity and other factors.*

85. **Page 4-7, Human Health Risk-Based Screening.** Please indicate which target risk levels were used for screening carcinogenic and noncarcinogenic chemicals.

***Response**: Target risk levels for RBS concentrations were based on $10^{-6}$ risks for cancer and 0.1 for noncancer effects.*

86. **Table 4-7, TCDD Equivalents.** What does the "0" in the column entitled "Screening Concentration" mean? This would not be the result of a risk-based calculation. Perhaps this means it's below detection limits? If so, the value should still be given and a footnote added to explain this.

***Response**: This is the value actually reported in the Region III risk-based screening tables for fish tissue.*

87. **Page 5-6, first full paragraph.** This paragraph does not provide enough information to clearly understand the basis for the fish consumption values listed in Tables 3-5 and 5-1. The text mentions that only the fraction of fish and shellfish obtained from Puget Sound (as opposed to stores, etc.) were expected to represent fish and shellfish that come from the PSR site. This seems to be the factor labeled "$f_{PS}$" in Table 5-1, but the same factor seems to labeled differently (as $f_{msu}$?) on page 3-5 or Table 3-5. In addition, I am unclear as to why the value is 21% when the same factor was estimated to be 69% for finfish for the Hylebos Risk Assessment. It looks like the 15.96 gram/day estimate is based on the 95th percentile for bottom fish consumption only. However, this does not seem to be explained in detail in the report.

***Response**: The factors used in development of the fish consumption rates have been clarified in the risk assessment.*

88. **Page 5-6, last paragraph.** It is unclear to me why the 95th UCL on the mean would be preferable to the 90th percentile, as proposed by the State. An UCL is driven more by the variability of the data and may be above the highest value, while a percentile better reflects the conceptual definition of the goals of the State, to be protective of at least 90% of a sensitive population.

***Response**: The use of an 95th UCL of an arithmetic mean is more conservative than use of the 90th percentile for an exposure point concentration; however, EPA guidance is flexible with respect to representation of an upper bound exposure point concentration. The risk assessment was revised to incorporate use of the 90th percentile as the exposure point concentration.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

89. **Page 5-7, second paragraph**. This methodology could use a better explanation. What is meant by the "percent" of the chemical remaining in sediments? Percent by volume, by weight, molar percent, percent by area? Ideally, it would be percent exposure, based on area-weighted surface sediment concentrations. This assumption that home range is limited to the area of the PSR Sediments Unit is questionable. I'm glad to see that this is noted in uncertainties discussion on page 7-4.

***Response**: This section has been deleted from the risk assessment.*

90. **Page 5-8, bullets**. Under the first bullet, since the nearshore area is proposed as part of Area 1 (which will presumably be remediated under any scenario) additional access to the shoreline should not increase risks. Under the third bullet, why not check the literature-derived BSAFs against actual data from the site (paired sediment and tissue data)? This might give you a sense of its accuracy or the uncertainty involved in this estimate. Better yet, why not use a site-specific BSAF derived from these data?

***Response**: This bullet has been revised.*

*Too few data were collected from the site to allow accurate calculation of site-specific BSAFs per the state guidance, therefore, BSAFs were not derived based on site data.*

91. **Pages 6-7 and 6-8**. Why were ANOVA techniques used in the analysis of SMS compliance for amphipod and echinoderm bioassays? Please eliminate this and stay in compliance with agreed-upon interagency statistical guidance.

***Response**: Both t-tests and ANOVAs were conducted. T-tests were used to determine compliance with the State SMS.*

92. **Page 6-8, Section 6.2.3**. The clam tests were bioaccumulation tests, about which little or nothing can be said in terms of risk assessment. Discussion of this test should be removed from this section. Mortality is not an appropriate endpoint since it is a performance standard for the test (i.e., this species was selected for bioaccumulation tests because of its ability to survive even high sediment concentration). Growth data are useless since the organisms did not grow. Less reduction in growth than the control is not an appropriate risk assessment endpoint. If you were really modeling interpretation of this test after *Neanthes*, the growth data would be considered invalid since a minimum growth rate was not achieved. It is unlikely you could see a statistically significant difference in growth without achieving a reasonable growth rate, and you certainly are unlikely to see it with a negative growth rate (weight loss). I am concerned that, as presented, these data could be interpreted as lack of an adverse effect, when really they are not valid indicators in either direction.

***Response**: Please see response to comment #75.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

93. **Page 6-13, Section 6.2.6.1.2**. It would seem like an appropriate selection here might be the lowest LOAEL or the highest NOAEL, whichever is lowest.

***Response**: Use of other effects values was discussed as part of the uncertainties in the risk calculations (Section 7.4.6).*

94. **Page 7-1, first paragraph and Section 7.1.1**. Given the requirement for State concurrence at this site, and for Superfund to meet State ARARs, it would seem appropriate for the risk assessment results to be reviewed in light of MTCA acceptable risk ranges, as well as EPA's risk management range. It is inexplicable to Ecology why we have to keep making this basic request at site after site.

***Response**: The risks are discussed relative to the MTCA risk ranges in the revised report.*

95. **Page 8-4, Section 8.1.2.1.2**. Lack of an observed correlation is irrelevant, and should not be used to screen the amphipod data out from further consideration. It is not surprising that a correlation was not observed, since bioassays were only taken at borderline stations, where responses would be expected to be most variable. Had a wider range of sediment concentrations (both higher and lower) been included in the tests, and/or a larger number of stations been tested, a correlation might have been found. Amphipods are well-known to respond to petroleum contamination, and they may be responding to components of the mixture not well-represented by the variables selected (i.e., PAHs). Regardless of the results of correlation analyses, the SQS and CSL exceedances observed are State standards (ARARs) for the site, and cannot be ignored or factored out of the preponderance of evidence approach.

***Response**: The responses exhibited by the amphipods used in the bioassays for the MSU were unexpected, since a number of the samples had PAH concentrations above levels that would have predicted severe effects (i.e., greater than CSL). In addition, because of the limited number of biological samples tested, it was desirable to evaluate the correlation between bioassay responses and chemical and physical factors at the site to aid in the interpretation of samples that only had chemistry data. Ultimately, those stations with amphipod CSL "hits" were all incorporated into areas defined by chemical CSL exceedances, and were not set aside or ignored. The two samples with amphipod "hits" at an SQS level fell within either an SQS or CSL chemical exceedance area.*

96. **Page 8-6, fourth paragraph**. These and later conclusions should be revised to reflect amphipod moralities observed at the site. The extent of the problem appears to be downplayed here and in section 8.1.5.2 (Page 8-15).

***Response**: Please see response comment #95.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

97. **Page 8-21, second paragraph**. The AETs absolutely do not assume a positive correlation between concentration and effects or a dose response relationship (for example, a simple threshold model would work just as well). No cause and effect relationship whatsoever is presumed (nor can lack of a correlation be used to eliminate biological data from consideration).

***Response**: Comment noted. Please see response to comment #95.*

98. **Page 8-5, last paragraph**. It is important to emphasize here that site-wide averages are not relevant to benthic organisms. This is why State ARARs for benthic organisms (chemical and biological CSLs) are required to be met at all stations. The discussion is somewhat vague as to whether biological risks are addressed by cleanup of the identified remediation areas. The remediation areas preliminarily proposed early in the document should be refined at the end on the basis of the risk assessment and biological data presented (i.e., boundaries should be refined to reflect important human health and biological criteria such as $10^{-6}$, $10^{-5}$, $10^{-4}$ for human health and SQS, CSL, etc for ecological risks). We should not be stuck with using the first set of remediation areas defined before the risk assessments were conducted, particularly if they are not the most efficient configuration for eliminating biological risks.

***Response**: The risk assessment has been revised to address these concerns by calculating risks for areas defined by on the SQS and CSL standards.*

## ATSDR GENERAL COMMENTS

99. I confined my review to the human risk assessment portion. Overall, the document reflected a thorough, well though out, and defensible human health risk assessment. The methodology was clear and consistent.

In the risk assessment, it was recognized that default variables for consumption of fish and shellfish would not be appropriate for characterizing a tribal subsistence fisher. However, the EPA's default reasonable maximum exposure (RME) duration of 30 years is used. Even as the tribal subsistence fisher cannot be characterized by default consumption variables, it may not be appropriate to use the default RME to characterize exposure duration given the potentially unique situation of tribes in regards to length of residency. The unusual situation posed by residence on a reservation combined with the family oriented traditions and ties of tribal members may mean that, like consumption rates, values specific to the tribal subsistence fisher may need to be developed. While I cannot immediately point to any document, ATSDR may be able to assist in obtaining some documentation to use in development of a better number, or confirming the use of the default RME.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: Currently, the extended exposure duration for an RME scenario is addressed in the uncertainties section. If an individual resides in the area for a life time (assume 70 years), the effect would be that risks would change by a factor of about 2.*

100. The harvest of fish and shellfish from the Marine Sediments Unit is assumed to occur for only six months of the year. This was based upon information from the Washington State Department of Fish and Wildlife. However, the discussion didn't specify whether tribes had to abide by the limitations set for commercial and sport fishers, or whether they were exempt due to possible treaty stipulations. If tribes are exempted from the limitations, the six month exposure period should be reassessed.

***Response**: Tribes abide by approximately the same seasonal limitations [Cain, T., Washington State Department of Fish and Wildlife, pers. com. with N. Musgrove]*

## WDNR GENERAL COMMENTS

101. I have reviewed the Draft on behalf of DNR; however, because of time constraints, my review has been preliminary, I have a few points of clarification in the proceeding section, but in general, the report was well written, and I found that it provided very useful information on several issues of importance to DNR.

***Response**: No response required.*

102. My general comment relates to the ecological risk information in the text. I do not recall a discussion or evaluation, in the preponderance of evidence, of other types of effects to organisms, such as the presence of lesions. I am unclear if these types of effects were issues at the site.

***Response**: Given the types of contamination at the site, other types of effects including lesions may be expected at the site. However, at the planning stage for the RI, specific receptors and endpoints were selected for evaluation that would allow the clearest interpretation of site-specific effects. Use of a histopathological endpoints was not considered easy to interpret with respect to relevance to population health, so it was not included.*

## WDNR SPECIFIC COMMENTS

103. **Page 2-8, Section 2.2, Conceptual Site Model**: The text and associated figure (Figure 2-1) indicate that the completed cleanup actions at the upland facility have controlled sources of contaminants and that contribution to the Marine sediments Unit is no longer expected (the figure therefore shows some pathways to be historical). Although I have not reviewed the specific comments submitted, my understanding is that the

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Department of Ecology had some questions regarding the degree to which the cleanup actions at the upland facility have controlled contaminant release to the Marine Sediments Unit. It is not clear to me if these issues have been resolved or if the text and figure need to be clarified.

***Response**: Upland cleanup actions have been completed, and as such represent the feasible source control actions for the site. The figure will be modified to reflect the latest information available from the Upland RI Report (**RETEC, 1997**) and the MSU RI Report with respect to potential ongoing pathways (see **Figure 3-4** in the RI).*

104. It is also not clear to me if the sediments at the PSR site serve as a source of contamination for the overlying water column, and if this needs to be better reflected in the conceptual site model.

***Response**: At the current levels of contamination, sediments may act as a source to the water column based on partitioning to the water column. However, PAHs have a high affinity for binding with organic material in the sediment and the HPAHs, in particular, are not expected to be very mobile. Preliminary contaminant mobility data also suggest this is the case. Compared to exposure to sediment and subsequently contaminated biota, the water column pathway is considered to be minor.*

105. **Figure 2-2**: Although I realize that the figure was intended to be a generalization, it is not clear to me what the dark material above the area marked "Soils contaminated by LNAPL" is, and I am assuming that "Asphalt Cap" is used in lieu of a more detailed description of what actually overlies the "Contaminated Vadose Zone Soils."

***Response**: The stated assumption is correct. The figure has been modified to clarify these portions.*

## DOH SPECIFIC COMMENTS

### Section 2 - Site Characterization and Conceptual Site Model

106. Overall, the human health risk assessment presents two approaches in estimating risk and determining cleanup areas at the site. Site characterization of the land use appears to protect both recreational and tribal fisher persons at reasonable maximum exposure levels. By protecting subsistence Tribal fishers who consume above average amounts of fish and shellfish from the PSR site, it is assumed this approach will be protective of other populations potentially consuming fish and shellfish from the PSR site. DOH agrees with the use of EPA-promulgated toxicity criteria for cancerous and noncancerous endpoints in establishing cleanup areas. Furthermore, the conceptual site model depicting

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

the transport of site-related contaminants to humans that may occur in the vicinity of the site is well established and scientifically defensible.

***Response**: Comments noted.*

**Section 3 - Identification of Potential Cleanup Areas**

107. DOH supports the use of indicator chemicals in evaluating the site based on the likely contribution to risk and widespread distribution. In general, chemicals which are of low toxicity and/or of limited distribution within a site do not add greatly to the overall risk to humans.

***Response**: Comment noted.*

108. Development of preliminary remediation goals (PRGs) is a novel approach in setting cleanup levels. This approach differs slightly from the approach DOH recommended to the Washington State Department of Ecology (Ecology) for establishing human health sediment quality criteria (SQC). The primary difference is that the SQCs are expressed as an organic carbon normalized value, and the PRGs are expressed in terms of dry weight. The use of a non-organic carbon normalized value is not consistent with Washington State's current Sediment Management standards (SMS) nor to the SQCs. Sediment PRGs which are converted to dry weight concentrations by use of an average site total organic carbon (TOC) concentration may result in sediment cleanup levels that may over or under estimate actual risk. Such over or under estimation may be within an order of magnitude. The use of actual TOC values is preferred; however, in order to normalize a sediment chemical concentration, TOC data must be collected during chemical sampling, which is often not the case.

***Response**: The non-polar organics are TOC-normalized according to the State SMS. TOC data were collected at the site concurrently with chemistry data and used in the comparison to criteria.*

109. The PRG equations for noncancerous and cancerous endpoints are improved upon from DOH's SQC equations by the addition of parameters designating the fraction of fish obtained and consumed from the site ($f_{msu}$) and the fraction of types of fish/shellfish species consumed that may be obtained from the site ($f_{species}$). One drawback to including these values is they require additional information which may not be available. However, estimates of these parameters are likely to improve the accuracy of the final cleanup level. Another concern is whether $f_{msu}$ is accounted for in the ingestion rate (IR). Table 3-5 indicates an adult fish ingestion rate of 15.96 g/day. Our understanding is this value is based upon the fraction of total fish consumed by tribal members. The 15.96 g/day value is the amount of English sole consumed from the site (the total fish consumption rate beginning much higher. Is inclusion of the $f_{msu}$ redundant, thereby lowering the fish

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

consumption percentage again? Should the IR be the total fish consumed then adjusted by the fraction obtained and consumed from the Marine Sediment Unit?

***Response**: The 15.96 g/day represents all of the bottom fish consumed by a tribal member, regardless of source. The fraction of the bottom fish eaten that were actually caught in Puget Sound is represented by $f_{msu}$ or more accurately $f_{PS}$ (the equations will be consistent in the revised risk assessment). Of those fish eaten from Puget Sound, all are assumed to come from the Marine Sediments Unit (i.e., $f_{species} = 1.0$). No information exists that would allow reduction of this fraction to account for only those flatfish that were caught at the site.*

110. Two other improvements have been made to DOH's SQC equation for carcinogens. This includes the refinement of the body weight parameter ($BW_{twa}$) as well as the time weighted average of human daily ingestion rate of fish over a lifetime ($IR_{twa}$). Including such corrections for differences in body weight and ingestion rate in children and adults more accurately estimates these parameters over a lifetime.

***Response**: Comment noted.*

111. The ranking and grouping of indicator chemical exceedances (ICEs) appear to be subjective. No explanation was provided as to how the distinctions were made between the initial cleanup area for the PSR site, and the two other areas. It appears all groups had ICEs greater than one, indicating potential for adverse effects. From a prioritization of which areas to cleanup first, this is a good strategy; however, from a public health policy, even the lowest ranking group may pose a potential risk to humans.

***Response**: The approach to delineation of cleanup areas has been substantially revised based on the State SMS; prioritization is no longer part of this section.*

**Section 4 - Contaminant Selection**

112. Comparison of site sediment chemical concentrations and Elliott Bay background chemical concentrations is useful in regulatory actions such as setting cleanup levels. Given the wide spread distribution of many chemicals found at the PSR site and the fact that these chemicals are not specific to this site, it is not feasible to clean up below a man-made background level. From a public health perspective, background concentrations may represent an inherent risk to humans; however, no attempt is made to regulate this background risk. Nonetheless, areas that have potential human health effects associated with background concentrations may require a human health advisory from DOH warning of health threats caused by background conditions. Any risk above that expected from naturally-occurring chemicals may fall under regulatory control by Ecology. These risks must be greater than those associated with background levels in order to invoke a regulatory response.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: Comment noted.*

113. Finally, Ecology is in the process of implementing human health sediment quality criteria (SQCs) for marine sediments. Although the PRGs have been derived using similar equations and bioaccumulation factors, it is likely the PRGs and SQCs will be different for the same chemical. Will the PSR site adopt future SQC values likely to be promulgated in the near future? Given the novel approach in using BSAF values in establishing sediment criteria for the protection of human health, it may be wise to coordinate the efforts of EPA and Ecology, ultimately resulting in a consistent cleanup methodology.

***Response**: EPA will consider any promulgated standards at the time of the draft Record of Decision.*

## SPECIFIC COMMENTS FROM U.S. ARMY CORPS OF ENGINEERS

114. **Section 2.2.3, Ecology Assessment Endpoints**: There is not enough discussion of the process for selection of assessment endpoints (which are not so named) in on pages 2-10 and 2-11. This section selects benthic invertebrates and marine fish, dismisses marine birds due to their range in relation to the marine unit, and then selects measures of possible effect. Previously identified receptors of special status are not mentioned here, but are important in terms of individuals as well as populations, and include marine mammals, peregrine falcon, Great Blue Heron, and a bald eagle with a nearby nesting site. The Conceptual Site Model (CSM) identifies bioaccumulating chemicals are a "major" pathway for marine birds.

***Response**: The assessment endpoints were selected as part of the RI/FS Work Plan (WESTON, 1996c), which went through an interagency review cycle.*

115. Recommendation: It would be much clearer to the reader if the first paragraph in this section described the management goal of environmental protection at the site drives, through considerations in the CSM, selection of animals that are most likely at risk or which are a key trophic link. There needs to be clearer presentation of the selection process, and discussion of surrogates for these receptors identifying exposed and susceptible assessment endpoints. Major CSM pathways (including bioaccumulation potential) to receptors of special status such as the heron (and/or the eagle) should at least be addressed in the text here. I do not see reason for dropping the heron (or eagle) as an assessment endpoint, and would like more information that assures me that this is appropriate. Possible, although it does not clearly say it, there is a scarcity of suitable heron (or eagle) feeding sites; there is a discussion of few "pocket" beaches that may be intended to convey this. Please revisit the heron (or eagle) as an assessment endpoint in

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

view of the conclusion that a number of the compounds which are bioaccumulative have been to be available to the benthic infauna at the marine sediment unit.

***Response**: Additional information is included in Section 2 of the revised risk assessment regarding selection of endpoints.*

116. **Section 2.3.2.1, Ecological Measurement Endpoints**: The transition to the effects (or measurement) endpoints also needs to have language justifying the selection.

Recommendation: Reference to commonly used tests for this purpose in Puget Sound may help this. (Note that, if the heron were retained as an assessment endpoint, there would still be a measurement endpoint here, in the clam bioaccumulation experiment. There is also information available on cormorants and herons for PCDD/PCDF and PCBs relating to reproductive failure effects.)

***Response**: The effects to be measured as part of the risk assessment were discussed in Section 3.5.4 of the RI/FS Work Plan (WESTON, 1996c). Additional language was added to the risk assessment.*

117. **Figure 2-2**: Groundwater should be labeled in the figure.

***Response**: This figure has been revised.*

118. **Page 3-7, paragraph 3.2**: Lockhead should be Lockheed.

***Response**: Spelling has been corrected.*

119. **Page 8-13**: "The limited range of responses for the mortality and growth rate tests using these clams did not support the identification of an effects threshold." For information: the Corps' Waterways Experiment Station has developed an Ecological Residue Effects Database. It displays responses to tissue residues of various compounds. It may be accessed through the Internet at http://actbbs.wes.army.mil/public/default.htm. John Malek and Erika Hoffman at EPA have access at this time, and WESTON may get access through request. I must add, though, that PAH information is sparse in the database. No recommendation associated with this comment.

***Response**: Thank you for this information. Further discussion of the contents of the database with EPA supported your impression that few PAH effects data are available. Therefore, this source was not pursued.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## NOAA GENERAL COMMENTS

120. In general, the approach presented in the document is well-designed and representative of current EPA methodology for ERA.

***Response**: No response required.*

## NOAA SPECIFIC COMMENTS

### Site Characterization

121. A reasonably thorough characterization of aquatic receptors is given, but the status of shrimp populations is confusing. On p. 2-6, three species of shrimp (spot, crangon, and dock) are identified as regular residents of Elliott Bay. Yet, the next paragraph indicates that spot and Alaskan pink shrimp represent 98 percent of the invertebrates sampled during trawl sampling events. Table 2-2 of the subject document, which lists the results of trawl sampling, does not list Alaskan pink shrimp.

***Response**: The differences in species composition are related to the source of information. Historical studies suggested that spot, crangon, and dock shrimp are present in Elliott Bay. The reconnaissance survey found that spot shrimp were most common (as reflected in Table 2-2). However, during the trawling for the bioaccumulation study, Alaska pink were also found in moderate abundances in some trawls. Therefore, the statement was made that spot and Alaskan pink shrimp were the dominant invertebrate species found. Table 2-2 does not include the incidental catch data from the bioaccumulation study; however Table 4-9 does. Clarification will be added to the text (see Section 2.1.3.4).*

### Identification of Potential Cleanup Areas

122. The extent of contamination is identified by the potential cleanup boundaries presented in Figure 3-1 of the subject document does not appear to be adequately characterized. Even at the edge of the proposed boundaries, there are stations for which the mean exceedance ratio of sediment criteria is greater than 10. For example, at stations EB97, EB85, EB86, and EB67, all of which are located near the outer edge of the proposed boundaries, Washington's Cleanup Screening levels (CSLs) for both naphthalene and acenaphthene are exceeded. Exceedance of CSLs are "generally used to identify areas potentially requiring active remediation" (quotation from p. 4-2 of the subject document).

***Response**: Archived data from Phase 3 were analyzed to address the farthest extent of contamination.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

123. The method used to identify preliminary cleanup areas is not explained adequately. The manner in which the exceedance ratio quartiles presented in Table 3-10 of the subject document are used is not specified. Without additional explanation, it is difficult to determine if the proposed cleanup areas presented in Figure 3-1 of the subject document are reasonable.

***Response**: The identification of preliminary cleanup areas has been substantially revised and is based on the use of the SMS (see Section 1).*

124. Potential cleanup areas were identified by evaluating human health and ecological risks simultaneously. It would have been interesting to derive cleanup areas separately for human health and ecological endpoints. Although ultimately only a single cleanup scenario can be implemented, by comparing the cleanup areas derived by independent methods, the driving force behind the cleanup at the site can be identified. Such identification may allow for increased focus on the most influential parameters.

***Response**: This type of evaluation was conducted during the data analysis effort for the risk assessment. Carcinogenic chemicals are the risk driver for the site. Areas representing risks to ecological receptors are incorporated into the areas representing human health risks.*

125. Ecologically-based Preliminary Remediation Goals (PRGs) are given in section 3.1.3 of the subject document. Even though the risk from PCBs is evaluated at the end of the document, PRGs for PCBs are not included in the tables in this chapter (i.e., 3-1, 3-7, 3-8, 3-9) or in Appendix F, which includes the derivation of risk scores for the delineation of potential cleanup areas. Values for all the parameters needed to calculate PRGs for PCBs are given in the text. PRGs for PCBs should have been included in this exercise. It is not known if inclusion of PCB PRGs would have altered the identification of proposed cleanup areas.

***Response**: Due to the availability of SQS and CSL, the PRG calculation has been dropped for the site. In addition, the PSR facility does not appear to be a source of PCBs.*

126. The effects concentration for TCDD in fish eggs given on Table 3-7 of the subject document should be 0.034 mg/kg, not 0.043 mg/kg as given. The calculation presented in Table 3-9, which uses the number in Table 3-7, is correct as given. The table referenced in the footnote in Table 3-7 should be 6.4, not 6.3.

There should be a footnote given for Figure 3-1 which provides an explanation for the numbers in the polygons. I understand them to be mean exceedance ratios.

***Response**: This section has been removed from the risk assessment.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

**Contaminant Selection**

127. Even though PAHs were identified as potentially site-related contaminants (section 4.1 of subject document), they were not evaluated for the benthic fish endpoint. The authors defend this decision by stating that the detoxification enzymes present in all vertebrates (i.e., mixed function oxidases) make the evaluation of these compounds difficult. While it is true that these enzymes play an important role in the elimination of PAHs in fish, they do not necessarily eliminate the toxic effects of PAHs (Hellou et al. 1995). The carcinogenic components of PAHs are the metabolites, not the parent compounds. The metabolites can be reliably measured in the bile of fish. This technique has been repeatedly used by the NMFS Montlake laboratory to demonstrate exposure to PAHs. The relationship between exposure to PAHs and hepatic lesions in English sole has been known for many years (Malins et al. 1985). By not including PAH metabolites in the risk assessment, the authors may have underestimated the risk to benthic fish.

***Response**: The endpoints used in the risk assessment were selected as part of the RI/FS Work Plan (WESTON, 1996c) and represented those receptors and effects that could be clearly measured and interpreted as being site-related and relevant to receptor population health. PAH effects on fish health are acknowledged in the risk assessment. Uncertainties associated with the selected endpoints are addressed Section 7 of the risk assessment (see also response to comment #68).*

128. Section 4.0 of the subject document indicates that changes in analytical methodology make the historical data not comparable to the data collected for the RI. The changes should be specified so the reader can evaluate the comparability. No matter what the changes may have been, it may be possible to apply some type of correction factor to include the historical data. If the data are unusable for some reason, this fact should be stated. Given the fact that the boundaries of contamination may not have been adequately characterized (see above), any historical data outside the present sampling boundaries could be very useful.

***Response**: No historical data exist outside the boundary of the area sampled as part of the MSU RI, with the exception of several samples from the Southwest Harbor project that were collected in between the Lockheed piers. However, these samples are located within the Lockheed proposed cleanup area boundary, which has been selected as the administrative easternmost boundary for the MSU. Therefore, these data were not evaluated as part of the MSU RI and risk assessments.*

129. The manner in which bioaccumulation potential was characterized was not identified (see Section 4.3 of the subject document). While it appears that the most consequential chemicals were included at this step, a more rigorous screening or rationale should be provided.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

***Response**: The detail regarding the criterion used to retain or drop a chemical for evaluation was provided in Table 3-1 of the Risk Assessment Technical Memorandum. No bioaccumulative compounds related to wood-treating activities were dropped from the risk assessment.*

**Exposure Assessment**

130. For Table 5-11, the source of the data presented should be identified. Also, maternal transfer rates for dioxins/furans should be provided in this table.

***Response**: Table 5-11 has been revised (see Table 4-11 in Appendix K of the RI).*

**Toxicity Assessment**

131. The tissue effects concentrations used for dioxins/furans and PCBs are based on studies conducted on rainbow trout. No uncertainty factor was applied to these concentrations as they were applied to English sole. The use of uncertainty factors for exotoxicity data is common practice in ecological risk assessments (Suter 1993). If uncertainty factors are not to be used, then a discussion of the applicability of the rainbow trout to English sole should be provided. The discussion could be based on differences in physiology and life history.

***Response**: Selection of uncertainties factors are difficult to support. There are no data to support what factor should be used with rainbow trout effects data when applied to English sole. Use of a factor to account for surrogacy will affect the risk by the same degree as the factor and is discussed in the uncertainty section.*

132. The tissue effects levels selected for use in this assessment were the highest available No Observed Adverse Effects levels (NOAELs). For both dioxins/furans and PCBs, the highest reported NOAEL was higher than the lowest reported Lowest Observed Adverse Effects Levels (LOAEL). In an assessment of this type, you could use values ranging in conservativeness from the lowest NOAEL (most conservative) to the highest LOAEL (lease conservative). Using the highest NOAEL represents a middle ground between these two extremes, but since these values were higher than the lowest LOAEL, the approach used is skewed toward the less conservative side of the spectrum. A more conservative (and recommended by this reviewer) approach would be to use the highest NOAEL only if it was lower than the lowest LOAEL. In this case, the lowest LOAEL should have been used. Using this approach, the resulting risk estimates would have been 4x higher for PCBs and just slightly (~1.3x) higher for dioxins.

***Response**: Use of other effects levels has been discussed as part of uncertainties in the risk assessment.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## Risk Characterization

133. On p. 8-4 of the subject document, it is stated that the amphipod toxicity results (all of which were significantly different from control results) are not reliable indicators of sediment toxicity because of low correlation with sediment contaminant concentrations. Since sediment toxicity tests are a more direct measurement of toxicity, it can be argued that the reverse statement is true. in the case of amphipods, the sediment contaminant concentrations are not reliable predictors of the observed toxicity. The authors use the lack of concordance between these two measurement endpoints to dismiss the amphipod toxicity results from consideration in the risk characterization.

***Response**: The results of the amphipod test were surprising in that responses did not track with chemical concentrations at all. Some lack of concordance was expected because typically the amphipod endpoint does not identify the lowest AET (nor even the second lowest AET in some cases). When a comparison was made based on the chemical concentration associated with the amphipod AET, relationships between chemistry and mortality still remained unclear. Mortalities were highest (72 percent) where there were the most exceedances of the AETs set by the amphipod; however, the next highest mortality (61 percent) occurred for a sample with no exceedances of any amphipod AETs. The lowest mortalities also occurred at stations with no amphipod AET exceedances. Moderate levels of mortality (43 to 51 percent) occurred at sites with one or more amphipod AET exceedances with widely varying degrees of exceedance.*

*The amphipod data were interpreted according to the State SMS, and the stations exceeding biological criteria are incorporated into either an SQS or CSL chemical problem area. However, for the purposes of risk characterization, use of these data was more difficult because the chemical thresholds that may define a problem were not clear based on the amphipod results. This affected our ability to extrapolate those results to other stations with only chemical data.*

134. The weight-of-evidence approach for the benthic invertebrate community assessment endpoint is presented in Table 8-25 of the subject document. While the table is well-designed and easy to read, the rationale for the overall benthic impact rating is not given. A better approach may be to assign some type of quantitative value to each qualitative category, so that a score can be calculated for each station. Part of the confusion about the table as currently presented regards the relative weight given to each measurement endpoint. As indicated above, it appears that values for the amphipod toxicity measurement endpoint, all of which were recorded as moderate or severe, may have been discounted. The criteria for the derivation of the final impact categories (i.e., minimal, minimal to moderate, and moderate) needs to be more thoroughly explained.

***Response**: Table 7-25 describes the criteria used to assign impact categories for the benthic endpoints.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

135. The discussion of residual risks in this section is confusing. Residual risks following an assumed cleanup were evaluated separately from the baseline risk. However, the specific PRGs to which sediment cleanup was assumed to achieve were not specified. The way in which the weight-of-evidence approach used to characterize ecological risk to the benthic invertebrate community was used for residual risk (see Table 8-28 of the subject document) was not explained. Most of the measurement endpoints shown in Table 1 represent an organism's response to contaminated sediment. The residual risk approach implies that you can predict the response based on an assumed sediment concentration (one of the PRGs). The data presented in this ERA (9 datapoints) are inadequate for such a prediction. Therefore, the foundation for the predictions in Table 8-28 of the subject document on how many stations would show adverse impacts following cleanup of one or more of the assumed cleanup areas appears to be weak. An alternate approach in which scores and weighting factors were assigned to each component of the benthic invertebrate community analysis would provide a more defensible conclusion.

***Response**: Residual risk calculations have been revised and are based on the assumption that either SQS or CSL chemical criteria are achieved through a cleanup action.*

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

## REFERENCES

Cain, T. 1997. Point Whitney Shellfish Laboratory, Washington Department of Fish and Wildlife. Personal communication with N. Musgrove, Roy F. Weston, Inc., Seattle, WA.

RETEC. 1997. Upland Remedial Investigation and Feasibility Study Report. Pacific Sound Resources Superfund Site, Southwest Harbor Project Remediation Area 4. Prepared for the Port of Seattle, Seattle, WA. 24 February.

WESTON (Roy F. Weston, Inc.). 1997a. Phase 2 Technical Memorandum, Pacific Sound Resources Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. April.

WESTON. 1997b. Technical Memorandum, Draft Ecological and Human Health Risk Assessments, Pacific Sound Resources Marine Sediments Unit. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. September.

WESTON. 1997c. PSR Marine Sediments Unit, Phase 2 Technical Memorandum Revisions. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. 23 July.

WESTON. 1996a. Phase 1 Technical Memorandum, Pacific Sound Resources (PSR) Offshore Unit, Seattle, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. August.

WESTON. 1996b. Sampling and Analysis Plan, Phase 2 Addendum, Offshore Sediments Unit, Pacific Sound Resources (PSR). Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. Roy F. Weston, Inc., Seattle, WA. November.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

# APPENDIX K

# ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT TECHNICAL MEMORANDUM

**(See Volume II)**