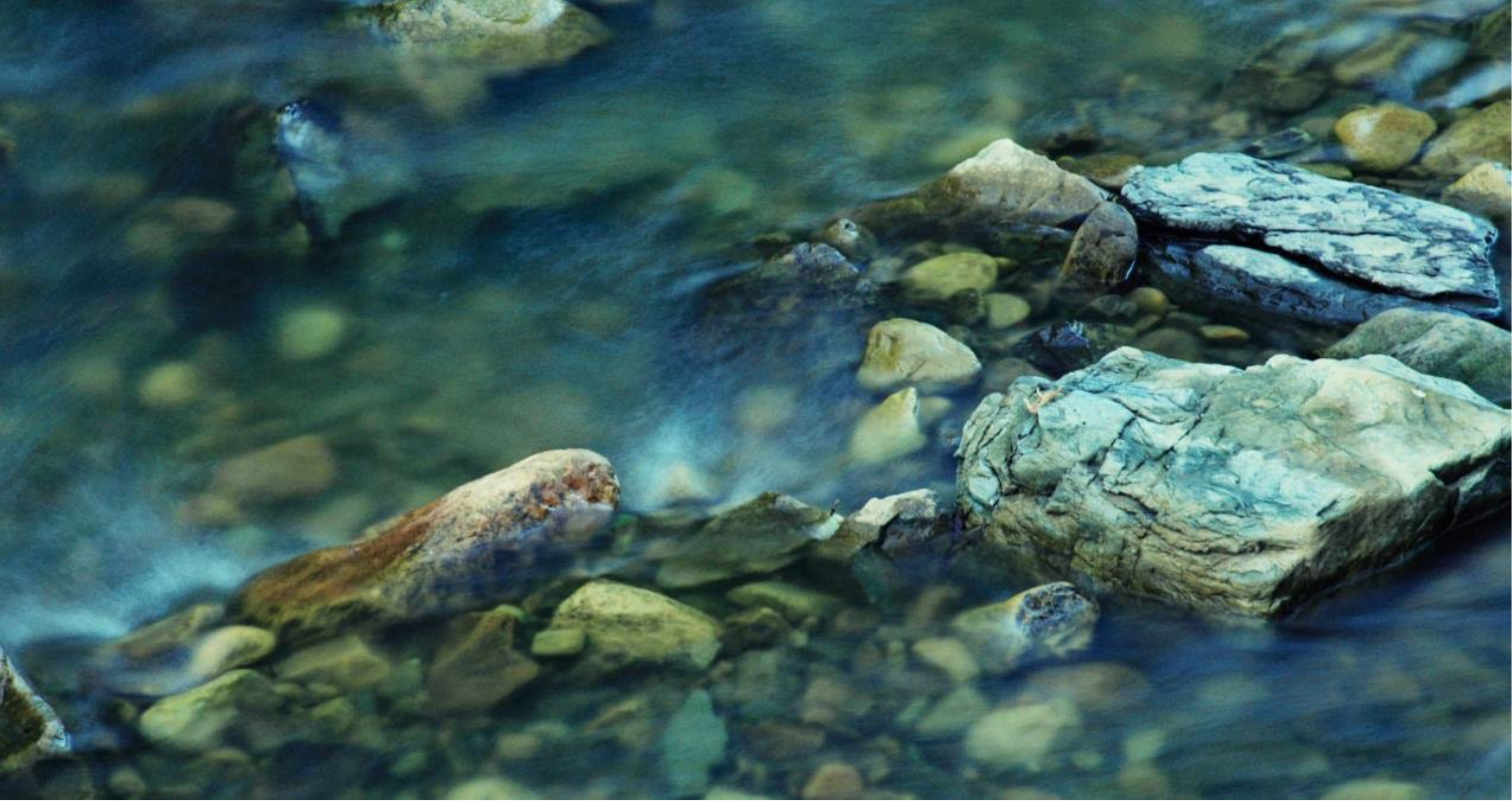

August 2022
Shelton Harbor Sediment Cleanup Unit
Oakland Bay and Shelton Harbor Sediments Site (Cleanup Site ID 13007)

Public Review Draft Remedial Investigation

Prepared for Simpson Timber Company, Manke Lumber Company, and Washington State Department of Ecology

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ABBREVIATIONS

µg/kg	micrograms per kilogram
AO	Agreed Order DE 14091
AST	aboveground storage tank
AXYS	AXYS Analytical Services Ltd.
BAF	bioaccumulation factor
BODR	*Shelton Harbor Interim Action Basis of Design Report*
cm	centimeter
CoC	chemical of concern
Corps	U.S. Army Corps of Engineers
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CPF	IRIS oral cancer potency slope factor
CSL	cleanup screening level
CSM	conceptual site model
dioxins/furans	polychlorinated dibenzo-*p*-dioxin and furan congeners
DGT	diffusive gradients in thin films
DOH	Washington State Department of Health
DQO	data quality objective
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
grams/day	grams per day
H_2S	hydrogen sulfide
IRIS	Integrated Risk Information System
Manke	Manke Lumber Company
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLLW	mean lower low water
MTCA	Model Toxics Control Act
OMMP	*Interim Action Operations, Maintenance, and Monitoring Plan*
ng/kg	nanograms per kilogram
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDI	pre-design investigation
PQL	practical quantitation limit
RI	remedial investigation
RI report	*Remedial Investigation* report

RPD	redox potential discontinuity
SCL	sediment cleanup level
SCO	sediment cleanup objective
SCU	Sediment Cleanup Unit
Simpson	Simpson Timber Company
SMA	sediment management area
SMS	Sediment Management Standards
SPI	sediment profile imaging
SPME	solid-phase microextraction
SQAPP	*Sampling and Quality Assurance Project Plan*
SWAC	surface-weighted average concentration
TBT	tributyltin
TEQ	toxicity equivalence
TVS	total volatile solids
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
Work Plan	*Remedial Investigation/Feasibility Study Work Plan*
Work Plan Addendum	*Remedial Investigation/Feasibility Study Work Plan Addendum No. 1*
WWTP	wastewater treatment plant

1 Introduction

1.1 Background and Overview

Shelton Harbor is a natural embayment located within Oakland Bay, in South Puget Sound. It is situated at the heart of the town of Shelton, in Mason County, Washington. The Shelton area economy was built around logging, wood products industries, farming, dairying, and ranching, as well as oyster and clam cultivation. Industrial development in Shelton Harbor began with sawmill operations in the late 1800s, followed by wood product industries including a pulp mill, plywood manufacturing, and fiberboard manufacturing. Like other areas of Puget Sound, waterfront industrial operations peaked in the 1950s and 1960s and have declined since that period. In the mid-2000s Oakland Bay was designated as a priority environmental cleanup area by the Washington State Department of Ecology (Ecology) as part of the Puget Sound Initiative. A 2008 Ecology investigation of Oakland Bay and Shelton Harbor (Herrera and Ecology & Environment 2010) reported elevated concentrations of polychlorinated dibenzo-*p*-dioxin and furan congeners (dioxins/furans), polycyclic aromatic hydrocarbons (PAHs), copper, tributyltin (TBT), and toxicity associated with wood debris and its breakdown products in Shelton Harbor sediments.

In 2016, Ecology and Simpson Timber Company (Simpson) entered into Agreed Order (AO) No. DE 14091, for Simpson to conduct remedial actions to address contaminated sediments within Shelton Harbor. In accordance with Washington Administrative Code (WAC) 173-204-500(4)(a), the AO designated Shelton Harbor as a distinct 196-acre Sediment Cleanup Unit (SCU) within the 1,600-acre Oakland Bay Site (Figure 1-1). The SCU was designated to expedite cleanup of Shelton Harbor sediments, in order to coordinate the cleanup with habitat restoration activities that were scheduled to be implemented within the SCU by the Squaxin Island Tribe and South Puget Sound Salmon Enhancement Group. The AO required Simpson to characterize the nature and extent of sediment contamination in Shelton Harbor, conduct interim remedial actions, and if directed by Ecology, develop a Feasibility Study and Cleanup Action Plan. As discussed in Section 4, interim actions (construction of engineered caps; Anchor QEA 2018a) were performed in 2018 and 2019, and two of the three planned areas of habitat restoration were complete by 2020.

This *Remedial Investigation* report (RI report) presents the RI of the SCU. It has been prepared in accordance with the Sediment Management Standards (SMS; Chapter 173-204 WAC) and the Model Toxics Control Act (MTCA; Chapter 173-340 WAC). Simpson, working in cooperation with Ecology, Manke Lumber Company (Manke), and other parties, performed this RI to satisfy in part the requirements of the AO.

1.2 RI Objectives and Work Plans

The overall objective of this RI is to provide a comprehensive evaluation of the nature and extent of sediment contamination in Shelton Harbor that meets MTCA and SMS requirements. This RI report addresses the following objectives:

- Provides an overview of the history, land use, ownership, environmental setting and resources within Shelton Harbor
- Characterizes sediment quality, sediment transport mechanisms, and exposure pathways within Shelton Harbor
- Develops preliminary site-specific sediment cleanup levels (SCLs) for chemicals of concern (CoCs) identified in Shelton Harbor
- Summarizes the conceptual site model (CSM) of sources and extent of contaminants, exposure pathways, receptors, and risks and identifies locations where potential future cleanup actions are being considered by Ecology

The Shelton Harbor SCU Remedial Investigation/Feasibility Study Work Plan (Work Plan; Anchor QEA 2017a), including a Sampling and Quality Assurance Project Plan (SQAPP), was prepared in accordance with the AO. The Work Plan described the tasks to be performed in the RI, including identification of data gaps, data quality objectives (DQOs), and data collection activities. The SQAPP detailed sampling and analyses procedures. The Pre-Design Investigation (PDI) Work Plan (Anchor QEA 2018b), along with the Remedial Investigation/Feasibility Study Work Plan Addendum No. 1 (Work Plan Addendum; Anchor QEA 2020a), were subsequently prepared to describe additional sampling and analysis activities performed within the SCU.

1.3 Document Organization

This RI report is organized into the following sections:

- **Section 2—Site Background:** Summarizes the Oakland Bay environmental setting and aquatic resources and describes Shelton Harbor shoreline industrial/commercial development and current ownership
- **Section 3—Environmental Investigations:** Describes the scope of environmental investigations supporting this RI report and identifies CoCs
- **Section 4—Interim Actions and Habitat Restoration:** Describes interim actions performed in 2018 and 2019, as well as separate coordinated habitat restoration actions performed from 2017 to 2020
- **Section 5—Nature and Extent of Contamination and Source Control:** Describes the nature and extent of sediment CoCs and source control evaluations, along with sediment toxicity associated with wood debris and its breakdown products

- **Section 6—Preliminary Cleanup Standards:** Summarizes ecological and human health risk screening and develops preliminary SCLs
- **Section 7—Conceptual Site Model:** Presents the conceptual understanding of sources and extent of contaminants, exposure pathways, receptors, and risks in Shelton Harbor and identifies locations where potential future cleanup actions are being considered by Ecology
- **Section 8—References:** Provides a list of documents cited in the RI report

Supplemental materials are provided in the following appendices:

- **Appendix A—Ecology 2008 Oakland Bay Study Chemical Data**
- **Appendix B—DOH 2009 Oakland Bay Shellfish Tissue Chemical Data**
- **Appendix C—Simpson 2017 SPI Survey Report**
- **Appendix D—Simpson 2017 RI Bioassay Report**
- **Appendix E—Simpson 2017 RI Chemical Data**
- **Appendix F—Simpson 2018 PDI Chemical Data**
- **Appendix G—Manke 2019 PDI Chemical Data**
- **Appendix H—Simpson 2020 RI/OMMP Chemical Data**
- **Appendix I—Bivalve Tissue Data from Puget Sound Reference Areas**

2 Site Background

This section summarizes the Oakland Bay environmental setting and aquatic resources and describes Shelton Harbor shoreline industrial/commercial land development, current and likely future uses of Shelton Harbor, and current ownership.

2.1 Environmental Setting

Oakland Bay is a shallow marine estuary located in the southern portion of Puget Sound, linked to the greater Puget Sound basin through Hammersley Inlet. Like the rest of Puget Sound, Oakland Bay was glaciated and carved out during the last ice age. Oakland Bay, including Shelton Harbor and Hammersley Inlet, is likely the remnant of a subglacial channel formed during the most recent glacial retreat (Herrera and Ecology & Environment 2010; Figure 1-1). Water depths in Shelton Harbor range up to 26 feet below mean lower low water (MLLW), with broad, shallow intertidal zones exposed during low tides (Figure 1-2).

National Oceanic and Atmospheric Administration tidal predictions for Shelton Harbor (Station No. #9446628) have ranged from approximately -5 to +17 feet MLLW (Anchor QEA 2018c, Appendix C). Regional sea level rise predictions for Shelton Harbor suggest that by 2100, water levels could increase between approximately 1 and 5 feet (https://coast.noaa.gov/digitalcoast/tools/slr.html). Based on these predictions, the 2100 mean higher high -water elevation in Shelton Harbor could range between approximately +16 and +20 feet MLLW (2018 MLLW datum).

Maximum sustained wind speeds in the Shelton area range from approximately 35 miles per hour (from the southwest) to 16 miles per hour (from the northeast; Anchor QEA 2018c, Appendix C). These winds generate waves of up to approximately 0.7 feet, capable of transporting larger gravel sediments (up to approximately 1.3-inch diameter) under breaking wave conditions, and smaller gravel sediments (up to approximately 0.25-inch diameter) under non-breaking wave conditions.

Goldsborough Creek is the primary source of freshwater to Shelton Harbor and the larger Oakland Bay system; its influence on the morphology of Shelton Harbor is apparent at low tidal stages when its relatively large intertidal delta is exposed (NewFields 2014; Figure 1-2). Shelton Creek discharges into northwest Shelton Harbor. The mouths of both of these creeks have been channeled.

The Shelton Harbor intertidal delta surface is composed of a mixture of silt, sand, gravel, and clay sediments that form broad mudflats. Silt, sand, and clay sediments deposit within deeper subtidal depositional pockets located in the southern and northwest areas of Shelton Harbor. Sediment grain size distributions and transport processes are summarized in Section 2.1.1.

Since the mid-1800s, a number of timber industries have operated along the Shelton Harbor waterfront, including sawmills and plywood manufacturing, pulp and paper production, and insulation board and fiber board manufacturing. Bulkheads were constructed along the Shelton Harbor shoreline between the 1920s and 1960s (Herrera 2008). Pilings were installed in Shelton Harbor to support overwater railroad spurs used for unloading logs from trains directly into the water; other pilings were installed across the harbor for stabilizing log rafts. Historical harbor development, wastewater discharges, and log rafting operations are summarized in Section 2.2.

2.1.1 Sediment Transport

Broad intertidal mudflat habitats (above approximately -5 feet MLLW)) are present throughout Oakland Bay, including Shelton Harbor (Figures 1-1 and 1-2). These mudflats are intertidal sedimentary features created through the deposition of sediments supplied to Oakland Bay that are dispersed by wind waves and tidal currents. Oakland Bay has a high degree of water retention/ refluxing but little net flushing (NewFields 2014). Water generally flows into Oakland Bay from Hammersley Inlet at depth and out from the bay near the water surface. As a result of these conditions, most of the sediments that enter Oakland Bay and Shelton Harbor through freshwater inputs remain within the embayment. Strong flow at depth and near the bed of Hammersley Inlet occurs as marine water enters the narrow channel during flood tides. This strong current generally prevents sediment deposition in Hammersley Inlet and in the portion of Oakland Bay adjacent to the entrance of Shelton Harbor, as evidenced by predominantly coarse-grained gravel and cobble sediments with less than 10% fines (silt and clay) in these areas. The circulation and hydrodynamic characteristics of Oakland Bay and Shelton Harbor result in these environments being long-term sinks for depositional sediments.

Intertidal mudflat sediments in Oakland Bay and Shelton Harbor, periodically mobilized by wind waves as discussed above, appear to be in dynamic equilibrium with sediment deposition (see Section 5.2.2). Subtidal sedimentation rates in Shelton Harbor were measured during the RI using radioisotope (Lead-210) dating methods (Magar et al. 2009; see Section 3.3.1). Net sedimentation rates in Shelton Harbor averaged 0.30 ± 0.06 centimeter (cm) per year (Anchor QEA 2018a; see Section 5.2), consistent with sedimentation rates measured in Oakland Bay (Herrera and Ecology & Environment 2010). This subtidal sedimentation rate is equivalent to roughly 6 inches of sediment deposition (primarily silt; excluding wood debris accumulations) over the last 50 years. Based on regional evaluations (Carpenter et al. 1985; Lavelle et al. 1985), sediment sources to the Oakland Bay and Shelton Harbor Sediments Site are largely from phytoplankton (e.g., diatom) production/settling, supplemented locally with inputs from regional streams including Goldsborough and Shelton creeks.

Once sediments deposit in subtidal areas of Shelton Harbor (deeper than roughly -5 feet MLLW), the relatively weak currents in these areas are not sufficient to resuspend even the finest sediment material (Anchor QEA 2018c, Appendix C). Thus, subtidal sediment deposited within the confines of the Oakland Bay and Shelton Harbor Sediments Site remains there with little likelihood of transport out of the system (Herrera and Ecology & Environment 2010).

In addition to providing information on sedimentation rates, radioisotope analyses of core sections also provide empirical confirmation of sediment stability (Magar et al. 2009). Within subtidal zones of Shelton Harbor, Lead-210 profiles exhibit the characteristic exponential decay of this radioisotope (half-life of 22 years; see Section 5.2), confirming the long-term stability of subtidal sediments below -5 feet MLLW.

In contrast to the stability of subtidal sediments, mudflat sediments in the nearshore intertidal and deltaic zones of Oakland Bay and Shelton Harbor (shallower than roughly -5 feet MLLW) are subject to periodic resuspension from wind waves, like other prominent mudflat habitats such as San Francisco Bay (Van der Wegen et al. 2017; Anchor QEA 2018c, Appendix C). During wind events, regular breaking wave conditions on the intertidal bed of Oakland Bay and Shelton Harbor transport surface sediments, resulting in bed level changes during the tidal cycle, depending on wind conditions. Intertidal mudflat sediments in Oakland Bay and Shelton Harbor are periodically mobilized by wind waves. Resuspended intertidal mudflat fines (silt and clay) are dispersed by wind waves and tidal currents, exchanging within Oakland Bay and Shelton Harbor and between these systems through dynamic equilibrium processes.

2.1.2 Aquatic Resources

Both Goldsborough and Shelton creeks are productive salmonid streams. In conjunction with the Washington Department of Fish and Wildlife (WDFW), Simpson, and the Squaxin Island Tribe, in 2000 the U.S. Army Corps of Engineers (Corps) removed a 33-foot-high dam in Goldsborough Creek upstream of Shelton Harbor, opening over 30 miles of habitat for Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and chum (*O. keta*) salmon, coastal cutthroat trout (*O. clarkii clarkii*), and bull trout (*Salvelinus confluentus*). Today, Goldsborough Creek is one of the only watersheds in Puget Sound with increasing salmon runs (O'Connell 2015). Shelton Creek has continued to support chum salmon runs, even though it is in an urbanized watershed.

Intertidal habitats in Oakland Bay (above approximately -5 feet MLLW) provide some of the most productive commercial shellfish-growing areas in the United States. Oakland Bay is known worldwide for its Manila clams (*Tapes philippinarum*; DOH 2010a). Pacific oysters (*Crassostrea gigas*), Kumamoto oysters (*C. sikamea*), and mussels (*Mytilus edulis*) are also grown in Oakland Bay. Approximately three million pounds of clams and 1.8 million pounds of oysters are harvested yearly from Oakland Bay by the Squaxin Island Tribe and 21 other shellfish growers. Some public and private beaches in Oakland Bay also support recreational shellfish harvesting. Approximately 2,000 recreational harvesting licenses are obtained for the area each year.

Due to Shelton Harbor's proximity to the City of Shelton wastewater discharge outfall and marina areas that make shellfish unsafe to eat, Washington State Department of Health (DOH) has closed

Shelton Harbor to shellfish harvesting. (Figure 2-2). No known harvest of shellfish occurs in Shelton Harbor by the Squaxin Island Tribe or the public.

2.2 Harbor Development

The Shelton area economy was built around logging, timber-related industries (including lumber and plywood mills, pulp production, fiberboard production, farming, dairying, and ranching, as well as oyster and clam cultivation. Industrial development in Shelton Harbor began with sawmill operations in the late 1800s. Figures 2-3 through 2-7 present representative aerial photographs that depict changes in development of Shelton Harbor over the last 70 years. In general, waterfront industrial operations peaked in the 1950s and 1960s and have declined since that period like other areas of Puget Sound. As discussed above, bulkheads were constructed along the Shelton Harbor shoreline between the 1920s and 1960s, and pilings were installed to support overwater railroad spurs used for unloading logs from trains directly into the water; other pilings were installed across the harbor for stabilizing log rafts.

As described in the AO, several industrial facilities operating in Shelton Harbor historically released hazardous substances or wood debris to sediments, based on their scale, nature of operations, and years of operation. Each of these facilities is briefly summarized in the following subsections. More detailed descriptions are provided in Herrera (2008). As summarized in Herrera and Ecology & Environment (2010), historical sources of contamination to Shelton Harbor included wood debris, wood burning and hog fuel boiler burning, upland mill activities, wastewater discharges, and other operations. Transport pathways include currents and tidal fluctuations, aerial deposition, and stormwater runoff.

2.2.1 Simpson Timber Company

Since the mid-1800s, several timber industries have operated in Shelton Harbor. Through the early 1930s, three sawmills operated along the Shelton waterfront, and a shingle mill operated at Eagle Point. By the early 1940s, Simpson had acquired sawmills along with the shingle mill, redeveloping the Shelton waterfront into a combined sawmill and plywood/fiberboard manufacturing facility. In the mid-1940s, Simpson developed the waterfront north of Goldsborough Creek and built an insulating board plant, plywood plant, railroad roundhouse, and machine shops, as well as a railroad log dump (Figure 2-3). In the late 1940s, a wooden bulkhead log dump was constructed east of the Shelton Creek delta, and two aboveground storage tanks (ASTs) for petroleum were installed northeast of this log dump (all ASTs in this area were removed in 1965). From the 1950s to the early 1960s, Simpson further expanded the facility on the north side of Goldsborough Creek, building planing mills, dry kilns, and other facilities. Simpson used Shelton Harbor extensively for rafting of logs during its years of operations.

In 1926, a wood-fired power plant was built on the south side of Goldsborough Creek to supply power to the sawmills. From 1938 to 1963, this power plant was jointly owned and operated by Simpson and Rayonier Inc. (Section 2.2.2). After 1963, Simpson became the sole owner of the power plant. The power plant's seven boilers burned hog fuel, which was generally comprised of bark, wood chips, and wood debris generated by the sawmills. Fuel oil was used to supplement the hog fuel as needed. Simpson built a new power plant on the north side of Goldsborough Creek in 1984 and subsequently decommissioned and demolished the original power plant. Prior to 1976, the boilers operated without air emission controls; in 1976, Simpson installed baghouses to capture air emissions (Herrera 2008). The baghouse dust and residues were tested by the U.S. Environmental Protection Agency (EPA) in the late 1980s as a part of a nationwide study of dioxin/furan sources and were found to contain elevated concentrations of dioxins/furans (CH2M Hill 1987). Baghouse residues were discharged to the former City of Shelton wastewater treatment plant (WWTP) on Pine Street between 1976 and 1979 and then to the present-day plant at Eagle Point from 1979 to 1984 (Figure 2-3).

In 2015, Sierra Pacific Industries acquired the sawmill facilities on both sides of Goldsborough Creek from Simpson (Figure 2-7), demolished the extensive mill facilities that were present at that time (with the exception of the 1984 power plant), and constructed a new sawmill and associated facilities on the north site of Goldsborough Creek.

2.2.2 Rayonier Pulp Mill

From 1926 to 1957, Rayonier operated a pulp and paper sulfite mill on the south side of Shelton Harbor (Figure 2-3). The mill produced pulp for manufacturing rayon and other specialty cellulose products, with limited paper pulp production (Herrera 2008). Mill processes included pulp production (cooking), bleaching, screening, washing, and drying. Pulp was produced from wood chips supplied by Shelton sawmills or brought in by trucks or barges.

The calcium sulfite pulping process used by the Rayonier mill generated sulfite waste liquor as a byproduct. The liquor consisted of dissolved organic compounds such as lignins and sugars extracted from the wood chips by an acid-digestion pulping process. Prior to the early 1930s, spent sulfite liquor was discharged directly to Shelton Harbor and Hammersley Inlet (NewFields 2014). Rayonier attempted alternative methods of waste liquor disposal during the mid- to late 1930s, including application to Shelton roads for dust control and production of specialty products such as plywood adhesives and linoleum paste. In addition to the sulfite liquor waste, from 1927 to 1957 Rayonier discharged approximately 8 million gallons per day of untreated plant process wastewater to Shelton Harbor, as well as chlorine bleach wastewaters from a laboratory facility.

Between the early 1930s and early 1940s, Rayonier pumped waste liquor from the mill to Goose Lake (located in the northwest watershed of Shelton Harbor) via a 3-mile-long pipeline (NewFields 2014). Between the early 1930s and 1974, liquid and solid waste materials generated at Rayonier's former pulp mill and laboratory in Shelton were also disposed at Goose Lake. Remedial investigations of the Goose Lake site were completed in 2012 (GeoEngineers 2012).

In 1945, Rayonier constructed a burn plant with a 320-foot-high stack on the hillside above the mill for incinerating spent liquor. Both the pulp mill and burn plant continued operation until 1957. Both facilities were demolished by the mid-1960s. In 1952, Rayonier dredged approximately 30,000 cubic yards of sediment from southwest Shelton Harbor and disposed of these materials in deeper water areas adjacent to the Shelton Harbor SCU.

2.2.3 Manke Lumber Company

Manke purchased the pulp mill property from Rayonier in the 1960s and converted it into a sorting yard for logs brought in by trucks, which were then shipped out in rafts to Tacoma, Washington, for processing (Figures 2-4 through 2-7). Manke remains in operation today and continues to use the property in a similar manner. Manke rafts logs along the southern shore of Shelton Harbor. In 2020, Manke purchased all of the southern Shelton Harbor tideland property from Simpson.

2.2.4 Shelton Yacht Club

The former Simpson marine railway facility located west of the Oakland Bay marina included two sets of launching rails extending southeast into the harbor historically used to haul log handling tugboats out of the water for maintenance and repair activities (Figure 2-3). Investigations of sediments in this area in 2000 and 2005 detected elevated concentrations of copper and TBT immediately adjacent to the launching rails (Ecology 2000a; Herrera and Ecology & Environment 2010), and Ecology identified the marine railway as a MTCA cleanup site (Shelton Yacht Club Site, Cleanup Site ID 1581). In 2020, the Shelton Yacht Club purchased all of the northern Shelton Harbor tideland property from Simpson, including the marine railways, and is planning to move the boat maintenance operation to a dedicated upland location away from the marine waters.

2.2.5 Evergreen Fuel Company

The former Evergreen Fuel Company petroleum bulk plant located northeast of the Shelton Yacht Club operated from 1913 until 2005 (Figures 2-4 through 2-6). The site included nine ASTs and an overhead tanker truck fueling station that provided a range of petroleum products. Remedial investigations of the upland and marine areas were completed in 2005 pursuant to an Agreed Order between Ecology and Evergreen Marine Fuel Company (Farallon and Anchor 2005). Cleanup activities were subsequently performed in 2006 and 2007, including removal of approximately 7,500 tons of petroleum-containing soil, groundwater treatment through enhanced aerobic bioremediation, and groundwater monitoring to confirm the effectiveness of the remedy. Sediment investigations conducted under the RI did not detect sediment toxicity or chemical exceedances offshore of the facility.

2.2.6 City of Shelton

Prior to 1950, pipes conveyed untreated sewage directly into Shelton Creek (Herrera 2008). Between 1950 and 1979, the City of Shelton operated a WWTP that discharged into the northeast corner of the Shelton Harbor SCU at the Pine Street right of way (Figures 2-2 and 2-3). Since 1979, the City of Shelton has operated a WWTP at Eagle Point that discharges through a deep-water outfall into Hammersley Inlet. As noted in Section 2.2.1, baghouse residues containing dioxins/furans were discharged to the treatment plants between 1976 and 1984.

2.2.7 General Log Rafting, Booming, and Log Dumps

The Shelton Harbor SCU was historically used for extensive log rafting by Simpson, Rayonier, Manke, and potentially other entities, resulting in the release of wood debris from log dump and rafting areas (Figures 2-3 through 2-7). Today, the only log rafting remaining in Shelton Harbor is conducted by Manke in a small area along the southern shoreline.

2.3 Land Ownership and Covenants

Current aquatic land ownership of the Shelton Harbor SCU is depicted in Figure 2-8. Primary aquatic landowners of Shelton Harbor tidelands include Manke, Shelton Yacht Club, and the City of Shelton. The Washington State Department of Natural Resources (WDNR) manages a relatively small parcel of state-owned aquatic land that is leased to the Shelton Yacht Club.

As discussed in Section 4, interim actions (construction of engineered caps) were completed in 2019 on tidelands currently owned by Manke and Shelton Yacht Club. To ensure the continued integrity and protectiveness of these caps, certain activities and uses of capped properties (e.g., dredging) are restricted by environmental covenants executed pursuant to MTCA.

3 Environmental Investigations

This section describes the scope of environmental investigations supporting this RI report.

3.1 Ecology 2008 Oakland Bay Study

Several investigations of Shelton Harbor sediments have occurred beginning in the early 1970s. Although historical information collected prior to 2008 is considered in this RI report (e.g., Ecology 2000a), more recent sediment sampling data collected from 2008 to 2020 are used in this RI report to characterize current environmental conditions, consistent with SMS guidance (Ecology 2021). Table 3-1 summarizes the primary surveys and the types of analyses conducted during this period.

As part of the Puget Sound Initiative for restoration and recovery of Puget Sound, Ecology identified the Oakland Bay and Shelton Harbor Sediments Site (Figure 1-1) as one of seven high-priority areas in Puget Sound for cleanup and restoration because of its important habitat and valuable natural resources. In 2008, Ecology performed a study of Oakland Bay and Shelton Harbor to identify potential areas of sediment contamination and confirm priority areas for cleanup. Ecology designed the study to characterize sediment quality, determine the nature and extent of sediment contamination and wood debris, and help identify protective SCLs. Findings from the study were presented in the *Sediment Investigation Report* (Herrera and Ecology & Environment 2010).

The scope of Ecology's 2008 Oakland Bay study included Shelton Harbor and adjoining areas and included an assessment of sediment input and transport throughout the bay system and collection of sediment samples for both CoC and toxicity analyses (Herrera and Ecology & Environment 2010). Fifty surface sediment grabs and 51 subsurface core samples were collected across the Oakland Bay study area; additionally, three reference sediment surface grab samples were collected from Carr Inlet to provide background toxicity comparisons. Samples were analyzed for a wide range of potential CoCs in the SMS suite often associated with historical industrial activities (Appendix A):

- Conventional analytes (ammonia, sulfides, organic carbon, and total volatile solids [TVS])
- Dioxins/furans
- Polychlorinated biphenyls (PCBs)
- Chlorinated pesticides
- Semivolatile organic compounds (PAHs, phenols, pentachlorophenol, cresols, and phthalates)
- Resin acids and guaiacols
- TBTs
- Heavy metals
- Petroleum products (gasoline-, diesel-, and lube oil-range hydrocarbons)

Ecology's 2008 Oakland Bay study identified surface and subsurface deposits of wood debris (with associated elevated levels of TVS and total sulfides), PAHs, dioxins/furans, and other contaminants within portions of the northern and southern Shelton Harbor SCU (Herrera and Ecology & Environment 2010). Only one of the 26 Shelton Harbor surface sediment samples collected in 2008 exceeded SMS sediment cleanup objective (SCO) chemical criteria for benthic community protection, and only for a single PAH (fluoranthene) in the southern harbor. Historical (2000 to 2005) sediment sampling of the marine railway area in the northern harbor also identified a localized SCO chemical criterion exceedance of copper, as well as localized areas of elevated TBT concentrations in the upper intertidal zone. There is no promulgated SMS criterion for TBT, but levels can be compared to regional risk-based benchmarks for the purposes of evaluating areas for potential cleanup.

Bioassay testing performed in 2008 found toxicity at several stations within Shelton Harbor, primarily for the larval bioassay test. However, the results were not conclusive because clean Carr Inlet reference sediments used for comparison to test sediments failed some SMS acceptability criteria (Herrera and Ecology & Environment 2010). SMS testing procedures in use for the larval bioassay test in 2008 were later revised because the earlier test method was found to be unreliable.

Ecology's 2008 study reported elevated surface sediment dioxin/furan toxicity equivalence (TEQ) concentrations throughout much of Oakland Bay, including within Shelton Harbor, where the highest concentrations were identified (Herrera and Ecology & Environment 2010). Dioxins/furans were also detected at elevated concentrations in sediment core samples. In most cases the deeper sediment samples were found to contain higher dioxin/furan TEQ concentrations, likely due to historical sources.

As discussed in Herrera and Ecology & Environment (2010), Ecology's 2008 Oakland Bay study identified the following sediment CoCs in the Shelton Harbor SCU:

- Copper and TBT (interim actions targeted this CoC; see Section 4.1)
- Dioxin/furan TEQ (interim actions targeted this CoC; see Section 4.1)
- Carcinogenic polycyclic aromatic hydrocarbon (cPAH) TEQ
- Toxicity from wood debris degradation (e.g., bioassay failures)

3.2 DOH 2009 Oakland Bay Shellfish Sampling and Health Consultation

After reviewing the 2008 sediment data collected by Ecology, DOH performed two human health risk assessment consultations. One DOH consultation focused on dioxins/furans in shellfish within commercial shellfish-growing areas in Oakland Bay (DOH 2010a). Another consultation examined potential health risks from direct contact or incidental ingestion of all CoCs in sediments in Oakland Bay and Shelton Harbor (DOH 2010b).

To inform its human health consultation related to risks from seafood consumption, in 2009 DOH (2010a) sampled shellfish in intertidal (above approximately-5 feet MLLW) commercial shellfish harvesting areas throughout Oakland Bay (Figure 2-2). DOH collected 21 samples (each consisting of a composite of approximately 10 individual organisms of legal harvest size) of Manila clams, Pacific oysters, Kumamoto oysters, and mussels from Oakland Bay, along with a single Hammersley Inlet reference composite of Manila clams collected near Walker County Park (Appendix B). Dioxins/furans were the only shellfish tissue CoC evaluated by DOH for the following reasons: 1) Ecology's 2008 study reported elevated surface sediment dioxin/furan concentrations across Oakland Bay and Shelton Harbor (Herrera and Ecology & Environment 2010); 2) compared to other sediment CoCs, dioxins/furans have a higher potential to bioaccumulate in shellfish; and 3) dioxins/furans have suspected health effects.

The DOH (2010a) study used the shellfish data to estimate risk to human health from seafood consumption for a range of consumption rates (from the general population rate of 17.5 grams per day [grams/day] to a high-end subsistence consumer rate of 260 grams/day).[1] For consumption of clams, which are the most commonly consumed, DOH estimated the theoretical lifetime cancer risk to range from 1.8 in 1 million for the general population to 2.6 in 100,000 for the high-end subsistence consumer.

The DOH (2010a) concluded that eating shellfish from Oakland Bay is unlikely to produce harmful health effects, even for people who eat a lot of these organisms.[2] The DOH (2010b) sediment evaluation similarly concluded that touching, breathing in, or accidentally eating sediment containing dioxins/furans and other CoCs from Oakland Bay and Shelton Harbor is unlikely to harm human health. Thus, there are no DOH public health advisories to reduce exposure to CoCs in Oakland Bay or Shelton Harbor. However, because of potential pathogen contamination from wastewater discharge into Shelton Harbor as well as marina operations, DOH prohibits harvesting of shellfish throughout Shelton Harbor and adjoining portions of Hammersley Inlet and Oakland Bay (Figure 2-2).

3.3 Remedial Investigations

The results from Ecology's 2008 Oakland Bay study and DOH's 2009 Oakland Bay shellfish sampling, as summarized in the previous subsections, were used by Ecology and Simpson to identify remaining RI data gaps. The RI activities needed to address these data gaps, including data collection, analysis, and evaluation, were then defined using the EPA (DQO) process (EPA 2006). This subsection provides an overview of data collection conducted between 2017 and 2020 to further support this RI report.

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[1] DOH (2010a) assumed that 50% of estimated seafood consumption would be clams, and only 1% would be oysters/mussels.

[2] As discussed in Section 6.2, SMS exposure parameters for calculating human health risk-based tissue concentrations for consumption of fish/shellfish are different than those developed by DOH (2010a) and are established by Ecology on a site-specific basis in consultation with affected tribes (Ecology 2021).

As discussed in Section 1.2, the initial RI Work Plan and SQAPP were prepared in 2017 (Anchor QEA 2017a). Pre-design investigation (PDI) work plans and SQAPP addenda were subsequently prepared in 2018 and 2019 to support interim actions within the SCU (Anchor QEA 2018b and 2019b; see Section 4.1), also informing this RI report. A final RI Work Plan Addendum (Anchor QEA 2020a), including a SQAPP addendum, was prepared in 2020 to describe additional sampling and analysis activities within the SCU to complete the RI. The *Interim Action Operations, Maintenance, and Monitoring Plan* (OMMP; Anchor QEA 2020b) was also prepared in 2020 to verify the integrity and protectiveness of interim actions (engineered caps) constructed in the SCU (see Section 4.1); these data further inform this RI report. In summary, consistent with the Ecology-approved plans, four sampling events were performed between 2017 and 2020 to further support this RI report:

- 2017 Simpson RI sampling
- 2018 Simpson PDI sampling
- 2019 Manke PDI sampling
- 2020 Simpson RI/OMMP sampling

Each of these sampling programs is outlined in the following subsections, including summaries of data quality assessments supporting use of these data in this RI report. 2017 to 2020 sampling locations are depicted in Figure 3-1. RI sampling results are discussed in Section 5.

3.3.1 2017 Simpson RI Sampling

Consistent with the Work Plan (Anchor QEA 2017a), initial RI sampling was performed by Simpson in 2017. The DQOs identified in the Work Plan included the following:

- DQO 1: Evaluate benthic conditions
- DQO 2: Evaluate potential bioaccumulation exposures to humans and wildlife
- DQO 3: Evaluate ongoing sources to sediments
- DQO 4: Evaluate recent natural recovery

The 2017 Simpson RI sampling included the following:

- Sediment profile imaging (SPI)[3] was conducted at 63 locations to evaluate benthic conditions in surface sediments throughout the SCU (Appendix C).
- Confirmatory bioassay testing was conducted at 11 locations in the SCU, including eight 2008 bioassay exceedance locations that were retested (larval and/or polychaete bioassays) and three new locations added following review of the SPI survey (full SMS bioassay suite; Appendix D).

[3] SPI is a survey method that takes cross section and plan view photographs of surface sediments to assess substrates, benthic infauna, feeding voids, wood debris, presence of methane, presence of bacterial mats (*Beggiatoa* sp.), and apparent redox potential discontinuity (RPD) depths, that collectively evaluate benthic conditions.

- All bioassay testing was conducted in accordance with current SMS testing methods (Ecology 2021) to provide more reliable confirmatory bioassay data for comparison with SMS biological criteria, as potential laboratory artifacts may have resulted in false positive larval and polychaete toxicity determinations during Ecology's earlier 2008 Oakland Bay study (Herrera and Ecology & Environment 2010).[4]
- To supplement the bioassay tests, bulk sediment TVS and grain size analyses were performed.
- Porewater ammonia and hydrogen sulfide (H_2S) concentrations were also measured at the bioassay sampling locations; porewater H_2S was measured in situ using diffusive gradients in thin films (DGT) passive sampling methods.[5]
- Surface (top 10 cm) sediment samples were collected and analyzed for dioxins/furans (10 locations) and PAHs (4 locations) to supplement Ecology's 2008 Oakland Bay study data (Herrera and Ecology & Environment 2010), focusing on areas that exceeded preliminary cleanup levels.
- Three sediment push cores where advanced to approximately 2 feet below mudline at subtidal locations along an east-west transect within the southern portion of the SCU (Stations SH-14, -19 and -22; see Figure 3-1) and processed into selected 2-cm intervals for radioisotope (Lead-210 and Cesium-137), dioxin/furan, and PAH analyses to evaluate sedimentation rates, sediment stability, and natural recovery trends, supplementing Ecology's 2008 Oakland Bay study data (Herrera and Ecology & Environment 2010).
- Five sediment vibracores were advanced to approximately 7 feet below mudline in selected wood debris, dioxin/furan, and/or cPAH deposits throughout the SCU to delineate the vertical extent of sediment contamination, supplementing Ecology's 2008 Oakland Bay study data (Herrera and Ecology & Environment 2010).
- In situ solid-phase microextraction (SPME) passive sampling of groundwater dioxin/furan concentrations adjacent to Shelton Creek was performed to evaluate the potential for former pulp mill or sawmill burner "clinker" residues placed historically on the north bank of Shelton Creek to be an ongoing dioxin/furan source to the SCU.
- Sediment porewater dioxin/furan concentrations were also measured using ex situ SPME passive sampling methods, along with total organic carbon and black carbon, in a representative surface sediment sample (SH-19) containing elevated bulk sediment

[4] As discussed in Anchor QEA (2017a), performance of the larval and polychaete bioassays in Ecology's 2008 Oakland Bay study (Herrera and Ecology & Environment 2010) were highly inconsistent, with widespread failures in reference areas and at locations with no wood debris or SMS chemical exceedances. Improved laboratory bioassay protocols for both the larval and polychaete bioassays have subsequently been developed and approved by Ecology (2021) for SMS evaluations, addressing the potential for entrainment of larvae by flocculent particulate material in tested sediments, and eliminating bias due to inorganic materials present in the gut of polychaetes being tested.

[5] As discussed in Anchor QEA (2017a), the DGT methodology has developed considerably over the past 15 years to accurately characterize bioavailable H_2S concentrations in sediment, removing the influence of colloidal sulfide forms to provide a more direct comparison with toxicity benchmarks. Due to physical conditions encountered during in situ deployment, DGT samplers were deployed at 7 of 11 bioassay locations. Porewater ammonia concentrations were analyzed ex situ using an electrochemical probe in the bioassay laboratory.

dioxin/furan concentrations, to evaluate sediment dioxin/furan bioavailability (with and without activated carbon amendment).

DQOs and quality assurance procedures are provided in the SQAPP (Anchor QEA 2017a). Chemical analyses were performed by SGS in Wilmington, North Carolina (dioxins/furans); ALS Environmental in Kelso, Washington; and Analytical Resources, Inc., in Tukwila, Washington. Stage 2B and/or Stage 4 (dioxins/furans) data validation was performed on all data (EPA 2009). Laboratory data reports and data validation reports are available in Ecology's administrative record for the Oakland Bay and Shelton Harbor Sediments Site. All data were determined to be useable for site characterization as reported or as qualified/updated (see Section 3.3.2). The 2017 Simpson RI sampling data are available in Ecology's Environmental Information Management (EIM) database (Study ID: OAKSED17) and are summarized in Appendix E.

3.3.2 2018 Simpson PDI Sampling

A PDI work plan and SQAPP addendum was prepared in 2018 to support interim actions within the SCU (Anchor QEA 2018b; see Section 4.1). The 2018 Simpson PDI sampling included the following:

- Surface (top 10 cm) sediment samples were collected and analyzed for dioxins/furans and PAHs at 55 locations, along with 8 locations for TBT, copper, and total organic carbon, to delineate the footprint of sediment management areas (SMAs) with the highest CoC concentrations that were targeted for interim actions (SMA-1 to -3; see Section 4.1).
- Surface sediment (top 10 cm) porewater H_2S was measured at 15 stations using ex situ DGT passive sampling methods.
- Archived splits of all 10 surface (top 10 cm) sediment samples collected in 2017 were reanalyzed for dioxins/furans.

Chemical analyses were performed by AXYS Analytical Services Ltd. (AXYS) in Sidney, British Columbia, Canada (dioxins/furans) and Analytical Resources., Inc. Stage 2B and/or Stage 4 (dioxins/furans) data validation was performed on all data (EPA 2009). Laboratory data reports and data validation reports are available in Ecology's administrative record for the Oakland Bay and Shelton Harbor Sediments Site. All data were determined to be useable for site characterization as reported or as qualified. Because the 2017 dioxin/furan reanalysis results (reported by AXYS) indicated higher concentrations than the original data (reported by SGS), AXYS reanalysis results superseded the original SGS results for development of interim action designs and the RI. The 2018 Simpson PDI sampling data are summarized in Appendix F.

3.3.3 2019 Manke PDI Sampling

A second PDI work plan and SQAPP addendum was prepared in 2019 to support planned interim actions within SMA-4 located in the southern portion of the SCU adjacent to Manke (Anchor QEA 2019b).[6] The 2019 Manke PDI sampling included the following:

- Surface (top 10 cm) sediment samples were collected and analyzed for the presence of bacterial mats (*Beggiatoa* sp.), wood debris volumetric percentage, TVS, and porewater H_2S (ex situ DGT passive sampling methods) at 18 locations to delineate the footprint of SMA-4.

Chemical analyses were performed by Analytical Resources., Inc. Stage 2B data validation was performed on all data (EPA 2009). Laboratory data reports and data validation reports are available in Ecology's administrative record for the Oakland Bay and Shelton Harbor Sediments Site. All data were determined to be useable for site characterization as reported or as qualified. The 2019 Simpson PDI sampling data are summarized in Appendix G.

3.3.4 2020 Simpson RI/OMMP Sampling

A final RI Work Plan Addendum (Anchor QEA 2020a), including a SQAPP addendum, was prepared in 2020 to describe additional sampling and analysis activities within the SCU to complete the RI. The OMMP (Anchor QEA 2020b) was also prepared in 2020 to verify the integrity and protectiveness of interim actions (engineered caps) constructed in the SCU (see Section 4.1); these data also inform this RI report. The 2020 Simpson RI/OMMP sampling included the following:

- A bathymetric survey of the entire SCU was performed following interim action and habitat restoration project modifications (Section 4).
- Surface (top 10 cm) sediment samples were collected from 37 discrete locations within the SCU outside of the SMA-1 to -3 and northern habitat restoration area footprints and analyzed for dioxins/furans (all 37 samples) and PAHs (13 selected samples).
- One composite sample of surface (top 10 cm) sediment was collected from SMA-1 and analyzed for dioxins/furans and PAHs; two discrete sediment samples were analyzed for porewater H_2S (ex situ DGT passive sampling methods).
- One composite sample of surface (top 10 cm) sediment was collected from SMA-2 and analyzed for dioxins/furans, PAHs, TBT, and copper.
- One composite sample of surface (top 10 cm) sediment was collected from SMA-3 and analyzed for dioxins/furans and PAHs.
- One composite sample of surface (top 10 cm) sediment was collected from northern habitat restoration areas (see Section 4.2) and analyzed for dioxins/furans and PAHs.

[6] Remedial actions in SMA-4 are pending; see Section 7.

- Composite samples (one each from SMA-1 and -3) of surficial fine-grained sediment (approximately the top 3 cm) that had accumulated on the surface of the caps were collected and analyzed for dioxins/furans and PAHs.
- Two sediment vibracores were advanced to approximately 15 feet below mudline in selected wood debris areas of SMA-4 to delineate the vertical extent of sediment contamination.
- Former pulp mill or sawmill burner clinker residues placed historically on the north bank of Shelton Creek (Figure 1-2) were visually surveyed to delineate the areal extent of this deposit.
- The spit located southeast of the Goldsborough Creek delta was also visually surveyed to evaluate the stability of the shoreline in this area (Figure 1-2); the chemical quality of upland fill soils in the spit was characterized as part of separate habitat restoration actions (Anchor QEA 2017b).)

Chemical analyses were performed by AXYS (dioxins/furans) and Analytical Resources. Stage 2B and/or Stage 4 (dioxins/furans) data validation was performed on all data (EPA 2009). Laboratory data reports and data validation reports are available in Ecology's administrative record for the Oakland Bay and Shelton Harbor Sediments Site. All data were determined to be useable for site characterization as reported or as qualified. The 2020 Simpson RI/OMMP sampling data have been submitted to Ecology's EIM database and are summarized in Appendix H.

4 Interim Actions and Habitat Restoration

This section describes interim actions performed in 2018 and 2019, as well as separate coordinated habitat restoration actions performed from 2017 to 2020.

4.1 Interim Cleanup Actions

An interim action is a remedial action partially addressing the cleanup of a site, as provided under MTCA (WAC 173-340-430) and the AO. Ecology determined that interim actions would be beneficial to address those sediments within the Oakland Bay and Shelton Harbor Sediments Site that contained the highest concentrations of CoCs (see Section 3.1). These areas were known to be in Shelton Harbor intertidal areas (above approximately -5 feet MLLW) based on data from Ecology's 2008 Oakland Bay study (Herrera and Ecology & Environment 2010). More detailed data generated under the *RI/FS Work Plan* (Anchor QEA 2017a) identified three specific SMAs within the Shelton Harbor SCU for interim actions. Specifically, interim actions in SMA-1 to -3 (Figure 1-2) were targeted to address areas with the highest exceedances of preliminary sediment cleanup standards for dioxin/furan TEQ, cPAH TEQ, copper, and TBT.

Following public review and Ecology approval of the *Shelton Harbor Interim Action Plan* (Anchor QEA 2018a), Simpson performed detailed PDI sampling to refine the SMA-1 and -2 interim action areas (Anchor QEA 2018b). PDI data were merged with other recent data to accurately delineate these SMAs. The subsequent *Shelton Harbor Interim Action Basin of Design Report* (BODR; Anchor QEA 2018c) developed protective engineered cap designs in accordance with EPA and Corps guidance. The total intertidal cap design thickness was a minimum of 1.5 feet to provide combined chemical isolation, filtering, and armoring under wave action. Cap designs also optimized the development of intertidal habitat functions by incorporating fine-grained sediments supporting a cap surface in dynamic equilibrium with shoreline conditions. Interim action construction was subsequently authorized through a Nationwide Permit 38 for Cleanup of Hazardous and Toxic Waste issued by the Corps (2018; Permit No. #NWS-2018-210), also complying with the requirements of MTCA, SMS, and other applicable or relevant and appropriate requirements.

Interim action construction in SMA-1 and -2 began in 2018 (Anchor QEA 2019a), and a PDI addendum (Anchor QEA 2019b) and BODR addendum (Anchor QEA 2019c) were subsequently prepared to incorporate SMA-3. Interim actions in all three SMAs were completed in 2019 (Anchor QEA 2019d), resulting in the placement of 2 feet or more of engineered cap material over 13 acres of the Shelton Harbor SCU (8.2 acres in SMA-1, 0.4 acre in SMA-2, and 4.5 acres in SMA-3). Separate coordinated habitat restoration actions in Shelton Harbor were also performed between 2017 and 2020 by the South Puget Sound Salmon Enhancement Group, Squaxin Island Tribe, and Simpson (see Section 4.2).

The first round of post-construction interim action performance monitoring was performed in 2020, in accordance with the OMMP (Anchor QEA 2020b). These data are reported in the *RI/FS and OMMP Data Report* (Anchor QEA 2020c and Appendix H) and are summarized in Section 5 of this RI report.

4.2 Northern Habitat Restoration Project

In 1991, a railroad ferry dock located on the north side of the spit that bisects Shelton Harbor was removed by the Corps, after which the mouth of Goldsborough Creek migrated to the north into deeper, formerly dredged areas, creating an abrupt grade drop from the creek channel into a former dredged area within the delta (Anchor QEA 2017a). Even following removal of the Goldsborough Creek dam in 2000, this grade change has continued to propagate an upstream channel incision into Lower Goldsborough Creek as it has adjusted to its new base elevation, exposing buried pipelines in the creek, creating fish passage barriers, and degrading estuary and creek habitat.

The Squaxin Island Tribe, South Puget Sound Salmon Enhancement Group, Simpson, and other project partners designed, permitted, and constructed an intertidal habitat restoration project within the northern portion of Shelton Harbor to address these habitat impacts, with the objective of facilitating greater salmon runs. The habitat restoration project is located within northern portions of the Shelton Harbor SCU (Figure 1-2). The initial (2017) phase of the habitat restoration project installed engineered log jams in the Goldsborough Creek delta designed to slow and reverse the upstream channel incision. Subsequent phases of the habitat restoration project from 2018 to 2020 placed clean fill lobes in the estuary to raise the grade of the sediment, facilitating development of salt marsh habitat and enhancing adjacent riparian areas (Figure 2-7). The overall goals of the habitat restoration project were as follows (Anchor QEA 2017a):

- Improve aquatic habitat and hydraulic complexity
- Promote aggradation and complex flow paths
- Restore estuary functions and facilitate natural processes
- Improve habitat conditions at the mouths of Goldsborough and Shelton Creeks

As part of a future phase of the habitat restoration project, an additional intertidal habitat lobe may be placed in the northern portion of the Shelton Harbor SCU, potentially overlying portions of SMA-1 and -2 (Figure 1-2). The timing of this restoration action is not currently defined.

5 Nature and Extent of Contamination and Source Control

This section describes the nature and extent of CoCs in the Shelton Harbor SCU, as well as dioxin/furan bioavailability testing, CoC transport, and source controls. As discussed in Section 3.1, the following CoCs have been identified in the Shelton Harbor SCU:

- Copper and TBT (interim actions targeted this CoC)
- Dioxin/furan TEQ (interim actions targeted this CoC)
- cPAH TEQ
- Toxicity from wood debris degradation (e.g., H_2S, bioassay failures)

Each of these CoCs is discussed in the following subsections below.

5.1 Copper and TBT

As discussed in Ecology's 2008 Oakland Bay study (Herrera and Ecology & Environment 2010), historical (pre-2008) sampling of the marine railway area in the northern intertidal portion of the SCU (SMA-2; Figures 1-2 and 2-3) identified a localized exceedance of the SCO chemical criterion for copper (390 milligrams per kilogram [mg/kg]), as well as localized areas of elevated TBT concentrations in the upper intertidal zone of SMA-2. Although there is no promulgated SMS criterion for TBT, detailed evaluations of sediment TBT exposure and toxicity in Seattle's East Waterway resulted in the development of a risk-based benchmark for the protection of the benthic invertebrate community from sediment TBT of 7.5 mg/kg, normalized to the organic carbon content of the sediment (Windward and Anchor QEA 2014). Historical sampling of the marine railway area in the northern harbor identified localized TBT concentrations in the upper intertidal zone of SMA-2 that previously exceeded this benchmark. The 2018 Simpson PDI sampling (Appendix F) confirmed that the affected area would be addressed by the SMA-2 cap (Anchor QEA 2018a).

Interim actions summarized in Section 4.1 addressed both copper and TBT risks by protectively containing localized deposits of these CoCs below the intertidal SMA-2 engineered cap (Figure 1-2). Copper and TBT concentrations in the 2020 post-construction cap monitoring samples collected in SMA-2 were below risk-based benchmarks (Appendix H), verifying the protectiveness of the interim action, which will continue to be monitored under the OMMP (Anchor QEA 2020b).

5.2 Dioxin/Furan TEQ

To delineate current surface sediment concentrations of dioxin/furan TEQ for this RI report, the most recent discrete surface sediment sampling data available for each 2008 to 2020 sediment sampling station in the Shelton Harbor SCU (Figure 3-1) were used to develop concentration interpolations.[7]

[7] Additional Simpson 2020 RI composite sample results from outer Shelton Harbor were also collected and were nearly identical to the average of individual discrete subsample results included in the composites, verifying the accuracy of the discrete sampling data.

Post-construction SMA-1 to -3 and northern habitat restoration composite results from the 2020 Simpson RI/OMMP sampling (Appendix H) were applied to each individual subsample included in the composite. The combined sampling data were interpolated using inverse distance weighting of individual samples or subsamples.

Current surface sediment (top 10 cm) dioxin/furan TEQ concentrations within Shelton Harbor and Oakland Bay are presented in Figures 5-1 and 5-2, respectively. Relatively lower dioxin/furan concentrations (less than 20 nanograms per kilogram [ng/kg] TEQ; by dry weight) were detected in the post-construction SMA-1 to -3 interim action and northern habitat restoration areas, as well on the Goldsborough Creek intertidal delta. Relatively higher dioxin/furan concentrations (greater than 40 ng/kg TEQ) were detected in subtidal areas in the southeast, northeast, and southwest areas of the Shelton Harbor SCU. Similarly elevated surface sediment dioxin/furan TEQ concentrations were also detected in intertidal and subtidal areas of Oakland Bay.

As discussed in Section 3, subsurface sediment sampling in the Shelton Harbor SCU was conducted as part of Ecology's 2008 Oakland Bay study (Appendix A), the Simpson 2017 RI (Appendix E), and the Simpson 2020 RI/OMMP (Appendix H). In all cores, dioxin/furan TEQ concentrations increased with depth, with peak concentrations occurring 1 to 10 feet below mudline, depending on location. Average subsurface Lead-210 and dioxin/furan concentration profiles in stable sediment deposits of the southern portion of the SCU (from the Simpson 2017 RI) are presented in Figure 5-3. These profile data reveal that net sedimentation rates (0.30 ± 0.06 cm per /year) have resulted in relatively slow natural recovery of dioxins/furans in surface sediments over the past 50 years, with approximate 25% dioxin/furan TEQ concentration reductions roughly every ten years.

Under SMS, potential human health risks to bioaccumulative contaminants such as dioxins/furans are evaluated on an area-wide average basis to reflect potential long-term exposures (Ecology 2021). In situations where the exposure pathway is associated with potential shellfishing activities (see Section 6.2.1), the averaging area is typically limited to intertidal areas of the SCU where access to shellfish could occur (Floyd|Snider et al. 2020). The Shelton Harbor intertidal area (above -5 feet MLLW) comprises approximately 120 acres of the 196-acre SCU. Current surface-weighted average concentrations (SWACs) of dioxins/furans in the Shelton Harbor SCU and adjacent areas of Oakland Bay (excluding coarse sediments adjoining Hammersley Inlet; see Section 2.1.1) are as follows (by dry weight):

- Intertidal and subtidal areas combined:
  - Shelton Harbor SCU SWAC = 32 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 31 ± 5 ng/kg TEQ
- Intertidal areas only (above approximately -5 feet MLLW):
  - Shelton Harbor SCU SWAC = 29 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 37 ± 5 ng/kg TEQ

As summarized in Section 4.1, SMA-1 to -3 interim actions performed in 2018 and 2019 remediated 13 intertidal acres of Shelton Harbor that previously contained the highest dioxin/furan concentrations. Sampling data reveal that interim actions successfully reduced the dioxin/furan TEQ SWAC within intertidal areas (above approximately -5 feet MLLW) of the SCU by approximately 33% (i.e., from approximately 43 to 29 ng/kg TEQ).

5.2.1 Sediment Dioxin/Furan Bioavailability

Research over the last several decades has demonstrated that black carbon[8] strongly binds hydrophobic CoCs including dioxins/furans (Luthy et al. 1997). Contaminant sequestration in native sediments can also be enhanced by the addition of clean, manufactured black carbon materials such as activated carbon (Ghosh et al. 2011).

To assess dioxin/furan bioavailability in Shelton Harbor, a relatively large-volume sediment sample was collected as part of the Simpson 2017 RI from Station SH-19 in the southwest harbor adjacent to SMA-3 (Figure 3-1). This sample contained a bulk dioxin/furan TEQ concentration of 42 ng/kg TEQ (by dry weight), higher than the current Shelton Harbor SCU SWAC. The native black carbon content in the SH-19 sample averaged approximately 1.2% (by dry weight). Similar concentrations of black carbon in sediments (both natural and anthropogenic) have been demonstrated to reduce bioaccumulation, often by an order of magnitude or more compared to organic matter (Gustafsson et al. 1996; Luthy et al. 1997; Cornelissen et al. 2005; Lohmann et al. 2005). Thus, the presence of black carbon in Shelton Harbor sediments has the potential to significantly reduce the bioavailability of sediment-bound dioxins/furans.

Porewater concentrations provide a direct measure of the bioavailability of hydrophobic CoCs such as dioxins/furans (Gustafsson et al. 1996; Cornelissen et al. 2005; Ghosh et al. 2011). Porewater dioxin/furan concentrations in the Station SH-19 sample were measured as part of the Simpson 2017 RI using ex situ SPME passive sampling methods, with and without 5% powdered activated carbon amendment (Anchor QEA 2017a). Only 4 of the 13 dioxin/furan TEQ congeners were detected in the unamended SH-19 sample, at concentrations near the method detection limit (approximately 0.1 picogram per liter TEQ) and below the practical quantitation limit (PQL)[9], whereas no dioxin/furan congeners were detected in the sample amended with activated carbon. Although the largely undetected dioxin/furan porewater concentrations limit the precision of the bioavailability evaluation, the relatively low porewater concentrations measured in the unamended SH-19 sample are nonetheless consistent with significantly reduced bioavailability of sediment-bound dioxins/furans in Shelton Harbor compared to systems with lower black carbon levels.

[8] Black carbon consists of pure carbon in several forms. It is formed through the incomplete combustion of fossil fuels, biofuel, and biomass, and includes both naturally occurring and anthropogenic soot, coal, and charcoal.

[9] Undetected porewater tetrachlorodibenzo-*p*-dioxin concentrations in the SH-19 sample were below the 0.064 picogram per liter Washington State Surface Water Quality Standard for this congener (Chapter 173-201A Washington Administrative Code).

5.2.2 *Current Depositional Sediment Dioxin/Furan Concentrations*

As part of the Simpson 2020 RI/OMMP sampling, performed approximately two years after SMA-1 and -2 cap construction and one year after construction of the SMA-3 cap, the first round of sampling required under the OMMP was conducted. During sample collection (which occurred during low tides), the sampling crew noted that variable thicknesses of recent fine-grained sediment (averaging approximately 3 cm) had deposited in depressions and across the surface of the SMA-1 and -3 intertidal caps (above approximately -5 feet MLLW; see SMA-1 low tide picture below). These recent depositional sediments were largely composed of silt-sized materials, with total solids (38% ± 1% by wet weight) and total organic carbon (3.3% ± 0.1% by dry weight) concentrations similar to uncapped Shelton Harbor and Oakland Bay intertidal mudflats. Composite dioxin/furan concentrations (representing an average condition) in these depositional materials averaged 39 ± 2 ng/kg TEQ, similar to the average surface sediment dioxin/furan concentrations in uncapped intertidal mudflats of Shelton Harbor (30 ± 5 ng/kg TEQ) and Oakland Bay (37 ± 5 ng/kg TEQ).

As discussed in Section 2.1.1, sediments in nearshore intertidal zones (above approximately -5 feet MLLW) throughout the Oakland Bay and Shelton Harbor Sediments Site are subject to periodic resuspension from wind waves (Anchor QEA 2018a). During wind events, regular breaking wave conditions on the intertidal bed of Oakland Bay and Shelton Harbor resuspend surface sediments, resulting in small (millimeter-scale) bed level changes during the tidal cycle. Resuspended intertidal mudflat fines (silt and clay) are dispersed by wind waves and tidal currents, exchanging within Oakland Bay and Shelton Harbor and between these systems through dynamic equilibrium processes.

Dioxin/furan congener TEQ "fingerprints" in sediments that have recently deposited on the surface of the SMA-1 and -3 intertidal caps provide further evidence of this dynamic equilibrium process. The dioxin/furan TEQ concentrations and individual congener fingerprint patterns of these recent sediment deposits are nearly identical to those of intertidal sediments throughout the Oakland Bay and Shelton Harbor Sediments Site (Figure 5-4)[10]. These data further corroborate the dynamic equilibrium process—intertidal sediments regularly exchange within and between Oakland Bay and Shelton Harbor. As discussed in the following subsection, the weight of evidence indicates that upland and shoreline inputs are not a significant ongoing source of dioxins/furans to Shelton Harbor.

[10] Dioxin/furan congener TEQ fingerprints were consistent between individual Oakland Bay and Shelton Harbor intertidal sediment samples (2008 and 2020 data), as well as uncapped Shelton Harbor intertidal sediment samples (2020 data), supporting the averages presented in Figure 5-4.

5.2.3 Dioxin/Furan Source Control Evaluation

The *Oakland Bay Sediment Dioxin Source Study* (NewFields 2014) presents a review of sediment dioxin/furan data in Oakland Bay and Shelton Harbor to identify potential upland sources and transport pathways using chemometric profile interpretations. A main deduction of that study is that dioxin/furan concentrations remaining in surface sediments within Shelton Harbor are from historical practices that are no longer occurring. For example, most of the dioxin/furan deposits detected in Shelton Harbor were either associated with the release of chlorinated organic compounds that are no longer permitted and not in use in the harbor (pentachlorophenol, for example, is a chemical currently banned from most industrial uses) or uncontrolled combustion of salt-laden wood. Such uncontrolled combustion practices were associated with historical operations but have been eliminated. The effectiveness of prior source controls is verified by significantly lower dioxin/furan TEQ concentrations in surface sediments of Shelton Harbor compared to historical underlying sediments (Figure 5-3).

The following subsections below summarize surface water discharge controls, along with evaluations of potential dioxin/furan releases from the clinker deposit adjacent to Shelton Creek and the Goldsborough Creek spit (Figure 1-2).

5.2.3.1 Surface Water Discharge Controls

As a condition of the mitigated Determination of Non-Significance under the State Environmental Policy Act for demolition of former sawmill buildings and construction of new mills, Sierra Pacific Industries capped and closed historical catch basins, storm drain lines, and stormwater outfalls that formerly discharged from the historical sawmill facilities to Shelton Harbor (City of Shelton 2015). These recent actions effectively cut off potential historical sources related to former outfalls (Figure 5-5). Similar upland stormwater controls have been implemented by Manke at the former Rayonier facility (e.g., stormwater infiltration; no hog fuel burning).

Compared to surface sediment concentrations in the Shelton Harbor SCU, lower dioxin/furan TEQ concentrations are present in Goldsborough and Shelton creek sediments immediately upstream of Shelton Harbor and at an outfall from the former Rayonier pulp mill near SMA-3 (Figure 5-1). These tributary data corroborate the deduction that upland surface water discharge sources are not a significant ongoing source of dioxins/furans to Shelton Harbor.

5.2.3.2 Clinker Deposit Evaluation

Ecology (2013a) sampled former pulp mill or sawmill burner clinker residues that were historically deposited on the north bank of Shelton Creek and have been observed to be eroding into the creek. The surveyed extent of the clinker deposit is depicted in Figure 5-5. The average dioxin/furan concentration in these materials was approximately 31 ± 10 ng/kg TEQ (n = 2 samples). However, the clinker deposit has a distinctly different dioxin/furan congener TEQ fingerprint compared to sediments in Shelton Harbor and recently deposited sediments on the interim action caps; the clinker fingerprint is also distinctly different from the sample in Shelton Creek collected immediately downstream of the clinker deposit (Station SG-01; Figure 5-4). Thus, the present-day clinker deposit is unlikely to be a significant ongoing source of sediment dioxins/furans to Shelton Harbor.

The clinker deposit was also evaluated as a potential source of dissolved dioxins/furans to Shelton Creek. Drainage features on the clinker deposit were mapped as depicted in Figure 5-5, though no significant surface water drainage was observed during surveys conducted under mild rainfall events (up to approximately one-half inch of rainfall over a 24-hour period). Five in situ SPME passive samplers were successfully deployed in the groundwater discharge transition zone adjacent to Shelton Creek. Dioxin/furan congeners were not detected in four of the five deployments, and the one detection was below the PQL. Thus, the clinker deposit was not identified as a significant ongoing source of dissolved dioxins/furans.

5.2.3.3 Goldsborough Creek Spit Evaluation

Finally, the spit located southeast of the Goldsborough Creek delta was evaluated as a potential source of dioxins/furans to Shelton Harbor. Characterized as part of separate habitat restoration actions, dioxin/furan concentrations in subsurface upland soils within the spit averaged approximately 79 ± 23 ng/kg TEQ (Anchor QEA 2017b; n = 8 samples).[11] One of the constructed habitat lobes was built adjacent to the north side of the spit, downstream of the mouth of Goldsborough Creek (Figure 2-7), providing protection from potential erosion on the north side.

A visual survey of the south side of the spit face was conducted as part of the Simpson 2020 RI/OMMP sampling to evaluate its stability and potential for erosion into Shelton Harbor. The visual survey was conducted on foot at low tide. Below approximately +12 feet MLLW (underneath and adjacent to the unused railroad trestle), the visual survey noted that the south side of the spit face was stable, with gentle cobble/gravel slopes supporting abundant oysters and clams. Above approximately elevation +12 feet MLLW, portions of the south side of the spit beneath the trestle were not covered by the cobble/gravel slope materials, with several relatively small, localized erosional features extending up to the ordinary higher water elevation (approximately +15 feet MLLW). Given the relatively small (less than 10 square feet) erosional features on the spit, and that current surface sediment dioxin/furan concentrations adjacent to the spit are consistent with levels throughout much of the harbor (Figure 5-2), the present-day spit deposit is unlikely to be a significant current source of dioxins/furans to Shelton Harbor.

[11] Dioxin/furan congener TEQ fingerprints in subsurface soils within the spit are similar to recent sediments depositing in Shelton Harbor as well as Oakland Bay intertidal sediments (Figure 5-44). The similarity of these fingerprints likely reflects similar legacy sources and does not provide evidence of an ongoing source from the spit.

5.3 cPAH TEQ

Similar to the dioxin/furan data discussed in Section 5.2, to delineate current surface sediment concentrations of cPAH TEQ for this RI report, the most recent discrete surface sediment sampling data available for each 2008 to 2020 sediment sampling station in the Shelton Harbor SCU (Figure 3-1) were used to develop concentration interpolations. Post-construction SMA-1 to -3 and northern habitat restoration composite results from the 2020 Simpson RI/OMMP sampling (Appendix H) were applied to each individual subsample included in the composite. The combined sampling data were interpolated using inverse distance weighting of samples or subsamples.

Current surface sediment (top 10 cm) cPAH TEQ concentrations within Shelton Harbor and Oakland Bay are presented in Figures 5-6 and 5-7, respectively. Relatively lower cPAH concentrations (less than 30 micrograms per kilogram [μg/kg] TEQ; by dry weight) were detected in the post--construction SMA-1 to -3 interim action and northern habitat restoration areas, as well on the Goldsborough Creek intertidal delta and throughout Oakland Bay. Relatively higher cPAH concentrations (greater than 300 μg/kg TEQ) were detected in areas of the southern harbor adjacent to historical and/or current creosote pilings (Figure 2-7).[12] Surface sediment PAH fingerprints in this area of the harbor are similar to creosote sources (Stout and Graan 2010), consistent with historical and/or current releases from decaying creosote piling.

Similar to dioxins/furans, cPAH TEQ concentrations increased with depth, with peak concentrations occurring 1 to 10 feet below mudline, depending on location. Compared with dioxins/furans, sediment core data reveal that surface sediment cPAH TEQ concentrations in the Shelton Harbor SCU have declined more modestly over the past 50 years (Figure 5-3).

As discussed in Section 5.2, potential human health risks to bioaccumulative contaminants such as cPAHs are evaluated on an area-wide average basis (Ecology 2021). Current SWACs of cPAHs in the Shelton Harbor SCU and adjacent areas of Oakland Bay (excluding coarse sediments adjoining Hammersley Inlet; see Section 2.1.1) are as follows (by dry weight):

- Intertidal and subtidal areas combined:
  - Shelton Harbor SCU SWAC = 121 ± 50 μg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 μg/kg TEQ
- Intertidal areas only (above approximately -5 feet MLLW):
  - Shelton Harbor SCU SWAC = 153 ± 60 μg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 μg/kg TEQ

[12] Four replicate PAH analyses were performed on the 2020 surface sediment sample collected at Station SMA5-SG10, yielding cPAH concentrations ranging from 115 to 6,972 μg/kg TEQ (Appendix H). These data are consistent with the presence of fragments of creosote piling in the sample. For the Figure 5-6 interpolation and SWAC calculations, the four replicate cPAH results from Station SMA5-SG10 were averaged (2,608 μg/kg TEQ).

5.4 Toxicity from Wood Debris Degradation

As discussed in Ecology (2013c), bioassay testing provides the best tool to determine whether toxicity from wood debris degradation exceeds SMS cleanup levels. Selectively sequencing the RI to include SPI surveys, sediment bioassays, and focused sediment chemical testing provides an optimized weight-of-evidence approach to determine compliance with SMS cleanup levels. Each of these investigation elements is summarized in the following subsections below.

5.4.1 Sediment Profile Imaging

As discussed in Section 3.3.1, as part of the Simpson 2017 RI, an SPI survey was conducted at 63 locations to evaluate benthic conditions in surface sediments throughout the Shelton Harbor SCU (Appendix C). The SPI survey focused on the following wood debris indicator parameters:

- Wood debris levels greater than 25% by volume
- Apparent redox potential discontinuity (RPD) values of less than 1 cm, indicative of high sediment oxygen demand
- Presence of *Beggiatoa* (bacteria found in H_2S environments)

Figure 5-8 summarizes the 2017 SPI survey results, revealing that elevated levels of these wood debris indicator parameters primarily occurred in the southern portion of the SCU adjacent to Manke.

5.4.2 Sediment Bioassays

Acute and chronic bioassays of sediments collected from the Shelton Harbor SCU were performed as part of the Ecology 2008 Oakland Bay study (Herrera and Ecology & Environment 2010) to evaluate whether surface sediments (0 to 10 cm) are toxic to benthic organisms. Although potential laboratory artifacts may have resulted in false positive larval and polychaete toxicity determinations during the earlier study (see Section 3.3.1), 2008 bioassays with no measurable toxicity met SMS criteria. As part of the subsequent Simpson 2017 RI sampling, confirmatory bioassay testing was conducted at 11 locations in the SCU, including retesting eight representative 2008 locations in the northern and southern harbor that previously exceeded SMS criteria (larval and/or polychaete bioassays) and three new locations added following review of the SPI survey (full SMS bioassay suite; Appendix D).

In total, confirmatory bioassays using reliable methods currently recommended in SMS guidance (Ecology 2021) were performed at 29 locations within or immediately adjacent to the Shelton Harbor SCU, including several locations that were subsequently capped during interim actions (Section 4.1). Sediment toxicity data were evaluated according to the SMS (WAC 173-204-562 Table IV) to determine whether sediment exceeded SMS sediment toxicity criteria. The most current bioassay results for each station are presented in Figure 5-8 and reveal that 26 of the 29 confirmatory bioassay locations passed SCO biological criteria. Similar to the SPI results summarized above, bioassay exceedances were restricted to the southern portion of the SCU, one in SMA-4 (larval bioassay) and at two separate locations adjacent to SMA-3 (larval and/or polychaete bioassays).

5.4.3 Sediment Chemical Testing

As discussed in Ecology (2013c), wood debris decomposition by-products such as H_2S can cause or contribute to sediment toxicity. Porewater H_2S concentrations greater than 0.07 milligrams per liter (mg/L) exceed the no-effects screening level for sensitive benthic species in Puget Sound (Podger 2006), whereas porewater H_2S concentrations greater than 3.5 mg/L exceed the threshold for juvenile polychaete growth (Kendall and Barton 2004).

Surface sediment porewater H_2S concentrations were measured between 2017 and 2020 using in situ and ex situ DGT passive sampling methods. Figure 5-8 summarizes the DGT results, revealing that surface sediment porewater H_2S concentrations above the 0.07 mg/L screening level were present in much of the southern harbor, whereas porewater H_2S concentrations exceeding the 3.5 mg/L polychaete growth threshold primarily occurred within or adjacent to SMA-4.

5.4.4 Wood Debris Toxicity Weight-of-Evidence

As summarized in Section 5.4.2 and in Figure 5-8, bioassay results, which provide the best tool to determine whether toxicity from wood debris degradation exceeds SMS cleanup levels, were correlated with the following weight-of-evidence parameters of wood debris degradation:

- Presence of *Beggiatoa* (bacteria found in H_2S environments)
- Porewater H_2S concentrations greater than 3.5 milligrams per liter (mg/L), the no-effects threshold for juvenile polychaete growth (Kendall and Barton 2004)
- Apparent RPD values of less than 1 cm, indicative of high sediment oxygen demand
- Wood debris levels greater than 25% by volume

The approximate areal extent of SMA-4 (3.2 acres) depicted in Figure 5-8 was delineated based on the combined confirmatory bioassay and wood debris degradation weight-of-evidence parameters. The approximate vertical extent of wood debris deposits in SMA-4 was delineated based on two cores advanced in this area (Stations SC-01 and SC-02). Based on these cores, wood debris levels greater than 25% by volume extend to depths approximately 7 to 10 feet below mudline. Potential future cleanup actions are being considered by Ecology to remediate SMA-4 to SMS biological criteria (see Section 7).

SMS biological criteria were also exceeded at two locations in southwestern Shelton Harbor adjacent to SMA-3 (Stations SH-13A and -19; Figure 5-8). However, neither of these exceedances were correlated with hazardous substances (i.e., all chemical concentrations were below SMS benthic chemical criteria) nor with wood debris degradation weight-of-evidence parameters (i.e., no *Beggiatoa,* porewater H_2S concentrations less than 0.07 mg/L, apparent RPD greater than 3 cm, and wood debris levels less than 10% by volume). Consistent with similar confounding bioassay results at other Puget Sound areas such as Port Angeles Harbor (Floyd|Snider et al. 2020), it is likely that these bioassay results represent a potentially natural condition unrelated to CoC releases. Future OMMP monitoring will include confirmatory bioassays at these locations to verify this condition (see Section 7).

6 Preliminary Cleanup Standards

This section develops preliminary site-specific sediment cleanup standards that are protective of human health and the environment. Cleanup standards consist of the following: 1) SCLs that are protective of human health and the environment; and 2) the point of compliance at which the SCLs must be met. Site-specific cleanup standards are developed for the protection of the benthic community, human health, and upper-trophic-level wildlife, as discussed in the following subsections.

6.1 Protection of the Benthic Community

SCLs for benthic community protection are based on SMS bioassay criteria (WAC 173-204-562[3]). The preliminary site-specific bioassay SCL is the SCO criterion. Evaluation of compliance with biological criteria in the Shelton Harbor SCU uses bioassay testing performed since 2008 along with other supporting information such as the presence of *Beggiatoa*, porewater H_2S concentrations, RPDs, and wood debris levels. These data are discussed in Section 5.4.

6.2 Protection from Bioaccumulative Chemicals

Site-specific SCLs for bioaccumulative chemicals are based on protection of human health and upper-trophic-level wildlife, also considering background levels, PQLs, technical possibility, and net adverse environmental impacts (Ecology 2021). This subsection summarizes the basis for site-specific SCLs for dioxin/furan and cPAH TEQ.

6.2.1 Protection of Human Health

The SMS regulation sets forth a process for developing site-specific SCLs for protection of human health from bioaccumulative chemicals. Potential exposure pathways addressed by the human health SCLs include fish/shellfish consumption and incidental sediment ingestion/direct contact. The SCLs consider site-specific risk-based sediment concentrations as well as comparisons with background concentrations and PQLs. Site-specific SCLs for dioxin/furan and cPAH TEQ based on human health protection are summarized in the following subsections.

Although relatively high sediment TBT concentrations have the potential to pose human health risks associated with fish/shellfish consumption, detailed evaluations of sediment TBT exposure and toxicity in Seattle's East Waterway concluded that the primary risk posed by TBT is to the benthic community (Windward and Anchor QEA 2014). Moreover, these evaluations reveal that achieving the risk-based benchmark for the protection of the benthic invertebrate community from sediment TBT exposure (7.5 mg/kg organic carbon) also protects human health as well as upper-trophic-level wildlife. Interim cleanup actions summarized in Section 4.1 addressed TBT risks by protectively containing localized TBT deposits below the SMA-2 engineered cap (see Section 5.1).

6.2.1.1 Fish/Shellfish Consumption Protection

SMS guidance (Ecology 2021) describes an approach for developing site-specific, risk-based sediment concentrations of bioaccumulative chemicals for protection of human health when both sediment and tissue data are available for the site. This approach has four primary steps, as follows:

1. Determine site-specific fish/shellfish consumption rates in consultation with affected tribes
2. Using SMS risk assessment methods, apply site-specific consumption rates to calculate protective risk-based concentrations in tissue for each bioaccumulative CoC
3. Use paired tissue and sediment data to develop a site-specific bioaccumulation factor (BAF) for each CoC
4. Use these BAFs to back-calculate protective risk-based sediment concentrations from the risk--based tissue concentrations

Each of these steps is discussed in the following subsections below.

6.2.1.1.1 Site-Specific Fish/Shellfish Consumption Rates

Oakland Bay is within the usual and accustomed fishing and shellfishing area of the Squaxin Island Tribe. Between 2017 and 2020, Simpson consulted with the Squaxin Island Tribe to develop appropriate site-specific seafood consumption rates for this RI report.

A seafood consumption survey of Squaxin Island Tribe tribal members (Toy et al. 1996) reported upper 95% adult consumption rates for fish and shellfish.[13] Although EPA subsequently reanalyzed the survey data and reported slightly different consumption rates (Ecology 2013a), these reanalysis results are not recognized by the Squaxin Island Tribe. In a subsequent letter to the Squaxin Island Tribe, Ecology (2018a) agreed to use a total fish/shellfish consumption rate of 330.5 grams/ per day (grams/day) to establish cleanup levels for bioaccumulative contaminants within the Squaxin Island Tribe's usual and accustomed fishing and shellfishing area, which corresponds to the following approximate rates for different food groups:

- Anadromous fish: 192 grams/day
- Shellfish: 75 grams/day
- Bottom fish: 31 grams/day
- Pelagic fish: 22 grams/day
- Other fish: 11 grams/day

Because of their large home range and because no anadromous fish are caught by tribal members within Oakland Bay (Toy et al. 1996), there is minimal exposure linkage between anadromous fish and Shelton Harbor. Similarly, because Toy et al. (1996) reported that no pelagic or bottom fish are

[13] Toy et al. (1996) reported that adults had higher body weight-normalized fish/shellfish consumption rates compared to children; thus, human health risks are assessed based on lifetime exposures with early life exposure adjustment as appropriate (Ecology 2021).

caught by tribal members within Oakland Bay, there is also minimal exposure linkage between bottom, pelagic, and other fish and Shelton Harbor. No known crab harvest occurs in Oakland Bay. Therefore, development of cleanup levels for sediments in Shelton Harbor is based on the shellfish (bivalve) consumption pathway.

Consultations with the Squaxin Island Tribe further refined shellfish (bivalve) consumption rates specific to the Shelton Harbor SCU for this RI report. As reported by Toy et al. (1996), based on the location and percentage of shellfishing areas in Puget Sound frequented by Squaxin Island tribal members, and assuming similar harvests among individual areas, approximately 39% of tribal shellfish (bivalve) consumption is harvested from commercial tracts in Oakland Bay. Thus, the upper 95% tribal shellfish (bivalve) consumption rate from Oakland Bay is approximately 29 grams/day (39% × 75 grams/day).

SMS guidance recommends that human health-based sediment cleanup standards be established based on consumption rates applicable to the whole site, not an individual SCU within the site (Ecology 2021). Thus, for this RI report the Oakland Bay reasonable maximum (upper 95%) tribal shellfish (bivalve) consumption rate of 29 grams/day (Toy et al. 1996) was applied throughout the Oakland Bay and Shelton Harbor Sediments Site.

Because of potential pathogen contamination from wastewater discharge into Shelton Harbor as well as marina operations, DOH prohibits harvesting of shellfish (bivalves) throughout Shelton Harbor and adjoining portions of Hammersley Inlet and Oakland Bay (Figure 2-2). Based on DOH and Squaxin Island Tribe surveys, there is no known current consumption of shellfish from Shelton Harbor. Further, there are no plans to remove the current City of Shelton wastewater treatment discharge outfall that discharges into outer Shelton Harbor and Hammersley Inlet. Given these institutional controls, and consistent with consultations with the Squaxin Island Tribe, applying the 29 grams/day Oakland Bay tribal shellfish (bivalve) consumption rate to the Shelton Harbor SCU provides a highly conservative consumption rate to develop protective SCLs for this RI.

6.2.1.1.2 Protective Risk-Based Tissue Concentrations

Consistent with Ecology (2021) SMS guidance, cancer risk-based tissue concentrations that are protective of human health were calculated for this RI report based on the following equation:

Equation 1

$$\text{Tissue RBC} = (\text{ACR x BW x AT x UCF}) / (\text{CPF x FCR x FDF x EF x ED})$$

where:

Tissue RBC	=	calculated protective tissue concentration (mg/kg by wet weight)
ACR	=	acceptable cancer risk (10^{-6} [SCO]) or 10^{-5} [cleanup screening level; CSL])
BW	=	body weight (80-kilogram average; Toy et al. 1996)
AT	=	averaging time (25,550 days [70 years]; Ecology 2021)
UCF	=	unit conversion factor (1,000 grams per kilogram)
CPF	=	oral cancer potency factor (kilogram-day per milligram; see below)
FCR	=	shellfish (bivalve) consumption rate (29 grams/day; Oakland Bay)
FDF	=	fish/shellfish diet fraction (1.0; Oakland Bay)
EF	=	exposure frequency (365 days per year; Ecology 2021)
ED	=	exposure duration (70 years; Ecology 2021)

EPA's Science Advisory Board conducts regular reviews of the scientific basis supporting human health risk assessments and reports the results of those reviews on the Integrated Risk Information System (IRIS) database. Potential human health risks associated with dietary exposure of dioxin/furan and cPAH TEQ were evaluated using current IRIS oral cancer potency slope factors (CPFs) of 150,000 kilogram-day per milligram and 1 kilogram-day per milligram, respectively. Because cPAHs have a mutagenic mode of action, age-dependent adjustment factors provided in Ecology (2021) were used to account for early life exposure to cPAHs.

Using Equation 1, calculated risk-based tissue concentrations of individual bioaccumulative CoCs[14] that are protective of human health throughout the Oakland Bay and Shelton Harbor Sediments Site are as follows (by wet weight):

- Dioxins/furans:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000): 0.021 ng/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000): 0.21 ng/kg TEQ
- cPAHs:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000): 1.4 µg/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000): 14 µg/kg TEQ

Shellfish (bivalve) tissue data from relatively pristine non-urban Puget Sound reference areas, as compiled by Ecology (2012), AECOM and Windward (2012), and Anchor QEA (2022), provide further

[14] WAC 173-204-561(3) requires SCLs to be adjusted downward if there are multiple carcinogens and/or exposure pathways at the site and the total lifetime excess cancer risk for the site exceeds 1×10^{-5}. Downward adjustments are discussed in Section 6.4.

context for tissue comparisons (see Appendix I).[15] Average Puget Sound reference area tissue concentrations from these compilations are approximately as follows (by wet weight):

- Dioxin/furan: 0.23 ± 0.10 ng/kg TEQ
- cPAH: 0.25 ± 0.07 µg/kg TEQ

Puget Sound reference area dioxin/furan TEQ tissue concentrations are at or above the calculated CSL risk-based tissue concentration, whereas reference area cPAH TEQ tissue levels are below the SCO.

6.2.1.1.3 Site-Specific Bioaccumulation Factor

As discussed in Section 3.2, in 2009 DOH (2010a) sampled shellfish (bivalves) in intertidal (above approximately -5 feet MLLW) commercial shellfish harvesting areas in Oakland Bay (Figure 2-2; Appendix B). These values were compared to surface sediment concentrations collected from nearby intertidal areas during Ecology's 2008 Oakland Bay study (Herrera and Ecology & Environment 2010; Appendix A). Since sediment dioxin/furan fingerprint patterns and concentrations are similar across Oakland Bay and Shelton Harbor (NewFields 2014; Figure 5-4), these paired intertidal surface sediment and shellfish tissue data were used to derive a site-specific BAF applicable throughout the Oakland Bay and Shelton Harbor Sediments Site. The BAF was calculated from the linear regression (through the origin) of dioxin/furan TEQ concentrations in shellfish (bivalves) and sediment collected from intertidal commercial shellfish harvest tracts in Chapman Cove and Upper Oakland Bay, along with the Walker County Park reference area in Hammersley Inlet (Figures 2-2 and 6-1)[16]:

- Oakland Bay dioxin/furan TEQ BAF = 0.0065 ± 0.0016 (dry/wet weight basis)

As depicted in Figure 6-1, dioxin/furan TEQ levels measured by DOH (2010a) in shellfish (bivalve) tissue concentrations in Chapman Cove and Upper Oakland Bay intertidal areas with elevated surface sediment concentrations (36 ± 5 ng/kg TEQ) are similar to tissue levels measured in relatively pristine non-urban Puget Sound reference areas (Appendix I). Because the intertidal dioxin/furan sediment SWAC in the Shelton Harbor SCU is lower (29 ± 5 ng/kg TEQ), dioxin/furan tissue concentrations in Shelton Harbor are also projected to be within the Puget Sound reference area range.

Although similar BAF data for cPAHs are not available within the Oakland Bay and Shelton Harbor Sediment Site, Ecology collected paired shellfish and sediment cPAH TEQ data at Port Angeles Harbor (Ecology & Environment and NewFields 2012; NewFields 2013), which has similar

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[15] As summarized in Appendix I, validated shellfish (bivalve) tissue data have been collected from relatively pristine non-urban Puget Sound reference areas including Padilla/Fidalgo Bay (Ecology 2000), Salsbury Point (Parametrix 2003), Dungeness/Freshwater Bay (Malcolm Pirnie 2007; Ecology and Environment 2012), and Penn Cove (Washington State Department of Fish and Wildlife 2015; Anchor QEA 2017c).

[16] Normalizing the BAF regression to lipid (tissue) and organic carbon (sediment) contents unnecessarily adds additional variability because the nearly 50-fold range of tissue lipid content in Oakland Bay shellfish samples is not correlated with dioxin/furan TEQ tissue concentrations (DOH 2010a). The non-normalized regression BAF presented in Figure 6-1 provides the most reliable site-specific measure of bioaccumulation in this environment.

estuarine/nearshore habitats and other site characteristics as Oakland Bay. The average shellfish (bivalve) tissue BAF for cPAHs developed by Ecology from these data was (NewFields 2014):

- Port Angeles Harbor cPAH TEQ BAF = 0.043 ± 0.044 (dry/wet weight TEQ basis)

6.2.1.1.4 Protective Risk-Based Sediment Concentrations

The final step in developing site-specific, protective risk-based sediment concentrations for fish/shellfish consumption protection is to use the BAFs derived in Section 6.2.1.1.3 to back-calculate protective risk-based sediment concentrations as follows:

- Protective sediment concentration = tissue RBC (Equation 1) ÷ BAF

Calculated risk-based sediment concentrations of individual CoCs[14] that are protective of shellfish (bivalve) consumption throughout the Oakland Bay and Shelton Harbor Sediments Site, along with current SWACs in intertidal areas of the site (above approximately -5 feet MLLW where access to bivalves could occur), are as follows (by dry weight):

- Dioxins/furans:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000) = 3 ng/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000) = 32 ng/kg TEQ
  - Shelton Harbor SCU SWAC = 29 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 37 ± 5 ng/kg TEQ
- cPAHs:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000) = 32 µg/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000) = 320 µg/kg TEQ
  - Shelton Harbor SCU SWAC = 153 ± 60 µg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 µg/kg TEQ

6.2.1.2 Direct Contact Protection

As discussed in Section 3.2, DOH (2010b) evaluated potential health risks from direct contact and incidental ingestion of dioxins/furans, cPAHs, and other CoCs in sediments in Oakland Bay and Shelton Harbor using data collected during Ecology's 2008 Oakland Bay study and concluded that touching, breathing in, or accidentally eating sediment is unlikely to harm human health.

Ecology (2021) also developed risk-based sediment concentrations for ingestion of sediment and direct contact with sediment using recommended SMS exposure parameters. The most conservative exposure pathway for dioxin/furan and cPAH TEQ is for an adult subsistence clam-digging scenario. Ecology's direct contact criteria, along with current SWACs in intertidal areas of the site (above approximately -5 feet MLLW where access to sediment could occur), are as follows (by dry weight):

- Dioxins/furans:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000) = 15 ng/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000) = 150 ng/kg TEQ
  - Shelton Harbor SCU SWAC = 29 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 37 ± 5 ng/kg TEQ
- cPAHs:
  - SCO (10^{-6} cancer risk; 1 in 1,000,000) = 320 µg/kg TEQ
  - CSL (10^{-5} cancer risk; 1 in 100,000) = 3,200 µg/kg TEQ
  - Shelton Harbor SCU SWAC = 153 ± 60 µg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 µg/kg TEQ

Ecology's (2021) risk-based direct contact criteria are higher than the site-specific shellfish (bivalve) consumption protection criteria summarized in Section 6.2.1.1.

6.2.2 Protection of Upper-Trophic-Level Wildlife

Risk calculations for protection of upper-trophic-level species (e.g., fish, birds, and mammals) are usually above risk levels that are protective of human health (Windward and Anchor QEA 2014). Thus, by protecting human health, upper-trophic-level species will also be protected, obviating the need to develop cleanup levels for higher-trophic-level receptors.

Both Shelton Harbor and Port Angeles Harbor are characterized by similar historical CoC sources (e.g., wood burning and hog fuel boiler operations; pulp mill, bleaching, and sawmill facilities; and wastewater discharges from industrial and public-owned treatment works), as well as similar historical transport pathways (e.g., currents and tidal fluctuations; Herrera and Ecology & Environment 2010; Ecology & Environment and NewFields 2012). Existing surface sediment dioxin/furan congener TEQ fingerprint patterns in these two harbors are also similar, further supporting comparability between these sites (NewFields 2014).

The *Port Angeles Harbor Marine Environment: Sediment Investigation Report and Screening Level Human Health and Ecological Risk Assessment* (Ecology & Environment and NewFields 2012) included a quantitative evaluation of potential risks of dioxin/furan exposure to upper-trophic-level wildlife from bioaccumulation (e.g., ingestion of prey and incidental ingestion of sediment). The Port Angeles Harbor ecological risk assessment evaluated three piscivorous species (double-crested cormorant [*Phalacrocorax auritus*], harbor seal [*Phoca vitulina*], and bald eagle [*Haliaeetus leucocephalus*]), as well as three omnivorous species (brant [*Branta bernicla*], greater scaup [*Aythya marila*], and common raccoon [*Procyon lotor*]). The risk assessment used conservative exposure parameters for the species evaluated, providing quantitative risk characterization results for dioxin/furan exposures using current toxicity reference values.

The Port Angeles Harbor ecological risk assessment (Ecology & Environment and NewFields 2012) concluded that there were no unacceptable dioxin/furan risks for any of the species evaluated. Because of similarities between these sites (e.g., similar estuarine and nearshore habitats), similarly low ecological risks are likely present in Oakland Bay and Shelton Harbor, further underscoring that protection of human health will also protect upper-trophic-level species.

6.3 Background

The current SMS rule includes a two-tiered framework to establish SCLs for human health protection. It incorporates natural background as one component of the SCO and regional background as one component of the CSL. Puget Sound natural sediment background concentrations of dioxins/furans (4 ng/kg TEQ) and cPAHs (21 µg/kg TEQ) have been developed by Ecology (2021).

The SMS rule provides a definition for regional background in WAC 173-204-505(16) and parameters for establishing it in WAC 173-204-560(5):

> "Regional Background" means the concentration of a contaminant within a department defined geographic area that is primarily attributable to diffuse sources, such as atmospheric deposition or stormwater, not attributable to a specific source or release.

Using procedures set forth in the SMS rule, Ecology (2018b) established regional background levels for dioxins/furans and cPAHs of 19 ng/kg TEQ and 78 µg/kg TEQ, respectively. Ecology has determined that these regional background values apply to the Shelton Harbor SCU.

6.4 Site-Specific SCO and CSL Criteria

Numeric criteria for sediment that are protective of human health are established using a two-tiered framework bounded by the SCO and the CSL. The SCO is the long-term sediment quality goal for protection of human health and the environment. The SCL is initially established at the SCO and may be adjusted upward as appropriate on a site-specific basis up to the CSL, based on technical possibility and evaluation of net adverse environmental impacts.

Site-specific SCOs for individual carcinogenic chemicals (e.g., dioxin/furan and cPAH TEQ) are established as the highest of the following (WAC 173-204-560[[3]] and WAC 173-204-561[[2]]):]):

- The concentration of an individual chemical corresponding to a risk level equal or less than 1×10^{-6} (1 in 1,000,000; summing multiple exposure pathways for that chemical)[17]
- Natural background: dioxins/furans = 4 ng/kg TEQ; cPAHs = 21 µg/kg TEQ (Ecology 2021)

[17] WAC 173-204-561(2) requires the SCO to be adjusted downward if there are multiple carcinogens and/or exposure pathways at the site and the total lifetime excess cancer risk for the site exceeds 1 in 100,000 (1×10^{-5}).

- PQL: dioxins/furans = 5 ng/kg TEQ; cPAHs = 9 μg/kg TEQ (Ecology 2021)

Site-specific SCOs for dioxins/furans and cPAHs under a conservative maximum exposure scenario, along with current SWACs in intertidal areas of the site (above approximately -5 feet MLLW where access to shellfish [bivalves] and sediment could occur), are as follows (Table 6-1; by dry weight):

- Dioxins/furans:
  - Shellfish (bivalve) consumption (10^{-6} cancer risk; 1 in 1,000,000) = 3 ng/kg TEQ
  - Natural background = 4 ng/kg TEQ
  - PQL = 5 ng/kg TEQ
  - Site-specific SCO = 5 ng/kg TEQ (PQL)
  - Shelton Harbor SCU SWAC = 29 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 37 ± 5 ng/kg TEQ
- cPAHs:
  - Shellfish (bivalve) consumption (10^{-6} cancer risk; 1 in 1,000,000) = 32 μg/kg TEQ
  - Natural background = 21 μg/kg TEQ
  - PQL = 9 ng/kg TEQ
  - Site-specific SCO = 32 μg/kg TEQ (shellfish [bivalve] consumption)
  - Shelton Harbor SCU SWAC = 153 ± 60 μg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 μg/kg TEQ

Site-specific CSLs for individual chemicals are established as the highest of the following levels in accordance with WAC 173-204-560(4) and WAC 173-204-561(3):

- The concentration of individual chemicals corresponding to a cumulative risk level equal or less than 1×10^{-5} (1 in 100,000; summing multiple exposure pathways for that chemical)[18]
- Regional background: dioxins/furans = 19 ng/kg TEQ; cPAHs = 78 μg/kg TEQ (Ecology 2018b)
- PQL: dioxins/furans = 5 ng/kg TEQ; cPAHs = 9 μg/kg TEQ (Ecology 2021)

Consistent with WAC 173-204-561(3), the site-specific CSL for dioxins/furans and cPAHs was adjusted downward to achieve a cumulative risk level equal to 1×10^{-5} (1 in 100,000), summing shellfish (bivalve) consumption and direct contact exposures for both of these CoCs. The resulting CSL human health risk criteria, which reflect roughly proportional downward adjustments to both CoCs, are as follows:

- Dioxins/furans = 20 ng/kg TEQ
- cPAHs = 76 μg/kg TEQ

[18] WAC 173-204-561(3) requires the CSL to be adjusted downward if there are multiple carcinogens and/or exposure pathways at the site and the total lifetime excess cancer risk for the site exceeds 1 in 100,000 (1×10^{-5}).

Site-specific CSLs for dioxins/furans and cPAHs under a conservative maximum exposure scenario, along with current SWACs in intertidal areas of the site (above approximately -5 feet MLLW where access to shellfish [bivalves] and sediment could occur), are as follows (Table 6-1; by dry weight):

- Dioxins/furans:
  - Human health risk criterion (cumulative 10^{-5} cancer risk; 1 in 1,000,000) = 20 ng/kg TEQ
  - Regional background = 19 ng/kg TEQ
  - PQL = 5 ng/kg TEQ
  - Site-specific CSL = 20 ng/kg TEQ (cumulative 10^{-5} cancer risk criterion)
  - Shelton Harbor SCU SWAC = 29 ± 5 ng/kg TEQ
  - Oakland Bay SWAC = 37 ± 5 ng/kg TEQ
- cPAHs:
  - Human health risk criterion (cumulative 10^{-5} cancer risk; 1 in 1,000,000) = 76 µg/kg TEQ
  - Regional background = 78 µg/kg TEQ
  - PQL = 9 ng/kg TEQ
  - Site-specific CSL = 78 µg/kg TEQ (regional background)
  - Shelton Harbor SCU SWAC = 153 ± 60 µg/kg TEQ
  - Oakland Bay SWAC = 15 ± 5 µg/kg TEQ

6.5 Site-Specific Sediment Cleanup Levels

Site-specific SCLs for the Shelton Harbor SCU were developed for all Shelton Harbor CoCs and risk pathways identified in Section 6.1 and 6.2, including benthic toxicity from wood debris breakdown products and human health risks from dioxin/furan and cPAH TEQ (Table 6-1).

As discussed in Ecology (2021), the site-specific SCL can be adjusted upward from the SCO to a value no greater than the CSL based on the following considerations:

- **Technical Possibility:** Whether it is technically possible to achieve an SCL at the applicable point of compliance within the SCU (WAC 173-204-560[2][a][ii][A])
- **Net Adverse Environmental Impacts:** Whether meeting an SCL will have a net adverse environmental impact on the aquatic environment

Technically possible is defined as "capable of being designed, constructed and implemented in a reliable and effective manner, regardless of cost" (WAC 173-204-505[23]). Technical possibility depends on a variety of site-specific factors that include the ability to achieve the SCL.

The determination of net adverse environmental impacts is based on whether meeting the SCL will have a net adverse impact, considering short- and long-term positive and adverse impacts of cleanup actions on natural resources, including shellfish, forage fish, aquatic habitat, and restoration and enhancement opportunities (WAC 173-204-560[2][a][ii][B]). Targeting portions of the

Shelton Harbor SCU for interim actions by establishing site-specific SCLs above the SCO reduces risks more rapidly by focusing active remediation on the higher concentration areas and avoiding extensive disturbance of lower-concentration sediments. The duration of adverse impacts on natural resources and habitat associated with remedial construction is more limited, and natural recovery is accelerated over the rest of the SCU.

Preliminary dioxin/furan and cPAH SCLs were set at the site-specific CSLs of 20 ng/kg TEQ and 78 ng/kg TEQ, respectively, as summarized in Section 6.4. However, based on the following considerations, it may not be practicable to achieve these preliminary SCLs:

- Completed interim actions remediated 13 acres previously containing the highest surface sediment dioxin/furan concentrations in the Shelton Harbor SCU, reducing the intertidal surface sediment dioxin/furan SWAC in the SCU by approximately 33% (i.e., from approximately 43 to 29 ng/kg TEQ; see Section 5.2).
- Intertidal (above approximately -5 feet MLLW) surface sediment dioxin/furan concentrations in Shelton Harbor (29 ± 5 ng/kg TEQ) were successfully reduced to less than current levels in adjacent Oakland Bay (37 ± 5 ng/kg TEQ). Moreover, intertidal sediments regularly exchange throughout the Oakland Bay and Shelton Harbor Sediments Site in a dynamic equilibrium process (Section 2.1.1). Consistent with this exchange process, dioxin/furan fingerprints and concentrations in recent sediments depositing on the surface of the SMA-1 and -3 caps (39 ± 2 ng/kg TEQ) are also similar to site-wide concentrations (see Figure 5-4 and Section 5.2.2). Thus, further reducing the Shelton Harbor dioxin/furan SWAC to 20 ng/kg TEQ by performing additional broader-scale actions is likely not technically possible and could result in net adverse environmental impacts to the Oakland Bay and Shelton Harbor Sediments Site.
- Measured (DOH 2010a) and projected (Figure 6-1) dioxin/furan shellfish (bivalve) tissue concentrations throughout the Oakland Bay and Shelton Harbor Sediments Site are similar to tissue levels measured in relatively pristine non-urban Puget Sound reference areas (see Section 6.2.1.1.2 and Appendix I). Thus, further reducing the Shelton Harbor dioxin/furan SWAC to 20 ng/kg TEQ by performing additional broader-scale actions will likely not result in meaningful risk reduction.
- Although current surface sediment dioxin/furan and cPAH TEQ concentrations throughout the Oakland Bay and Shelton Harbor Sediments Site exceed preliminary dioxin/furan and cPAH SCLs, DOH (2010a, 2010b) determined that eating shellfish or accidentally eating sediment containing dioxins/furans and cPAHs from the site is unlikely to produce harmful health effects. No public health advisories are needed to reduce exposure to dioxins/furans or cPAHs in either Shelton Harbor or Oakland Bay.

- Preliminary dioxin/furan and cPAH SCLs for the Shelton Harbor SCU were developed using a highly conservative MTCA/SMS maximum exposure scenario that assumes possible future shellfish (bivalve) consumption in Shelton Harbor at rates equivalent to those in Oakland Bay.
- Because of potential pathogen contamination from wastewater discharge into Shelton Harbor as well as marina operations, DOH has imposed an institutional control that effectively prohibits harvesting of shellfish (bivalves) throughout Shelton Harbor and adjoining portions of Hammersley Inlet and Oakland Bay (Figure 2-2). This existing and future institutional control provides further human health protection in Shelton Harbor.

Separate considerations of net adverse environmental impacts based on the short- and long-term positive and negative effects of cleanup actions on natural resources, as required under WAC 173-204-560(2)(a)(ii)(B), apply to benthic community protection. For example, potential sediment toxicity impacts on natural resources resulting from setting site-specific benthic chemical criteria at levels greater than the SCO must be appropriately balanced with construction impacts during and after remediation. For benthic toxicity, the SCO is the criterion at which no adverse effects occur, including no acute or chronic adverse effects on biological resources. The CSL is the minor adverse effects level, which is the minimum level to be achieved in all cleanup actions under the SMS. Because only localized exceedances of the benthic SCO occur in southern portions of the Shelton Harbor SCU (Section 5.2), the site-specific SCL for benthic community protection is appropriately set at the SCO, the level of no adverse effects (Table 6-1).

6.6 Points of Compliance

Under MTCA, the point of compliance is the point or location within an SCU where cleanup levels must be attained. For sediments, the vertical point of compliance is the biologically active zone, which is the depth in surface sediments where most benthic organisms are found and where bioturbation occurs. For typical soft-bottom sediment in Puget Sound, Ecology (2021) has established a 10-cm biologically active zone. Site-specific radioisotope (Lead-210) data collected in subtidal zones in Shelton Harbor reveal that relatively little bioturbation and vertical mixing of sediment occurs within the SCU beyond the top 10 cm (Figure 5-3; Anchor QEA 2018a). The 10-cm point of compliance applies to intertidal areas within Shelton Harbor, particularly given the lack of current or future consumption of shellfish from Shelton Harbor.

As set forth in the SMS, SCLs for protection of the benthic community (proposed to be the SCO bioassay criteria for the Shelton Harbor SCU) apply to individual sampling stations; therefore, each station across the cleanup area is evaluated for compliance separately. For protection of human health and upper-trophic-level species, preliminary dioxin/furan and cPAH SCLs apply to the intertidal (above approximately -5 feet MLLW) SWAC across the entire Shelton Harbor SCU where access to bivalves and sediment could potentially occur.

7 Conceptual Site Model

As defined in the MTCA regulation, a CSM is "a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors" (WAC 173-340-200). The CSM informs and identifies locations requiring further cleanup action evaluations. Key elements of the Shelton Harbor CSM are as follows:

- A wide range of historical sources including industrial facilities released hazardous substances or wood debris into Shelton Harbor, based on their scale, nature of operations, and years of operation. Detailed descriptions of historical sources are provided in the *Summary of Existing Information and Identification of Data Gaps Technical Memorandum* (Herrera 2008). As further detailed in Herrera and Ecology & Environment (2010), historical sources of contamination to Shelton Harbor likely included wood debris, wood burning and hog fuel boiler operations, pulp mill and bleaching operations, sawmill facilities, wastewater discharges from industrial sources and public-owned treatment works, vessel maintenance and repair, and other operations.
- Historical sources of CoCs to Shelton Harbor have been reduced over time as waterfront industrial activities have declined and as controls have improved. Neither upland nor shoreline inputs have been identified as significant ongoing sources of dioxins/furans to Shelton Harbor. The effectiveness of prior source controls is demonstrated by significantly lower dioxin/furan TEQ concentrations in surface sediments of Shelton Harbor compared to historical underlying sediments (Figure 5-3). Because of relatively low net sedimentation rates in the harbor (0.30 ± 0.06 cm per year), natural recovery processes slowly reduce surface sediment dioxin/furan TEQ concentrations, with approximate 25% reductions roughly every 10 years.
- In 2018 and 2019, Simpson constructed engineered caps over 13 acres of SMA-1 to -3 previously containing the highest dioxin/furan concentrations in the Shelton Harbor SCU (see Section 4.1), successfully reducing the intertidal surface sediment dioxin/furan SWAC in the SCU by roughly 33% (i.e., from approximately 43 to 29 ng/kg TEQ; see Section 5.2), accelerating natural recovery throughout the site. The interim action caps have remained stable and protective.
- Recent sediments depositing on the surface of the SMA-1 and -3 caps with dioxin/furan concentrations of 39 ± 2 ng/kg TEQ indicate that there is movement and redistribution of surface sediments throughout the Oakland Bay and Shelton Harbor Sediments Site. Similar surface sediment dioxin/furan TEQ concentrations with comparable dioxin/furan fingerprints are present in intertidal (above approximately -5 feet MLLW) mudflats of Oakland Bay (37 ± 5 ng/kg TEQ) and Shelton Harbor (29 ± 5 ng/kg TEQ). Although subtidal sediments are not subject to resuspension, intertidal mudflat sediments in Oakland Bay and uncapped areas of Shelton Harbor are periodically resuspended by wind waves (see Section 2.1.1). Resuspended

intertidal mudflat fines (silt and clay) are dispersed by wind waves and tidal currents, exchanging within Oakland Bay and Shelton Harbor and between these systems through dynamic equilibrium processes (see Section 5.2). Thus, further reducing the Shelton Harbor dioxin/furan SWAC to 20 ng/kg TEQ by performing additional broader-scale actions is likely not technically possible and could result in net adverse environmental impacts to the Oakland Bay and Shelton Harbor Sediments Site (see Section 6.5).

- As discussed in Section 5.2.3.3, because there are only relatively small (less than 10 square feet) erosional features on the spit located southeast of the Goldsborough Creek delta, and current surface sediment dioxin/furan concentrations adjacent to the spit are consistent with levels throughout much of the harbor, the present-day spit deposit is unlikely to be a significant current source of dioxins/furans to Shelton Harbor. However, periodic future reevaluations of the stability of the spit may be warranted, particularly if sea levels continue to rise.
- Most creosote pilings in the northern harbor were removed concurrent with 2018/2019 interim cleanup and habitat restoration actions (see Section 4). However, decaying creosote piling remaining along the spit located southeast of the Goldsborough Creek delta and in adjacent areas of the southern harbor (Figure 2-7) may be an ongoing and/or potential future source of cPAHs to the SCU (see Section 5.3). Potential future evaluations of creosote pile removals, including Clean Water Act habitat mitigation options as appropriate, may be warranted to further reduce surface sediment cPAH TEQ concentrations in the Shelton Harbor SCU.
- Because of potential pathogen contamination from wastewater discharge into Shelton Harbor as well as marina operations, DOH has imposed an institutional control that effectively prohibits harvesting of shellfish (bivalves) throughout Shelton Harbor and adjoining portions of Hammersley Inlet and Oakland Bay (Figure 2-2). Based on DOH and Squaxin Island Tribe surveys, there is no known current consumption of shellfish from Shelton Harbor, and there are no plans to remove the current City of Shelton wastewater treatment discharge outfall. This existing and future institutional control provides human health protection in Shelton Harbor.
- Figure 5-8 presents an overall summary of benthic conditions across Shelton Harbor, revealing that 26 of the 29 confirmatory bioassay locations pass SCO biological criteria. A localized area of the southern harbor (denoted SMA-4) exceeds bioassay criteria, and bioassay results in SMA-4 are correlated with weight-of-evidence parameters of wood debris degradation (i.e., *Beggiatoa*, porewater H_2S, low RPD, and wood debris greater than 25% by volume). Potential future cleanup actions are being considered by Ecology to remediate SMA-4 to SMS biological criteria.
- Based on the weight of evidence of the combined 2008 to 2020 data, including confirmatory bioassays that passed SCO biological criteria and SPI results showing a healthy benthic community, no benthic risks are identified in Shelton Harbor outside of SMA-4. Additional

confirmatory bioassays will be performed as part of planned 2024 OMMP sampling to verify this condition.

As discussed in the list above, because of dynamic equilibrium sediment exchange processes and because Oakland Bay intertidal surface sediments have higher dioxin/furan TEQ concentrations than the Shelton Harbor SCU, further reducing the Shelton Harbor dioxin/furan SWAC by performing additional broader-scale actions is likely not technically possible and could result in net adverse environmental impacts to Oakland Bay and Shelton Harbor (see Section 6.5). Moreover, because dioxin/furan shellfish (bivalve) tissue concentrations throughout Oakland Bay and Shelton Harbor are similar to tissue levels measured in relatively pristine non-urban Puget Sound reference areas, and since an institutional control effectively prohibits harvesting of shellfish (bivalves) throughout Shelton Harbor, performing additional actions will likely not result in meaningful risk reduction.

Additional OMMP monitoring of Shelton Harbor will be performed in 2024 and 2029.

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Tables

Table 3-1
Oakland Bay and Shelton Harbor Sediment Sampling: 2008 to 2020

Study Name	Ecology EIM Study ID	Year Sampled	Sample Type(s)	Sediment Collection Depths	Number of Sediment Samples Analyzed	Sediment Analyte Groups					
						Dioxins/ Furans	Metals/TBT	PAHs	H_2S/TVS	Bioassay	Geochronology
Washington State Department of Ecology 2008 Oakland Bay Study (Herrera and Ecology & Environment 2010; Appendix A)	OAKSED08	2008	Sediment	0–120 cm (variable)	74	X	X	X	X	X	X
Washington State Dept. of Health 2009 Oakland Bay Shellfish Sampling (DOH 2021a; Appendix B)	--	2009	Tissue	--	22	X	--	--	--	--	--
Budd Inlet and Oakland Bay Dioxin Study	BuddOakDioxins	2011	Sediment	0–2 cm	2	X	--	X	--	--	--
2017 Simpson RI Sampling (Appendices C to E)	OAKSED17	2017	Sediment	0–232 cm (variable)	95	X	X	X	X	X	X
2018/2019 Simpson/Manke Pre-Remedial Design Sampling (Appendices F and G)	--	2018/2019	Sediment	0–165 cm (variable)	87	X	X	X	X	--	--
2020 Simpson RI/OMMP Sampling (Appendix H)	--	2020	Sediment	0–335 cm (variable)	49	X	X	X	X	X	--

Notes:
--: not available or applicable
cm: centimeter
dioxin/furan: polychlorinated dibenzo-*p* -dioxin and furan congener
EIM: Environmental Information Management
H_2S: hydrogen sulfide
PAH: polycyclic aromatic hydrocarbon
RI/FS: Remedial Investigation/Feasibility Study
TBT: tributyltin
TVS: total volatile solids

Table 6-1
Preliminary Shelton Harbor SCU Sediment Cleanup Levels

Cleanup Level Type	Site-Specific Sediment Cleanup Levels	Toxicity from Wood Debris Degradation	Dioxin/Furan TEQ ng/kg dry weight	cPAH TEQ μg/kg dry weight
SCO and CSL	Practical Quantitation Limit (Ecology 2021)	N/A	5	9
SCO	Puget Sound Natural Background (Ecology 2021)	N/A	4	21
SCO	Benthic Community Protection	SCO Bioassay Criteria	N/A	N/A
SCO	Human Health Protection for Individual Chemicals (1×10^{-6})	N/A	3	32
SCO	Upper-Trophic-Level Wildlife Protection[1]	N/A	N/A	N/A
	Site-Specific SCO	**SCO Bioassay Criteria**	**5**	**32**
CSL	South Puget Sound Regional Background (Ecology 2018a)	N/A	19	78
CSL	Human Health Protection for Multiple Chemicals (1×10^{-5})	N/A	20	76
	Site-Specific CSL	**CSL Bioassay Criteria**	**20**	**78**
	Current Shelton Harbor Intertidal SWAC (Section 5)	N/A	29	153
	Site-Specific SCL	**SCO Bioassay Criteria**[2]	**20**[3]	**78**[3]

Notes:

1. A specific cleanup level for upper-trophic-level wildlife protection is not applicable, as discussed in Section 6.2.2.
2. Sample-specific point of compliance is the top 10 cm.
3. SWAC-based point of compliance is the top 10 cm.

μg/kg: micrograms per kilogram
cm: centimeter
cPAH: carcinogenic polycyclic aromatic hydrocarbon
CSL: cleanup screening level
dioxin/furan: polychlorinated dibenzo-*p* -dioxin and furan congener
N/A: not applicable
ng/kg: nanograms per kilogram
SCL: sediment cleanup level
SCO: sediment cleanup objective
SWAC: surface-weighted average concentration
TEQ: toxicity equivalence

Figures

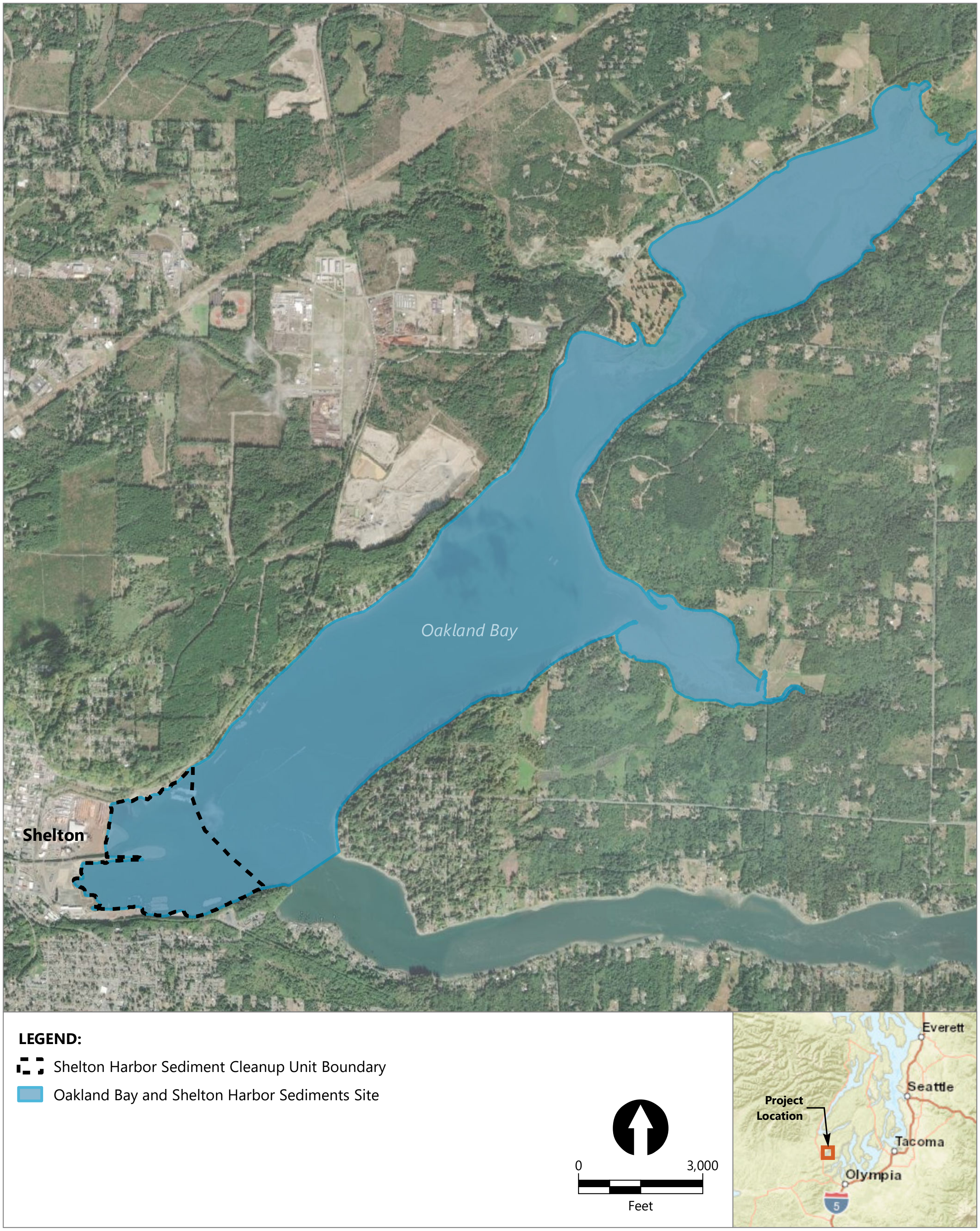

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Figure 1-1
Oakland Bay and Shelton Harbor Sediments Site
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

NOTE:
1. Background orthoimagery provided by Google Earth.

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Figure 1-2
Shelton Harbor Bathymetry, SMAs, and Constructed Habitat Lobes
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

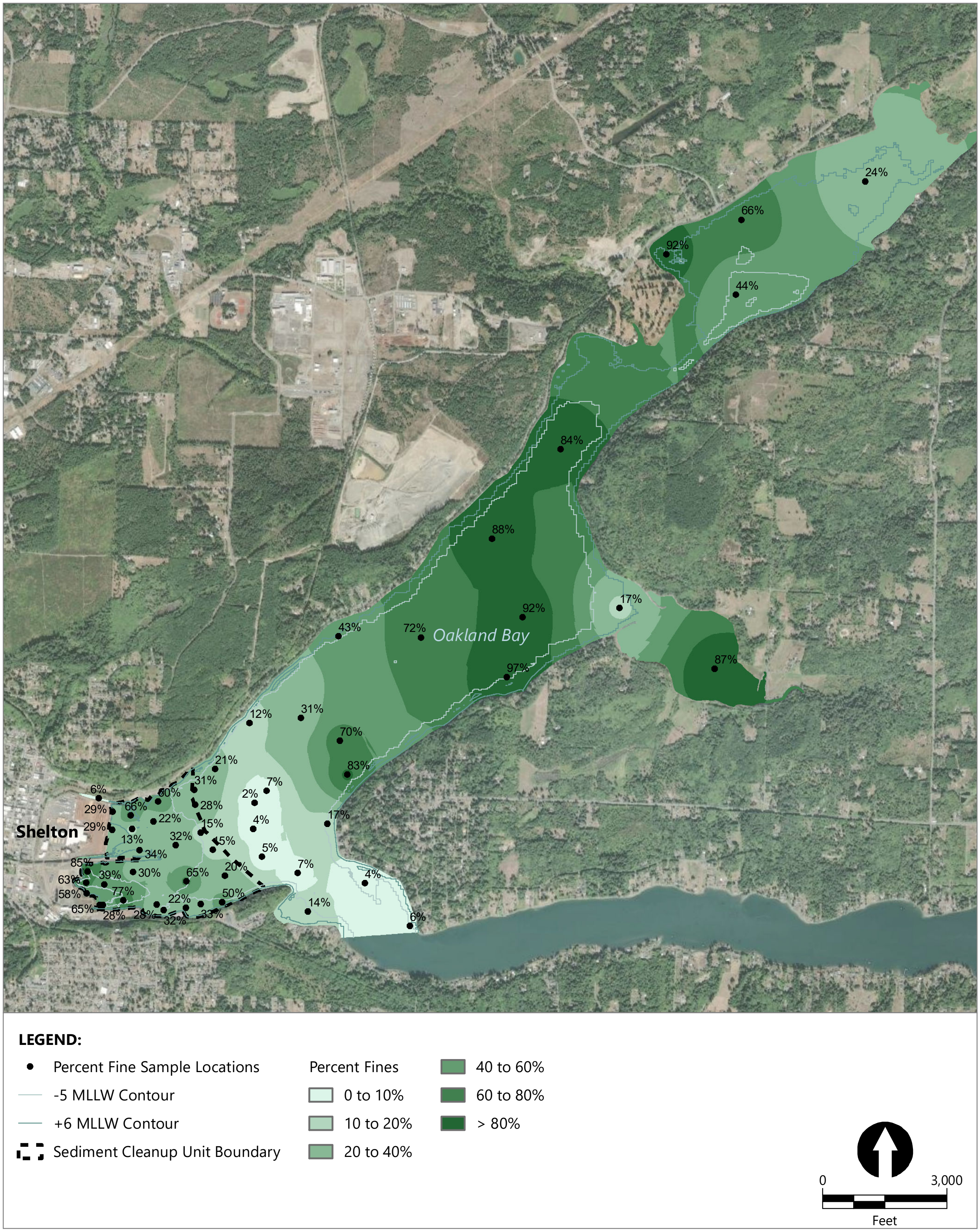

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Figure 2-1
Oakland Bay Sediment Percent Fines
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

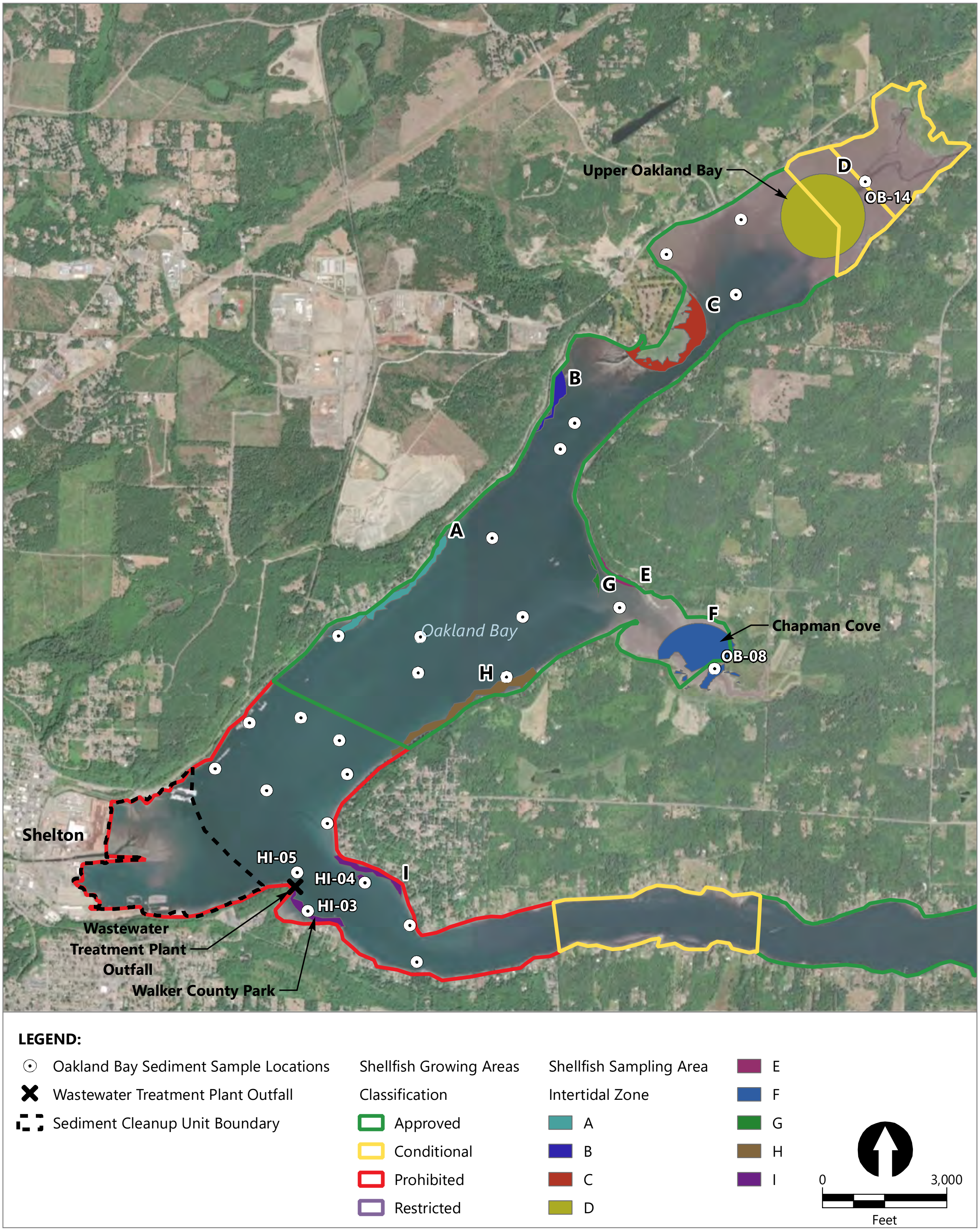

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Figure 2-2
Oakland Bay Shellfish Growing Areas and Tissue Sampling Locations
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

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Figure 2-3
Shelton Harbor Aerial Photograph: 1951
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

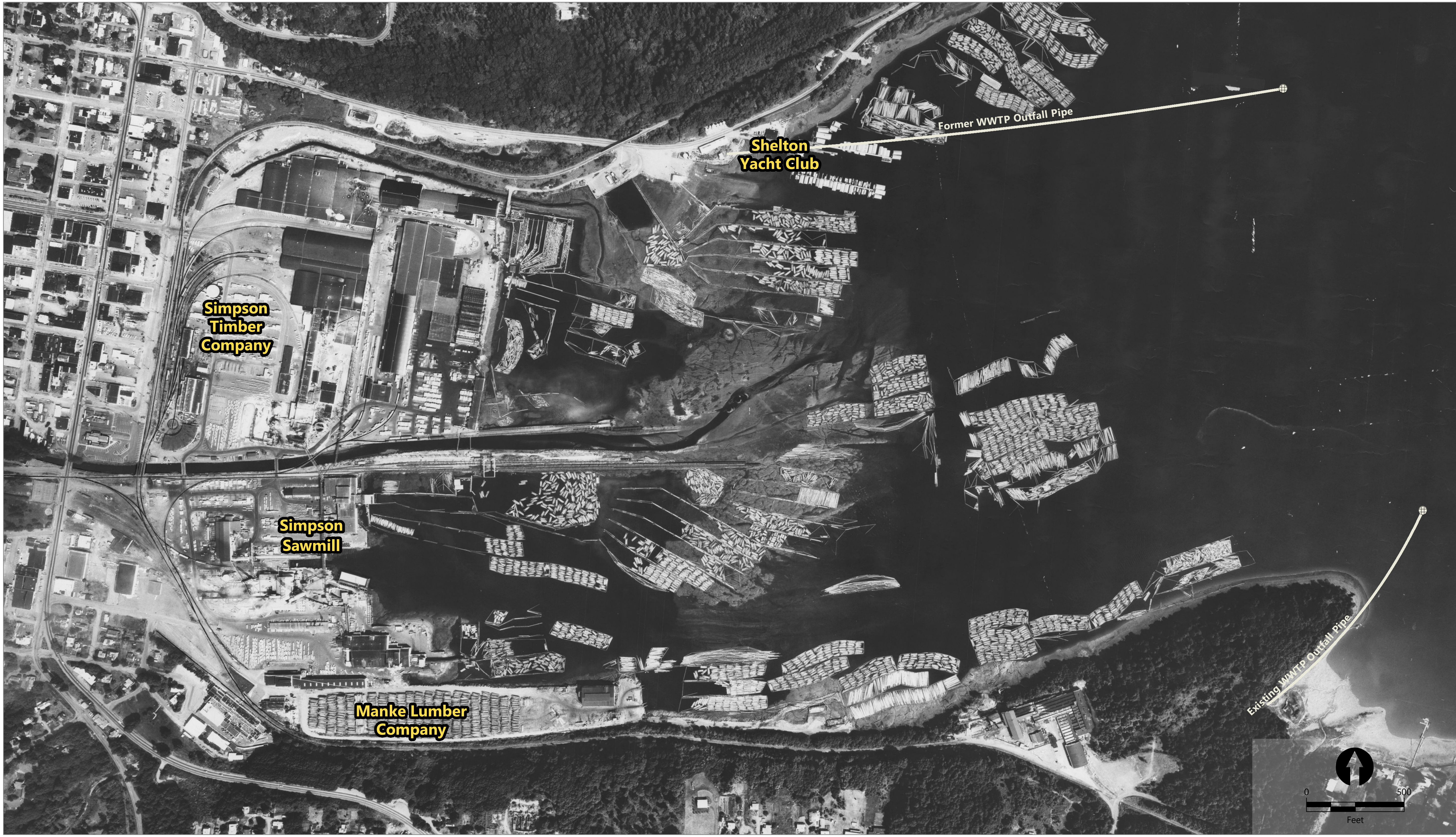

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Figure 2-4
Shelton Harbor Aerial Photograph: 1975
Remedial Investigation
Oakland Bay and Shelton Harbor Sediments Cleanup Site

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Figure 2-5
Shelton Harbor Aerial Photograph: 1990
Remedial Investigation
Oakland Bay and Shelton Harbor Sediments Cleanup Site

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Figure 2-6
Shelton Harbor Aerial Photograph: 2006
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

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Figure 2-7
Shelton Harbor Aerial Photograph: 2020
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

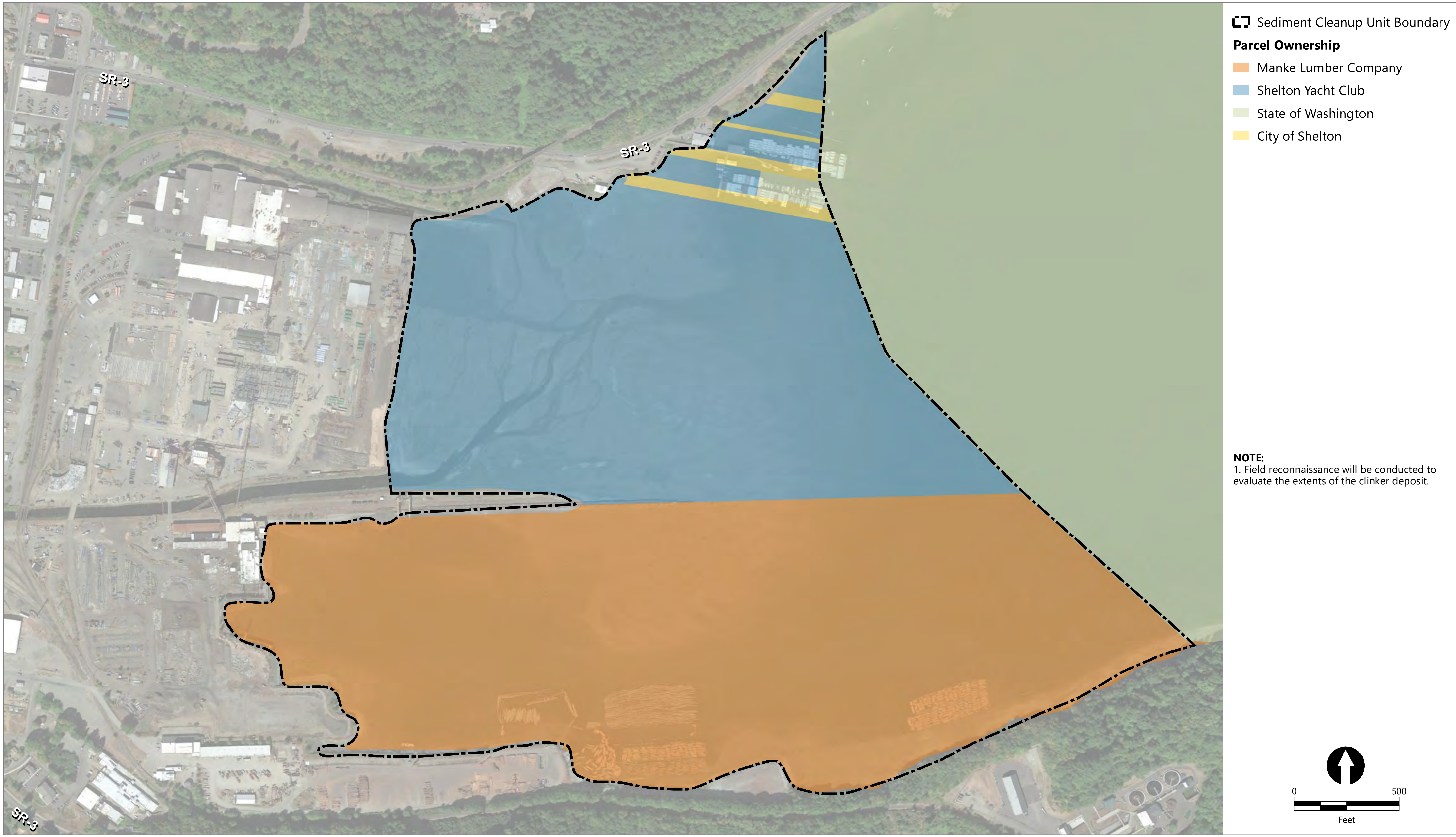

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Figure 2-8
Current Shelton Harbor Aquatic Land Ownership
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

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Figure 3-1
Shelton Harbor Sediment Sampling Locations: 2008 to 2020
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

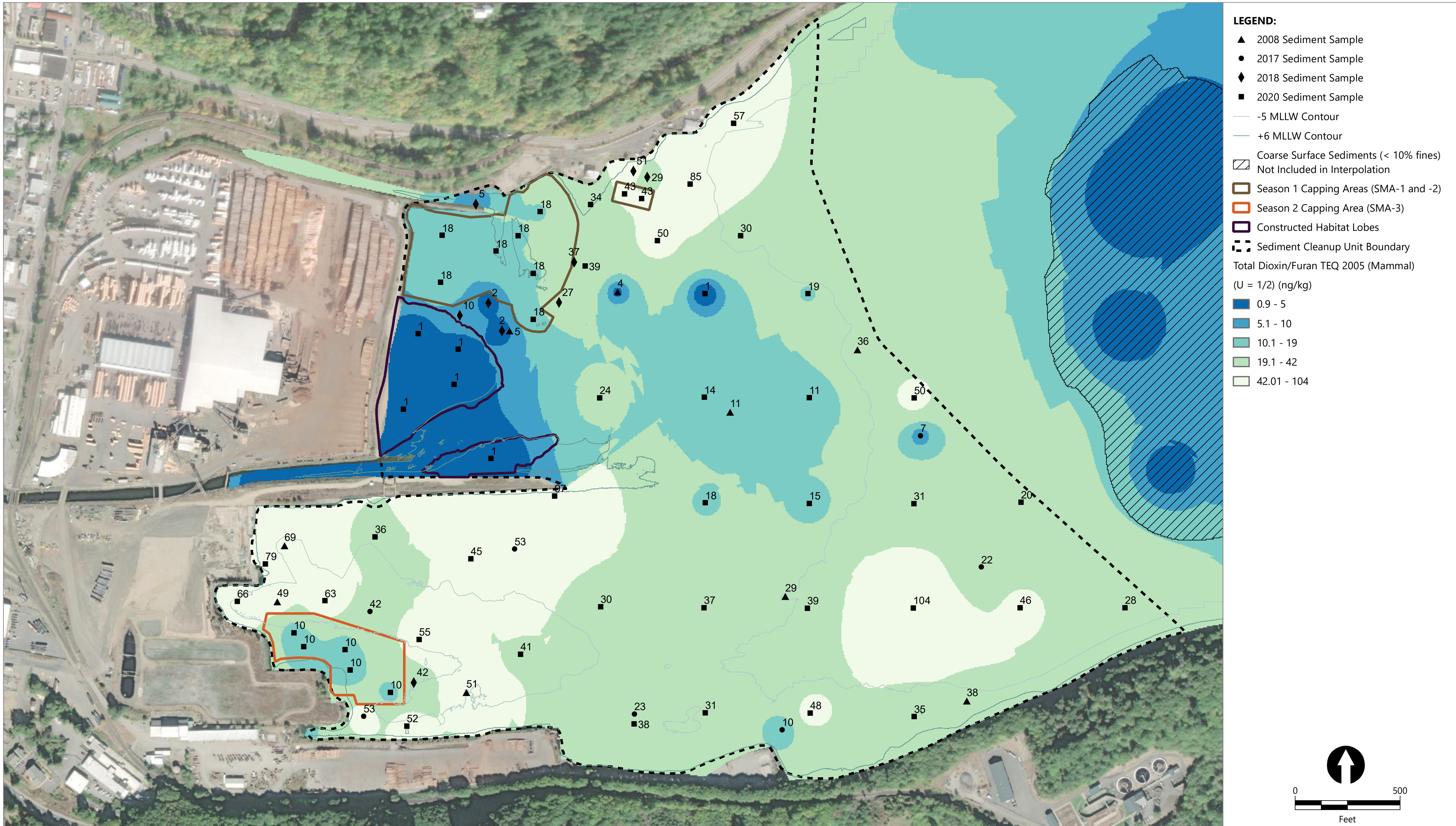

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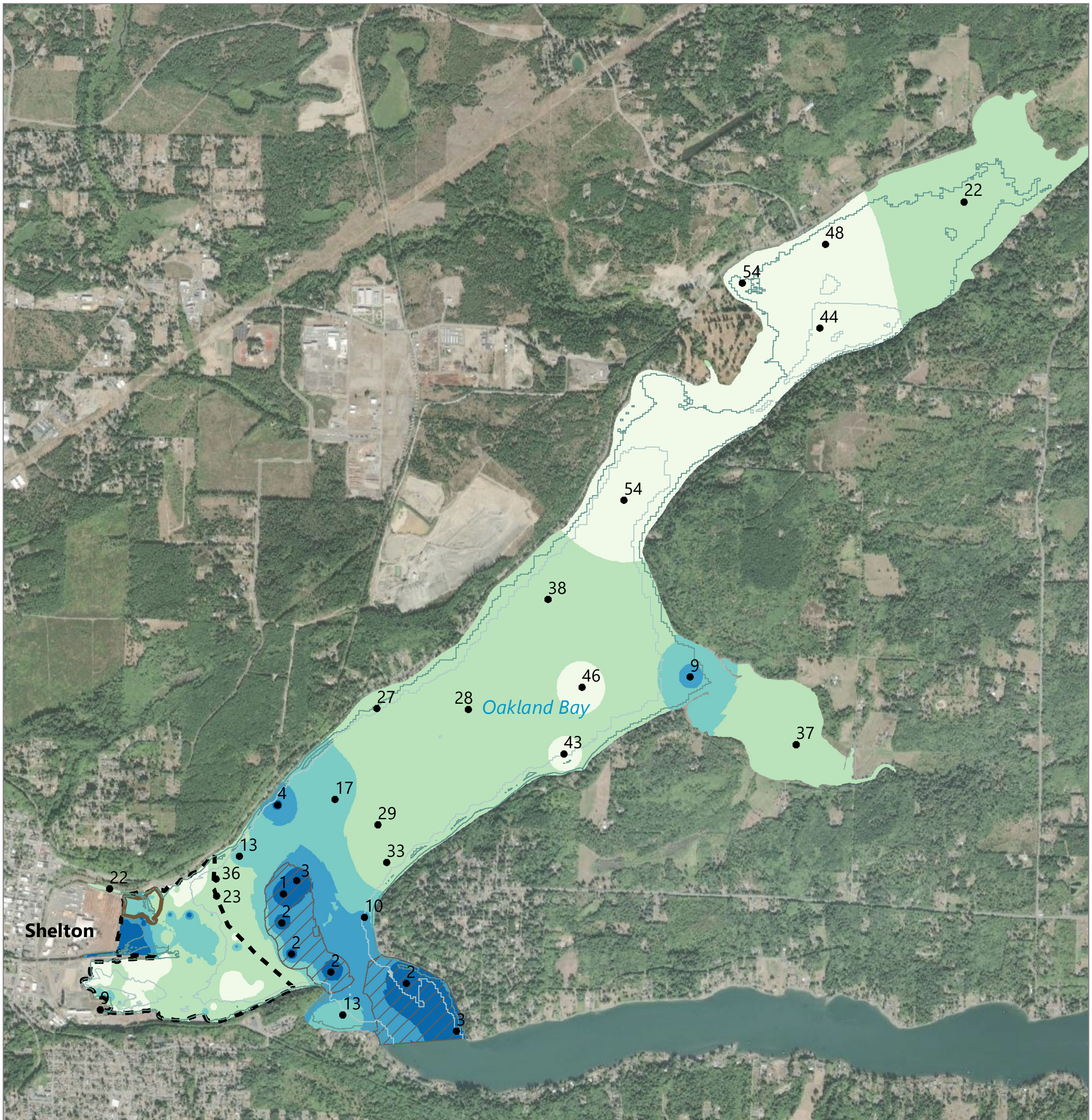
Figure 5-1
Shelton Harbor Surface Sediment Dioxin/Furan TEQ
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit



LEGEND:

- Sediment Sample Locations
- -5 MLLW Contour
- +6 MLLW Contour
- Sediment Cleanup Unit Boundary
- Coarse Surface Sediments (< 10% fines) Not Included in Interpolation

Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2) (ng/kg)

- 0.9 - 5
- 5.1 - 10
- 10.1 - 19
- 19.1 - 42
- 42.01 - 104

0 3,000
Feet

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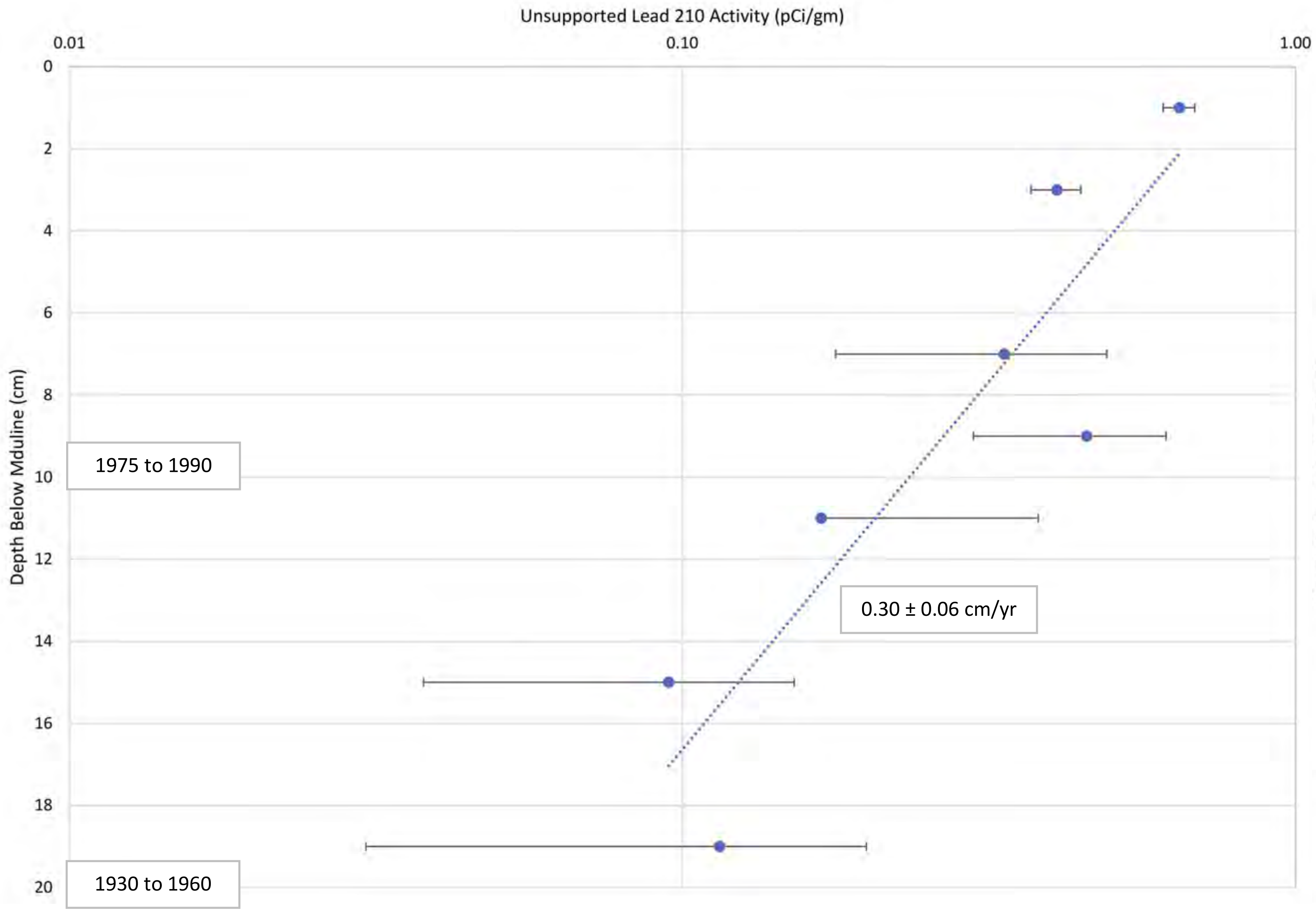
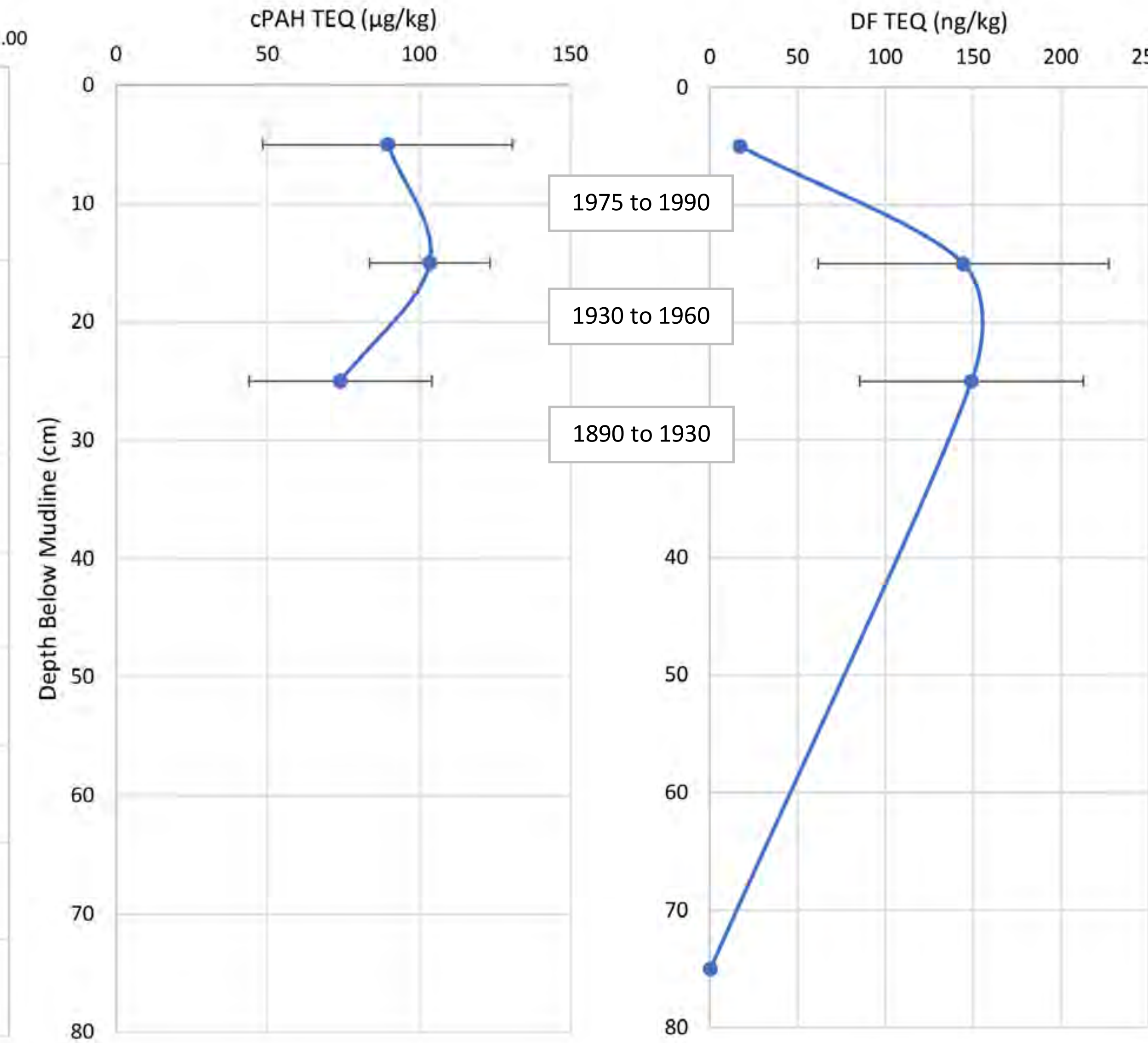
Figure 5-2
Oakland Bay Surface Sediment Dioxin/Furan TEQ
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

Shelton Harbor Average Unsupported Lead 210 Activity



Shelton Harbor Subsurface Sediment Concentration Profile



Notes:

1. Profiles depict the standard error of the mean.
2. cPAH TEQ and dioxin/furan TEQ profiles include locations SH14, SH19, and SH22.

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Figure 5-3
Shelton Harbor Subsurface Sediment Lead-210 and CoC Profiles

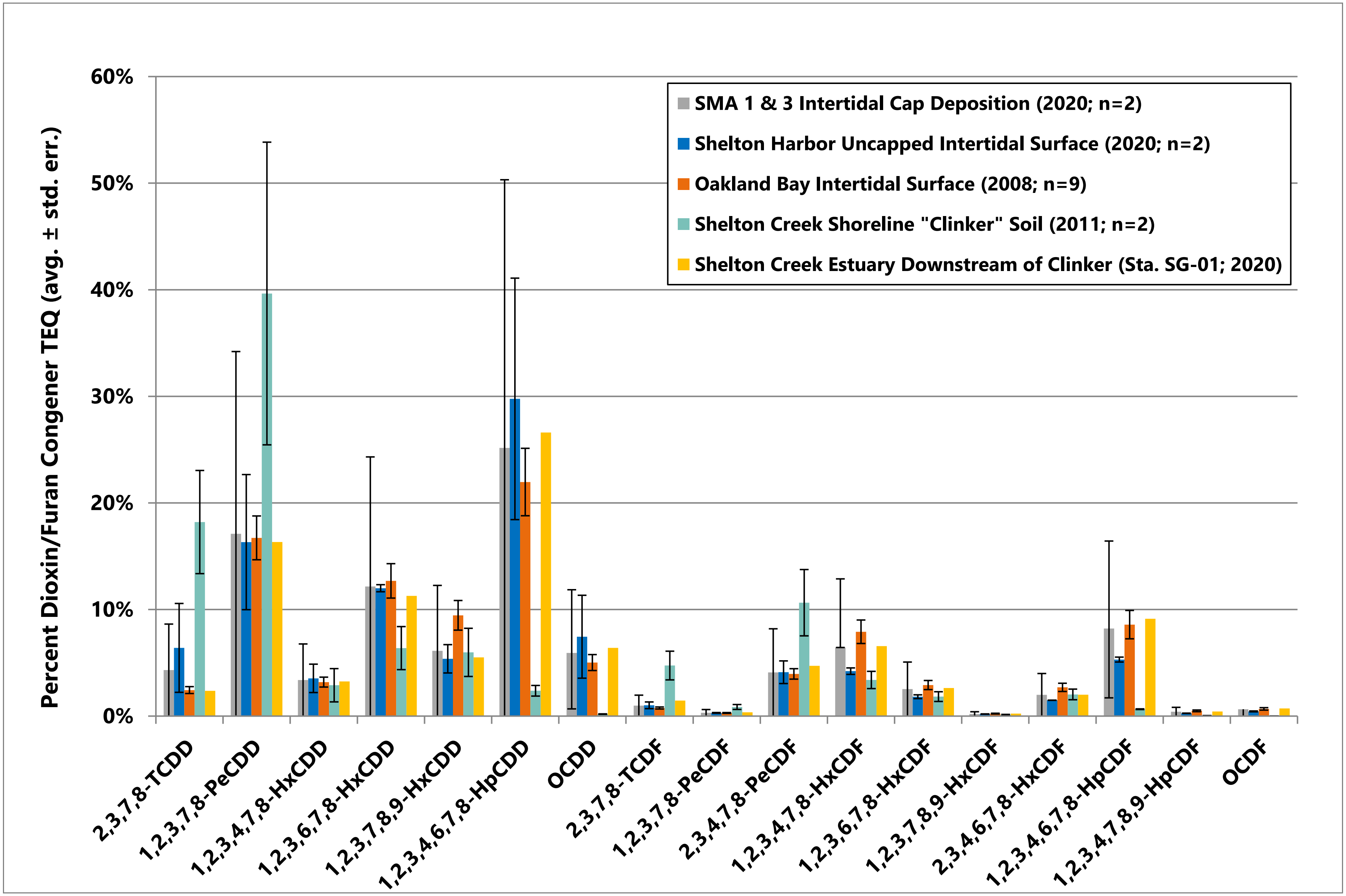

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Figure 5-4
Oakland Bay and Shelton Harbor Intertidal Sediment Dioxin/Furan Fingerprints

Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

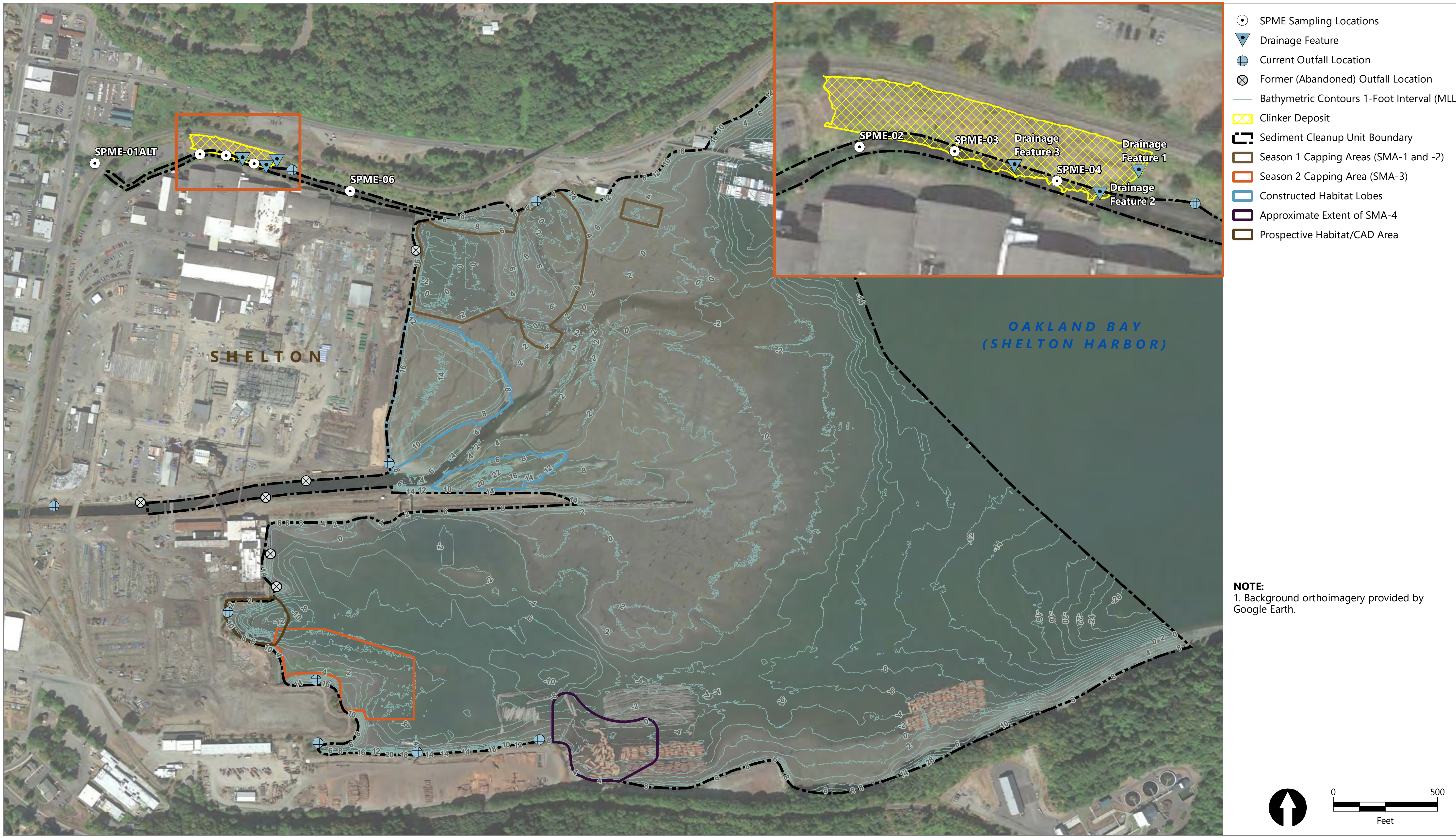

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Figure 5-5
Shelton Harbor Current and Historical Surface Water Discharge Pathways
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

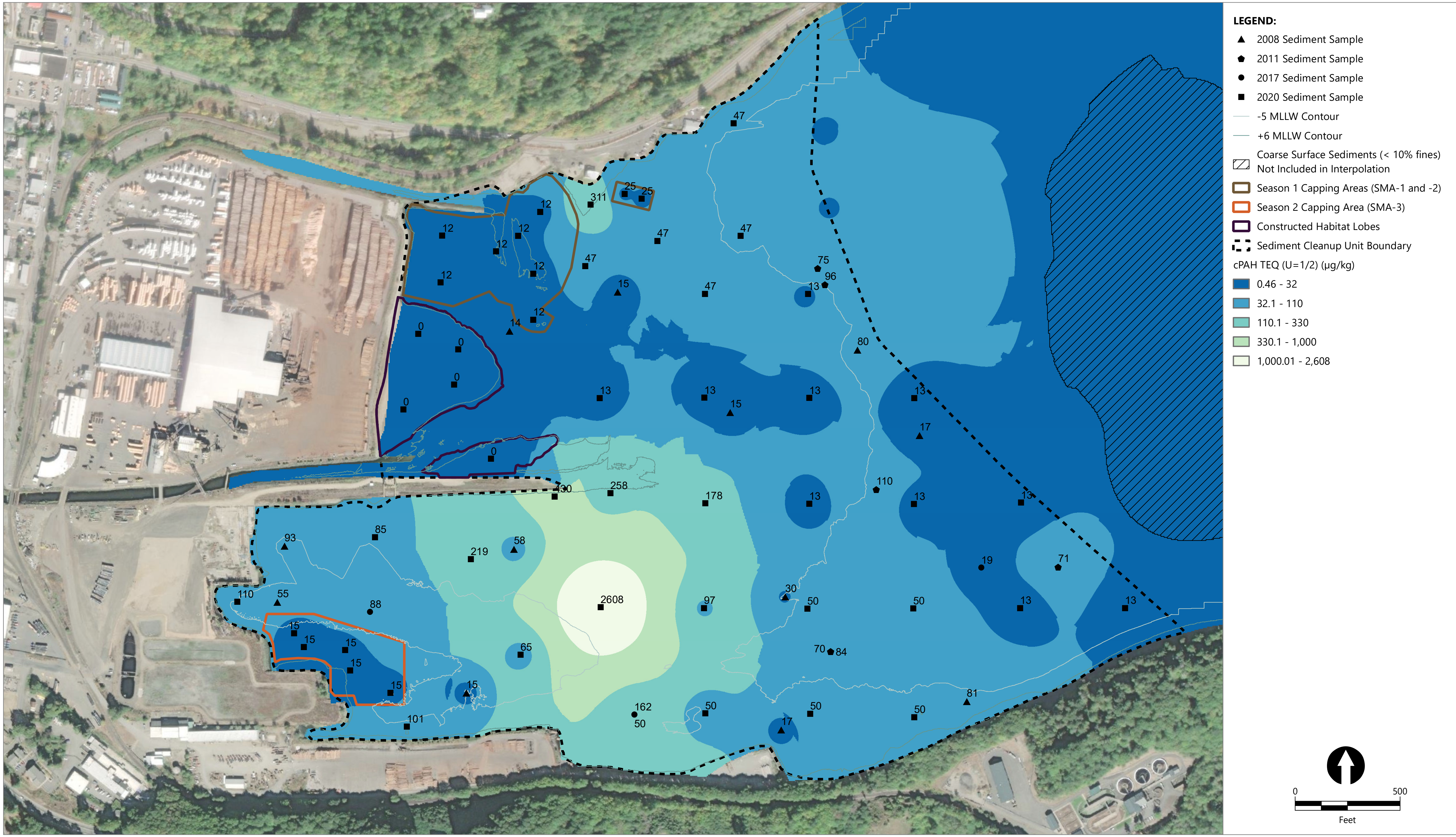

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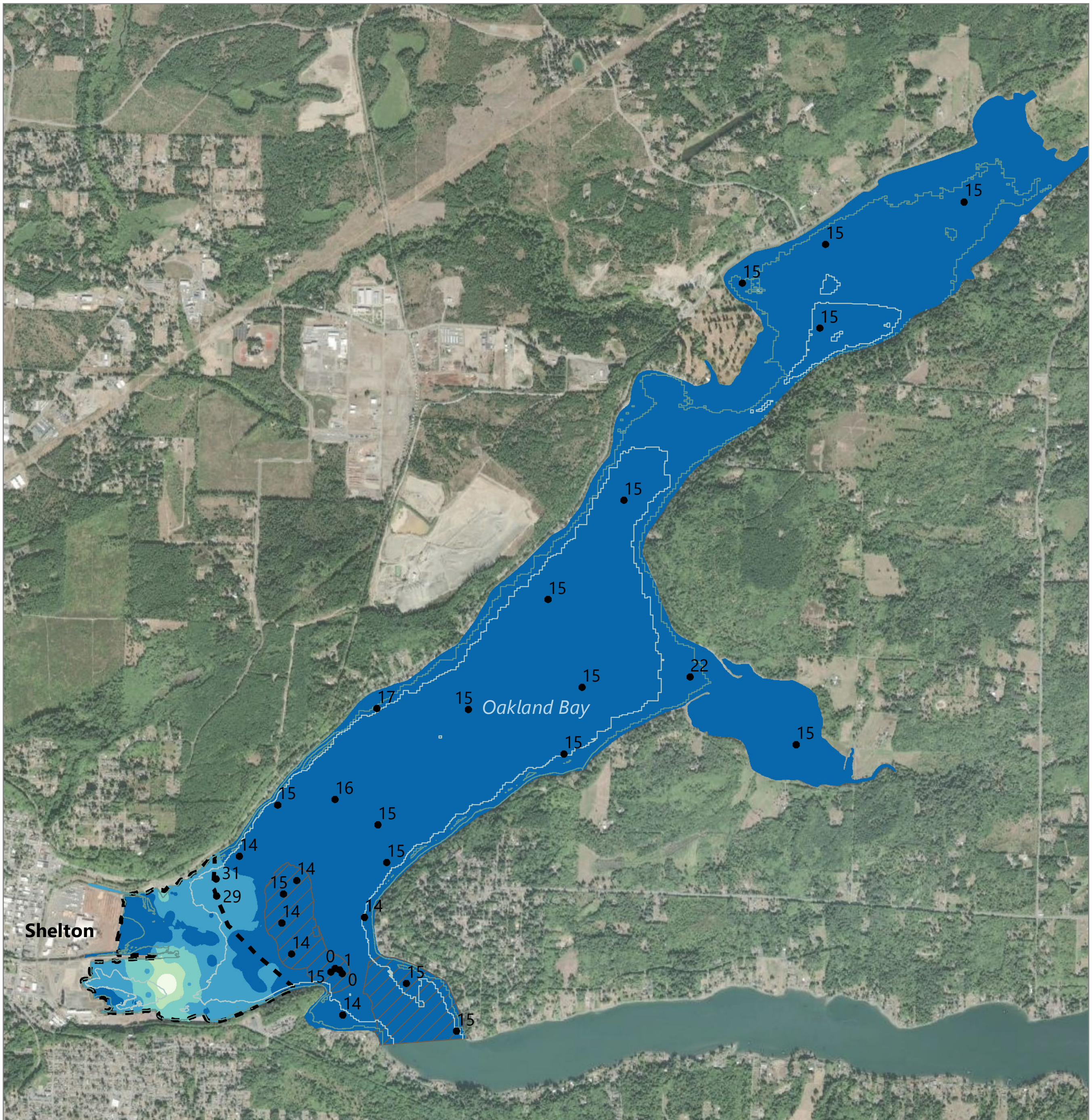
Figure 5-6
Shelton Harbor Surface Sediment cPAH TEQ
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit



LEGEND:

- Sediment Sample Locations
- -5 MLLW Contour
- +6 MLLW Contour
- Sediment Cleanup Unit Boundary
- Coarse Surface Sediments (< 10% fines) Not Included in Interpolation

cPAH TEQ (U=1/2) (µg/kg)

- 0.46 - 32
- 32.1 - 110
- 110.1 - 330
- 330.1 - 1,000
- 1,000.01 - 2,608

0 3,000
Feet

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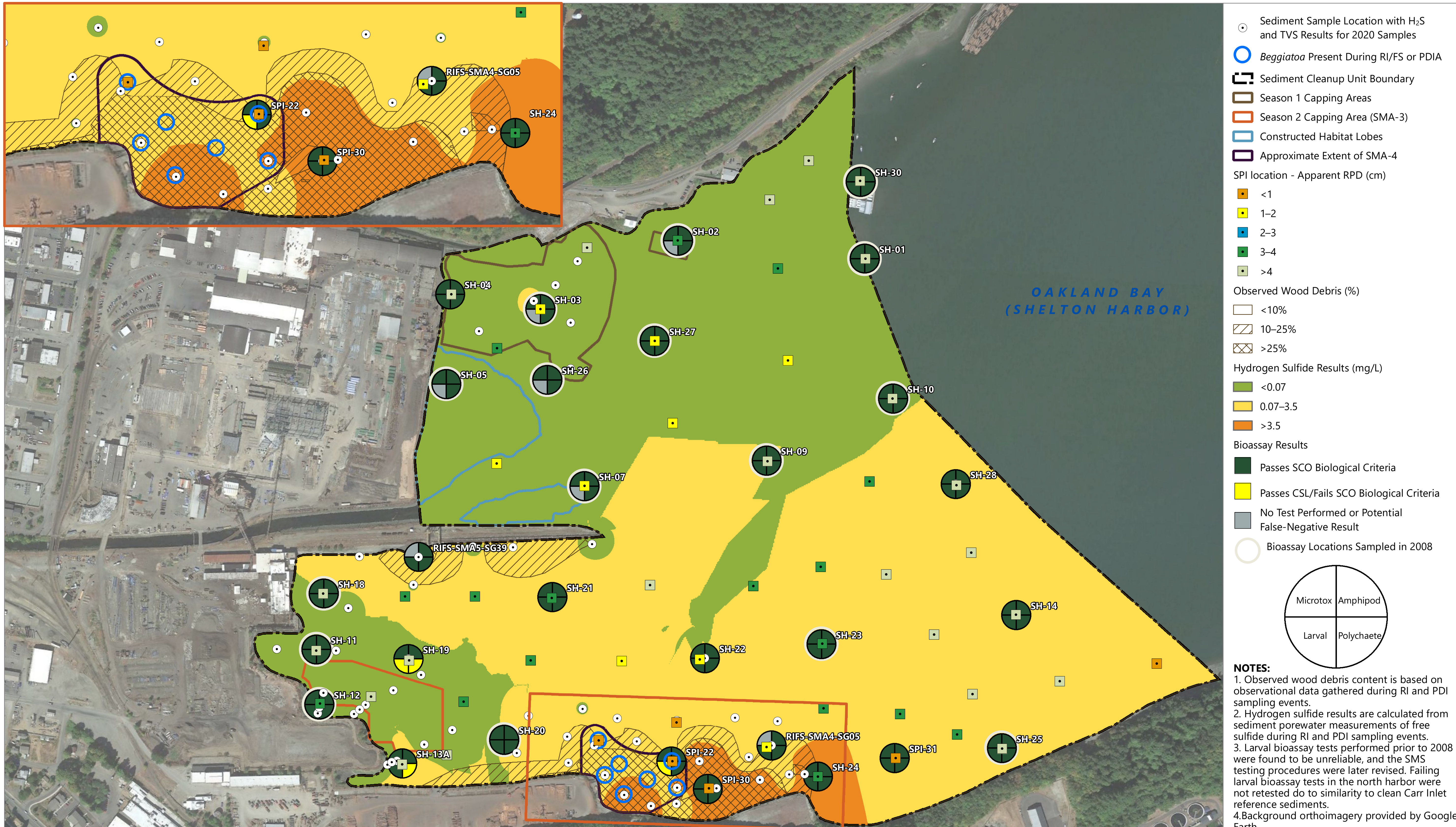
Figure 5-7
Oakland Bay Surface Sediment cPAH TEQ
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit



NOTES:
1. Observed wood debris content is based on observational data gathered during RI and PDI sampling events.
2. Hydrogen sulfide results are calculated from sediment porewater measurements of free sulfide during RI and PDI sampling events.
3. Larval bioassay tests performed prior to 2008 were found to be unreliable, and the SMS testing procedures were later revised. Failing larval bioassay tests in the north harbor were not retested do to similarity to clean Carr Inlet reference sediments.
4.Background orthoimagery provided by Google Earth.

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ANCHOR QEA

0 500
Feet

Figure 5-8
Shelton Harbor Surface Sediment Toxicity/Wood Debris Degradation Indicators
Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

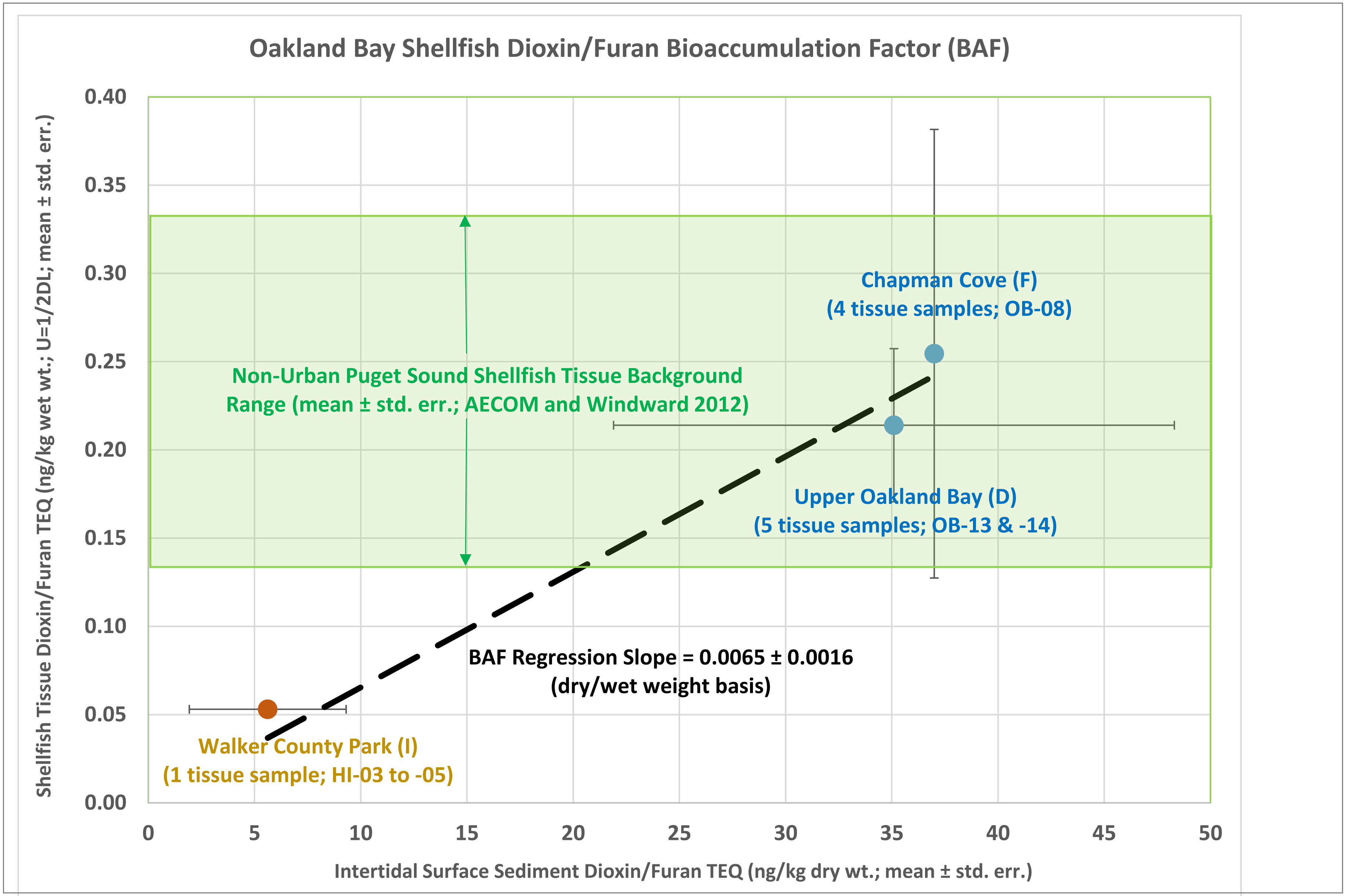

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Figure 6-1
Oakland Bay Shellfish Dioxin/Furan Bioaccumulation Factor

Remedial Investigation
Shelton Harbor Sediment Cleanup Unit

APPENDIX A

Ecology 2008 Oakland Bay Study Chemical Data

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																	
				SH-01-SS-00	SH-01-SC-12	SH-02-SS-00	SH-02-SC-12	SH-02-SC-23	SH-03-SS-00	SH-04-SS-00 [d]	SH-04-SC-12 [d]	SH-04-SC-23	SH-05-SS-00	SH-05-SC-12 [d]	SH-07-SS-00	SH-07-SC-12	SH-08-SC-12	SH-09-SS-00	SH-09-SC-12	SH-09-SC-23	SH-10-SS-00
	LAET	SQS	CSL	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm
Conventional Parameters																					
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	27.8	47.9	59.7	57.4		66.2	76	74.4		29	2.3	34.2	28.9	30.2	32.4	21.7		15
Particle/Grain Size, Phi Scale <-1	---	---	---	0.4	1.0	2.0	7.4		2.5	1.5	2.3		36.3	49.4	1	8.3	1.3	0.5	17		0.1
Particle/Grain Size, Phi Scale >10	---	---	---	5.4	8.4	7.6	10.1		8.8	10.8	12.8		4		4.1	3.8	3.7	4.8	3.3		2.2
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	0.8	1.2	2.2	4.6		2.1	3.2	4.8		3.1	13.6	1	11.4	6.2	5	8.5		5
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	0.6	1.0	2.6	4.0		2.9	3.0	4.1		5.7	10.8	1.6	5.6	4.3	1.9	6.3		0.3
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	2.0	1.7	3.3	7.9		4.1	4.3	4.1		4.6	21	3.4	17.2	11.8	19	16.9		14.8
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	19.1	13.8	6.6	8.3		7.3	4.6	4.8		10.4	2.7	27.1	13.6	22.9	25.3	18.8		38.7
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	49.4	33.4	23.6	10.5		14.8	7.4	5.5		11	0.3	31.7	15	23.3	15.8	10.7		26.2
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	10	11.7	20	8.1		14.9	10.9	10.2		5.8		13.1	10	11.1	9.6	8.4		8.4
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	2.9	6.7	10.5	9.8		14.6	19.1	12		6		6.2	4.3	4.9	6.1	2.9		2.1
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	2.7	5.7	7.2	8.4		12.9	12.8	12		5.2		3.8	3.2	3.7	2.6	2.1		0.8
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	2.1	5.2	5.2	7.9		4.9	10.5	10.3		2.4		2.8	2.9	2.6	3.6	1.9		0.5
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	2.4	5.3	4.6	6.7		5.2	6.2	8.6		2.8		2.1	2.4	2.3	2.5	1.8		0.4
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	2.4	4.7	4.5	6.3		5.0	5.8	8.4		2.8		2	2.2	2	3.2	1.4		0.6
Total Volatile Solids %	---	---	---																		
Ammonia (mg/kg)	---	---	---	12.9	46.3	14.8	42.5		11.2	14.8	65.8		6.33	0.03 U	8.21	6.47	21.3	7.91	2.91		9.69
Sulfide	---	---	---	283	91	548	152		155	550	461		391	36.1	158	109	433	192	192		159
Total organic carbon (%)	---	---	---	1.59	1.58	2.46	1.35		3.8	4.13	5.82		3.2	1.45	1.59	0.232	1.28	2.17	2.09		2.03
Total solids (%)	---	---	---	58.7	59.4	44.4	50.6		45.4	34.4	33.2		51.9	90.6	56.3	65.9	64.2	59.4	70.7		59.8
Metals (mg/kg dry weight)																					
Antimony	150	---	---	0.22 J	0.22 J	0.33 J	0.22 J		0.4 J	0.35 J	0.28 J		0.2 J	0.074 J	0.19 J	0.22 J	0.17 J	0.14 J	0.19 J		0.18 J
Arsenic	57	57	93	5.5	4.7	8.2	4.6		7.3	6	4.1		3.7	1.5	3.4	3.8	2.8	3.5	3.6		4.6
Cadmium	5.1	5.1	6.7	0.72	0.75	1	0.74		0.66	0.87	0.98		0.29 J	0.25	0.25 J	0.33	0.21 J	0.35	0.39		0.53
Chromium	260	260	270	35	39	51	40		52	45	35		33	43	46	45	39	40	47		36
Copper	390	390	390	28	25	55	35		51	49	41		38	44	53	50	48	42	50		33
Lead	450	450	530	7.4	4	16	15		22	14	21		6	2.2	5.6	8.7	5.9	6.2	6.4		5.9
Mercury	0.41	0.41	0.59	0.068	0.034	0.092	0.184 U		0.1	0.066	0.092		0.029 J	0.0064 U	0.029 J	0.047	0.112 U	0.027 J	0.029		0.039
Nickel	140	---	---	33	35	42	33		41	36	27		28	34	41	40	38	36	42		34
Silver	6.1	6.1	6.1	0.09 J	0.067 J	0.22 J	0.098 J		0.2 J	0.16 J	0.2 J		0.067 J	0.045 J	0.07 J	0.094 J	0.065 J	0.079 J	0.082 J		0.079 J
Zinc	410	410	960	65	45	100	57		91	88	76		53	44	58	62	55	61	63		59
Butyltins (ug/kg dry weight)																					
Butyltin Ion	---	---	---	3.9 U	1.5 U	8.0	3.9 U														
Dibutyltin Ion	---	---	---	3.0 U	3.6 U	30	3.0 U														
Tributyltin Ion	---	---	---	1.7 U	2.8 U	13	1.7 U														
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																					
LPAHs																					
2-Methylnaphthalene (dry)	670	---	---	8.0 U	8.0 U	8.1 U	8.1 U		8 U	8.1 U	8.2 U		8.1 U	8.0 U	8.1 U	8.0 U	8.0 U	7.9 U	7.9 U		8.1 U
2-Methylnaphthalene (OC)	---	38	64	0.50 U	0.51 U	0.33 U	0.60 U		0.21 U	0.20 U	0.14 U		0.25 U	0.55 U	0.51 U	3.4 U	0.63 U	0.36 U	0.4 U		0.40 U
Acenaphthene (dry)	500	---	---	8 U	8.1 U	13 J	8.1 U		8.1 U	8.2 U	14 J		8.1 U	8.1 U	8.1 U	8.0 U	8 U	8.0 U	7.9 U		8.1 U
Acenaphthene (OC)	---	16	57	0.50 U	0.51 U	0.53 J	0.60 U		0.21 U	0.20 U	0.24 J		0.25 U	0.56 U	0.51 U	3.4 U	0.63 U	0.37 U	0.4 U		0.4 U
Acenaphthylene (dry)	560	---	---	8.4 U	8.5 U	32	8.5 U		8.5 U	8.6 U	12 J		8.6 U	8.5 U	8.5 U	8.4 U	8.4 U	8.4 U	8.4 U		8.5 U
Acenaphthylene (OC)	---	66	66	0.53 U	0.54 U	1.3	0.63 U		0.22 U	0.21 U	0.21 J		0.27 U	0.59 U	0.53 U	3.6 U	0.66 U	0.39 U	0.4 U		0.42 U
Anthracene (dry)	960	---	---	7.5 U	7.6 U	130	7.6 U		7.6 U	7.7 U	42		7.7 U	7.6 U	7.6 U	7.5 U	7.5 U	7.5 U	7.5 U		14 J
Anthracene (OC)	---	220	1,200	0.47 U	0.48 U	5.3	0.56 U		0.20 U	0.19 U	0.72		0.24 U	0.52 U	0.48 U	3.2 U	0.6 U	0.35 U	0.4 U		0.7 J
Fluorene (dry)	540	---	---	8.7 U	8.8 U	48	8.8 U		8.8 U	8.9 U	13 J		8.9 U	8.8 U	8.8 U	8.7 U	8.7 U	8.7 U	8.6 U		8.8 U
Fluorene (OC)	---	23	79	0.55 U	0.56 U	2.0	0.65 U		0.23 U	0.22 U	0.22 J		0.28 U	0.61 U	0.55 U	3.8 U	0.68 U	0.40 U	0.4 U		0.43 U
Naphthalene (dry)	2,100	---	---	30	8.5 U	13 J	8.6 U		8.5 U	8.6 U	8.6 U		8.6 U	8.5 U	8.6 U	8.5 U	8.5 U	8.4 U	8.4 U		8.6 U
Naphthalene (OC)	---	99	170	1.9	0.5 U	0.53 J	0.64 U		0.22 U	0.21 U	0.15 U		0.27 U	0.59 U	0.54 U	3.7 U	0.66 U	0.4 U	0.4 U		0.42 U
Phenanthrene (dry)	1500	---	---	29	8.2 U	380	26		49	8.3 U	160		27	14 J	8.3 U	24	28	8.1 U	16 J		22
Phenanthrene (OC)	---	100	480	1.8	0.5 U	15	1.9		1.3	0.20 U	2.7		0.84	1.0 J	0.52 U	10	2.2	0.4 U	0.8 J		1.1
Total LPAHs (dry) [c]	5200	---	---	59	20 U	620	26		49	20 U	240		27	14 J	20 U	24	28	19 U	16 J		36
Total LPAHs (OC) [c]	---	370	780	3.7	1.3 U	25	1.9		1.3	0.48 U	4.1		0.84	0.97 J	1.3 U	10	2.2	0.88 U	0.77 J		1.8
HPAHs																					
Benzo(a)anthracene (dry)	1,300	---	---	18 J	5.8 U	170	26		88	42	71		58	10 J	5.8 U	35	50	5.7 U	23		70
Benzo(a)anthracene (OC)	---	110	270	1.1 J	0.37 U	6.9	1.9		2.3	1.0	1.2		1.8	0.69 J	0.36 U	15	3.9	0.26 U	1.1		3.4
Benzo(a)pyrene (dry)	1,600	---	---	21	8 U	180	29		200	64	220		69	15 J	8.1 U	54	43	7.9 U	28		53
Benzo(a)pyrene (OC)	---	99	210	1.3	0.51 U	7.3	2.1		5.3	1.5	3.8		2.2	1.0 J	0.51 U	23	3.4	0.36 U	1.3		2.6
Benzo(b)fluoranthene (dry)	---	---	---	23	9.3 U	130	28		70	40	100		58	9.3 U	12 J	26	45	9.2 U	20		93
Benzo(b)fluoranthene (OC)	---	---	---	1.4	0.59 U	5.3	2.1		1.8	1.0	1.7		1.8	0.64 U	0.8 J	11	3.5	0.42 U	1.0		4.6
Benzo(g,h,i)perylene (dry)	670	---	---	20	6.6 U	66	6.7 U		82	29	80		35	16 J	6.7 U	51	6.6 U	6.6 U	11 J		28
Benzo(g,h,i)perylene (OC)	---	31	78	1.3	0.42 U	2.7	0.50 U		2.2	0.70	1.4		1.1	1.1 J	0.42 U	22	0.52 U	0.30 U	0.53 J		1.4
Benzo(k)fluoranthene (dry)	---	---	---	16 J	9.1 U	130	31		96	29	120		38	9.1 U	10 J	26	42	9 U	33		63
Benzo(k)fluoranthene (OC)	---	---	---	1.0 J	0.58 U	5.3	2.3		2.5	0.70	2.1		1.2	0.63 U	0.63 J	11	3.3	0.41 U	1.6		3.1
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---	39	20 U	260	59		170	69	220		96	20 U	22 J	52	87	19 U	53		160
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450	2.4	1.3 U	11	4.4		4.5	1.7	3.8		3.0	1.4 U	1.4 J	22	6.8	0.88 U	2.5		7.9
Chrysene (dry)	1,400	---	---	34	6.5 U	200	38		160	76	220		130	19 J	11 J	67	82	26	37		140
Chrysene (OC)	---	110	460	2.1	0.41 U	8.1	2.8		4.2	1.8	3.8		4.1	1.3 J	0.69 J	29	6.4	1.2	1.8		6.9
Dibenz(a,h)anthracene (dry)	230	---	---	8.3 U	8.4 U	14 J	8.4 U		8.4 U	8.5 U	8.5 U		8.5 U	8.4 U	8.4 U	8.3 U	8.3 U	8.3 U	8.3 U		11 J
Dibenz(a,h)anthracene (OC)	---	12	33	0.52 U	0.53 U	0.57 J	0.62 U		0.22 U	0.21 U	0.15 U		0.27 U	0.58 U	0.53 U	3.6 U	0.65 U	0.38 U	0.40 U		0.54 J
Fluoranthene (dry)	1,700	---	---	46	7.8 U	370	44		93	46	470		100	27	15 J	76	99	44	48		170
Fluoranthene (OC)	---	160	1,200	2.9	0.49 U	15.0	3.3		2.4	1.1	8.1		3.1	1.9	0.94 J	33	7.7	2.0	2.3		8.4
Indeno(1,2,3-cd)pyrene (dry)	600	---	---	13 J	8.4 U	60	8.5 U		23	8.5 U	33		8.5 U	8.4 U	8.5 U	13 J	8.4 U	8.3 U	8.3 U		24
Indeno(1,2,3-cd)pyrene (OC)	---	34	88	0.82 J	0.53 U	2.4	0.63 U		0.61	0.21 U	0.57		0.27 U	0.58 U	0.53 U	5.6 J	0.66 U	0.38 U	0.40 U		1.2
Pyrene (dry)	2,600	---	---	56	21	370	54		140	61	190		140	28	11 J	76	130	42	92		160
Pyrene (OC)	---	1,000	1,400	3.5	1.3	15	4.0		3.7	1.5	3.3		4.4	1.9	0.69 J	33	10	1.9	4.4		7.9
Total HPAHs (dry) [c]	12,000	---	---	250	21	1,500	250		960	390	1500		630	120	59 J	420	490	110	290		820
Total HPAHs (OC) [c]	---	960	5,300	16	1.3	61	19		25	9.4	26		20	8.3	3.7 J	180	38	5.1	14		40

Parameter	Freshwater Sediment Apparent Effects Threshold[a] LAET	Marine Sediment Management Standard[b] SQS	CSL	Shelton Harbor SH-01-SS-00 0 to 10 cm	SH-01-SC-12 1 to 2 ft	SH-02-SS-00 0 to 10 cm	SH-02-SC-12 1 to 2 ft	SH-02-SC-23 2 to 3 ft	SH-03-SS-00 0 to 10 cm	SH-04-SS-00 [d] 0 to 10 cm	SH-04-SC-12 [d] 1 to 2 ft	SH-04-SC-23 2 to 3 ft	SH-05-SS-00 0 to 10 cm	SH-05-SC-12 [d] 1 to 2 ft	SH-07-SS-00 0 to 10 cm	SH-07-SC-12 1 to 2 ft	SH-08-SC-12 1 to 2 ft	SH-09-SS-00 0 to 10 cm	SH-09-SC-12 1 to 2 ft	SH-09-SC-23 2 to 3 ft	SH-10-SS-00 0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																					
1,2,4-Trichlorobenzene (dry)	31	---	---	8.8 U	8.9 U	9 U	8.9 U		8.9 U	9 U	9.0 U		9.0 U	8.9 U	9.0 U	8.8 U	8.8 U	8.8 U	8.8 U		8.9 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8	0.55 U	0.56 U	0.37 U	0.66 U		0.23 U	0.22 U	0.15 U		0.28 U	0.61 U	0.57 U	3.8 U	0.69 U	0.41 U	0.42 U		0.44 U
1,2-Dichlorobenzene (dry)	35	---	---	7.7 U	7.7 U	7.8 U	7.8 U		7.7 U	7.8 U	7.8 U		7.8 U	7.7 U	7.8 U	7.7 U	7.7 U	7.6 U	7.6 U		7.8 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3	0.48 U	0.49 U	0.32 U	0.58 U		0.20 U	0.19 U	0.13 U		0.24 U	0.53 U	0.49 U	3.3 U	0.60 U	0.35 U	0.36 U		0.38 U
1,4-Dichlorobenzene (dry)	110	---	---	7.2 U	7.2 U	7.3 U	7.2 U		7.2 U	7.3 U	7.3 U		7.3 U	7.2 U	7.3 U	7.2 U	7.2 U	7.1 U	7.1 U		7.2 U
1,4-Dichlorobenzene (OC)	---	3.1	9	0.45 U	0.46 U	0.30 U	0.53 U		0.19 U	0.18 U	0.13 U		0.23 U	0.50 U	0.46 U	3.1 U	0.56 U	0.33 U	0.34 U		0.35 U
Phthalates (ug/kg dry weight or mg/kg OC)																					
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---	**20**	11 U	**37**	11 U		60 U	55 U	**82 J**		49 U	11 U	**24**	11 U	**45**	11 U	**27**		**65**
bis(2-Ethylhexyl)phthalate (OC)	---	47	78	**1.3**	0.70 U	**1.5**	0.81 U		1.6 U	1.3 U	**1.4 J**		1.5 U	0.76 U	**1.5**	4.7 U	**3.5**	0.51 U	**1.3**		**3.2**
Butylbenzylphthalate (dry)	63	---	---	11 U	11 U	11 U	11 U		**38**	11 U	11 U		11 U	11 U	11 U	11 U	11 U	11 U	11 U		11 U
Butylbenzylphthalate (OC)	---	4.9	64	0.69 U	0.70 U	0.45 U	0.81 U		**1.0**	0.27 U	0.19 U		0.34 U	0.76 U	0.69 U	4.7 U	0.86 U	0.51 U	0.53 U		0.54 U
Di-n-Butylphthalate (dry)	1400	---	---	12 U	12 U	12 U	12 U		12 U	12 U	12 U		12 U	12 U	12 U	12 U	12 U	12 U	12 U		12 U
Di-n-Butylphthalate (OC)	---	220	1,700	0.75 U	0.76 U	0.49 U	0.89 U		0.32 U	0.29 U	0.21 U		0.38 U	0.83 U	0.75 U	5.2 U	0.94 U	0.55 U	0.57 U		0.59 U
Di-n-Octyl phthalate (dry)	6200	---	---	8.1 U	8.2 U	8.3 U	8.2 U		8.2 U	8.3 U	8.3 U		8.3 U	8.2 U	8.2 U	8.1 U	8.1 U	8.1 U	8.0 U		8.2 U
Di-n-Octyl phthalate (OC)	---	58	4,500	0.51 U	0.52 U	0.34 U	0.61 U		0.22 U	0.20 U	0.14 U		0.26 U	0.57 U	0.52 U	3.5 U	0.63 U	0.37 U	0.38 U		0.40 U
Diethylphthalate (dry)	200	---	---	16 U	16 U	16 U	16 U		16 U	16 U	16 U		16 U	16 U	16 U	16 U	16 U	16 U	16 U		16 U
Diethylphthalate (OC)	---	61	110	1.0 U	1.0 U	0.65 U	1.2 U		0.42 U	0.39 U	0.27 U		0.50 U	1.1 U	1.0 U	6.9 U	1.3 U	0.74 U	0.77 U		0.79 U
Dimethylphthalate (dry)	71	---	---	7.6 U	7.6 U	7.7 U	7.6 U		7.6 U	7.7 U	7.7 U		7.7 U	7.6 U	7.7 U	7.6 U	7.6 U	7.5 U	7.5 U		7.6 U
Dimethylphthalate (OC)	---	53	53	0.48 U	0.48 U	0.31 U	0.56 U		0.20 U	0.19 U	0.1 U		0.24 U	0.52 U	0.48 U	3.3 U	0.59 U	0.35 U	0.36 U		0.37 U
Ionizable Organic Compounds (ug/kg dry weight)																					
2,4-Dimethylphenol	29	29	29	14 U	15 U	15 U	15 U		15 U	15 U	15 U		15 U	15 U	15 U	14 U	14 U	14 U	14 U		15 U
Benzoic Acid	650	650	650	110 U	110 U	110 U	110 U		110 U	110 U	110 U		110 U	110 U	110 U	110 U	110 U	110 U	110 U		110 U
Benzyl Alcohol	57	57	73	14 U	14 U	14 U	14 U		14 U	14 U	14 U		14 U	14 U	14 U	14 U	14 U	14 U	14 U		14 U
Pentachlorophenol	360	360	690	46 U	47 U	47 U	47 U		47 U	47 U	47 U		47 U	47 U	47 U	46 U	46 U	46 U	46 U		47 U
Phenol	420	420	1,200	13 U	13 U	14 U	13 U		**20**	14 U	**40**		14 U	13 U	14 U	**36**	13 U	13 U	13 U		13 U
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																					
Dibenzofuran (dry)	540	---	---	7.4 U	7.4 U	7.5 U	7.4 U		7.4 U	7.5 U	**15 J**		7.5 U	7.4 U	7.5 U	7.4 U	7.4 U	7.3 U	7.3 U		7.4 U
Dibenzofuran (OC)	---	15	58	0.47 U	0.47 U	0.30 U	0.55 U		0.19 U	0.18 U	**0.26 J**		0.23 U	0.51 U	0.47 U	3.2 U	0.58 U	0.34 U	0.35 U		0.36 U
Hexachlorobenzene (dry)	22	---	---	7.8 U	7.9 U	7.9 U	7.9 U		7.9 U	8.0 U	8.0 U		7.9 U	7.9 U	7.9 U	7.8 U	7.8 U	7.8 U	7.7 U		7.9 U
Hexachlorobenzene (OC)	---	0.38	2.3	0.49 U	0.50 U	0.32 U	0.59 U		0.21 U	0.19 U	0.14 U		0.25 U	0.54 U	0.50 U	3.4 U	0.61 U	0.36 U	0.37 U		0.39 U
Hexachlorobutadiene (dry)	11	---	---	7.9 U	8 U	8.0 U	8.0 U		8.0 U	8.1 U	8.1 U		8.0 U	8.0 U	8.0 U	7.9 U	7.9 U	7.9 U	7.8 U		8.0 U
Hexachlorobutadiene (OC)	---	3.9	6.2	0.50 U	0.5 U	0.33 U	0.59 U		0.21 U	0.20 U	0.14 U		0.25 U	0.55 U	0.50 U	3.4 U	0.62 U	0.36 U	0.37 U		0.39 U
N-Nitrosodiphenylamine (dry)	28	---	---	8.5 U	8.5 U	8.6 U	8.6 U		8.5 U	8.6 U	8.6 U		8.6 U	8.5 U	8.6 U	8.5 U	8.5 U	8.4 U	8.4 U		8.6 U
N-Nitrosodiphenylamine (OC)	---	11	11	0.53 U	0.54 U	0.35 U	0.64 U		0.22 U	0.21 U	0.15 U		0.27 U	0.59 U	0.54 U	3.7 U	0.66 U	0.39 U	0.40 U		0.42 U
2-Methylphenol	---	63	63	14 U	14 U	14 U	14 U		14 U	14 U	14 U		14 U	14 U	14 U	14 U	14 U	14 U	14 U		14 U
4-Methylphenol	---	670	670	**54**	13 U	13 U	13 U		13 U	13 U	13 U		13 U	13 U	13 U	12 U	12 U	12 U	12 U		13 U
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																					
Total PCBs (OC) [c]	---	12	65	**0.62 JG**	0.25 UJ	0.12 U	0.29 UJG		0.11 UJ	0.085 UJG	0.067 U		0.12 U	0.26 U	0.25 UJ	1.7 U	0.41 U	0.18 UJ	0.19 UJ		0.14 UJG
Total PCBs (dry) [c]	130	---	---	**9.9 JG**	4.0 UJ	2.9 U	3.9 UJG		4.1 UJ	3.5 UJG	3.9 U		3.8 U	3.8 U	4.0 UJ	4.0 U	5.3 U	4.0 UJ	3.9 UJ		2.8 UJG
Aroclor 1016	---	---	---	2.8 UJG	1.6 UJ	2.9 U	1.6 UJG		1.6 UJ	1.6 UJG	1.6 U		1.5 U	1.5 U	1.6 UJ	1.6 U	2.1 U	1.6 UJ	1.5 UJ		2.8 UJG
Aroclor 1221	---	---	---	2.8 UJG	4.0 UJ	2.9 U	3.9 UJG		4.1 UJ	4 UJG	3.9 U		3.8 U	3.8 U	4 UJ	4.0 U	5.3 U	4.0 UJ	3.9 UJ		2.8 UJG
Aroclor 1232	---	---	---	2.8 UJG	3.5 UJ	2.9 U	3.4 UJG		3.6 UJ	3.5 UJG	3.4 U		3.3 U	3.3 U	3.5 UJ	3.5 U	4.7 U	3.5 UJ	3.4 UJ		2.8 UJG
Aroclor 1242	---	---	---	2.8 UJG	1.1 UJ	2.9 U	1.0 UJG		1.1 UJ	1.1 UJG	1.0 U		1.0 U	0.99 U	1.0 UJ	1.0 U	1.4 U	1.1 UJ	1.0 UJ		2.8 UJG
Aroclor 1248	---	---	---	2.8 UJG	0.66 UJ	2.9 U	0.64 UJG		0.66 UJ	0.66 UJG	0.64 U		0.62 U	0.61 U	0.65 UJ	0.65 U	0.87 U	0.65 UJ	0.63 UJ		2.8 UJG
Aroclor 1254	---	---	---	0.72 UJG	1.1 UJ	0.74 U	1.0 UJG		1.1 UJ	1.1 UJG	1.0 U		1.0 U	0.99 U	1.0 UJ	1.0 U	1.4 U	1.1 UJ	1.0 UJ		0.72 UJG
Aroclor 1260	---	---	---	**9.9 JG**	1.5 UJ	0.74 U	1.5 UJG		1.5 UJ	1.5 UJG	1.5 U		1.4 U	1.4 U	1.5 UJ	1.5 U	2.0 U	1.5 UJ	1.4 UJ		0.72 UJG
Chlorinated Pesticides (ug/kg dry weight)																					
4,4'-DDD	16	---	---	0.26 UJG	0.14 U	**0.47 J**	**0.53 J**		**1.7 J**	**2.9 J**	0.14 U		**1 J**	0.14 U	0.15 U	**0.14 JTG**	0.19 U	**0.44 J**	**0.31 J**		0.26 UJG
4,4'-DDE	9	---	---	0.23 UJG	**1.5 J**	**0.31 J**	0.14 UJ		**0.35 J**	**0.81 J**	0.14 U		**1.4 J**	0.14 U	**2.3 J**	0.13 U	0.19 U	**0.99 J**	**0.89 J**		0.22 UJG
4,4'-DDT	34	---	---	0.26 UJG	0.15 U	0.26 U	**0.27 J**		0.15 U	0.15 U	0.15 U		0.15 U	0.15 U	**0.65 J**	**1.2 JTG**	0.2 U	0.15 U	**3 J**		0.25 UJG
Aldrin	---	---	---	0.11 UJG	0.22 U	0.11 U	0.22 UJ		0.22 U	**2.0 J**	0.21 U		**2.2 J**	0.22 U	0.22 U	0.21 U	**19 J**	0.22 U	0.21 U		0.1 UJG
alpha-Chlordane	---	---	---	0.12 UJG	0.13 U	0.12 U	0.13 UJ		0.13 U	0.13 U	**0.42 J**		0.13 U	**0.14 J**	**0.14 J**	**0.13 JTG**	0.18 U	0.13 U	0.13 U		0.11 UJG
Dieldrin	---	---	---	0.22 UJG	0.12 U	0.22 U	0.12 UJ		0.12 U	**1.9 J**	0.11 U		0.11 U	**0.18 J**	0.12 U	0.11 U	0.16 U	**0.12 J**	0.11 U		0.21 UJG
gamma-BHC	---	---	---	0.12 UJG	**0.33 J**	0.11 U	0.076 UJ		0.077 U	**3.1 J**	0.075 U		0.076 U	0.077 U	0.079 U	0.074 U	**0.77 J**	**0.48 J**	**0.3 J**		**0.39 JTG**
Heptachlor	---	---	---	**0.19** JTG	0.46 U	0.13 U	0.45 UJ		0.46 U	0.46 U	0.45 U		0.45 U	0.46 U	0.47 U	0.44 U	**16 J**	0.46 U	0.44 U		**0.27 JTG**
Petroleum Hydrocarbons (mg/kg dry weight)																					
Gasoline	---	---	---	31 U	30 U	43 U	38 UJ						33 U								
Diesel Range	---	---	---	78 U	76 U	110 U	96 UJ						82 U								
Motor Oil	---	---	---	160 U	150 U	210 U	**270 J**						**220**								
Dioxins/Furans (ng/kg dry weight)																					
DX TOTAL (TEQ ND=1/2 DL)	---	---	---	**22.7**		**53**		**14**	**175**	**57.9**		**315**	**26.5**		**6.47**			**10.6**		**2.68**	**35.5**
1,2,3,4,6,7,8-HPCDD	---	---	---	**468**		**1,040**		**255 B**	**5,590 B**	**1,550**		**5,100 B**	**712**		**152 B**			**247**		**67.9 B**	**754**
1,2,3,4,6,7,8-HPCDF	---	---	---	**176**		**290**		**95.4**	**1,700 B**	**368**		**1,500**	**179**		**42.8 B**			**87.4**		**22.3**	**336**
1,2,3,4,7,8,9-HPCDF	---	---	---	**10**		**16.2**		**4.26 B**	**98.8**	**24.1**		**76.3 B**	**11.5**		**2.91**			**5.4**		**1.38 B**	**31.7**
1,2,3,4,7,8-HXCDD	---	---	---	**4.74**		**21**		**6.51**	**29.3**	**15.9**		**169**	**6.73**		**1.97**			**2.95**		**0.517 J**	**3.41**
1,2,3,4,7,8-HXCDF	---	---	---	**15.7**		**27.2**		**7.53**	**126**	**31.2**		**124**	**16.1**		**3.46**			**7.27**		**2.31**	**73.1**
1,2,3,6,7,8-HXCDD	---	---	---	**30.3**		**76.8**		**20.4**	**220**	**75.2**		**502**	**31.7**		**8**			**14**		**3.63**	**48.3**
1,2,3,6,7,8-HXCDF	---	---	---	**5.15**		**10.5**		**2.79**	**37.4**	**11.9**		**65**	**5.8**		**1.33**			**2.63**		**0.683**	**12.5**
1,2,3,7,8,9-HXCDD	---	---	---	**16.7**		**50.6**		**14.8**	**85.9**	**44**		**357**	**19.2**		**5.09**			**8.67**		**1.74**	**11.2**
1,2,3,7,8,9-HXCDF	---	---	---	**0.482 J**		**0.98**		**2.28**	**4.04**	**1.15**		**8.17**	**0.556**		**0.132 J**			**0.225 J**		**0.089 J**	**1.21**
1,2,3,7,8-PECDD	---	---	---	**3.88**		**11.6**		**3.19**	**15.4**	**7.91**		**75.1**	**3.44**		**1.17**			**1.72**		**0.233 J**	**2.1**
1,2,3,7,8-PECDF	---	---	---	**2.85**		**5.5**		**1.42**	**12.6**	**4.76**		**32.2**	**2.31**		**0.592**			**1.01**		**0.31 J**	**4.01**
2,3,4,6,7,8-HXCDF	---	---	---	**4.52**		**9.37**		**2.51**	**29.9**	**10.7**		**51.2**	**4.71**		**1.2**			**2.25**		**0.545**	**7.06**
2,3,4,7,8-PECDF	---	---	---	**4.91**		**8.17**		**2.3 B**	**20.4 B**	**6.84**		**51.1 B**	**3.22**		**0.801 B**			**1.47**		**0.564 B**	**14.3**
2,3,7,8-TCDD	---	---	---	**0.978**		**2.45**		**0.387 J**	**2.88**	**1.33**		**9.1 B**	**0.621**		**0.295**			**0.351**		**0.092 BJ**	**0.477**
2,3,7,8-TCDF	---	---	---	**3.78**		**5.21**		**1.8**	**7.47**	**3.89**		**38.2**	**1.66 J**		**0.581**			**0.341 J**		**0.217**	**1.75**
OCDD	---	---	---	**4,850 B**		**8,030 B**		**1,860 B**	**67,600 B**	**24,200 B**		**48,700 B**	**12,500 B**		**1,810 B**			**2,470 B**		**894 B**	**3,500 B**
OCDF	---	---	---	**652**		**947**		**220 B**	**7,660 B**	**1,210**		**4,230 B**	**607**		**157 B**			**292**		**56.7 B**	**1,230**

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																	
				SH-01-SS-00	SH-01-SC-12	SH-02-SS-00	SH-02-SC-12	SH-02-SC-23	SH-03-SS-00	SH-04-SS-00 [d]	SH-04-SC-12 [d]	SH-04-SC-23	SH-05-SS-00	SH-05-SC-12 [d]	SH-07-SS-00	SH-07-SC-12	SH-08-SC-12	SH-09-SS-00	SH-09-SC-12	SH-09-SC-23	SH-10-SS-00
	LAET	SQS	CSL	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---	**1,260**		**2,370**		**552**	**14,000 B**	**4,870**		**12,000**	**2,280**		**421 B**			**636**		**194**	**1,460**
TOTAL HEPTA-FURANS	---	---	---	**722**		**1,150**		**335**	**8,090**	**1,410**		**5,670**	**687**		**246**			**329**		**81.3**	**1,780**
TOTAL HEXA-DIOXINS	---	---	---	**574**		**1,680**		**505**	**2,090**	**1,130**		**12,500**	**452**		**113**			**207**		**53.7**	**319**
TOTAL HEXA-FURANS	---	---	---	**314**		**466**		**123**	**2,570**	**579**		**2,180**	**272**		**56.2**			**121**		**36.3**	**687**
TOTAL PENTA-DIOXINS	---	---	---	**207**		**1,380**		**430**	**660**	**449**		**9,650**	**163**		**55.4**			**89.8**		**16.5**	**76.1**
TOTAL PENTA-FURANS	---	---	---	**115**		**177**		**44.9**	**457**	**155**		**857**	**72**		**18.3**			**36.4**		**9.18**	**140**
TOTAL TETRA-DIOXINS	---	---	---	**243**		**1,640**		**382**	**640**	**409**		**7,780**	**132**		**44.6**			**88.8**		**12.5**	**68**
TOTAL TETRA-FURANS	---	---	---	**96.5**		**170**		**51.7**	**198**	**78.8**		**923**	**32.3**		**12.7**			**21.8**		**4.04**	**36.8**
Guaicols and Resin Acids (ug/kg dry weight)																					
12-Chlorodehydroabietic Acid	---	---	---																		
14-Chlorodehydroabietic Acid	---	---	---																		
3,4,5-Trichloroguaiacol	---	---	---																		
3,4,6-Trichloroguaiacol	---	---	---																		
3,4-Dichloroguaiacol	---	---	---																		
4,5,6-Trichloroguaiacol	---	---	---																		
4,5-Dichloroguaiacol	---	---	---																		
4,6-Dichloroguaiacol	---	---	---																		
4-Chloroguaiacol	---	---	---																		
9,10-Dichlorostearic Acid	---	---	---																		
Abietic Acid	---	---	---																		
Dehydroabietic Acid	---	---	---																		
Dichlorodehydroabietic Acid	---	---	---																		
Guaiacol	---	---	---																		
Isopimaric Acid	---	---	---																		
Linolenic Acid	---	---	---																		
Neoabietic Acid	---	---	---																		
Oleic Acid	---	---	---																		
Palustric Acid	---	---	---																		
Pimaric Acid	---	---	---																		
Retene	---	---	---																		
Sandaracopimaric Acid	---	---	---																		
Tetrachloroguaiacol	---	---	---																		
Total resin acids [c]	---	---	---																		

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram.
mg/kg	milligrams per kilogram.
PCBs	polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined	value indicates the sample result or detection limit is greater than the LAET or SQS value.
Shaded	value indicates the sample result or detection limit is greater than the CSL value.
U	The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.
J	The associated numerical value is considered an estimated concentration.
G	Bias is high.
B	Specifyied compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
				SH-10-SC-12	SH-10-SC-23	SH-11-SS-00	SH-11-SC-12 [d]	SH-12-SS-00 [d]	SH-12-SC-12 [d]	SH-12-SC-23	SH-13-SS-00 [d]	SH-13-SC-12	SH-13-SC-23	SH-14-SS-00	SH-14-SC-12	SH-14-SC-23	SH-15-SS-00	SH-15-SC-12	SH-16-SS-00	SH-16-SC-12	SH-18-WS-00 [d]	SH-18-WC-12 [d]	SH-19-WS-00 [d]
Parameter	LAET	SQS	CSL	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Conventional Parameters																							
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	28.3		63.4	36.8	57.6	69.2		65.3	9.4		51.7	48.9		4.6	5.6	2.2	1.6	85	74.5	67.3
Particle/Grain Size, Phi Scale <-1	---	---	---	1.7		7.2	1.3	4.6	3.5		7.3	62.8		1.3	1.8		0.1	0.3	1.7	3.5	2.7	3.1	7.9
Particle/Grain Size, Phi Scale >10	---	---	---	4.9		10.2	5.4	8.5	10.4		10.2	1.8		9.8	7.8		1.4	1.3			12.7	14.4	11.3
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	1.8		4.5	8.1	5.9	5.8		4.4	6.6		3.1	1.6		0.4	0.4	13.2	9.9	1.9	4.2	4.2
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	1.9		4.6	2.6	4.6	4.8		5.6	7.6		3	1.7		0.1	0.3	4.6	2.7	4	4.5	4.4
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	8.5		7.5	25	9.1	6.1		5.2	7.1		3.6	2.2		28.4	20.2	62.6	64	2.3	5.2	5.9
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	27.5		6.3	17.1	8.5	5		4.8	4.2		11	12.1		65.2	69.5	15.3	17	1.7	4.5	4.6
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	30.3		6.5	9.1	9.6	5.6		7.4	2.4		26.3	31.8		1.1	3.6	0.5	1.5	2.5	4	5.9
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	8.9		8	7	10.2	8.1		10.5	1.2		11	14.7		0.6	1.1			5.7	7.1	5.8
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	3.1		13	6.4	13.1	12.8		14.3	1.8		7.3	6.2		0.4	0.6			18.3	10.6	14.1
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	3.4		11.2	5.9	10.2	12.1		11.4	1.5		6.5	5.8		0.5	0.8			23.9	13.7	12.6
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	2.8		9.5	5.2	7.2	10.4		8.6	1.3		5.5	5.1		0.5	0.7			10.8	10.5	11.2
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	2.7		6.1	3.8	4	8.7		4.9	1		6.1	5		0.6	0.6			6.6	10.1	6.6
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	2.5		5.4	3.2	4.2	6.7		5.3	0.8		5.6	4.3		0.6	0.6			6.9	8.1	5.8
Total Volatile Solids %	---	---	---																		14.3	23.78	17.72
Ammonia (mg/kg)	---	---	---	39.3		4.96	61.4	10.7	12.4		7.34	1.16		18.7	39.1		4.3	4.33	2.76	0.03 U	32.4	113	17.1
Sulfide	---	---	---	259		541	123	1070	27		518	15.3		1,350	19.7		5.01	123	0.01 U	14.5	1,710	24.6	916
Total organic carbon (%)	---	---	---	2.49		2.32	4.31	4.79	8.79		11	2.84		3.1	3		0.542	1.12	0.511	1.03	4.79	5.08	4.44
Total solids (%)	---	---	---	59.2		94.1	55.1	37.7	33.2		35.1	77.4		40.8	56.8		74.3	79	75.4	79.7	27.7	34.3	31.5
Metals (mg/kg dry weight)																							
Antimony	150	---	---	0.23 J		0.83	0.62	0.36 J	0.69		0.41 J	0.12 J		0.33 J	0.37		0.12 J	0.15 J	0.1 J	0.14 J	0.45 J	0.67	0.54 J
Arsenic	57	57	93	4.7		6.2	4.9	6.9	9.1		7	2.1		8.1	5.9		2.3	3.6	2.9	2.6	8	7.6	8.5
Cadmium	5.1	5.1	6.7	0.43		1.2	1.2	0.97	1.4		1.1	0.32		0.88	0.88		0.11 J	0.17 J	0.13 J	0.18 J	1.8	1.8	1.3
Chromium	260	260	270	40		62	65	43	54		41	32		41	40		20	25	21	24	58	55	53
Copper	390	390	390	42		120	110	73	110		60	30		37	44		10	15	13	16	83	84	76
Lead	450	450	530	9.2		43	47	21	34		19	4.3		11	16		2.4	4.2	2.8	3.9	22	43	26
Mercury	0.41	0.41	0.59	0.055		0.19	0.11	0.17	0.29		0.15	0.065		0.088	0.11		0.036	0.012 J	0.0078 U	0.013 J	0.12	0.29	0.16
Nickel	140	---	---	38		44	45	34	41		31	22		37	35		21	27	24	26	46	40	42
Silver	6.1	6.1	6.1	0.12 J		0.18 J	0.15 J	0.16 J	0.55 J		0.18 J	0.053 J		0.13 J	0.17 J		0.033 J	0.036 J	0.018 J	0.023 J	0.23 J	0.37 J	0.19 J
Zinc	410	410	960	63		110	80	98	130		95	33		83	69		29	35	35	36	130	120	110
Butyltins (ug/kg dry weight)																							
Butyltin Ion	---	---	---																				
Dibutyltin Ion	---	---	---																				
Tributyltin Ion	---	---	---																				
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																							
LPAHs																							
2-Methylnaphthalene (dry)	670	---	---	8.1 U		8.0 U	8.0 U	8.1 U	24 U		8.1 U	8.1 U		8.1 U	8.1 U		7.9 U	7.9 U	8.0 U	7.9 U	8.1 U	24 U	8.1 U
2-Methylnaphthalene (OC)	---	38	64	0.33 U		0.34 U	0.19 U	0.17 U	0.27 U		0.07 U	0.29 U		0.26 U	0.27 U		1.5 U	0.71 U	1.6 U	0.77 U	0.17 U	0.47 U	0.18 U
Acenaphthene (dry)	500	---	---	8.1 U		8.0 U	8.0 U	10 J	120		8.1 U	8.1 U		8.1 U	8.1 U		8.0 U	8.0 U	8.1 U	7.9 U	8.1 U	68	8.1 U
Acenaphthene (OC)	---	16	57	0.33 U		0.34 U	0.19 U	0.21 J	1.4		0.07 U	0.29 U		0.26 U	0.27 U		1.5 U	0.71 U	1.6 U	0.77 U	0.17 U	1.3	0.18 U
Acenaphthylene (dry)	560	---	---	8.5 U		14 J	8.5 U	23	60		12 J	8.6 U		8.6 U	8.6 U		8.4 U	8.4 U	8.5 U	8.3 U	8.6 U	25 U	8.6 U
Acenaphthylene (OC)	---	66	66	0.34 U		0.60 J	0.20 U	0.48	0.68		0.11 J	0.30 U		0.28 U	0.29 U		1.5 U	0.75 U	1.7 U	0.81 U	0.18 U	0.49 U	0.19 U
Anthracene (dry)	960	---	---	7.6 U		18 J	7.6 U	67	190		37	7.7 U		7.7 U	7.6 U		7.5 U	7.5 U	7.6 U	7.5 U	21	100	7.7 U
Anthracene (OC)	---	220	1,200	0.31 U		0.78 J	0.18 U	1.4	2.2		0.34	0.27 U		0.25 U	0.25 U		1.4 U	0.7 U	1.5 U	0.73 U	0.44	2.0	0.17 U
Fluorene (dry)	540	---	---	8.8 U		10 J	8.8 U	18 J	110		15 J	8.9 U		8.9 U	8.9 U		8.7 U	8.7 U	8.8 U	8.6 U	8.9 U	88	8.9 U
Fluorene (OC)	---	23	79	0.35 U		0.4 J	0.20 U	0.38 J	1.3		0.14 J	0.31 U		0.29 U	0.30 U		1.6 U	0.78 U	1.7 U	0.83 U	0.19 U	1.7	0.20 U
Naphthalene (dry)	2,100	---	---	23		45	47	25	190		14 J	10 J		8.6 U	18 J		8.4 U	8.4 U	8.5 U	8.4 U	16 J	150	8.6 U
Naphthalene (OC)	---	99	170	0.92		1.9	1.1	0.52	2.2		0.13 J	0.4 J		0.28 U	0.60 J		1.5 U	0.75 U	1.7 U	0.82 U	0.33 J	3.0	0.19 U
Phenanthrene (dry)	1500	---	---	33		73	89	140	430		110	12 J		21	20		8.1 U	8.1 U	8.2 U	8.1 U	36	390	20
Phenanthrene (OC)	---	100	480	1.3		3.1	2.1	2.9	4.9		1.0	0.4 J		0.68	0.67		1.5 U	0.72 U	1.6 U	0.79 U	0.75	7.7	0.45
Total LPAHs (dry) [c]	5200	---	---	56		160	140	280	1100		190	22 J		21	38		19 U	19 U	20 U	19 U	73	800	20
Total LPAHs (OC) [c]	---	370	780	2.2		53	3.2	5.9	13		1.7	0.77 J		0.68	1.3		3.5 U	1.7 U	3.9 U	1.8 U	1.5	16	0.45
HPAHs																							
Benzo(a)anthracene (dry)	1,300	---	---	38		26	5.8 U	130	490		76	5.9 U		26	15 J		5.7 U	5.7 U	5.8 U	5.7 U	58	200	24
Benzo(a)anthracene (OC)	---	110	270	1.5		1.1	0.13 U	2.7	5.6		0.69	0.21 U		0.84	0.50 J		1.1 U	0.51 U	1.1 U	0.55 U	1.2	3.9	0.54
Benzo(a)pyrene (dry)	1,600	---	---	56		40	8.0 U	120	330		74	8.1 U		19 J	18 J		7.9 U	7.9 U	8.0 U	7.9 U	67	230	24
Benzo(a)pyrene (OC)	---	99	210	2.2		1.7	0.2 U	2.5	3.8		0.67	0.29 U		0.61 J	0.60 J		1.5 U	0.71 U	1.6 U	0.77 U	1.4	4.5	0.54
Benzo(b)fluoranthene (dry)	---	---	---	32		54	9.3 U	190	370		85	9.4 U		34	9.4 U		9.2 U	9.2 U	9.3 U	9.2 U	64	210	36
Benzo(b)fluoranthene (OC)	---	---	---	1.3		2.3	0.2 U	4.0	4.2		0.77	0.33 U		1.1	0.31 U		1.7 U	0.82 U	1.8 U	0.89 U	1.3	4.1	0.81
Benzo(g,h,i)perylene (dry)	670	---	---	51		17 J	6.6 U	30	110		23	6.7 U		9.9 J	19 J		6.6 U	6.5 U	6.6 U	6.5 U	30	83	6.7 U
Benzo(g,h,i)perylene (OC)	---	31	78	2.0		0.73 J	0.2 U	0.63	1.3		0.21	0.24 U		0.32 J	0.63 J		1.2 U	0.58 U	1.3 U	0.63 U	0.63	1.6	0.15 U
Benzo(k)fluoranthene (dry)	---	---	---	38		49	9.1 U	160	490		100	9.2 U		20	9.1 U		9.0 U	9.0 U	9.1 U	8.9 U	100	250	35
Benzo(k)fluoranthene (OC)	---	---	---	1.5		2.1	0.2 U	3.3	5.6		0.91	0.32 U		0.65	0.30 U		1.7 U	0.80 U	1.8 U	0.86 U	2.1	4.9	0.79
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---	70		100	20 U	350	860		190	20 U		54	20 U		19 U	19 U	20 U	19 U	160	460	71
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450	2.8		4.3	0.46 U	7.3	9.8		1.7	0.70 U		1.7	0.67 U		3.5 U	1.7 U	3.9 U	1.8 U	3.3	9.1	1.6
Chrysene (dry)	1,400	---	---	66		39	23	290	800		200	6.6 U		47	20		6.4 U	6.4 U	6.5 U	6.4 U	93	320	44
Chrysene (OC)	---	110	460	2.7		1.7	0.53	6.1	9.1		1.8	0.23 U		1.5	0.67		1.2 U	0.57 U	1.3 U	0.62 U	1.9	6.3	1.0
Dibenz(a,h)anthracene (dry)	230	---	---	8.4 U		8.4 U	8.4 U	8.5 U	25 U		8.4 U	8.5 U		8.5 U	8.5 U		8.3 U	8.3 U	8.4 U	8.2 U	8.5 U	25 U	8.5 U
Dibenz(a,h)anthracene (OC)	---	12	33	0.34 U		0.36 U	0.19 U	0.18 U	0.28 U		0.08 U	0.30 U		0.27 U	0.28 U		1.5 U	0.74 U	1.6 U	0.80 U	0.18 U	0.49 U	0.19 U
Fluoranthene (dry)	1,700	---	---	68		140	100	360	1,000		280	26		65	29		7.7 U	22	7.8 U	7.6 U	110	540	58
Fluoranthene (OC)	---	160	1,200	2.7		6.0	2.3	7.5	11.4		2.5	0.92		2.1	1.0		1.4 U	2.0	1.5 U	0.74 U	2.3	10.6	1.3
Indeno(1,2,3-cd)pyrene (dry)	600	---	---	15 J		11 J	8.4 U	31	110		25	8.5 U		8.5 U	8.5 U		8.3 U	8.3 U	8.4 U	8.3 U	23	25 U	8.5 U
Indeno(1,2,3-cd)pyrene (OC)	---	34	88	0.60 J		0.47 J	0.19 U	0.65	1.3		0.23	0.30 U		0.27 U	0.28 U		1.5 U	0.74 U	1.6 U	0.81 U	0.48	0.49 U	0.19 U
Pyrene (dry)	2,600	---	---	72		100	110	320	1,000		210	26		59	36		7.5 U	23	7.6 U	7.5 U	110	680	62
Pyrene (OC)	---	1,000	1,400	2.9		4.3	2.6	6.7	11.4		1.9	0.92		1.9	1.2		1.4 U	2.1	1.5 U	0.73 U	2.3	13.4	1.4
Total HPAHs (dry) [c]	12,000	---	---	440		470	230	1600	4700		1,100	52		280	140		19 U	55	20 U	19 U	650	2,500	280
Total HPAHs (OC) [c]	---	960	5,300	18		20	5.3	33	53		10	1.8		9	4.7		3.5 U	4.9	3.9 U	1.8 U	14	49	6.3

	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
				SH-10-SC-12	SH-10-SC-23	SH-11-SS-00	SH-11-SC-12 [d]	SH-12-SS-00 [d]	SH-12-SC-12 [d]	SH-12-SC-23	SH-13-SS-00 [d]	SH-13-SC-12	SH-13-SC-23	SH-14-SS-00	SH-14-SC-12	SH-14-SC-23	SH-15-SS-00	SH-15-SC-12	SH-16-SS-00	SH-16-SC-12	SH-18-WS-00 [d]	SH-18-WC-12 [d]	SH-19-WS-00 [d]
Parameter	LAET	SQS	CSL	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																							
1,2,4-Trichlorobenzene (dry)	31	---	---	8.9 U		8.9 U	8.9 U	9.0 U	27 U		8.9 U	9.0 U		9.0 U	9.0 U		8.8 U	8.8 U	8.9 U	8.7 U	9.0 U	27 U	9.0 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8	0.36 U		0.38 U	0.21 U	0.19 U	0.31 U		0.081 U	0.32 U		0.29 U	0.30 U		1.6 U	0.79 U	1.7 U	0.84 U	0.19 U	0.53 U	0.20 U
1,2-Dichlorobenzene (dry)	35	---	---	7.7 U		7.7 U	7.7 U	7.8 U	23 U		7.7 U	7.8 U		7.8 U	7.8 U		7.6 U	7.6 U	7.7 U	7.6 U	7.8 U	23 U	7.8 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3	0.31 U		0.33 U	0.18 U	0.16 U	0.26 U		0.07 U	0.27 U		0.25 U	0.26 U		1.4 U	0.68 U	1.5 U	0.74 U	0.16 U	0.45 U	0.18 U
1,4-Dichlorobenzene (dry)	110	---	---	7.2 U		7.2 U	7.2 U	7.3 U	22 U		7.2 U	7.3 U		7.3 U	7.3 U		7.1 U	7.1 U	7.2 U	7.1 U	7.3 U	22 U	7.3 U
1,4-Dichlorobenzene (OC)	---	3.1	9	0.29 U		0.31 U	0.17 U	0.15 U	0.25 U		0.07 U	0.26 U		0.24 U	0.24 U		1.3 U	0.63 U	1.4 U	0.69 U	0.15 U	0.43 U	0.16 U
Phthalates (ug/kg dry weight or mg/kg OC)																							
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---	**11 J**		**19 J**	11 U	**68**	73 U		**16 J**	11 U		**12 J**	11 U		11 U	11 U	11 U	**15 J**	**40**	32 U	35 U
bis(2-Ethylhexyl)phthalate (OC)	---	47	78	**0.44 J**		**0.82 J**	0.26 U	**1.4**	0.83 U		**0.15 J**	0.39 U		**0.39 J**	0.37 U		2.0 U	1.0 U	2.2 U	**1.5 J**	**0.8**	0.63 U	0.79 U
Butylbenzylphthalate (dry)	63	---	---	11 U		11 U	11 U	11 U	33 U		11 U	11 U		11 U	11 U		11 U	11 U	11 U	11 U	11 U	33 U	11 U
Butylbenzylphthalate (OC)	---	4.9	64	0.44 U		0.47 U	0.26 U	0.23 U	0.38 U		0.10 U	0.39 U		0.35 U	0.37 U		2.0 U	1.0 U	2.2 U	1.1 U	0.23 U	0.65 U	0.25 U
Di-n-Butylphthalate (dry)	1400	---	---	12 U		12 U	12 U	12 U	37 U		12 U	12 U		12 U	12 U		12 U	12 U	12 U	12 U	12 U	36 U	12 U
Di-n-Butylphthalate (OC)	---	220	1,700	0.48 U		0.52 U	0.28 U	0.25 U	0.42 U		0.11 U	0.42 U		0.39 U	0.40 U		2.2 U	1.1 U	2.3 U	1.2 U	0.3 U	0.71 U	0.27 U
Di-n-Octyl phthalate (dry)	6200	---	---	8.2 U		8.1 U	8.2 U	8.3 U	25 U		8.2 U	8.3 U		8.3 U	8.2 U		8.1 U	8.1 U	8.2 U	8 U	8.3 U	25 U	8.3 U
Di-n-Octyl phthalate (OC)	---	58	4,500	0.33 U		0.35 U	0.19 U	0.17 U	0.28 U		0.07 U	0.29 U		0.27 U	0.27 U		1.5 U	0.72 U	1.6 U	0.78 U	0.17 U	0.49 U	0.19 U
Diethylphthalate (dry)	200	---	---	16 U		16 U	16 U	16 U	49 U		16 U	16 U		16 U	16 U		16 U	16 U	16 U	16 U	16 U	48 U	16 U
Diethylphthalate (OC)	---	61	110	0.64 U		0.69 U	0.37 U	0.33 U	0.56 U		0.15 U	0.56 U		0.52 U	0.53 U		3.0 U	1.4 U	3.1 U	1.6 U	0.3 U	0.94 U	0.36 U
Dimethylphthalate (dry)	71	---	---	7.6 U		7.6 U	7.6 U	7.7 U	23 U		7.6 U	7.7 U		7.7 U	7.7 U		7.5 U	7.5 U	7.6 U	7.5 U	7.7 U	23 U	7.7 U
Dimethylphthalate (OC)	---	53	53	0.31 U		0.33 U	0.18 U	0.16 U	0.26 U		0.07 U	0.27 U		0.25 U	0.26 U		1.4 U	0.67 U	1.5 U	0.73 U	0.16 U	0.45 U	0.17 U
Ionizable Organic Compounds (ug/kg dry weight)																							
2,4-Dimethylphenol	29	29	29	15 U		14 U	14 U	15 U	44 U		15 U	15 U		15 U	15 U		14 U	14 U	15 U	14 U	15 U	44 U	15 U
Benzoic Acid	650	650	650	110 U		110 U	110 U	110 U	340 U		110 U	110 U		110 U	110 U		110 U	110 U	110 U	110 U	110 U	340 U	110 U
Benzyl Alcohol	57	57	73	14 U		14 U	14 U	14 U	43 U		14 U	14 U		14 U	14 U		14 U	14 U	14 U	14 U	14 U	43 U	14 U
Pentachlorophenol	360	360	690	47 U		46 U	47 U	47 U	140 U		47 U	47 U		47 U	47 U		46 U	46 U	47 U	46 U	47 U	140 U	47 U
Phenol	420	420	1,200	13 U		13 U	13 U	14 U	41 U		13 U	14 U		**66**	14 U		13 U	13 U	13 U	13 U	14 U	40 U	14 U
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																							
Dibenzofuran (dry)	540	---	---	7.4 U		7.4 U	7.4 U	7.5 U	**75**		7.4 U	7.5 U		7.5 U	7.5 U		7.3 U	7.3 U	7.4 U	7.3 U	7.5 U	**62**	7.5 U
Dibenzofuran (OC)	---	15	58	0.30 U		0.32 U	0.17 U	0.16 U	**0.9**		0.07 U	0.26 U		0.24 U	0.25 U		1.3 U	0.65 U	1.4 U	0.71 U	0.16 U	**1.2**	0.17 U
Hexachlorobenzene (dry)	22	---	---	7.9 U		7.8 U	7.8 U	8 U	24 U		7.9 U	7.9 U		7.9 U	7.9 U		7.8 U	7.8 U	7.9 U	7.7 U	8 U	24.0 U	7.9 U
Hexachlorobenzene (OC)	---	0.38	2.3	0.32 U		0.34 U	0.18 U	0.17 U	0.27 U		0.07 U	0.28 U		0.25 U	0.26 U		1.4 U	0.70 U	1.5 U	0.75 U	0.17 U	0.47 U	0.18 U
Hexachlorobutadiene (dry)	11	---	---	8.0 U		7.9 U	7.9 U	8.1 U	24 U		8.0 U	8.0 U		8.0 U	8.0 U		7.9 U	7.9 U	8.0 U	7.8 U	8 U	24 U	8.0 U
Hexachlorobutadiene (OC)	---	3.9	6.2	0.32 U		0.34 U	0.18 U	0.17 U	0.27 U		0.07 U	0.28 U		0.26 U	0.27 U		1.5 U	0.71 U	1.6 U	0.76 U	0.17 U	0.47 U	0.18 U
N-Nitrosodiphenylamine (dry)	28	---	---	8.5 U		8.5 U	8.5 U	8.6 U	26 U		8.5 U	8.6 U		8.6 U	8.6 U		8.4 U	8.4 U	8.5 U	8.4 U	8.6 U	26 U	8.6 U
N-Nitrosodiphenylamine (OC)	---	11	11	0.34 U		0.37 U	0.20 U	0.18 U	0.30 U		0.08 U	0.30 U		0.28 U	0.29 U		1.5 U	0.75 U	1.7 U	0.82 U	0.18 U	0.51 U	0.19 U
2-Methylphenol	---	63	63	14 U		14 U	14 U	14 U	42 U		14 U	14 U		14 U	14 U		14 U	14 U	14 U	14 U	14 U	42 U	14 U
4-Methylphenol	---	670	670	13 U		**410**	**320**	**50**	**140**		13 U	**18** J		13 U	**23**		12 U	12 U	13 U	12 U	**18** J	**84**	**100**
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																							
Total PCBs (OC) [c]	---	12	65	0.11 U		0.17 U	0.09 U	0.084 UJ	0.046 UJG		0.036 UJ	0.14 U		0.094 U	0.093 U		0.72 U	0.34 UJ	0.74 UJG	0.37 UJ	0.086 UJ	0.077 UJG	0.79 UJG
Total PCBs (dry) [c]	130	---	---	2.8 U		3.9 U	3.9 U	4 UJ	4 UJG		4 UJ	3.9 U		2.9 U	2.8 U		3.9 U	3.8 UJ	3.8 UJG	3.8 UJ	4.1 UJ	3.9 UJG	3.5 UJG
Aroclor 1016	---	---	---	2.8 U		1.6 U	1.6 U	1.6 UJ	1.6 UJG		1.6 UJ	1.6 U		2.9 U	2.8 U		1.6 U	1.5 UJ	1.5 UJG	1.5 UJ	1.6 UJ	1.6 UJG	1.6 UJG
Aroclor 1221	---	---	---	2.8 U		3.9 U	3.9 U	4 UJ	4 UJG		4 UJ	3.9 U		2.9 U	2.8 U		3.9 U	3.8 UJ	3.8 UJG	3.8 UJ	4.1 UJ	3.9 UJG	4 UJG
Aroclor 1232	---	---	---	2.8 U		3.4 U	3.4 U	3.5 UJ	3.5 UJG		3.5 UJ	3.4 U		2.9 U	2.8 U		3.5 U	3.3 UJ	3.3 UJG	3.3 UJ	3.5 UJ	3.4 UJG	3.5 UJG
Aroclor 1242	---	---	---	2.8 U		1.0 U	1 U	1.1 UJ	1.1 UJG		1 UJ	1 U		2.9 U	2.8 U		1.0 U	0.98 UJ	1.0 UJG	0.99 UJ	1.1 UJ	1.0 UJG	1.0 UJG
Aroclor 1248	---	---	---	2.8 U		0.63 U	0.64 U	0.65 UJ	0.66 UJG		0.65 UJ	0.63 U		2.9 U	2.8 U		0.64 U	0.61 UJ	0.62 UJG	0.61 UJ	0.66 UJ	0.63 UJG	0.64 UJG
Aroclor 1254	---	---	---	0.73 U		1.0 U	1 U	1.1 UJ	1.1 UJG		1 UJ	1 U		0.75 U	0.72 U		1.0 U	0.98 UJ	1.0 UJG	0.99 UJ	1.1 UJ	1.0 UJG	1.0 UJG
Aroclor 1260	---	---	---	0.73 U		1.5 U	1.5 U	1.5 UJ	1.5 UJG		1.5 UJ	1.5 U		0.75 U	0.72 U		1.5 U	1.4 UJ	1.4 UJG	1.4 UJ	1.5 UJ	1.5 UJG	1.5 UJG
Chlorinated Pesticides (ug/kg dry weight)																							
4,4'-DDD	16	---	---	**0.95 JTG**		0.14 U	0.14 U	**1.2 J**	0.15 U		**0.34 J**	0.14 U		**2.9 JG**	**1.1 JTG**		0.14 U	0.14 UJG	0.14 UJG	0.13 U	0.15 U	**1.1 J**	0.14 UJG
4,4'-DDE	9	---	---	0.23 U		**0.24 J**	0.14 U	**2 J**	**1.4 J**		**0.42 J**	0.14 U		**4.1 JG**	0.22 U		0.14 U	0.14 UJG	0.13 UJG	**0.45 J**	0.14 U	**1.3 J**	0.14 UJG
4,4'-DDT	34	---	---	0.26 U		**0.24 J**	**0.8 J**	**4.8 J**	**0.71 J**		0.15 U	0.15 U		**2.7 JG**	**5.8 JG**		0.15 U	0.15 UJG	0.14 UJG	**2.5**	**3 J**	**1 J**	0.15 UJG
Aldrin	---	---	---	**0.19 J**		0.22 U	0.21 U	0.23 U	0.22 U		0.22 U	0.21 U		**4.8 JG**	**0.15 JTG**		0.22 U	0.22 UJG	0.21 UJG	0.2 U	0.22 U	**0.48 J**	0.22 UJG
alpha-Chlordane	---	---	---	0.12 U		0.13 U	0.13 U	**0.85 J**	**1.3 J**		**0.32 J**	**0.34 J**		**4.3 JG**	0.12 U		0.13 U	0.13 UJG	0.13 UJG	0.12 U	0.14 U	**0.62 J**	0.13 UJG
Dieldrin	---	---	---	0.22 U		0.11 U	0.11 U	0.12 U	0.12 U		0.12 U	0.11 U		**3.4 JG**	0.21 U		0.12 U	0.12 UJG	0.11 UJG	0.11 U	0.12 U	0.11 U	**1.7 JTG**
gamma-BHC	---	---	---	0.12 U		0.076 U	0.075 U	0.079 U	0.078 U		0.077 U	0.075 U		**4.4 JG**	0.11 U		0.077 U	0.076 UJG	0.074 UJG	**0.17 J**	**0.62 J**	0.076 U	**0.29 JTG**
Heptachlor	---	---	---	0.13 U		0.45 U	0.45 U	0.47 U	0.46 U		0.46 U	0.45 U		**5.6 JG**	0.13 U		0.46 U	0.45 UJG	0.44 UJG	0.43 U	0.47 U	0.45 U	0.46 UJG
Petroleum Hydrocarbons (mg/kg dry weight)																							
Gasoline	---	---	---																		72 U		
Diesel Range	---	---	---																		180 U		
Motor Oil	---	---	---																		360 U		
Dioxins/Furans (ng/kg dry weight)																							
DX TOTAL (TEQ ND=1/2 DL)	---	---	---		**902**	**48.6**		**100**	**202**	**309**	**106**	**12.6**	**16.2**	**35**		**8.02**	**1.89**		**1**		**69**		**78.6**
1,2,3,4,6,7,8-HPCDD	---	---	---		**32,000 B**	**498 B**		**1,980 B**	**3,680 B**	**5,820 B**	**2,870 B**	**330 B**	**516 B**	**815**		**149 B**	**41.6**		**22.2**		**1,610 B**		**1,660**
1,2,3,4,6,7,8-HPCDF	---	---	---		**14,100**	**180 B**		**605 B**	**1,270**	**2,200**	**652 B**	**156**	**207**	**300**		**96.9**	**18.2**		**10.2**		**558 B**		**688**
1,2,3,4,7,8,9-HPCDF	---	---	---		**801 B**	**10.7**		**33.6**	**72.7 B**	**98.8 B**	**38.9**	**8.05 B**	**12.6 B**	**15.2**		**3.95 B**	**1.13**		**0.579**		**29.1**		**36.3**
1,2,3,4,7,8-HXCDD	---	---	---		**61.6**	**16.8**		**32**	**66.9**	**135**	**28.8**	**2.78**	**1.74**	**8.38**		**1.44**	**0.525 J**		**0.288 J**		**18.2**		**17.6**
1,2,3,4,7,8-HXCDF	---	---	---		**1110**	**24.4**		**64.3**	**127**	**173**	**72.4**	**8.85**	**8.46**	**24.6**		**6.48**	**1.43**		**0.786**		**51.6**		**61.4**
1,2,3,6,7,8-HXCDD	---	---	---		**1170**	**40.1**		**122**	**251**	**415**	**121**	**16.4**	**20.3**	**44.5**		**10.2**	**2.34**		**1.28**		**85.4**		**99.8**
1,2,3,6,7,8-HXCDF	---	---	---		**211**	**10.4**		**22**	**41.4**	**59.9**	**20.9**	**2.73**	**2.84**	**8.38**		**1.97**	**0.521**		**0.296 J**		**16.5**		**19.1**
1,2,3,7,8,9-HXCDD	---	---	---		**237**	**32.7**		**71.3**	**152**	**268**	**79.8**	**7.27**	**5.53**	**24.1**		**4.04**	**1.59**		**0.811**		**48.8**		**45.1**
1,2,3,7,8,9-HXCDF	---	---	---		**15.7**	**1.04**		**1.94**	**3.67**	**5.13**	**2.48**	**0.563**	**0.219 J**	**0.669**		**0.17 J**	**0.047 J**		**0.026 J**		**1.26**		**1.51**
1,2,3,7,8-PECDD	---	---	---		**31.4**	**14.6**		**20.1**	**43**	**65.3**	**15.6**	**1.53**	**1.26**	**5.67**		**1.4**	**0.297 J**		**0.162 J**		**11.2**		**13**
1,2,3,7,8-PECDF	---	---	---		**40.7**	**10.8**		**15.5**	**27.5**	**34.1**	**12.7**	**1.04**	**0.795**	**3.73**		**1.15**	**0.177 J**		**0.077 J**		**8.43**		**10.9**
2,3,4,6,7,8-HXCDF	---	---	---		**118**	**8.71**		**18**	**55.5**	**46.9**	**18.3**	**1.89**	**2.03**	**7.49**		**1.76**	**0.505 J**		**0.284 J**		**13.6**		**16.7**
2,3,4,7,8-PECDF	---	---	---		**88.7 B**	**14.2**		**21.2**	**38.2 B**	**49.2 B**	**17**	**1.57 B**	**1.35 B**	**6.44**		**1.55 B**	**0.271 J**		**0.157 J**		**12.5**		**16.6**
2,3,7,8-TCDD	---	---	---		**9.51 B**	**5.72**		**5.67**	**9.93 B**	**12.7 B**	**4.09**	**0.337 B**	**0.321 B**	**1.23**		**0.433 B**	**0.061 J**		**0.043 J**		0.0976 U		**3.69**
2,3,7,8-TCDF	---	---	---		**23.1**	**20.5**		**22.1**	**46.8**	**54.1**	**13.4**	**1.25**	**1.07**	**3.68**		**1.46**	**0.138**		**0.079 J**		**11.5**		**16.3**
OCDD	---	---	---		**171,000 B**	**3,900 B**		**18,600 B**	**34,900 B**	**53,400 B**	**28,900 B**	**3,290 B**	**8,090 B**	**7,300 B**		**1220 B**	**373 B**		**203 B**		**14,600 B**		**14,500 B**
OCDF	---	---	---		**59,400 B**	**562 B**		**1,970 B**	**4,380 B**	**6,170 B**	**1,880 B**	**475 B**	**556 B**	**1,160**		**242 B**	**45**		**22.4**		**1,820 B**		**2,260**

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
				SH-10-SC-12	SH-10-SC-23	SH-11-SS-00	SH-11-SC-12 [d]	SH-12-SS-00 [d]	SH-12-SC-12 [d]	SH-12-SC-23	SH-13-SS-00 [d]	SH-13-SC-12	SH-13-SC-23	SH-14-SS-00	SH-14-SC-12	SH-14-SC-23	SH-15-SS-00	SH-15-SC-12	SH-16-SS-00	SH-16-SC-12	SH-18-WS-00 [d]	SH-18-WC-12 [d]	SH-19-WS-00 [d]
	LAET	SQS	CSL	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	2 to 3 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---		**62,500**	**1,190 B**		**5,850 B**	**10,100**	**14,800**	**7,490 B**	**899**	**1,870**	**2,100**		**355**	**98.3**		**52.8**		**4,240 B**		**3,970**
TOTAL HEPTA-FURANS	---	---	---		**80,900**	**668 B**		**2,450 B**	**5,270**	**8,240**	**2,620**	**705**	**971**	**1,200**		**336**	**54.2**		**29**		**2,160 B**		**2,660**
TOTAL HEXA-DIOXINS	---	---	---		**9,040**	**911**		**2,250**	**4,870**	**10,000**	**2,110**	**278**	**392**	**617**		**113**	**35**		**18.3**		**1,190**		**1,100**
TOTAL HEXA-FURANS	---	---	---		**19,100**	**296**		**970**	**1,940**	**2,990**	**1,100**	**170**	**221**	**434**		**116**	**22.9**		**13.2**		**800**		**1,040**
TOTAL PENTA-DIOXINS	---	---	---		**687**	**874**		**1,560**	**3,560**	**7,530**	**1,230**	**167**	**59.7**	**267**		**42.3**	**11.6**		**5.54**		**600**		**569**
TOTAL PENTA-FURANS	---	---	---		**1930**	**222**		**397**	**711**	**931**	**335**	**38.3**	**36.7**	**149**		**41.1**	**6.91**		**3.79**		**254**		**351**
TOTAL TETRA-DIOXINS	---	---	---		**420**	**1,200**		**1,790**	**3,680**	**7,620**	**1,530**	**174**	**55.8**	**317**		**52.8**	**7.62**		**3.52**		**602**		**682**
TOTAL TETRA-FURANS	---	---	---		**526**	**477**		**552**	**1,010**	**1,110**	**330**	**33.1**	**35.8**	**111**		**44.6**	**3.25**		**1.74**		**270**		**427**
Guaicols and Resin Acids (ug/kg dry weight)																							
12-Chlorodehydroabietic Acid	---	---	---																		190 U	300 U	**130**
14-Chlorodehydroabietic Acid	---	---	---																		190 U	300 U	98 U
3,4,5-Trichloroguaiacol	---	---	---																		20 U	59 U	20 U
3,4,6-Trichloroguaiacol	---	---	---																		20 U	59 U	20 U
3,4-Dichloroguaiacol	---	---	---																		20 U	59 U	20 U
4,5,6-Trichloroguaiacol	---	---	---																		20 U	59 U	20 U
4,5-Dichloroguaiacol	---	---	---																		20 U	59 U	20 U
4,6-Dichloroguaiacol	---	---	---																		20 U	59 U	20 U
4-Chloroguaiacol	---	---	---																		20 U	59 U	20 U
9,10-Dichlorostearic Acid	---	---	---																		190 U	300 U	98 U
Abietic Acid	---	---	---																		**760**	**33,000**	**1,200**
Dehydroabietic Acid	---	---	---																		**1600**	**9,000**	**1,700**
Dichlorodehydroabietic Acid	---	---	---																		190 U	300 U	98 U
Guaiacol	---	---	---																		20 U	59 U	20 U
Isopimaric Acid	---	---	---																		**220**	**3300**	**190**
Linolenic Acid	---	---	---																		**200**	300 U	98 U
Neoabietic Acid	---	---	---																		190 UJ	**550 J**	98 UJ
Oleic Acid	---	---	---																		**430**	300 U	**210**
Palustric Acid	---	---	---																		190 U	**920**	98 U
Pimaric Acid	---	---	---																		190 U	300 U	98 U
Retene	---	---	---																		**110**	**7300**	**900**
Sandaracopimaric Acid	---	---	---																		190 U	**580**	98 U
Tetrachloroguaiacol	---	---	---																		20 U	59 U	20 U
Total resin acids [c]	---	---	---																		**3,300**	**53,000**	**4,200**

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram.
mg/kg	milligrams per kilogram.
PCBs	polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined	value indicates the sample result or detection limit is greater than the LAET or SQS value.
Shaded	value indicates the sample result or detection limit is greater than the CSL value.
U	The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.
J	The associated numerical value is considered an estimated concentration.
G	Bias is high.
B	Specifyied compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
				SH-19-WC-12	SH-20-WS-00 [d]	SH-20-WC-12	SH-21-WS-00 [d]	SH-21-WC-12 [d]	SH-22-WS-00 [d]	SH-22-WC-12	SH-23-WS-00	SH-23-WC-12 [d]	SH-24-WS-00 [d]	SH-25-WS-00	SH-26-WS-00	SH-26-WC-12 [d]	SH-27-WS-00	SH-27-WC-12	SH-28-WS-00	SH-28-WC-12	SH-29-WS-00	SH-29-WC-12	SH-30-WS-00
Parameter	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Conventional Parameters																							
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	56.8	77.2	62.5	76.2	39.1	36.8	31.1	64.8	60.4	42	49.6	12.8	1.8	21.6	10.3	24.1	39.4	4.1	5.8	31.2
Particle/Grain Size, Phi Scale <-1	---	---	---	1	2.2	8.5	1.1	21.8	12.5	11.8	1.8	4.6	6.1	6.3	21.3	6.7	25.3	37	0.2	4	5.8	6.8	1.2
Particle/Grain Size, Phi Scale >10	---	---	---	6.7	12.1	12.1	10.8	7.2	6.6	5.4	10.6	10.6	7.1	7.4	1.9		3.4	2	5	6.9	1.1	1.1	6
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	3.9	4.9	6	3.4	8.8	5.6	11.6	2.4	2.7	5.1	4.5	13.9	21.1	8	9.8	1.5	2.3	23.7	19.4	2.4
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	1.6	8.9	5.3	8.4	10.9	6.7	9	2.5	3.4	4.3	4.2	7.7	6.1	7.6	8.9	1.1	2.4	16.8	11.9	1.7
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	14	1.9	8.8	3.4	9.1	11.2	17	3.9	3.8	15.5	5.7	26.4	53.7	15	15.4	2.5	2.5	33.3	32.5	3.8
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	11.4	1.3	7.5	2.9	6.1	14.2	12.4	7.3	8.7	15.8	9.5	14.4	9.9	12.8	13.3	28.6	17.1	15.3	21.4	19
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	11.3	3.5	1.4	4.6	4.3	13	7.1	17.2	16.3	11.2	20.2	3.7	0.7	9.7	5.2	42	32.3	1	2.1	40.7
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	11.1	6.6	8.7	8	2.5	8.1	6.4	13.8	13.6	7.8	13.8	4.2		7.5	1.7	6.1	11.3	0.6	1.1	8.6
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	10.1	15.3	8.3	16.6	7.1	7	4.6	10.6	9.4	7.7	9.2	1.8		3.1	2	2.4	4.7	0.4	0.8	3.7
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	9.3	15	11.4	14.7	7.1	4.8	4.4	9.6	8.1	6.1	5.7	1.5		2.4	1.5	2.8	4.7	0.5	1	3.1
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	8.5	12.2	8.3	11.1	6.3	4	3.9	8.3	7.8	4.6	5.5	1.2		1.9	1.4	2.6	4.2	0.5	0.9	3.3
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	6	8.4	7.5	6.8	4.8	3.5	3.4	6.3	5.8	4.4	4.2	1.2		1.8	0.9	2.6	4.1	0.5	0.6	3.1
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	5.1	7.7	6.1	8.2	4.1	2.9	3	5.6	5.2	4.4	3.8	1		1.5	0.9	2.6	3.5	0.5	0.4	3.4
Total Volatile Solids %	---	---	---	8.62	12.81	9.23	16.64	39.5	19.68	17.13	10.26	16.65	14.17	10.77	2.62	1.85	3.52	6.72	5.47	8.42	1.55	2.07	8.31
Ammonia (mg/kg)	---	---	---	6.74	17.8	58.3	18.6	59.7	30.5	37.2	21.4	59.7	17.2	8.45	8.77	1.71	6.97	8.65	12	42.7	6.67	0.19	17.1
Sulfide	---	---	---	65.1	1,810	490	1,890 J	759	969	200	1,760	239	148	950	510	0.01 U	15.8	678	338	227	1.42	87.6	896
Total organic carbon (%)	---	---	---	2.47	5.15	1.38	5.59	11.1	5.77	3.4	3.33	6.88	4.97	2.6	1.92	0.153	1.38	3.48	1.24	2.76	0.594	1.14	1.99
Total solids (%)	---	---	---	43.7	30.2	50.5	30.1	31.5	39.8	58.5	38.6	44.7	45.7	42.1	67.9	84.7	63.8	60.8	57.3	55.7	77.5	81.7	51.8
Metals (mg/kg dry weight)																							
Antimony	150	---	---	0.35 J	0.34 J	0.37 J	0.37 J	0.22 J	0.27 J	0.24 J	0.29 J	0.39 J	0.26 J	0.33 J	0.11 J	0.065 J	0.1 J	0.14 J	0.21 J	0.24 J	0.13 J	0.17 J	0.25 J
Arsenic	57	57	93	3.2	7	6.1	7.8	3	6.5	5.5	7.6	7.1	6.1	7.5	2.1	1.3	3.5	2.6	5.6	5.9	4.1	2.9	7.6
Cadmium	5.1	5.1	6.7	0.62	1.6	1.2	1.6	0.74	0.59	0.52	0.89	1	0.71	0.64	0.25 J	0.23 J	0.34	0.29 J	0.58	0.66	0.1 J	0.15 J	1.1
Chromium	260	260	270	60	51	53	55	32	32	41	47	53	37	41	44	38	33	33	30	37	27	23	32
Copper	390	390	390	62	63	62	66	50	29	42	47	60	37	41	44	49	25	31	26	32	18	15	29
Lead	450	450	530	12	17	19	17	14	7.2	9.3	12	17	9.8	12	3.4	2	2.5	4.3	6.1	9.2	3.2	3.5	13
Mercury	0.41	0.41	0.59	0.045	0.1	0.222	0.1 J	0.088	0.048	0.141 U	0.072	0.12	0.086	0.06	0.019 J	0.11 U	0.012 J	0.122 U	0.07	0.056	0.0073 U	0.104 U	0.095
Nickel	140	---	---	42	42	39	44	26	26	32	41	44	31	36	39	37	25	28	30	34	30	31	30
Silver	6.1	6.1	6.1	0.097 J	0.18 J	0.18 J	0.21 J	0.14 J	0.095 J	0.11 J	0.14 J	0.16 J	0.11 J	0.13 J	0.046 J	0.035 J	0.04 J	0.038 J	0.075 J	0.11 J	0.017 J	0.02 J	0.11 J
Zinc	410	410	960	66	120	100	120	59	63	59	92	82	71	76	48	45	40	40	55	57	35	30	82
Butyltins (ug/kg dry weight)																							
Butyltin Ion	---	---	---																				3.6 U
Dibutyltin Ion	---	---	---																				2.8 U
Tributyltin Ion	---	---	---																				1.6 U
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																							
LPAHs																							
2-Methylnaphthalene (dry)	670	---	---	8 U	8.1 U	8.1 U	8.1 U	20 U	8.1 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.1 U	8.2 U	8.0 U	7.9 U	8.1 U	7.8 U	8.0 U	8.1 U
2-Methylnaphthalene (OC)	---	38	64	0.32 U	0.16 U	0.59 U	0.14 U	0.18 U	0.14 U	0.24 U	0.24 U	0.12 U	0.16 U	0.31 U	0.42 U	5.3 U	0.59 U	0.23 U	0.64 U	0.29 U	1.3 U	0.70 U	0.41 U
Acenaphthene (dry)	500	---	---	8 U	8.1 U	8.1 U	8.2 U	20 U	13 J	8.0 U	8.0 U	8.1 U	8.0 U	8.1 U	8.0 U	8.1 U	8.2 U	8.0 U	7.9 U	8.1 U	7.9 U	8.1 U	8.1 U
Acenaphthene (OC)	---	16	57	0.32 U	0.16 U	0.59 U	0.15 U	0.18 U	0.23 J	0.24 U	0.24 U	0.12 U	0.16 U	0.31 U	0.42 U	5.3 U	0.59 U	0.23 U	0.64 U	0.29 U	1.3 U	0.71 U	0.41 U
Acenaphthylene (dry)	560	---	---	8.5 U	8.6 U	8.5 U	8.6 U	21 U	29	8.4 U	8.5 U	8.5 U	8.5 U	8.5 U	8.4 U	8.6 U	8.6 U	8.5 U	8.4 U	8.5 U	8.3 U	8.5 U	8.5 U
Acenaphthylene (OC)	---	66	66	0.34 U	0.17 U	0.62 U	0.15 U	0.19 U	0.50	0.25 U	0.26 U	0.12 U	0.17 U	0.33 U	0.44 U	5.6 U	0.62 U	0.24 U	0.68 U	0.31 U	1.4 U	0.75 U	0.43 U
Anthracene (dry)	960	---	---	7.6 U	7.7 U	7.6 U	7.7 U	160	100	20	7.6 U	7.6 U	7.6 U	21	7.5 U	7.7 U	7.7 U	7.6 U	7.5 U	7.6 U	7.4 U	7.6 U	7.6 U
Anthracene (OC)	---	220	1,200	0.31 U	0.15 U	0.55 U	0.14 U	1.4	1.7	0.59	0.23 U	0.11 U	0.15 U	0.8	0.39 U	5.0 U	0.56 U	0.22 U	0.60 U	0.28 U	1.2 U	0.67 U	0.38 U
Fluorene (dry)	540	---	---	8.8 U	8.9 U	8.8 U	8.9 U	22 U	17 J	8.7 U	8.8 U	8.8 U	8.8 U	8.8 U	8.7 U	8.9 U	8.9 U	8.8 U	8.6 U	8.8 U	8.6 U	8.8 U	8.8 U
Fluorene (OC)	---	23	79	0.36 U	0.17 U	0.64 U	0.16 U	0.20 U	0.29 J	0.26 U	0.26 U	0.13 U	0.18 U	0.34 U	0.45 U	5.8 U	0.64 U	0.25 U	0.69 U	0.32 U	1.4 U	0.77 U	0.44 U
Naphthalene (dry)	2,100	---	---	36	8.6 U	8.5 U	8.6 U	22 U	8.6 U	8.4 U	8.5 U	8.5 U	8.5 U	8.5 U	8.4 U	8.6 U	8.6 U	8.5 U	8.4 U	8.6 U	8.3 U	8.5 U	8.5 U
Naphthalene (OC)	---	99	170	1.5	0.17 U	0.62 U	0.15 U	0.20 U	0.15 U	0.25 U	0.26 U	0.12 U	0.17 U	0.33 U	0.44 U	5.6 U	0.62 U	0.24 U	0.68 U	0.31 U	1.4 U	0.75 U	0.43 U
Phenanthrene (dry)	1500	---	---	88	8.3 U	24	21	74	270	61	18 J	14 J	8.20 U	56	8.2 U	8.3 U	8.4 U	8.2 U	9.6 J	20 J	25	8.2 U	25
Phenanthrene (OC)	---	100	480	3.6	0.16 U	1.7	0.38	0.67	4.7	1.8	0.54 J	0.20 J	0.16 U	2.2	0.43 U	5.4 U	0.61 U	0.24 U	0.77 J	0.72 J	4.2	0.72 U	1.3
Total LPAHs (dry) [c]	5200	---	---	120	20 U	24	21	230	430	81	18 J	14 J	20 U	77	19 U	20 U	20 U	20 U	9.6 J	20 J	25	20 U	25
Total LPAHs (OC) [c]	---	370	780	4.9	0.39 U	1.7	0.38	2.1	7.4	2.4	0.54 J	0.20 J	0.40 U	3.0	0.99 U	13 U	1.4 U	0.57 U	0.77 J	0.72 J	4.2	1.8 U	1.3
HPAHs																							
Benzo(a)anthracene (dry)	1,300	---	---	24	5.9 U	27	41	150	290	64	19 J	15 J	5.8 U	38	5.7 U	5.9 U	5.9 U	5.8 U	9.6 J	14 J	5.7 U	5.8 U	26
Benzo(a)anthracene (OC)	---	110	270	1.0	0.11 U	2.0	0.73	1.4	5.0	1.9	0.57 J	0.22 J	0.12 U	1.5	0.30 U	3.9 U	0.43 U	0.17 U	0.8 J	0.51 J	1.0 U	0.51 U	1.3
Benzo(a)pyrene (dry)	1,600	---	---	33	8.1 U	30	36	150	200	59	20	22	8.0 U	61	7.9 U	8.1 U	8.1 U	8.0 U	12 J	15 J	7.8 U	8 U	21
Benzo(a)pyrene (OC)	---	99	210	1.3	0.16 U	2.2	0.64	1.4	3.5	1.7	0.60	0.32	0.16 U	2.3	0.41 U	5.3 U	0.59 U	0.23 U	1.0 J	0.54 J	1.3 U	0.70 U	1.1
Benzo(b)fluoranthene (dry)	---	---	---	26	9.4 U	26	45	290	380	89	31	18 J	22	51	9.2 U	9.4 U	9.5 U	9.3 U	9.2 U	11 J	9.1 U	9.3 U	21
Benzo(b)fluoranthene (OC)	---	---	---	1.1	0.18 U	1.9	0.81	2.6	6.6	2.6	0.93	0.26 J	0.44	2.0	0.48 U	6.1 U	0.69 U	0.27 U	0.74 U	0.40 J	1.5 U	0.82 U	1.1
Benzo(g,h,i)perylene (dry)	670	---	---	22	6.7 U	6.7 U	6.7 U	47 J	64	6.6 U	6.6 U	6.6 U	6.6 U	26	6.6 U	6.7 U	6.7 U	6.6 U	6.5 U	15 J	6.5 U	6.6 U	6.7 U
Benzo(g,h,i)perylene (OC)	---	31	78	0.89	0.13 U	0.49 U	0.12 U	0.42 J	1.1	0.19 U	0.20 U	0.10 U	0.13 U	1.0	0.34 U	4.4 U	0.49 U	0.19 U	0.52 U	0.54 J	1.1 U	0.58 U	0.34 U
Benzo(k)fluoranthene (dry)	---	---	---	23	9.2 U	45	99	390	370	110	24	12 J	9.1 U	74	9 U	9.2 U	9.2 U	9.1 U	8.9 U	11 J	8.9 U	9.1 U	27
Benzo(k)fluoranthene (OC)	---	---	---	0.93	0.18 U	3.3	1.8	3.5	6.4	3.2	0.72	0.17 J	0.18 U	2.8	0.47 U	6.0 U	0.67 U	0.26 U	0.72 U	0.40 J	1.5 U	0.80 U	1.4
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---	49	20 U	71	140	680	750	200	55	30 J	22	120	19 U	20 U	20 U	20 U	19 U	22 J	19 U	20 U	48
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450	2	0.39 U	5.1	2.5	6.1	13	5.9	1.7	0.44 J	0.44	4.6	0.99 U	13 U	1.4 U	0.57 U	1.5 U	0.80 J	3.2 U	1.8 U	2.4
Chrysene (dry)	1,400	---	---	30	26	34	100	240	800	130	58	22	34	76	12 J	6.6 U	6.6 U	6.5 U	14 J	18 J	6.3 U	6.5 U	44
Chrysene (OC)	---	110	460	1.2	0.50	2.5	1.8	2.2	13.9	3.8	1.7	0.32	0.68	2.9	0.63 J	4.3 U	0.48 U	0.19 U	1.1 J	0.65 J	1.1 U	0.57 U	2.2
Dibenz(a,h)anthracene (dry)	230	---	---	8.4 U	8.5 U	8.4 U	8.5 U	21 U	18 J	8.3 U	8.4 U	8.4 U	8.4 U	8.4 U	8.3 U	8.5 U	8.5 U	8.4 U	8.3 U	8.4 U	8.2 U	8.4 U	8.4 U
Dibenz(a,h)anthracene (OC)	---	12	33	0.34 U	0.17 U	0.61 U	0.15 U	0.19 U	0.31 J	0.24 U	0.25 U	0.12 U	0.17 U	0.32 U	0.43 U	5.6 U	0.62 U	0.24 U	0.67 U	0.30 U	1.4 U	0.74 U	0.42 U
Fluoranthene (dry)	1,700	---	---	170	28	43	78	1,500	2,000	320	81	29	43	93	14 J	7.8 U	7.9 U	7.7 U	17 J	34	34	7.8 U	78
Fluoranthene (OC)	---	160	1,200	6.9	0.54	3.1	1.4	13.5	34.7	9.4	2.4	0.42	0.87	3.6	0.73 J	5.1 U	0.57 U	0.22 U	1.4 J	1.2	5.7	0.68 U	3.9
Indeno(1,2,3-cd)pyrene (dry)	600	---	---	8.4 U	8.5 U	8.5 U	8.5 U	33 J	78	8.3 U	8.4 U	8.4 U	8.4 U	22	8.3 U	8.5 U	8.6 U	8.4 U	8.3 U	8.5 U	8.2 U	8.4 U	8.5 U
Indeno(1,2,3-cd)pyrene (OC)	---	34	88	0.34 U	0.17 U	0.62 U	0.15 U	0.30 J	1.4	0.24 U	0.25 U	0.12 U	0.17 U	0.85	0.43 U	5.6 U	0.62 U	0.24 U	0.67 U	0.31 U	1.4 U	0.74 U	0.43 U
Pyrene (dry)	2,600	---	---	200	28	49	86	640	1,000	230	68	31	45	85	14 J	7.7 U	7.7 U	7.6 U	19	24	34	7.6 U	71
Pyrene (OC)	---	1,000	1,400	8.1	0.54	3.6	1.5	5.8	17.3	6.8	2.0	0.45	0.91	3.3	0.73 J	5.0 U	0.56 U	0.22 U	1.5	0.87	5.7	0.67 U	3.6
Total HPAHs (dry) [c]	12,000	---	---	530	82	250	480	3,400	5,200	1,000	300	150	140	520	40	20 U	20 U	20 U	91	140	68	20 U	290
Total HPAHs (OC) [c]	---	960	5,300	21	1.6	18	8.6	31	90	29	9.0	2.2	2.8	20	2.1	13 U	1.4 U	0.57 U	7.3	5.1	11	1.8 U	15

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
	LAET	SQS	CSL	SH-19-WC-12	SH-20-WS-00[d]	SH-20-WC-12	SH-21-WS-00[d]	SH-21-WC-12[d]	SH-22-WS-00[d]	SH-22-WC-12	SH-23-WS-00	SH-23-WC-12[d]	SH-24-WS-00[d]	SH-25-WS-00	SH-26-WS-00	SH-26-WC-12[d]	SH-27-WS-00	SH-27-WC-12	SH-28-WS-00	SH-28-WC-12	SH-29-WS-00	SH-29-WC-12	SH-30-WS-00
				1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																							
1,2,4-Trichlorobenzene (dry)	31	---	---	8.9 U	9.0 U	8.9 U	9.0 U	23 U	8.9 U	8.8 U	8.9 U	8.9 U	8.9 U	8.9 U	8.8 U	9.0 U	9.0 U	8.9 U	8.8 U	9.0 U	8.7 U	8.9 U	8.9 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8	0.36 U	0.17 U	0.64 U	0.16 U	0.21 U	0.15 U	0.26 U	0.27 U	0.13 U	0.18 U	0.34 U	0.46 U	5.9 U	0.65 U	0.26 U	0.71 U	0.33 U	1.5 U	0.78 U	0.45 U
1,2-Dichlorobenzene (dry)	35	---	---	7.7 U	7.8 U	7.8 U	7.8 U	20 U	7.8 U	7.6 U	7.7 U	7.7 U	7.7 U	7.7 U	7.6 U	7.8 U	7.8 U	7.7 U	7.6 U	7.8 U	7.5 U	7.7 U	7.8 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3	0.31 U	0.15 U	0.57 U	0.14 U	0.18 U	0.14 U	0.22 U	0.23 U	0.11 U	0.15 U	0.30 U	0.40 U	5.1 U	0.57 U	0.22 U	0.61 U	0.28 U	1.3 U	0.68 U	0.39 U
1,4-Dichlorobenzene (dry)	110	---	---	7.2 U	7.3 U	7.2 U	7.3 U	18 U	7.2 U	7.1 U	7.2 U	7.2 U	7.2 U	7.2 U	7.1 U	7.3 U	7.3 U	7.2 U	7.1 U	7.3 U	7.0 U	7.2 U	7.2 U
1,4-Dichlorobenzene (OC)	---	3.1	9	0.29 U	0.14 U	0.52 U	0.13 U	0.16 U	0.12 U	0.21 U	0.22 U	0.10 U	0.14 U	0.28 U	0.37 U	4.8 U	0.53 U	0.21 U	0.57 U	0.26 U	1.2 U	0.63 U	0.36 U
Phthalates (ug/kg dry weight or mg/kg OC)																							
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---	11 U	23 U	11 U	11 U	**72**	**11 J**	11 U	**11 J**	11 U	11 U	**36**	**25**	**20**	11 U	**36**	11 U	11 U	11 U	**24**	21 U
bis(2-Ethylhexyl)phthalate (OC)	---	47	78	0.45 U	0.45 U	0.80 U	0.20 U	**0.65**	**0.19 J**	0.32 U	**0.33 J**	0.16 U	0.22 U	**1.4**	**1.3**	**13.1**	0.80 U	**1.0**	0.89 U	0.40 U	1.9 U	**2.1**	1.1 U
Butylbenzylphthalate (dry)	63	---	---	11 U	11 U	11 U	11 U	28 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Butylbenzylphthalate (OC)	---	4.9	64	0.45 U	0.21 U	0.80 U	0.20 U	0.25 U	0.19 U	0.32 U	0.33 U	0.16 U	0.22 U	0.42 U	0.57 U	7.2 U	0.80 U	0.32 U	0.89 U	0.40 U	1.9 U	1.0 U	0.55 U
Di-n-Butylphthalate (dry)	1400	---	---	12 U	12 U	12 U	12 U	31 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Di-n-Butylphthalate (OC)	---	220	1,700	0.49 U	0.23 U	0.87 U	0.21 U	0.28 U	0.21 U	0.35 U	0.36 U	0.17 U	0.24 U	0.46 U	0.63 U	7.8 U	0.87 U	0.34 U	1.0 U	0.43 U	2.0 U	1.1 U	0.60 U
Di-n-Octyl phthalate (dry)	6200	---	---	8.2 U	8.3 U	8.2 U	8.3 U	21 U	8.2 U	8.1 U	8.2 U	8.2 U	8.2 U	8.2 U	8.1 U	8.3 U	8.3 U	8.2 U	8.0 U	8.2 U	8 U	8.2 U	8.2 U
Di-n-Octyl phthalate (OC)	---	58	4,500	0.33 U	0.16 U	0.59 U	0.15 U	0.19 U	0.14 U	0.24 U	0.25 U	0.12 U	0.16 U	0.32 U	0.42 U	5.4 U	0.60 U	0.24 U	0.65 U	0.30 U	1.3 U	0.72 U	0.41 U
Diethylphthalate (dry)	200	---	---	16 U	16 U	16 U	16 U	41 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U
Diethylphthalate (OC)	---	61	110	0.65 U	0.31 U	1.2 U	0.29 U	0.37 U	0.28 U	0.47 U	0.48 U	0.23 U	0.32 U	0.62 U	0.83 U	10.5 U	1.2 U	0.46 U	1.3 U	0.58 U	2.7 U	1.4 U	0.80 U
Dimethylphthalate (dry)	71	---	---	7.6 U	7.7 U	7.6 U	7.7 U	19 U	7.6 U	7.5 U	7.6 U	7.6 U	7.6 U	7.6 U	7.5 U	7.7 U	7.7 U	7.6 U	7.5 U	7.7 U	7.4 U	7.6 U	7.6 U
Dimethylphthalate (OC)	---	53	53	0.31 U	0.15 U	0.55 U	0.14 U	0.17 U	0.13 U	0.22 U	0.23 U	0.11 U	0.15 U	0.29 U	0.39 U	5.0 U	0.56 U	0.22 U	0.60 U	0.28 U	1.2 U	0.67 U	0.38 U
Ionizable Organic Compounds (ug/kg dry weight)																							
2,4-Dimethylphenol	29	29	29	14 U	15 U	15 U	15 U	37 U	15 U	14 U	14 U	15 U	14 U	15 U	14 U	15 U	15 U	14 U	14 U	15 U	14 U	15 U	15 U
Benzoic Acid	650	650	650	110 U	110 U	110 U	110 U	290 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U
Benzyl Alcohol	57	57	73	14 U	14 U	14 U	14 U	36 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U
Pentachlorophenol	360	360	690	47 U	47 U	47 U	47 U	120 U	47 U	46 U	47 U	47 U	47 U	47 U	46 U	47 U	47 U	47 U	46 U	47 U	46 U	47 U	47 U
Phenol	420	420	1,200	13 U	14 U	13 U	14 U	**47 J**	**16 J**	13 U	13 U	**19 J**	13 U	13 U	13 U	14 U	**21**	13 U	**40**	**20**	**54**	13 U	13 U
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																							
Dibenzofuran (dry)	540	---	---	7.4 U	7.5 U	7.4 U	7.5 U	19 U	7.4 U	7.3 U	7.4 U	7.4 U	7.4 U	7.4 U	7.3 U	7.5 U	7.5 U	7.4 U	7.3 U	7.5 U	7.2 U	7.4 U	7.4 U
Dibenzofuran (OC)	---	15	58	0.30 U	0.15 U	0.54 U	0.13 U	0.17 U	0.13 U	0.21 U	0.22 U	0.11 U	0.15 U	0.28 U	0.38 U	4.9 U	0.54 U	0.21 U	0.59 U	0.27 U	1.2 U	0.65 U	0.37 U
Hexachlorobenzene (dry)	22	---	---	7.9 U	7.9 U	7.9 U	8 U	20 U	7.9 U	7.8 U	7.9 U	7.9 U	7.9 U	7.9 U	7.8 U	7.9 U	8.0 U	7.8 U	7.7 U	7.9 U	7.7 U	7.9 U	7.9 U
Hexachlorobenzene (OC)	---	0.38	2.3	0.32 U	0.15 U	0.57 U	0.14 U	0.18 U	0.14 U	0.23 U	0.24 U	0.11 U	0.16 U	0.30 U	0.41 U	5.2 U	0.58 U	0.22 U	0.62 U	0.29 U	1.3 U	0.69 U	0.40 U
Hexachlorobutadiene (dry)	11	---	---	7.9 U	8.0 U	8.0 U	8.1 U	20 U	8.0 U	7.9 U	8.0 U	8.0 U	8.0 U	8.0 U	7.9 U	8 U	8.1 U	7.9 U	7.8 U	8.0 U	7.8 U	8.0 U	8.0 U
Hexachlorobutadiene (OC)	---	3.9	6.2	0.32 U	0.16 U	0.58 U	0.14 U	0.18 U	0.14 U	0.23 U	0.24 U	0.12 U	0.16 U	0.31 U	0.41 U	5.2 U	0.59 U	0.23 U	0.63 U	0.29 U	1.3 U	0.70 U	0.40 U
N-Nitrosodiphenylamine (dry)	28	---	---	8.5 U	8.6 U	8.5 U	8.6 U	22 U	8.6 U	8.4 U	8.5 U	8.5 U	8.5 U	8.5 U	8.4 U	8.6 U	8.6 U	8.5 U	8.4 U	8.6 U	8.3 U	8.5 U	8.5 U
N-Nitrosodiphenylamine (OC)	---	11	11	0.34 U	0.17 U	0.62 U	0.15 U	0.20 U	0.15 U	0.25 U	0.26 U	0.12 U	0.17 U	0.33 U	0.44 U	5.6 U	0.62 U	0.24 U	0.68 U	0.31 U	1.4 U	0.75 U	0.43 U
2-Methylphenol	---	63	63	14 U	14 U	14 U	14 U	35 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U
4-Methylphenol	---	670	670	**140**	13 U	13 U	13 U	32 U	13 U	12 U	13 U	13 U	**34**	**22**	12 U	13 U	13 U	13 U	**27**	13 U	12 U	13 U	32
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																							
Total PCBs (OC)[c]	---	12	65	0.16 U	0.78 UJG	0.29 UJ	0.14 UJG	0.035 UJ	0.049 U	0.11 UJ	0.087 UJG	0.041 UJG	0.076 UJG	0.15 UJ	0.15 U	2.5 U	0.2 U	0.11 UJ	0.22 UJG	0.11 UJG	0.66 U	0.33 U	0.19 UJ
Total PCBs (dry)[c]	130	---	---	3.9 U	4.0 UJG	4.0 UJ	8.0 UJG	3.9 UJ	2.8 U	3.9 UJ	2.9 UJG	2.8 UJG	3.8 UJG	3.9 UJ	2.8 U	3.8 U	2.8 U	4 UJ	2.7 UJG	2.9 UJG	3.9 U	3.8 U	3.8 UJ
Aroclor 1016	---	---	---	1.6 U	1.6 UJG	1.6 UJ	3.2 UJG	1.6 UJ	2.8 U	1.6 UJ	2.9 UJG	2.8 UJG	1.5 UJG	1.6 UJ	2.8 U	1.5 U	2.8 U	1.6 UJ	2.7 UJG	2.9 UJG	1.5 U	1.5 U	1.5 UJ
Aroclor 1221	---	---	---	3.9 U	4.0 UJG	4.0 UJ	8.0 UJG	3.9 UJ	2.8 U	3.9 UJ	2.9 UJG	2.8 UJG	3.8 UJG	3.9 UJ	2.8 U	3.8 U	2.8 U	4 UJ	2.7 UJG	2.9 UJG	3.9 U	3.8 U	3.8 UJ
Aroclor 1232	---	---	---	3.4 U	3.5 UJG	3.5 UJ	7.0 UJG	3.4 UJ	2.8 U	3.4 UJ	2.9 UJG	2.8 UJG	3.4 UJG	3.5 UJ	2.8 U	3.3 U	2.8 U	3.5 UJ	2.7 UJG	2.9 UJG	3.4 U	3.4 U	3.3 UJ
Aroclor 1242	---	---	---	1.0 U	1.0 UJG	1.0 UJ	2.1 UJG	1.0 UJ	2.8 U	1.0 UJ	2.9 UJG	2.8 UJG	1.0 UJG	1.0 UJ	2.8 U	0.99 U	2.8 U	1.1 UJ	2.7 UJG	2.9 UJG	1.0 U	1.0 U	0.99 UJ
Aroclor 1248	---	---	---	0.64 U	0.65 UJG	0.64 UJ	1.3 UJG	0.63 UJ	2.8 U	0.63 UJ	2.9 UJG	2.8 UJG	0.62 UJG	0.6 UJ	2.8 U	0.61 U	2.8 U	0.65 UJ	2.7 UJG	2.9 UJG	0.63 U	0.62 U	0.61 UJ
Aroclor 1254	---	---	---	1.0 U	1.0 UJG	1.0 UJ	2.1 UJG	1.0 UJ	0.73 U	1.0 UJ	0.75 UJG	0.72 UJG	1.0 UJG	1.0 UJ	0.72 U	0.99 U	0.72 U	1.1 UJ	0.71 UJG	0.75 UJG	1.0 U	1.0 U	0.99 UJ
Aroclor 1260	---	---	---	1.5 U	1.5 UJG	1.5 UJ	3.0 UJG	1.5 UJ	0.73 U	1.5 UJ	0.75 UJG	0.72 UJG	1.4 UJG	1.5 UJ	0.72 U	1.4 U	0.72 U	1.5 UJ	0.71 UJG	0.75 UJG	1.4 U	1.4 U	1.4 UJ
Chlorinated Pesticides (ug/kg dry weight)																							
4,4'-DDD	16	---	---	0.15 U	0.14 U	**2.7 J**	0.15 UJG	**3.6 J**	0.25 U	**1.1 J**	0.27 U	**1.1 J**	0.14 U	0.14 UJG	0.26 U	0.14 U	0.25 U	0.15 U	0.25 U	0.26 U	0.14 U	**0.34 J**	**2.3**
4,4'-DDE	9	---	---	0.14 U	0.14 U	0.14 U	0.14 UJG	0.14 U	0.22 U	**0.52 J**	0.23 U	0.22 U	0.14 U	**1.3 JTG**	0.22 U	0.13 U	0.22 U	0.14 U	0.22 U	**0.9 J**	0.14 U	**0.14 J**	0.14 U
4,4'-DDT	34	---	---	0.15 U	0.15 U	0.15 U	0.15 UJG	0.15 U	0.25 U	0.15 U	0.27 U	0.25 U	0.15 U	0.15 UJG	0.26 U	0.14 U	0.25 U	0.15 U	0.25 U	0.26 U	0.15 U	0.15 U	0.15 U
Aldrin	---	---	---	0.22 U	0.22 U	0.22 U	0.22 UJG	0.22 U	**0.63 JTG**	0.22 U	0.11 U	0.1 U	0.22 U	0.22 UJG	0.1 U	0.21 U	0.1 U	**2.9 J**	0.1 U	0.1 U	0.21 U	**0.36 J**	0.21 U
alpha-Chlordane	---	---	---	**0.15 J**	0.13 U	0.13 U	0.13 UJG	**2.5 J**	0.11 U	0.13 U	0.12 U	0.11 U	0.13 U	0.13 UJG	0.12 U	0.13 U	0.11 U	0.13 U	0.11 U	0.12 U	0.13 U	0.13 U	0.13 U
Dieldrin	---	---	---	0.12 U	0.12 U	0.12 U	0.12 UJG	0.12 U	0.21 U	0.11 U	0.22 U	0.21 U	0.12 U	0.12 UJG	**0.37 JTG**	**0.37 J**	0.21 U	0.12 U	0.21 U	**1.9 J**	0.11 U	0.11 U	0.11 U
gamma-BHC	---	---	---	0.078 U	0.077 U	**2.8**	0.078 UJG	0.076 U	0.11 U	0.076 U	0.12 U	0.11 U	**0.4 J**	**0.48 JTG**	0.11 U	0.074 U	0.11 U	**0.95 J**	0.11 U	0.11 U	0.075 U	0.075 U	**0.51 J**
Heptachlor	---	---	---	0.47 U	0.46 U	0.46 U	0.46 UJG	0.45 U	0.13 U	0.45 U	0.14 U	0.13 U	0.46 U	0.45 UJG	0.13 U	0.44 U	**0.22 JTG**	0.46 U	0.13 U	0.13 U	0.45 U	0.45 U	0.45 U
Petroleum Hydrocarbons (mg/kg dry weight)																							
Gasoline	---	---	---		65 U																		
Diesel Range	---	---	---		160 U																		
Motor Oil	---	---	---		320 U																		
Dioxins/Furans (ng/kg dry weight)																							
DX TOTAL (TEQ ND=1/2 DL)	---	---	---		**50.8**		**53.7**		**47.4**		**28.8**		**31.8**	**37.9**	**5.16**		**3.8**		**29.8**		**2.08**		**36**
1,2,3,4,6,7,8-HPCDD	---	---	---		**1,230**		**1,420**		**1,810**		**712**		**717**	**820 B**	**113**		**83.7**		**654**		**45.4**		**649 B**
1,2,3,4,6,7,8-HPCDF	---	---	---		**447**		**393**		**197**		**217**		**298**	**330 B**	**37.5**		**29.2**		**262**		**18.7**		**204 B**
1,2,3,4,7,8,9-HPCDF	---	---	---		**24.8**		**22.2**		**11**		**13.5**		**16.1**	**16.7**	**2.42**		**1.53**		**15.3**		**1.07**		**12.4**
1,2,3,4,7,8-HXCDD	---	---	---		**13.4**		**15.7**		**9.27**		**7.04**		**8.19**	**9.34**	**1.88**		**1.34**		**6.82**		**0.606**		**9.84**
1,2,3,4,7,8-HXCDF	---	---	---		**39.4**		**33.4**		**22.5**		**22**		**26.5**	**26.2**	**3.16**		**2.32**		**27.1**		**1.56**		**25.5**
1,2,3,6,7,8-HXCDD	---	---	---		**62.8**		**70.8**		**61.6**		**36.1**		**42.3**	**48.5**	**6.56**		**5.48**		**40.3**		**2.6**		**48.4**
1,2,3,6,7,8-HXCDF	---	---	---		**12.9**		**11.4**		**7.18**		**7.13**		**8.21**	**9.18**	**1.29**		**0.878**		**7.86**		**0.595**		**8.77**
1,2,3,7,8,9-HXCDD	---	---	---		**35.9**		**43.2**		**39.5**		**28.6**		**22.1**	**26.9**	**5.34**		**3.48**		**21.8**		**1.85**		**31.1**
1,2,3,7,8,9-HXCDF	---	---	---		**1.1**		**1.02**		**0.792**		**0.611 J**		**0.666**	**0.715**	**0.111 J**		**0.075 J**		**0.66**		**0.052 J**		**0.785**
1,2,3,7,8-PECDD	---	---	---		**7.26**		**8.34**		**4.23**		**3.93 J**		**5.01**	**6.82**	**0.951**		**0.657**		**4.39**		**0.339 J**		**7.39**
1,2,3,7,8-PECDF	---	---	---		**5.29**		**5.62**		**4.18**		**2.65 J**		**3.25**	**4.12**	**0.433 J**		**0.373 J**		**3.14**		**0.179 J**		**4.56**
2,3,4,6,7,8-HXCDF	---	---	---		**10.6**		**11**		**7.41**		**6.2**		**7.51**	**8.07**	**1.02**		**0.896**		**6.41**		**0.5 J**		**7.39**
2,3,4,7,8-PECDF	---	---	---		**7.88**		**7.56**		**5.81**		**4.27 J**		**5.22**	**6.23**	**0.602**		**0.488**		**5.74**		**0.279 J**		**8.02**
2,3,7,8-TCDD	---	---	---		**1.62**		**1.72**		**0.885**		**1.19**		**1.05**	**1.59**	**0.211**		**0.143**		**0.813**		**0.073 J**		**1.84**
2,3,7,8-TCDF	---	---	---		**5.35**		**5.08 J**		**4.59**		**2.3 J**		**2.92 J**	**4.01**	**0.325 J**		**0.284 J**		**3.89**		**0.163**		**5.51**
OCDD	---	---	---		**12,400 B**		**12,900 B**		**16,100 B**		**6,340 B**		**6,430 B**	**7,400 B**	**1,030 B**		**756 B**		**5,860 B**		**394 B**		**5,720 B**
OCDF	---	---	---		**1,750**		**1,230**		**490**		**634**		**1,030**	**1,020 B**	**105**		**80.2**		**735**		**50**		**586 B**

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor																			
				SH-19-WC-12	SH-20-WS-00 [d]	SH-20-WC-12	SH-21-WS-00 [d]	SH-21-WC-12 [d]	SH-22-WS-00 [d]	SH-22-WC-12	SH-23-WS-00	SH-23-WC-12 [d]	SH-24-WS-00 [d]	SH-25-WS-00	SH-26-WS-00	SH-26-WC-12 [d]	SH-27-WS-00	SH-27-WC-12	SH-28-WS-00	SH-28-WC-12	SH-29-WS-00	SH-29-WC-12	SH-30-WS-00
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---		**3,080**		**4,450**		**10,200**		**2,280**		**1,750**	**2,120 B**	**283**		**204**		**1,600**		**109**		**2,090 B**
TOTAL HEPTA-FURANS	---	---	---		**1,810**		**1,500**		**744**		**776**		**1,160**	**1,230 B**	**132**		**98.1**		**931**		**61.3**		**836 B**
TOTAL HEXA-DIOXINS	---	---	---		**898**		**1,180**		**1,130**		**570**		**527**	**655**	**121**		**92.8**		**646**		**39.5**		**924**
TOTAL HEXA-FURANS	---	---	---		**605**		**553**		**400**		**342**		**429**	**456**	**48.1**		**37.1**		**434**		**24.4**		**439**
TOTAL PENTA-DIOXINS	---	---	---		**391**		**574**		**182**		**215**		**259**	**293**	**67.9**		**54**		**248**		**13.6**		**400**
TOTAL PENTA-FURANS	---	---	---		**165**		**163**		**129**		**102**		**119**	**143**	**14.4**		**11.7**		**143**		**7.25**		**195**
TOTAL TETRA-DIOXINS	---	---	---		**367**		**545**		**169**		**163**		**247**	**262**	**61.5**		**40.8**		**263**		**9.78**		**441**
TOTAL TETRA-FURANS	---	---	---		**131**		**132**		**72.8**		**63.1**		**78.9**	**94.9**	**10**		**7.09**		**87.3**		**3.74**		**158**
Guaicols and Resin Acids (ug/kg dry weight)																							
12-Chlorodehydroabietic Acid	---	---	---	99 U	300 U	290 U	100 U	220 UJ	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	97 U	98 U	99 U	96 U	97 U	290 U
14-Chlorodehydroabietic Acid	---	---	---	99 U	300 U	290 U	100 U	220 UJ	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	97 U	98 U	99 U	96 U	97 U	290 U
3,4,5-Trichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
3,4,6-Trichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
3,4-Dichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
4,5,6-Trichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
4,5-Dichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
4,6-Dichloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
4-Chloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
9,10-Dichlorostearic Acid	---	---	---	99 U	300 U	290 U	100 U	220 UJ	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	97 U	98 U	99 U	96 U	97 U	290 U
Abietic Acid	---	---	---	**960**	**840**	**2,600**	**1,900**	**38,000 J**	**3,300**	**13,000**	**1,100**	**1,000**	**3,000**	**1,300**	**210**	98 U	**120**	**8,500**	**600**	**1,600**	96 U	**230**	**710**
Dehydroabietic Acid	---	---	---	**460**	**1,200**	**1,400**	**1,600**	**22,000 J**	**3,200**	**5,300**	**740**	**530**	**4,200**	**1,800**	**120**	98 U	98 U	**7,500**	**710**	**360**	96 U	**110**	**580**
Dichlorodehydroabietic Acid	---	---	---	99 U	300 U	290 U	100 U	220 UJ	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	97 U	98 U	99 U	96 U	97 U	290 U
Guaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
Isopimaric Acid	---	---	---	**140**	300 U	**290 J**	100 U	**3,700 J**	**540**	**2,400**	**130**	**120**	**520**	**340**	97 U	98 U	98 U	**3,300**	**100**	99 U	96 U	97 U	290 U
Linolenic Acid	---	---	---	99 U	300 U	290 U	**180**	**1,000 J**	99 U	480 U	**190**	99 U	290 U	**160**	97 U	98 U	98 U	**150**	**160**	99 U	96 U	97 U	**290 J**
Neoabietic Acid	---	---	---	99 UJ	300 UJ	290 UJ	100 UJ	**280 J**	99 U	480 UJ	98 U	99 U	290 UJ	98 UJ	97 U	98 UJ	98 U	97 UJ	98 U	99 U	96 UJ	97 UJ	290 UJ
Oleic Acid	---	---	---	99 U	300 U	290 U	**450**	**820 J**	**310**	480 U	**320**	**140**	**650**	**240**	**200**	98 U	**150**	**190**	**280**	**140**	**300**	97 U	**370**
Palustric Acid	---	---	---	99 U	300 U	290 U	100 U	220 U	99 U	**600**	98 U	99 U	290 U	98 U	97 U	98 U	98 U	**530**	98 U	99 U	96 U	97 U	290 U
Pimaric Acid	---	---	---	99 U	300 U	290 U	100 U	**220 J**	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	97 U	98 U	99 U	96 U	97 U	290 U
Retene	---	---	---	**220**	**26**	**21,000**	**230**	**220 J**	**36**	**16,000**	**10**	**30**	**640**	**62**	8.7 U	20 U	8.9 U	**50**	**18**	**15**	19 U	20 U	20 U
Sandaracopimaric Acid	---	---	---	99 U	300 U	290 U	**1,300**	**1,300 J**	99 U	480 U	98 U	99 U	290 U	98 U	97 U	98 U	98 U	**570**	98 U	99 U	96 U	97 U	290 U
Tetrachloroguaiacol	---	---	---	20 U	20 U	20 U	20 U	50 U	20 U	19 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	19 U	20 U	19 U	20 U	20 U
Total resin acids [c]	---	---	---	**1,800**	**2,100**	**25,000**	**5,700**	**68,000**	**7,400**	**38,000**	**2,500**	**1,800**	**9,000**	**3,900**	**530**	98 U	**270**	**21,000**	**1,900**	**2,100**	**300**	**340**	**2,000**

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram.
mg/kg	milligrams per kilogram.
PCBs	polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined	value indicates the sample result or detection limit is greater than the LAET or SQS value.
Shaded	value indicates the sample result or detection limit is greater than the CSL value.
U	The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.
J	The associated numerical value is considered an estimated concentration.
G	Bias is high.
B	Specifyied compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor	Oakland Bay																
				SH-30-WC-12	OB-01-SS-00	OB-01-SC-12 [d]	OB-02-SS-00	OB-02-SC-12	OB-03-SS-00	OB-03-SC-12	OB-04-SS-00	OB-04-SC-12	OB-05-SS-00	OB-05-SC-12	OB-06-SS-00 [d]	OB-06-SC-12	OB-07-SS-00	OB-07-SC-12	OB-08-SS-00	OB-08-SC-12	OB-09-SS-00
Parameter	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Conventional Parameters																					
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	**54.3**	**11.9**	**3.1**	**31.1**	**61.6**	**69.5**	**67.6**	**42.6**	**54.3**	**71.6**	**67.2**	**96.9**	**87.2**	**16.9**	**21.2**	**87.4**	**62**	**87.8**
Particle/Grain Size, Phi Scale <-1	---	---	---	**0.5**	**17.9**	**66.5**	**0.1**	**0.3**	**6**	**0.8**	**0.7**	**2.5**	**2.1**	**1**	**0.5**	**0.7**	**24.4**	**45.6**	**0.4**	**13.8**	**3.5**
Particle/Grain Size, Phi Scale >10	---	---	---	**10.5**	**2.2**		**6.6**	**11.4**	**13.5**	**13.8**	**5.1**	**10.3**	**12.4**	**11.4**	**9.2**	**14.4**	**2.9**	**3.2**	**12.8**	**12.7**	**13.4**
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	**0.9**	**16.5**	**7.6**	**1.4**	**0.5**	**4**	**1.3**	**1.8**	**1.3**	**3.4**	**1.7**	**0.3**	**2.3**	**4**	**3.4**	**1.7**	**4.1**	**1.6**
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	**0.6**	**12**	**10.4**	**0.8**	**0.5**	**5.1**	**1.1**	**0.8**	**0.9**	**3**	**1.7**	**0.2**	**4.6**	**3.6**	**3.5**	**1.3**	**2.2**	**2.9**
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	**1.4**	**27.7**	**8.9**	**2.2**	**0.8**	**3**	**1.5**	**3.6**	**1.7**	**3.7**	**2.3**	**0.2**	**1.1**	**11.7**	**8.3**	**1.6**	**7.4**	**1**
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	**10**	**10.4**	**2.7**	**21.1**	**10.6**	**2.4**	**5.4**	**13.4**	**11.6**	**4.1**	**7.1**	**0.3**	**1**	**22.2**	**9.4**	**2.2**	**5.1**	**0.8**
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	**32.3**	**3.6**	**0.9**	**43.3**	**25.6**	**10.1**	**22.2**	**37**	**27.6**	**12.1**	**19**	**1.6**	**3.2**	**17.2**	**8.6**	**5.5**	**5.3**	**2.3**
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	**9.8**	**1.9**		**6.1**	**7.6**	**8.1**	**13**	**13.3**	**8.2**	**7.2**	**9.4**	**10.8**	**10.9**	**4.3**	**6.8**	**13.4**	**4.9**	**5.5**
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	**7.2**	**1.1**		**3.3**	**6.7**	**10.1**	**9.1**	**14.9**	**6.4**	**12.2**	**11.1**	**24.3**	**15.2**	**2.4**	**2.6**	**18.7**	**8.9**	**18.1**
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	**7.1**	**1.5**		**3.4**	**8**	**10.7**	**8.9**	**3.3**	**7.7**	**14.9**	**9**	**22.4**	**15.7**	**1.9**	**2.5**	**16.5**	**11**	**21.7**
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	**7.7**	**1.8**		**4.4**	**9.3**	**10.9**	**9.4**	**1.9**	**8.1**	**9.4**	**9.7**	**13.1**	**12.3**	**1.9**	**2.4**	**10.7**	**11.3**	**12.1**
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	**6.4**	**1.6**		**3.9**	**9.7**	**8.4**	**6.6**	**1.9**	**7.3**	**8.1**	**8.5**	**11**	**10.3**	**1.8**	**2.1**	**8.1**	**7.4**	**9.1**
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	**5.6**	**1.7**		**3.4**	**8.7**	**7.8**	**6.8**	**2.1**	**6.3**	**7.5**	**8**	**6.2**	**8.5**	**1.7**	**1.7**	**7.3**	**5.8**	**8**
Total Volatile Solids %	---	---	---	**4.76**																	
Ammonia (mg/kg)	---	---	---	**45.1**	**15.1**	**0.18**	**4.79**	**40**	**11.7**	**13.5**	**8.52**	**58.6**	**11.6**	**36.3**	**9.47**	0.03 U	**9.34**	**6**	**8.22**	**7.38**	**10.8**
Sulfide	---	---	---	**19.3**	**6.83**	0.01 U	**489**	**216**	**1,240**	**241**	**599**	**216**	**761**	**555**	**1,190**	**351**	0.01 U	**141**	**167**	0.01 U	**1,530**
Total organic carbon (%)	---	---	---	**0.736**	**0.878**	**0.164**	**1.4**	**1.15**	**2.79**	**2.64**	**3.45**	**1.55**	**2.35**	**2.94**	**4.68**	**2.09**	**0.995**	**0.986**	**1.36**	**1.38**	**2.69**
Total solids (%)	---	---	---	**55.4**	**69.1**	**85.6**	**55.7**	**49**	**35.4**	**45.8**	**49.1**	**56.4**	**35.3**	**45.4**	**34.7**	**80.9**	**63.7**	**71.5**	**46.3**	**57**	**31.5**
Metals (mg/kg dry weight)																					
Antimony	150	---	---	**0.33 J**	**0.23 J**		**0.25 J**		**0.35 J**		**0.26 J**		**0.39 J**		**0.31 J**		**0.14 J**		**0.27 J**		**0.18 J**
Arsenic	57	57	93	**4.8**	**4.7**		**6.1**		**6.9**		**7.2**		**5.3**		**7.3**		**3.6**		**6.6**		**3.6**
Cadmium	5.1	5.1	6.7	**0.78**	**0.36**		**0.64**		**0.87**		**0.74**		**0.71**		**0.96**		**0.2 J**		**0.37 J**		**0.44**
Chromium	260	260	270	**37**	**29**		**37**		**46**		**33**		**36**		**47**		**28**		**46**		**24**
Copper	390	390	390	**26**	**18**		**26**		**43**		**26**		**34**		**47**		**19**		**34**		**23**
Lead	450	450	530	**3.5**	**4.1**		**7.2**		**13**		**8.1**		**10**		**15**		**5.2**		**11**		**7.1**
Mercury	0.41	0.41	0.59	**0.026 J**	**0.017 J**		**0.053**		**0.08**		**0.038**		**0.056**		**0.057 J**		**0.014 J**		**0.063**		**0.025 J**
Nickel	140	---	---	**35**	**22**		**36**		**43**		**31**		**33**		**42**		**24**		**37**		**21**
Silver	6.1	6.1	6.1	**0.16 J**	**0.037 J**		**0.089 J**		**0.16 J**		**0.097 J**		**0.34 J**		**0.21 J**		**0.065 J**		**0.14 J**		**0.1 J**
Zinc	410	410	960	**45**	**55**		**69**		**95**		**70**		**74**		**97**		**45**		**75**		**50**
Butyltins (ug/kg dry weight)																					
Butyltin Ion	---	---	---	3.8 U																	
Dibutyltin Ion	---	---	---	3.0 U																	
Tributyltin Ion	---	---	---	1.7 U																	
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																					
LPAHs																					
2-Methylnaphthalene (dry)	670	---	---	8.1 U	8.1 U		8.1 U		8.1 U		8.1 U		8.1 U		8.1 U		8.0 U		8.0 U		8.1 U
2-Methylnaphthalene (OC)	---	38	64	1.1 U	0.92 U		0.58 U		0.29 U		0.23 U		0.34 U		0.17 U		0.80 U		0.59 U		0.30 U
Acenaphthene (dry)	500	---	---	8.1 U	8.1 U		8.1 U		8.1 U		8.1 U		8.1 U		8.1 U		8.0 U		8.0 U		8.1 U
Acenaphthene (OC)	---	16	57	1.1 U	0.92 U		0.58 U		0.29 U		0.23 U		0.34 U		0.17 U		0.80 U		0.59 U		0.30 U
Acenaphthylene (dry)	560	---	---	8.6 U	8.6 U		8.5 U		8.5 U		8.6 U		8.6 U		8.5 U		8.5 U		8.5 U		8.6 U
Acenaphthylene (OC)	---	66	66	1.2 U	1.0 U		0.61 U		0.30 U		0.25 U		0.37 U		0.18 U		0.85 U		0.63 U		0.32 U
Anthracene (dry)	960	---	---	7.7 U	7.7 U		7.6 U		7.6 U		7.7 U		7.7 U		7.6 U		7.6 U		7.6 U		7.7 U
Anthracene (OC)	---	220	1,200	1.0 U	0.88 U		0.54 U		0.27 U		0.22 U		0.33 U		0.16 U		0.76 U		0.56 U		0.29 U
Fluorene (dry)	540	---	---	8.9 U	8.9 U		8.8 U		8.8 U		8.9 U		8.9 U		8.8 U		8.8 U		8.8 U		8.9 U
Fluorene (OC)	---	23	79	1.2 U	1.0 U		0.63 U		0.32 U		0.26 U		0.38 U		0.19 U		0.88 U		0.65 U		0.33 U
Naphthalene (dry)	2,100	---	---	8.6 U	8.6 U		8.5 U		8.6 U		8.6 U		8.6 U		8.6 U		8.5 U		8.5 U		8.6 U
Naphthalene (OC)	---	99	170	1.2 U	1.0 U		0.61 U		0.31 U		0.25 U		0.37 U		0.18 U		0.85 U		0.63 U		0.32 U
Phenanthrene (dry)	1500	---	---	8.3 U	8.3 U		8.3 U		8.3 U		**51**		8.3 U		8.3 U		**25**		8.2 U		8.3 U
Phenanthrene (OC)	---	100	480	1.1 U	0.95 U		0.59 U		0.30 U		**1.5**		0.35 U		0.18 U		**2.5**		0.60 U		0.31 U
Total LPAHs (dry) [c]	5200	---	---	20 U	20 U		20 U		20 U		**51**		20 U		20 U		**25**		20 U		20 U
Total LPAHs (OC) [c]	---	370	780	2.7 U	2.3 U		1.4 U		0.72 U		**1.5**		0.85 U		0.43 U		**2.5**		1.5 U		0.74 U
HPAHs																					
Benzo(a)anthracene (dry)	1,300	---	---	5.9 U	5.9 U		5.8 U		5.8 U		**24**		5.9 U		5.8 U		**18 J**		5.8 U		5.9 U
Benzo(a)anthracene (OC)	---	110	270	0.80 U	0.67 U		0.41 U		0.21 U		**0.70**		0.25 U		0.12 U		**1.8 J**		0.43 U		0.22 U
Benzo(a)pyrene (dry)	1,600	---	---	8.1 U	8.1 U		8.0 U		8.0 U		8.1 U		8.1 U		8.1 U		**15 J**		8.0 U		8.1 U
Benzo(a)pyrene (OC)	---	99	210	1.1 U	0.92 U		0.57 U		0.29 U		0.23 U		0.34 U		0.17 U		**1.5 J**		0.59 U		0.30 U
Benzo(b)fluoranthene (dry)	---	---	---	9.4 U	9.4 U		9.4 U		9.4 U		9.4 U		9.4 U		9.4 U		**9.8 J**		9.3 U		9.4 U
Benzo(b)fluoranthene (OC)	---	---	---	1.3 U	1.1 U		0.67 U		0.34 U		0.27 U		0.40 U		0.20 U		**1.0 J**		0.68 U		0.35 U
Benzo(g,h,i)perylene (dry)	670	---	---	6.7 U	6.7 U		6.6 U		6.7 U		6.7 U		6.7 U		6.7 U		6.6 U		6.6 U		6.7 U
Benzo(g,h,i)perylene (OC)	---	31	78	0.91 U	0.76 U		0.47 U		0.24 U		0.19 U		0.29 U		0.14 U		0.66 U		0.49 U		0.25 U
Benzo(k)fluoranthene (dry)	---	---	---	9.2 U	9.2 U		9.1 U		9.1 U		9.2 U		9.2 U		9.1 U		**18 J**		9.1 U		9.2 U
Benzo(k)fluoranthene (OC)	---	---	---	1.3 U	1.0 U		0.65 U		0.33 U		0.27 U		0.39 U		0.19 U		**1.8 J**		0.67 U		0.34 U
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---	20 U	20 U		20 U		20 U		20 U		20 U		20 U		**28 J**		20 U		20 U
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450	2.7 U	2.3 U		1.4 U		0.72 U		0.58 U		0.85 U		0.43 U		**2.8 J**		1.5 U		0.74 U
Chrysene (dry)	1,400	---	---	6.6 U	6.6 U		**11 J**		**15 J**		**25**		6.6 U		6.6 U		**21**		6.5 U		6.6 U
Chrysene (OC)	---	110	460	0.90 U	0.75 U		**0.8 J**		**0.54 J**		**0.72**		0.28 U		0.14 U		**2.1**		0.48 U		0.25 U
Dibenz(a,h)anthracene (dry)	230	---	---	8.5 U	8.5 U		8.4 U		8.4 U		8.5 U		8.5 U		8.4 U		8.4 U		8.4 U		8.5 U
Dibenz(a,h)anthracene (OC)	---	12	33	1.2 U	1.0 U		0.60 U		0.30 U		0.25 U		0.36 U		0.18 U		0.84 U		0.62 U		0.32 U
Fluoranthene (dry)	1,700	---	---	7.8 U	7.8 U		20 U		**13 J**		**48**		7.8 U		7.8 U		**36**		7.7 U		7.8 U
Fluoranthene (OC)	---	160	1,200	1.1 U	0.89 U		1.4 U		**0.47 J**		**1.4**		0.33 U		0.17 U		**3.6**		0.57 U		0.29 U
Indeno(1,2,3-cd)pyrene (dry)	600	---	---	8.5 U	8.5 U		**16 J**		8.5 U		8.5 U		8.5 U		8.5 U		8.4 U		8.4 U		8.5 U
Indeno(1,2,3-cd)pyrene (OC)	---	34	88	1.2 U	1.0 U		**1.1 J**		0.30 U		0.25 U		0.36 U		0.18 U		0.84 U		0.62 U		0.32 U
Pyrene (dry)	2,600	---	---	7.7 U	7.7 U		**10 J**		**17 J**		**61**		7.7 U		7.7 U		**33**		7.6 U		7.7 U
Pyrene (OC)	---	1,000	1,400	1.0 U	0.88 U		**0.71 J**		**0.61 J**		**1.8**		0.33 U		0.16 U		**3.3**		0.56 U		0.29 U
Total HPAHs (dry) [c]	12,000	---	---	20 U	20 U		**37 J**		**45 J**		**160**		20 U		20 U		**151**		20 U		20 U
Total HPAHs (OC) [c]	---	960	5,300	2.7 U	2.3 U		**2.6 J**		**1.6 J**		**4.6**		0.85 U		0.43 U		**15**		1.5 U		0.74 U

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Shelton Harbor	Oakland Bay																
				SH-30-WC-12	OB-01-SS-00	OB-01-SC-12 [d]	OB-02-SS-00	OB-02-SC-12	OB-03-SS-00	OB-03-SC-12	OB-04-SS-00	OB-04-SC-12	OB-05-SS-00	OB-05-SC-12	OB-06-SS-00 [d]	OB-06-SC-12	OB-07-SS-00	OB-07-SC-12	OB-08-SS-00	OB-08-SC-12	OB-09-SS-00
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																					
1,2,4-Trichlorobenzene (dry)	31	---	---	9.0 U	9.0 U		8.9 U		8.9 U		9.0 U		9.0 U		9.0 U		8.9 U		8.9 U		9.0 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8	1.2 U	1.0 U		0.64 U		0.32 U		0.26 U		0.38 U		0.19 U		0.89 U		0.65 U		0.33 U
1,2-Dichlorobenzene (dry)	35	---	---	7.8 U	7.8 U		7.7 U		7.8 U		7.8 U		7.8 U		7.8 U		7.7 U		7.7 U		7.8 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3	1.1 U	0.89 U		0.55 U		0.28 U		0.23 U		0.33 U		0.17 U		0.77 U		0.57 U		0.29 U
1,4-Dichlorobenzene (dry)	110	---	---	7.3 U	7.3 U		7.2 U		7.3 U		7.3 U		7.3 U		7.3 U		7.2 U		7.2 U		7.3 U
1,4-Dichlorobenzene (OC)	---	3.1	9	1.0 U	0.83 U		0.51 U		0.26 U		0.21 U		0.31 U		0.16 U		0.72 U		0.53 U		0.27 U
Phthalates (ug/kg dry weight or mg/kg OC)																					
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---	**13 J**	11 U		**16 J**		**18 J**		11 U		11 U		11 U		11 U		11 U		11 U
bis(2-Ethylhexyl)phthalate (OC)	---	47	78	**1.8 J**	1.3 U		**1.1 J**		**0.6 J**		0.32 U		0.47 U		0.24 U		1.1 U		0.81 U		0.41 U
Butylbenzylphthalate (dry)	63	---	---	11 U	11 U		11 U		11 U		11 U		11 U		11 U		11 U		11 U		11 U
Butylbenzylphthalate (OC)	---	4.9	64	1.5 U	1.3 U		0.79 U		0.39 U		0.32 U		0.47 U		0.24 U		1.1 U		0.81 U		0.41 U
Di-n-Butylphthalate (dry)	1400	---	---	12 U	12 U		12 U		12 U		12 U		12 U		12 U		12 U		12 U		12 U
Di-n-Butylphthalate (OC)	---	220	1,700	1.6 U	1.4 U		0.86 U		0.43 U		0.35 U		0.51 U		0.26 U		1.2 U		0.88 U		0.45 U
Di-n-Octyl phthalate (dry)	6200	---	---	8.2 U	8.3 U		8.2 U		8.2 U		8.3 U		8.3 U		8.2 U		8.2 U		8.2 U		8.3 U
Di-n-Octyl phthalate (OC)	---	58	4,500	1.1 U	0.95 U		0.59 U		0.29 U		0.24 U		0.35 U		0.18 U		0.82 U		0.60 U		0.31 U
Diethylphthalate (dry)	200	---	---	16 U	16 U		16 U		16 U		16 U		16 U		16 U		16 U		16 U		16 U
Diethylphthalate (OC)	---	61	110	2.2 U	1.8 U		1.1 U		0.57 U		0.46 U		0.68 U		0.34 U		1.6 U		1.2 U		0.59 U
Dimethylphthalate (dry)	71	---	---	7.7 U	7.7 U		7.6 U		7.6 U		7.70 U		7.7 U		7.7 U		7.6 U		7.6 U		7.7 U
Dimethylphthalate (OC)	---	53	53	1.0 U	0.88 U		0.54 U		0.27 U		0.22 U		0.33 U		0.16 U		0.76 U		0.56 U		0.29 U
Ionizable Organic Compounds (ug/kg dry weight)																					
2,4-Dimethylphenol	29	29	29	15 U	15 U		15 U		15 U		15 U		15 U		15 U		14 U		14 U		15 U
Benzoic Acid	650	650	650	110 U	110 U		110 U		110 U		110 U		110 U		110 U		110 U		110 U		110 U
Benzyl Alcohol	57	57	73	14 U	14 U		14 U		14 U		14 U		14 U		14 U		14 U		14 U		14 U
Pentachlorophenol	360	360	690	47 U	47 U		47 U		47 U		47 U		47 U		47 U		47 U		47 U		47 U
Phenol	420	420	1,200	14 U	**150**		13 U		**23**		14 U		14 U		14 U		**63**		13 U		14 U
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																					
Dibenzofuran (dry)	540	---	---	7.5 U	7.5 U		7.4 U		7.4 U		7.5 U		7.5 U		7.5 U		7.4 U		7.4 U		7.5 U
Dibenzofuran (OC)	---	15	58	1.0 U	0.85 U		0.53 U		0.27 U		0.22 U		0.32 U		0.16 U		0.74 U		0.54 U		0.28 U
Hexachlorobenzene (dry)	22	---	---	7.9 U	7.9 U		7.9 U		7.9 U		8 U		7.9 U		7.9 U		7.8 U		7.8 U		7.9 U
Hexachlorobenzene (OC)	---	0.38	2.3	1.1 U	0.90 U		0.56 U		0.28 U		0.23 U		0.34 U		0.17 U		0.78 U		0.57 U		0.29 U
Hexachlorobutadiene (dry)	11	---	---	8.0 U	8.0 U		8.0 U		8.0 U		8.0 U		8.0 U		8.0 U		7.9 U		7.9 U		8.0 U
Hexachlorobutadiene (OC)	---	3.9	6.2	1.1 U	0.91 U		0.57 U		0.29 U		0.23 U		0.34 U		0.17 U		0.79 U		0.58 U		0.30 U
N-Nitrosodiphenylamine (dry)	28	---	---	8.6 U	8.6 U		8.5 U		8.6 U		8.6 U		8.6 U		8.6 U		8.5 U		8.5 U		8.6 U
N-Nitrosodiphenylamine (OC)	---	11	11	1.2 U	1.0 U		0.61 U		0.31 U		0.25 U		0.37 U		0.18 U		0.85 U		0.63 U		0.32 U
2-Methylphenol	---	63	63	14 U	14 U		14 U		14 U		14 U		14 U		14 U		14 U		14 U		14 U
4-Methylphenol	---	670	670	13 U	13 U		13 U		**43**		13 U		13 U		13 U		13 U		13 U		13 U
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																					
Total PCBs (OC) [c]	---	12	65	0.54 UJ	0.44 UJ		0.28 UJ		0.14 UJ		0.11 UJ		0.17 UJ		0.085 UJ		0.36 UJ		0.29 UJ		0.17 UJ
Total PCBs (dry) [c]	130	---	---	4 UJ	3.9 UJ		3.9 UJ		4.0 UJ		3.9 UJ		4.0 UJ		4.0 UJ		3.6 UJ		3.9 UJ		4.6 UJ
Aroclor 1016	---	---	---	1.6 UJ	1.5 UJ		1.5 UJ		1.6 UJ		1.6 UJ		1.6 UJ		1.6 UJ		1.5 UJ		1.6 UJ		1.8 UJ
Aroclor 1221	---	---	---	4 UJ	3.9 UJ		3.9 UJ		4.0 UJ		3.9 UJ		4.0 UJ		4.0 UJ		3.6 UJ		3.9 UJ		4.6 UJ
Aroclor 1232	---	---	---	3.5 UJ	3.4 UJ		3.4 UJ		3.5 UJ		3.5 UJ		3.5 UJ		3.5 UJ		3.2 UJ		3.5 UJ		4.0 UJ
Aroclor 1242	---	---	---	1.1 UJ	1.0 UJ		1.0 UJ		1.0 UJ		1.0 UJ		1.1 UJ		1.0 UJ		0.96 UJ		1.0 UJ		1.2 UJ
Aroclor 1248	---	---	---	0.65 UJ	0.63 UJ		0.63 UJ		0.64 UJ		0.64 UJ		0.66 UJ		0.65 UJ		0.59 UJ		0.64 UJ		0.75 UJ
Aroclor 1254	---	---	---	1.1 UJ	1.0 UJ		1.0 UJ		1.0 UJ		1.0 UJ		1.1 UJ		1.0 UJ		0.96 UJ		1.0 UJ		1.2 UJ
Aroclor 1260	---	---	---	1.5 UJ	1.5 UJ		1.4 UJ		1.5 UJ		1.5 UJ		1.5 UJ		1.5 UJ		1.4 UJ		1.5 UJ		1.7 UJ
Chlorinated Pesticides (ug/kg dry weight)																					
4,4'-DDD	16	---	---	**0.68 J**	0.14 U		**0.36 J**		0.14 U		0.14 U		**0.31 J**		0.15 U		0.14 U		0.14 U		0.17 U
4,4'-DDE	9	---	---	**0.71 J**	**0.63 J**		**3.1 J**		0.14 U		0.14 U		0.14 U		0.14 U		0.13 U		0.14 U		0.16 U
4,4'-DDT	34	---	---	**1.6 J**	**3.3 J**		0.14 U		0.15 U		**5.6**		**0.31 J**		0.15 U		**3.3**		0.15 U		0.17 U
Aldrin	---	---	---	**0.74 J**	0.22 U		0.21 U		0.22 U		0.22 U		0.22 U		0.22 U		0.21 U		0.22 U		0.25 U
alpha-Chlordane	---	---	---	**0.9 J**	0.13 U		0.13 U		0.13 U		0.13 U		0.98 U		0.13 U		0.13 U		0.13 U		0.15 U
Dieldrin	---	---	---	0.12 U	0.12 U		0.11 U		0.12 U		0.12 U		0.12 U		0.12 U		**0.12 J**		0.12 U		0.13 U
gamma-BHC	---	---	---	**0.31 J**	0.077 U		0.073 U		0.077 U		0.076 U		**1.4 J**		0.078 U		0.074 U		0.077 U		0.089 U
Heptachlor	---	---	---	0.45 U	0.46 U		0.44 U		0.46 U		0.45 U		0.46 U		0.46 U		0.44 U		0.46 U		**1.1 J**
Petroleum Hydrocarbons (mg/kg dry weight)																					
Gasoline	---	---	---		30 UJG																
Diesel Range	---	---	---		76 UJG																
Motor Oil	---	---	---		150 UJG																
Dioxins/Furans (ng/kg dry weight)																					
DX TOTAL (TEQ ND=1/2 DL)	---	---	---		**4.44**		**16.6**		**29**	**82**	**27.2**		**27.6**		**43.3**	**180**	**8.72**		**37**		**38.5**
1,2,3,4,6,7,8-HPCDD	---	---	---		**97.4 B**		**345 B**		**664 B**	**1,910 B**	**467 B**		**634 B**		**965 B**	**4,470 B**	**181 B**		**856 B**		**849 B**
1,2,3,4,6,7,8-HPCDF	---	---	---		**36.8 B**		**133 B**		**256 B**	**921**	**186 B**		**246 B**		**405 B**	**2170**	**68.6 B**		**269 B**		**333 B**
1,2,3,4,7,8,9-HPCDF	---	---	---		**2.21**		**7.99**		**13.9**	**48.3 B**	**10.1**		**12.9**		**21.3**	**109 B**	**3.94**		**16.5**		**18.3**
1,2,3,4,7,8-HXCDD	---	---	---		**1.37**		**5.09**		**8.23**	**20.5**	**7.09**		**8.06**		**13.4**	**39.1**	**2.91**		**14**		**12.5**
1,2,3,4,7,8-HXCDF	---	---	---		**3.54**		**14.7**		**22.9**	**83.1**	**22.8**		**24.1**		**34.2**	**181**	**6.31**		**25.8**		**32**
1,2,3,6,7,8-HXCDD	---	---	---		**5.67**		**20.3**		**37.3**	**106**	**38.8**		**34**		**55.4**	**232**	**12.1**		**45.3**		**48.2**
1,2,3,6,7,8-HXCDF	---	---	---		**1.17**		**4.59**		**8.04**	**24.1**	**7.07**		**7.95**		**12**	**51.1**	**2.36**		**10.5**		**10.9**
1,2,3,7,8,9-HXCDD	---	---	---		**3.92**		**14.6**		**24.6**	**55.2**	**21.5**		**22.7**		**38.6**	**115**	**8.69**		**40**		**35.3**
1,2,3,7,8,9-HXCDF	---	---	---		**0.12 J**		**0.408 J**		**0.689**	**2.14**	**0.514**		**0.596**		**0.964**	**5.89**	**0.229 J**		**0.763**		**0.925**
1,2,3,7,8-PECDD	---	---	---		**0.749**		**2.8**		**4.41**	**10.7**	**5.44**		**4.26**		**6.83**	**20.8**	**1.58**		**6.84**		**6.2**
1,2,3,7,8-PECDF	---	---	---		**0.445 J**		**2.16**		**2.88**	**7.8**	**3.37**		**2.58**		**4.23**	**14.3**	**0.914**		**3.5**		**3.55**
2,3,4,6,7,8-HXCDF	---	---	---		**1.14**		**4.29**		**7.56**	**17.7**	**7.06**		**7.27**		**11.3**	**39.4**	**2.2**		**9.71**		**10.4**
2,3,4,7,8-PECDF	---	---	---		**0.566**		**2.84**		**3.95**	**12.6 B**	**5.99**		**3.76**		**5.62**	**23.7 B**	**1.15 B**		**4.5 B**		**4.83**
2,3,7,8-TCDD	---	---	---		**0.125**		**0.567**		**0.828**	**1.34 B**	**1.19**		**0.734**		**1.1**	**2.62 B**	**0.233**		**0.756**		**0.982**
2,3,7,8-TCDF	---	---	---		**0.387**		**2.19**		**2.41**	**6.67**	**3.87**		**2.25**		**3.06**	**11.8**	**0.692**		**2.8**		**2.85**
OCDD	---	---	---		**833 B**		**2,570 B**		**5,830 B**	**16,400 B**	**3,480 B**		**5,240 B**		**8,080 B**	**40,800 B**	**1,410 B**		**4,860 B**		**7,230 B**
OCDF	---	---	---		**112 B**		**350 B**		**783 B**	**2,320 B**	**488 B**		**759 B**		**1,230 B**	**6,010 B**	**171 B**		**529 B**		**938 B**

Parameter	Freshwater Sediment Apparent Effects Threshold[a] LAET	Marine Sediment Management Standard[b] SQS	CSL	Shelton Harbor SH-30-WC-12 1 to 2 ft	Oakland Bay OB-01-SS-00 0 to 10 cm	OB-01-SC-12 [d] 1 to 2 ft	OB-02-SS-00 0 to 10 cm	OB-02-SC-12 1 to 2 ft	OB-03-SS-00 0 to 10 cm	OB-03-SC-12 1 to 2 ft	OB-04-SS-00 0 to 10 cm	OB-04-SC-12 1 to 2 ft	OB-05-SS-00 0 to 10 cm	OB-05-SC-12 1 to 2 ft	OB-06-SS-00 [d] 0 to 10 cm	OB-06-SC-12 1 to 2 ft	OB-07-SS-00 0 to 10 cm	OB-07-SC-12 1 to 2 ft	OB-08-SS-00 0 to 10 cm	OB-08-SC-12 1 to 2 ft	OB-09-SS-00 0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---		**233 B**		**923 B**		**1,640 B**	**4,390**	**1,340 B**		**1,550 B**		**2,230 B**	**10,300**	**471 B**		**2,550 B**		**2,020 B**
TOTAL HEPTA-FURANS	---	---	---		**127 B**		**518**		**932 B**	**3,960**	**700 B**		**864 B**		**1,520 B**	**8,880**	**228**		**886**		**1,140 B**
TOTAL HEXA-DIOXINS	---	---	---		**89.8**		**357**		**594**	**1,800**	**597**		**555**		**956**	**3760**	**194**		**949**		**818**
TOTAL HEXA-FURANS	---	---	---		**51**		**222**		**359**	**1,290**	**394**		**342**		**558**	**2850**	**95.9**		**400**		**460**
TOTAL PENTA-DIOXINS	---	---	---		**33.4**		**112**		**192**	**624**	**206**		**184**		**387**	**1170**	**69.5**		**326**		**303**
TOTAL PENTA-FURANS	---	---	---		**15**		**78.6**		**108**	**344**	**187**		**104**		**149**	**677**	**32.8**		**135**		**131**
TOTAL TETRA-DIOXINS	---	---	---		**23.9**		**82.7**		**146**	**487**	**228**		**149**		**277**	**832**	**42.5**		**233**		**212**
TOTAL TETRA-FURANS	---	---	---		**7.83**		**55.1**		**60.1**	**198**	**123**		**55.6**		**81.6**	**326**	**17.2**		**72.7**		**67.3**
Guaicols and Resin Acids (ug/kg dry weight)																					
12-Chlorodehydroabietic Acid	---	---	---	98 U			100 U						99 U		99 U						
14-Chlorodehydroabietic Acid	---	---	---	98 U			100 U						99 U		99 U						
3,4,5-Trichloroguaiacol	---	---	---	20 U																	
3,4,6-Trichloroguaiacol	---	---	---	20 U																	
3,4-Dichloroguaiacol	---	---	---	20 U																	
4,5,6-Trichloroguaiacol	---	---	---	20 U																	
4,5-Dichloroguaiacol	---	---	---	20 U																	
4,6-Dichloroguaiacol	---	---	---	20 U																	
4-Chloroguaiacol	---	---	---	20 U																	
9,10-Dichlorostearic Acid	---	---	---	98 U			100 U						99 U		99 U						
Abietic Acid	---	---	---	98 U			**770**						**130**		**120**						
Dehydroabietic Acid	---	---	---	**110**			**580**						99 U		99 U						
Dichlorodehydroabietic Acid	---	---	---	98 U			100 U						99 U		99 U						
Guaiacol	---	---	---	20 U																	
Isopimaric Acid	---	---	---	98 U			100 U						99 U		99 U						
Linolenic Acid	---	---	---	98 U			**100**						99 U		99 U						
Neoabietic Acid	---	---	---	98 UJ			100 U						99 U		99 U						
Oleic Acid	---	---	---	98 U			**1,800**						**870**		**1,100**						
Palustric Acid	---	---	---	98 U			100 U						99 U		99 U						
Pimaric Acid	---	---	---	98 U			100 U						99 U		99 U						
Retene	---	---	---	**19**																	
Sandaracopimaric Acid	---	---	---	98 U			100 U						99 U		99 U						
Tetrachloroguaiacol	---	---	---	20 U																	
Total resin acids [c]	---	---	---	**130**			**3,200**						**1,000**		**1,200**						

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg nanograms per kilogram

µg/kg micrograms per kilogram.

mg/kg milligrams per kilogram.

PCBs polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined value indicates the sample result or detection limit is greater than the LAET or SQS value.

Shaded value indicates the sample result or detection limit is greater than the CSL value.

U The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.

J The associated numerical value is considered an estimated concentration.

G Bias is high.

B Specifyied compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Oakland Bay																	Hammersley Inlet	
				OB-09-SC-12	OB-10-SS-00	OB-10-SC-12	OB-11-SS-00	OB-11-SC-12	OB-12-SS-00	OB-12-SC-12	OB-13-SS-00	OB-13-SC-12	OB-14-SS-00	OB-14-SC-12	OB-17-WS-00	OB-17-WC-12	OB-18-WS-00	OB-18-WC-12 [d]	OB-19-WS-00	OB-19-WC-12 [d]	HI-01-SC-12 [d]	HI-02-SS-00
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	1 to 2 ft	0 to 10 cm
Conventional Parameters																						
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	**83.7**	**84.2**	**82.9**	**44.1**	**13.9**	**91.6**	**85.6**	**66.2**	**59.7**	**24.5**	**18.1**	**21.2**	**32.5**	**82.6**	**72.3**	**92**	**88.7**	**38.4**	**6**
Particle/Grain Size, Phi Scale <-1	---	---	---	**0.8**	**3.1**	**0.5**	**30.2**	**51.9**	**0.1**	**1.2**	**20.9**	**3.9**	**35.4**	**30.4**	**1.3**	**1.9**	**0.1**	**7.1**	**0.1**	**2.4**	**49.7**	**8.1**
Particle/Grain Size, Phi Scale >10	---	---	---	**15.8**	**11.6**	**14.8**	**7.4**	**2.9**	**9.4**	**12.9**	**11.1**	**11.6**	**2.7**	**2.8**	**3.4**	**7.2**	**14.5**	**12.9**	**18.1**	**18.1**	**2.1**	**1.5**
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	**1.4**	**1.8**	**3.3**	**3.7**	**10.3**	**1.3**	**1.8**	**1.4**	**1.6**	**7.3**	**8.1**	**1.6**	**1.9**	**3**	**2.3**	**1.5**	**1.5**	**2.1**	**11.8**
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	**3.1**	**4.5**	**2.7**	**4.9**	**11**	**2.2**	**1.8**	**2.7**	**2.7**	**6.1**	**8.1**	**1.6**	**1.9**	**3.8**	**3.6**	**2.5**	**2**	**4.4**	**6.6**
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	**1.2**	**1.4**	**2**	**8.3**	**7.6**	**0.8**	**2**	**1.4**	**2.3**	**14.3**	**22.2**	**2.2**	**2.8**	**1.7**	**2.5**	**0.9**	**1.2**	**2.9**	**33.5**
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	**1.7**	**1.6**	**2**	**5.3**	**2.9**	**1.1**	**2.6**	**2**	**7.4**	**8.8**	**10.3**	**38.4**	**29.4**	**1.8**	**3.1**	**0.6**	**1.1**	**1.7**	**28.5**
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	**8.1**	**3.4**	**6.6**	**3.5**	**2.4**	**2.7**	**4.9**	**5.3**	**22.5**	**3.6**	**2.8**	**33.7**	**29.5**	**7.1**	**9**	**2.4**	**3.2**	**0.8**	**5.5**
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	**11.9**	**6.7**	**9.6**	**2.5**	**1**	**16.7**	**9.4**	**5.7**	**9.7**	**3.9**	**4.6**	**3.7**	**5.1**	**8.2**	**10.2**	**8.8**	**7.5**	**3.6**	**0.3**
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	**12.7**	**23.4**	**12.8**	**7.8**	**1.2**	**22.3**	**12.3**	**11.9**	**7.4**	**5.9**	**2.5**	**2.9**	**3.8**	**13.5**	**10.8**	**14.1**	**14**	**6**	**0.8**
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	**13**	**18.9**	**14**	**8.9**	**2**	**18.2**	**17.4**	**10.9**	**9.5**	**4.5**	**2.8**	**3.2**	**4.3**	**19.2**	**11**	**15.7**	**14.7**	**15**	**0.9**
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	**11.3**	**9.9**	**13**	**6.6**	**2.7**	**11.6**	**14.1**	**11.6**	**8.5**	**3.6**	**2.2**	**3.1**	**4.3**	**12**	**9.7**	**16**	**12.5**	**7.7**	**0.9**
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	**10.3**	**7**	**10.3**	**5.5**	**2.3**	**7.3**	**7.4**	**7.4**	**7.3**	**2.1**	**1.7**	**2.5**	**4.3**	**7**	**8.6**	**9.1**	**11.7**	**2.7**	**0.7**
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	**8.8**	**6.8**	**8.5**	**5.4**	**1.8**	**6.1**	**12**	**7.6**	**5.6**	**1.7**	**1.4**	**2.5**	**3.6**	**8.2**	**9**	**10.3**	**10.2**	**1.3**	**0.8**
Total Volatile Solids %	---	---	---												**4.41**	**6.15**	**9.35**	**13.6**	**9.25**	**12.42**		
Ammonia (mg/kg)	---	---	---	**75.5**	**8.26**	**19.2**	**10.3**	**1.48**	**10.1**	**62.9**	**10.4**	**44.6**	**4.28**	**10.4**	**4.72**	**26.7**	**22.4**	**49.3**	**6.83**	**1.02**	**1.35**	**6.75**
Sulfide	---	---	---	**201**	**955**	**468**	**685**	**36.3**	**908**	**54.7**	**255**	**54.8**	**204**	**255**	**363**	**129** J	**1,110**	**311**	**823**	**28.6**	0.01 UJ	**4.18**
Total organic carbon (%)	---	---	---	**2.47**	**2.62**	**2.87**	**2.32**	**0.659**	**2.26**	**2.96**	**3.53**	**3.12**	**1.71**	**3.53**	**2.39**	**1.75**	**2.86**	**4.74**	**2.6**	**0.045**	**0.232**	**0.571**
Total solids (%)	---	---	---	**44.8**	**31.4**	**39.6**	**39.6**	**58.8**	**36.7**	**43.4**	**32.3**	**48.8**	**62.6**	**76.5**	**61**	**59.8**	**32.2**	**39.2**	**35.6**	**39.9**	**82.5**	**76.1**
Metals (mg/kg dry weight)																						
Antimony	150	---	---		**0.26 J**		**0.25 J**		**0.26 J**		**0.25 J**		**0.12 J**		**0.21 J**	**0.19 J**	**0.35 J**	**0.39 J**	**0.27 J**	**0.43 J**		**0.12 J**
Arsenic	57	57	93		**5.3**		**5.3**		**7.1**		**5.3**		**3.3**		**5**	**4.2**	**6.9**	**7.3**	**5.9**	**9**		**3.9**
Cadmium	5.1	5.1	6.7		**0.53**		**0.39 J**		**0.56**		**0.48 J**		**0.24 J**		**0.49**	**0.46**	**0.85**	**0.77**	**0.74**	**1**		0.11 U
Chromium	260	260	270		**36**		**34**		**45**		**41**		**34**		**24**	**28**	**48**	**45**	**36**	**50**		**28**
Copper	390	390	390		**31**		**26**		**34**		**33**		**21**		**19**	**22**	**46**	**50**	**34**	**50**		**12**
Lead	450	450	530		**10**		**9.2**		**13**		**12**		**5.1**		**5.5**	**4.9**	**13**	**17**	**11**	**20**		**2.9**
Mercury	0.41	0.41	0.59		**0.06**		**0.021 J**		**0.086**		**0.085**		**0.024 J**		**0.037**	0.125 U	**0.037 J**	**0.087**	**0.043**	**0.16**		0.0075 U
Nickel	140	---	---		**29**		**26**		**34**		**31**		**25**		**26**	**29**	**44**	**40**	**32**	**42**		**35**
Silver	6.1	6.1	6.1		**0.14 J**		**0.13 J**		**0.16 J**		**0.13 J**		**0.062 J**		**0.074 J**	**0.07 J**	**0.18 J**	**0.19 J**	**0.16 J**	**0.28 J**		**0.026 J**
Zinc	410	410	960		**70**		**57**		**79**		**75**		**43**		**50**	**41**	**99**	**74**	**73**	**87**		**28**
Butyltins (ug/kg dry weight)																						
Butyltin Ion	---	---	---																			
Dibutyltin Ion	---	---	---																			
Tributyltin Ion	---	---	---																			
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																						
LPAHs																						
2-Methylnaphthalene (dry)	670	---	---		8.2 U		8.1 U		8.1 U		8.1 U		8.0 U		7.9 U	8.0 U	8.1 U	8.2 U	8.1 U	8.1 U		8.1 U
2-Methylnaphthalene (OC)	---	38	64		0.31 U		0.35 U		0.36 U		0.23 U		0.47 U		0.33 U	0.46 U	0.28 U	0.17 U	0.31 U	18 U		1.4 U
Acenaphthene (dry)	500	---	---		8.2 U		8.1 U		8.1 U		8.1 U		8.0 U		7.9 U	8.0 U	8.1 U	8.2 U	8.1 U	8.1 U		8.1 U
Acenaphthene (OC)	---	16	57		0.31 U		0.35 U		0.36 U		0.23 U		0.47 U		0.33 U	0.46 U	0.28 U	0.17 U	0.31 U	18 U		1.4 U
Acenaphthylene (dry)	560	---	---		8.6 U		8.5 U		8.6 U		8.6 U		8.4 U		8.3 U	8.5 U	8.6 U	8.6 U	8.6 U	8.6 U		8.5 U
Acenaphthylene (OC)	---	66	66		0.33 U		0.37 U		0.38 U		0.24 U		0.49 U		0.35 U	0.49 U	0.30 U	0.18 U	0.33 U	19 U		1.5 U
Anthracene (dry)	960	---	---		7.7 U		7.6 U		7.7 U		7.7 U		7.5 U		7.5 U	7.6 U	7.7 U	7.7 U	7.6 U	7.7 U		7.6 U
Anthracene (OC)	---	220	1,200		0.29 U		0.33 U		0.34 U		0.22 U		0.44 U		0.31 U	0.43 U	0.27 U	0.16 U	0.29 U	17 U		1.3 U
Fluorene (dry)	540	---	---		8.9 U		8.8 U		8.9 U		8.9 U		8.7 U		8.6 U	8.8 U	8.9 U	8.9 U	8.8 U	8.9 U		8.8 U
Fluorene (OC)	---	23	79		0.34 U		0.38 U		0.39 U		0.25 U		0.51 U		0.36 U	0.50 U	0.31 U	0.19 U	0.34 U	20 U		1.5 U
Naphthalene (dry)	2,100	---	---		8.7 U		8.6 U		8.6 U		8.6 U		8.5 U		8.4 U	8.5 U	8.6 U	8.6 U	8.6 U	8.6 U		8.5 U
Naphthalene (OC)	---	99	170		0.33 U		0.37 U		0.38 U		0.24 U		0.50 U		0.35 U	0.49 U	0.30 U	0.18 U	0.33 U	19 U		1.5 U
Phenanthrene (dry)	1500	---	---		8.4 U		8.3 U		8.3 U		8.3 U		8.2 U		8.1 U	8.2 U	8.3 U	8.4 U	8.3 U	8.3 U		8.3 U
Phenanthrene (OC)	---	100	480		0.32 U		0.36 U		0.37 U		0.24 U		0.48 U		0.34 U	0.47 U	0.29 U	0.18 U	0.32 U	18 U		1.5 U
Total LPAHs (dry) [c]	5200	---	---		20 U		20 U		20 U		20 U		20 U		19 U	20 U	20 U	20 U	20 U	20 U		20 U
Total LPAHs (OC) [c]	---	370	780		0.76 U		0.86 U		0.88 U		0.57 U		1.2 U		0.79 U	1.1 U	0.70 U	0.42 U	0.77 U	44 U		3.5 U
HPAHs																						
Benzo(a)anthracene (dry)	1,300	---	---		5.9 U		5.8 U		5.9 U		5.9 U		5.8 U		5.7 U	5.8 U	5.9 U	5.9 U	5.8 U	5.9 U		5.8 U
Benzo(a)anthracene (OC)	---	110	270		0.23 U		0.25 U		0.26 U		0.17 U		0.34 U		0.24 U	0.33 U	0.21 U	0.12 U	0.22 U	13 U		1.0 U
Benzo(a)pyrene (dry)	1,600	---	---		8.1 U		8 U		8.1 U		8.1 U		8.0 U		7.9 U	8.0 U	8.1 U	8.1 U	8.1 U	**21**		8.0 U
Benzo(a)pyrene (OC)	---	99	210		0.31 U		0.34 U		0.36 U		0.23 U		0.47 U		0.33 U	0.46 U	0.28 U	0.17 U	0.31 U	**47**		1.4 U
Benzo(b)fluoranthene (dry)	---	---	---		9.5 U		9.4 U		9.4 U		9.4 U		9.3 U		9.2 U	9.3 U	9.4 U	9.5 U	9.4 U	9.4 U		9.4 U
Benzo(b)fluoranthene (OC)	---	---	---		0.36 U		0.41 U		0.42 U		0.27 U		0.54 U		0.38 U	0.53 U	0.33 U	0.20 U	0.36 U	21 U		1.6 U
Benzo(g,h,i)perylene (dry)	670	---	---		6.7 U		6.7 U		6.7 U		6.7 U		6.6 U		6.5 U	6.6 U	6.7 U	6.7 U	6.7 U	**23**		6.6 U
Benzo(g,h,i)perylene (OC)	---	31	78		0.26 U		0.29 U		0.30 U		0.19 U		0.39 U		0.27 U	0.38 U	0.23 U	0.14 U	0.26 U	**51**		1.2 U
Benzo(k)fluoranthene (dry)	---	---	---		9.2 U		9.1 U		9.2 U		9.2 U		9.0 U		8.9 U	9.1 U	9.2 U	9.2 U	9.1 U	9.2 U		9.1 U
Benzo(k)fluoranthene (OC)	---	---	---		0.35 U		0.39 U		0.41 U		0.26 U		0.53 U		0.37 U	0.52 U	0.32 U	0.19 U	0.35 U	20 U		1.6 U
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---		20 U		20 U		20 U		20 U		20 U		19 U	20 U	20 U	20 U	20 U	20 U		20 U
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450		0.76 U		0.86 U		0.88 U		0.57 U		1.17 U		0.79 U	1.1 U	0.70 U	0.42 U	0.77 U	44 U		3.5 U
Chrysene (dry)	1,400	---	---		6.6 U		6.5 U		**11 J**		6.6 U		6.5 U		6.4 U	6.5 U	6.6 U	6.6 U	6.6 U	6.6 U		6.5 U
Chrysene (OC)	---	110	460		0.25 U		0.28 U		**0.5 J**		0.19 U		0.38 U		0.27 U	0.37 U	0.23 U	0.14 U	0.25 U	15 U		1.1 U
Dibenz(a,h)anthracene (dry)	230	---	---		8.5 U		8.4 U		8.5 U		8.5 U		8.3 U		8.2 U	8.4 U	8.5 U	8.5 U	8.5 U	8.5 U		8.4 U
Dibenz(a,h)anthracene (OC)	---	12	33		0.32 U		0.36 U		0.38 U		0.24 U		0.49 U		0.34 U	0.48 U	0.30 U	0.18 U	0.33 U	19 U		1.5 U
Fluoranthene (dry)	1,700	---	---		7.9 U		7.8 U		7.8 U		**11 J**		7.7 U		7.6 U	7.8 U	7.8 U	**11 J**	7.8 U	7.8 U		7.8 U
Fluoranthene (OC)	---	160	1,200		0.30 U		0.34 U		0.35 U		**0.31 J**		0.45 U		0.32 U	0.45 U	0.27 U	**0.23 J**	0.30 U	17 U		1.4 U
Indeno(1,2,3-cd)pyrene (dry)	600	---	---		8.6 U		8.5 U		8.5 U		8.5 U		8.4 U		8.3 U	8.4 U	8.5 U	8.6 U	8.5 U	8.5 U		8.5 U
Indeno(1,2,3-cd)pyrene (OC)	---	34	88		0.33 U		0.37 U		0.38 U		0.24 U		0.49 U		0.35 U	0.48 U	0.30 U	0.18 U	0.33 U	19 U		1.5 U
Pyrene (dry)	2,600	---	---		7.7 U		7.6 U		7.7 U		7.7 U		7.6 U		**19**	7.6 U	7.7 U	**13 J**	7.7 U	7.7 U		7.6 U
Pyrene (OC)	---	1,000	1,400		0.29 U		0.33 U		0.34 U		0.22 U		0.44 U		**0.79**	0.43 U	0.27 U	**0.27 J**	0.30 U	17 U		1.3 U
Total HPAHs (dry) [c]	12,000	---	---		20 U		20 U		**11 J**		**11 J**		20 U		**19**	20 U	20 U	**24 J**	20 U	**44**		20 U
Total HPAHs (OC) [c]	---	960	5,300		0.76 U		0.86 U		**0.49 J**		**0.31 J**		1.17 U		**0.79**	1.1 U	0.70 U	**0.51 J**	0.77 U	**98**		3.5 U

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Oakland Bay																	Hammersley Inlet	
				OB-09-SC-12	OB-10-SS-00	OB-10-SC-12	OB-11-SS-00	OB-11-SC-12	OB-12-SS-00	OB-12-SC-12	OB-13-SS-00	OB-13-SC-12	OB-14-SS-00	OB-14-SC-12	OB-17-WS-00	OB-17-WC-12	OB-18-WS-00	OB-18-WC-12 [d]	OB-19-WS-00	OB-19-WC-12 [d]	HI-01-SC-12 [d]	HI-02-SS-00
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	1 to 2 ft	0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																						
1,2,4-Trichlorobenzene (dry)	31	---	---		9.1 U		8.9 U		9.0 U		9.0 U		8.8 U		8.7 U	8.9 U	9.0 U	9.0 U	9.0 U	9.0 U		8.9 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8		0.35 U		0.38 U		0.40 U		0.25 U		0.51 U		0.36 U	0.51 U	0.31 U	0.19 U	0.35 U	20 U		1.6 U
1,2-Dichlorobenzene (dry)	35	---	---		7.9 U		7.8 U		7.8 U		7.8 U		7.7 U		7.6 U	7.7 U	7.8 U	7.8 U	7.8 U	7.8 U		7.7 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3		0.30 U		0.34 U		0.35 U		0.22 U		0.45 U		0.32 U	0.44 U	0.27 U	0.16 U	0.30 U	17 U		1.3 U
1,4-Dichlorobenzene (dry)	110	---	---		7.3 U		7.3 U		7.3 U		7.3 U		7.2 U		7.1 U	7.2 U	7.3 U	7.3 U	7.3 U	7.3 U		7.2 U
1,4-Dichlorobenzene (OC)	---	3.1	9		0.28 U		0.31 U		0.32 U		0.21 U		0.42 U		0.30 U	0.41 U	0.26 U	0.15 U	0.28 U	16 U		1.3 U
Phthalates (ug/kg dry weight or mg/kg OC)																						
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---		11 U		11 U		11 U		11 U		11 U		11 U	11 U	11 U	11 U	**44**	11 U		11 U
bis(2-Ethylhexyl)phthalate (OC)	---	47	78		0.42 U		0.47 U		0.49 U		0.31 U		0.64 U		0.46 U	0.63 U	0.38 U	0.23 U	**1.7**	24 U		1.9 U
Butylbenzylphthalate (dry)	63	---	---		11 U		11 U		11 U		11 U		11 U		11 U	11 U	11 U	11 U	11 U	11 U		11 U
Butylbenzylphthalate (OC)	---	4.9	64		0.42 U		0.47 U		0.49 U		0.31 U		0.64 U		0.46 U	0.63 U	0.38 U	0.23 U	0.42 U	24 U		1.9 U
Di-n-Butylphthalate (dry)	1400	---	---		12 U		12 U		12 U		12 U		12 U		12 U	12 U	12 U	12 U	12 U	12 U		12 U
Di-n-Butylphthalate (OC)	---	220	1,700		0.46 U		0.52 U		0.53 U		0.34 U		0.70 U		0.50 U	0.69 U	0.42 U	0.25 U	0.46 U	27 U		2.1 U
Di-n-Octyl phthalate (dry)	6200	---	---		8.3 U		8.2 U		8.3 U		8.2 U		8.1 U		8.0 U	8.2 U	8.3 U	8.3 U	8.2 U	8.3 U		8.2 U
Di-n-Octyl phthalate (OC)	---	58	4,500		0.32 U		0.35 U		0.37 U		0.23 U		0.47 U		0.33 U	0.47 U	0.29 U	0.18 U	0.32 U	18 U		1.4 U
Diethylphthalate (dry)	200	---	---		16 U		16 U		16 U		16 U		16 U		16 U	16 U	16 U	16 U	16 U	16 U		16 U
Diethylphthalate (OC)	---	61	110		0.61 U		0.69 U		0.71 U		0.45 U		0.94 U		0.67 U	0.91 U	0.56 U	0.34 U	0.62 U	36 U		2.8 U
Dimethylphthalate (dry)	71	---	---		7.7 U		7.6 U		7.7 U		7.7 U		7.6 U		7.5 U	7.6 U	7.7 U	7.7 U	7.7 U	7.7 U		7.6 U
Dimethylphthalate (OC)	---	53	53		0.29 U		0.33 U		0.34 U		0.22 U		0.44 U		0.31 U	0.43 U	0.27 U	0.16 U	0.30 U	17 U		1.3 U
Ionizable Organic Compounds (ug/kg dry weight)																						
2,4-Dimethylphenol	29	29	29		15 U		15 U		15 U		15 U		14 U		14 U	14 U	15 U	15 U	15 U	15 U		15 U
Benzoic Acid	650	650	650		110 U		110 U		110 U		110 U		110 U		110 U	110 U	110 U	110 U	110 U	110 U		110 U
Benzyl Alcohol	57	57	73		14 U		14 U		14 U		14 U		14 U		14 U	14 U	14 U	14 U	14 U	14 U		14 U
Pentachlorophenol	360	360	690		47 U		47 U		47 U		47 U		46 U		46 U	47 U	47 U	47 U	47 U	47 U		47 U
Phenol	420	420	1,200		**27**		14 U		14 U		14 U		13 U		13 U	13 U	14 U	14 U	14 U	**21**		**290**
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																						
Dibenzofuran (dry)	540	---	---		7.5 U		7.4 U		7.5 U		7.5 U		7.4 U		7.3 U	7.4 U	7.5 U	7.5 U	7.5 U	7.5 U		7.4 U
Dibenzofuran (OC)	---	15	58		0.29 U		0.32 U		0.33 U		0.21 U		0.43 U		0.31 U	0.42 U	0.26 U	0.16 U	0.29 U	16.7 U		1.3 U
Hexachlorobenzene (dry)	22	---	---		8.0 U		7.9 U		7.9 U		7.9 U		7.8 U		7.7 U	7.9 U	7.9 U	8 U	7.9 U	7.9 U		7.9 U
Hexachlorobenzene (OC)	---	0.38	2.3		0.31 U		0.34 U		0.35 U		0.22 U		0.46 U		0.32 U	0.45 U	0.28 U	0.17 U	0.30 U	17.6 U		1.4 U
Hexachlorobutadiene (dry)	11	---	---		8.1 U		8.0 U		8.0 U		8.0 U		7.9 U		7.8 U	8.0 U	8.0 U	8.1 U	8.0 U	8.0 U		8.0 U
Hexachlorobutadiene (OC)	---	3.9	6.2		0.31 U		0.34 U		0.35 U		0.23 U		0.46 U		0.33 U	0.46 U	0.28 U	0.17 U	0.31 U	17.8 U		1.4 U
N-Nitrosodiphenylamine (dry)	28	---	---		8.7 U		8.6 U		8.6 U		8.6 U		8.5 U		8.4 U	8.5 U	8.6 U	8.6 U	8.6 U	8.6 U		8.5 U
N-Nitrosodiphenylamine (OC)	---	11	11		0.33 U		0.37 U		0.38 U		0.24 U		0.50 U		0.35 U	0.49 U	0.30 U	0.18 U	0.33 U	19.1 U		1.5 U
2-Methylphenol	---	63	63		14 U		14 U		14 U		14 U		14 U		14 U	14 U	14 U	14 U	14 U	14 U		14 U
4-Methylphenol	---	670	670		**53**		13 U		13 U		13 U		12 U		12 U	13 U	13 U	13 U	13 U	13 U		13 U
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																						
Total PCBs (OC) [c]	---	12	65		0.15 UJ		0.16 UJ		0.18 UJ		0.11 UJ		0.23 UJ		0.16 UJ	0.23 U	0.14 UJ	0.084 UJ	0.15 UJ	9.11 UJ		0.61 UJ
Total PCBs (dry) [c]	130	---	---		3.9 UJ		3.8 UJ		4.0 UJ		3.9 UJ		3.9 UJ		3.8 UJ	4.0 U	4.0 UJ	4.0 UJ	3.9 UJ	4.1 UJ		3.5 UJ
Aroclor 1016	---	---	---		1.6 UJ		1.5 UJ		1.6 UJ		1.5 UJ		1.6 UJ		1.5 UJ	1.6 U	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ		1.4 UJ
Aroclor 1221	---	---	---		3.9 UJ		3.8 UJ		4.0 UJ		3.9 UJ		3.9 UJ		3.8 UJ	4.0 U	4.0 UJ	4.0 UJ	3.9 UJ	4.1 UJ		3.5 UJ
Aroclor 1232	---	---	---		3.4 UJ		3.3 UJ		3.5 UJ		3.4 UJ		3.4 UJ		3.3 UJ	3.5 U	3.5 UJ	3.5 UJ	3.5 UJ	3.5 UJ		3.1 UJ
Aroclor 1242	---	---	---		1 UJ		0.99 UJ		1.0 UJ		1.0 UJ		1.0 UJ		1.0 UJ	1.0 U	1.1 UJ	1.1 UJ	1.0 UJ	1.1 UJ		0.93 UJ
Aroclor 1248	---	---	---		0.63 UJ		0.61 UJ		0.64 UJ		0.63 UJ		0.63 UJ		0.62 UJ	0.65 U	0.65 UJ	0.65 UJ	0.64 UJ	0.66 UJ		0.57 UJ
Aroclor 1254	---	---	---		1 UJ		0.99 UJ		1.0 UJ		1.0 UJ		1.0 UJ		1.0 UJ	1.0 U	1.1 UJ	1.1 UJ	1.0 UJ	1.1 UJ		0.93 UJ
Aroclor 1260	---	---	---		1.5 UJ		1.4 UJ		1.5 UJ		1.4 UJ		1.5 UJ		1.4 UJ	1.5 U	1.5 UJ	1.5 UJ	1.5 UJ	1.5 UJ		1.3 UJ
Chlorinated Pesticides (ug/kg dry weight)																						
4,4'-DDD	16	---	---		0.14 U		0.14 U		0.14 U		0.14 U		0.14 U		0.14 U	0.14 U	0.15 U	**1.0 J**	0.15 U	0.15 UJ		0.13 U
4,4'-DDE	9	---	---		0.14 U		0.14 U		0.14 U		0.14 U		0.14 U		0.13 U	**0.3 J**	0.14 U	0.14 U	0.14 U	**0.33 J**		0.13 U
4,4'-DDT	34	---	---		0.15 U		0.15 U		**0.54 J**		0.15 U		**0.29 J**		0.14 U	0.15 U	0.15 U	0.15 U	0.15 U	**1.6 J**		**0.96 J**
Aldrin	---	---	---		0.22 U		0.21 U		0.22 U		0.22 U		0.22 U		0.21 U	0.22 U	0.22 U	0.23 U	0.22 U	0.22 UJ		0.2 U
alpha-Chlordane	---	---	---		0.13 U		0.13 U		0.13 U		0.28 U		0.26 U		0.13 U	0.13 U	0.13 U	0.14 U	0.13 U	**0.28 J**		0.12 U
Dieldrin	---	---	---		0.12 U		0.11 U		0.12 U		0.11 U		0.11 U		0.11 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 UJ		0.11 U
gamma-BHC	---	---	---		0.077 U		0.075 U		0.077 U		**0.11 J**		0.076 U		0.073 U	**0.34 J**	0.078 U	0.079 U	0.078 U	0.078 UJ		0.071 U
Heptachlor	---	---	---		0.46 U		0.45 U		0.46 U		0.45 U		0.45 U		0.44 U	0.46 U	0.47 U	0.47 U	0.46 U	0.46 UJ		0.42 U
Petroleum Hydrocarbons (mg/kg dry weight)																						
Gasoline	---	---	---						51 U		54 UJ											
Diesel Range	---	---	---						130 U		140 UJ											
Motor Oil	---	---	---						260 U		270 UJ											
Dioxins/Furans (ng/kg dry weight)																						
DX TOTAL (TEQ ND=1/2 DL)	---	---	---	**52.4**	**53.6**	**104**	**43.8**		**54.4**	**70.8**	**48.3**		**21.9**		**13.4**		**33**		**45.5**			**3.19**
1,2,3,4,6,7,8-HPCDD	---	---	---	**1,410 B**	**1,250 B**	**2,730 B**	**982 B**		**1,210 B**	**1,840 B**	**1070 B**		**478 B**		**280 B**		**768 B**		**1,040 B**			**72.1 B**
1,2,3,4,6,7,8-HPCDF	---	---	---	**644**	**455 B**	**1270**	**397 B**		**502 B**	**803**	**427 B**		**182 B**		**95.6 B**		**290 B**		**379 B**			**24.2 B**
1,2,3,4,7,8,9-HPCDF	---	---	---	**30.1 B**	**26.3**	**70.1 B**	**21.9**		**28.2**	**39.1 B**	**28.1**		**11**		**5.36**		**15.7**		**21.6**			**1.53**
1,2,3,4,7,8-HXCDD	---	---	---	**10.2**	**17**	**22.3**	**13.8**		**18.1**	**15.7**	**15.5**		**6.69**		**3.96**		**9.86**		**13.6**			**0.954**
1,2,3,4,7,8-HXCDF	---	---	---	**52.9**	**43.5**	**99.4**	**35.9**		**41.9**	**85.7**	**41.6**		**18.1**		**10.9**		**24.8**		**34.4**			**2.39**
1,2,3,6,7,8-HXCDD	---	---	---	**66.2**	**64**	**132**	**55.8**		**68**	**91.5**	**57.3**		**27.5**		**17.5**		**42.9**		**60.7**			**4.29**
1,2,3,6,7,8-HXCDF	---	---	---	**15.2**	**15.3**	**31**	**13.7**		**16.8**	**22.2**	**14.6**		**6.7**		**3.48**		**8.82**		**12.4**			**0.789**
1,2,3,7,8,9-HXCDD	---	---	---	**32.5**	**47.5**	**65.4**	**40.5**		**53.8**	**44.9**	**48.8**		**19.8**		**11.8**		**28.7**		**40.6**			**2.87**
1,2,3,7,8,9-HXCDF	---	---	---	**1.18**	**1.28**	**2.91**	**1.07**		**1.47**	**1.11**	**1.06**		**0.645**		**0.34 J**		**0.72**		**1.09**			**0.079 J**
1,2,3,7,8-PECDD	---	---	---	**5.48**	**8.66**	**11.4**	**7.03**		**8.44**	**7.57**	**8.01**		**3.75**		**2.48**		**5.21**		**7.3**			**0.574**
1,2,3,7,8-PECDF	---	---	---	**4.15**	**5.23**	**8.34**	**4.22**		**5.24**	**4.52**	**4.58**		**2.07**		**1.61**		**3.12**		**4.22**			**0.304 J**
2,3,4,6,7,8-HXCDF	---	---	---	**12.1**	**13.5**	**22.1**	**11.9**		**15.2**	**18.7**	**13.9**		**5.93**		**3.15**		**8.46**		**10.8**			**0.728**
2,3,4,7,8-PECDF	---	---	---	**6.94 B**	**6.75 B**	**12.9 B**	**5.27**		**6.81 B**	**9.46 B**	**5.47**		**2.95 B**		**2.37**		**4.16**		**5.78 B**			**0.477 B**
2,3,7,8-TCDD	---	---	---	**0.707 B**	**1.07**	**1.25 B**	**0.84**		**1.21**	**0.818 B**	**1.16**		**0.473**		**0.519**		**0.793**		**0.984**			**0.085 J**
2,3,7,8-TCDF	---	---	---	**3.2**	**3.6**	**5.41**	**2.64**		**3.68**	**2.42**	**3.18**		**1.59**		**1.57**		**2.68**		**3.49**			**0.301 J**
OCDD	---	---	---	**11,100 B**	**11,600 B**	**23,500 B**	**7,890 B**		**9,710 B**	**13,000 B**	**7,220 B**		**4,060 B**		**1,580 B**		**6,490 B**		**9,640 B**			**629 B**
OCDF	---	---	---	**1,760 B**	**1,180 B**	**4,020 B**	**1,060 B**		**1,180 B**	**1,740 B**	**1,220 B**		**412 B**		**268 B**		**867 B**		**1130 B**			**66.9 B**

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Oakland Bay																	Hammersley Inlet	
				OB-09-SC-12	OB-10-SS-00	OB-10-SC-12	OB-11-SS-00	OB-11-SC-12	OB-12-SS-00	OB-12-SC-12	OB-13-SS-00	OB-13-SC-12	OB-14-SS-00	OB-14-SC-12	OB-17-WS-00	OB-17-WC-12	OB-18-WS-00	OB-18-WC-12 [d]	OB-19-WS-00	OB-19-WC-12 [d]	HI-01-SC-12 [d]	HI-02-SS-00
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	1 to 2 ft	0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---	**3,230**	**3,110 B**	**6,040**	**2,350 B**		**3,150 B**	**4,430**	**2,570 B**		**1,220 B**		**677 B**		**1,900 B**		**2,680 B**			**194 B**
TOTAL HEPTA-FURANS	---	---	---	**2,570**	**1,610**	**5,640**	**1,350 B**		**1,820**	**2,590**	**1,510**		**596**		**322 B**		**1,040 B**		**1,490**			**93.2**
TOTAL HEXA-DIOXINS	---	---	---	**1,010**	**1,190**	**2,060**	**970**		**1240**	**774**	**953**		**460**		**287**		**666**		**1,030**			**61.4**
TOTAL HEXA-FURANS	---	---	---	**829**	**658**	**1640**	**556**		**711**	**1,060**	**577**		**271**		**154**		**382**		**546**			**35.1**
TOTAL PENTA-DIOXINS	---	---	---	**254**	**341**	**581**	**293**		**430**	**116**	**318**		**155**		**120**		**225**		**409**			**18.3**
TOTAL PENTA-FURANS	---	---	---	**203**	**188**	**376**	**160**		**208**	**272**	**171**		**86.6**		**56.3**		**110**		**147**			**11.3**
TOTAL TETRA-DIOXINS	---	---	---	**202**	**273**	**378**	**191**		**318**	**62.7**	**204**		**117**		**97.8**		**163**		**317**			**13.1**
TOTAL TETRA-FURANS	---	---	---	**91.6**	**89.9**	**176**	**70.7**		**99.5**	**87.4**	**78.2**		**41.8**		**38.2**		**58.5**		**83.8**			**5.77**
Guaicols and Resin Acids (ug/kg dry weight)																						
12-Chlorodehydroabietic Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		98 U
14-Chlorodehydroabietic Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		98 U
3,4,5-Trichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
3,4,6-Trichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
3,4-Dichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
4,5,6-Trichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
4,5-Dichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
4,6-Dichloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
4-Chloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
9,10-Dichlorostearic Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		98 U
Abietic Acid	---	---	---		100 U				**130**		99 U				**920**	**610**	**450**	**1,700**	**560**	**5,900**		98 U
Dehydroabietic Acid	---	---	---		100 U				**170**		99 U				**710**	**530**	**290 J**	**1,000**	**300**	**2,000**		98 U
Dichlorodehydroabietic Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		98 U
Guaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
Isopimaric Acid	---	---	---		100 U				99 U		99 U				**170**	**110**	300 U	**290**	300 U	**870**		98 U
Linolenic Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		**130**
Neoabietic Acid	---	---	---		100 U				99 U		99 U				97 UJ	97 UJ	300 UJ	99 UJ	300 UJ	300 UJ		98 U
Oleic Acid	---	---	---		**920**				**1,500**		**1,100**				97 U	97 U	300 U	99 U	**610**	300 U		**1,300**
Palustric Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		98 U
Pimaric Acid	---	---	---		100 U				99 U		99 U				**99**	97 U	300 U	99 U	300 U	300 U		98 U
Retene	---	---	---												19 U	**430**	20 U	**48**	20 U	**160**		
Sandaracopimaric Acid	---	---	---		100 U				99 U		99 U				97 U	97 U	300 U	99 U	300 U	300 U		110 U
Tetrachloroguaiacol	---	---	---												19 U	20 U	20 U	20 U	20 U	20 U		
Total resin acids [c]	---	---	---		**920**				**1,800**		**1,100**				**1,900**	**1,700**	**740**	**3,000**	**1,500**	**8,900**		**1,400**

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram.
mg/kg	milligrams per kilogram.
PCBs	polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined	value indicates the sample result or detection limit is greater than the LAET or SQS value.
Shaded	value indicates the sample result or detection limit is greater than the CSL value.
U	The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.
J	The associated numerical value is considered an estimated concentration.
G	Bias is high.
B	Specifiyed compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Hammersley Inlet										Reference		
				HI-02-SC-12	HI-03-SS-00	HI-03-SC-12 [d]	HI-04-SS-00	HI-04-SC-12	HI-05-SS-00	HI-06-SS-00	HI-06-SC-12	HI-07-SS-00	HI-07-SC-12 [d]	RF-01-SS-00	RF-02-SS-00	RF-03-SS-00 [d]
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	0 to 10 cm
Conventional Parameters																
Particle/Grain Size, Fines (Silt/Clay)	---	---	---	**23.9**	**13.7**	**62.9**	**4.3**	**7.8**	**6.9**	**16.7**	**4.3**	**6.8**	**7.4**	**81.2**	**51.5**	**13.1**
Particle/Grain Size, Phi Scale <-1	---	---	---	**14.4**	**0.1**	**33.8**	**0.1**	**0.8**	**1.6**	**3.6**	**70.3**	**4.8**	**2.9**	**0.1**	**0.1**	**0.1**
Particle/Grain Size, Phi Scale >10	---	---	---	**2.2**	**3.1**	**2.8**	**1.4**	**1.5**	**1.8**	**2.3**	**0.4**	**1.4**	**1.3**	**4.5**	**3.6**	**1.9**
Particle/Grain Size, Phi Scale 0 to 1	---	---	---	**11.1**	**1.8**	**0.2**	**0.9**	**0.4**	**8.9**	**7.4**	**3.7**	**4.2**	**2**	**0.4**	**0.6**	**4.6**
Particle/Grain Size, Phi Scale -1 to 0	---	---	---	**9.7**	**0.7**	**0.2**	**0.2**	**0.3**	**3.7**	**3.6**	**4**	**3.1**	**1.8**	**0.1**	**0.1**	**0.3**
Particle/Grain Size, Phi Scale 1 to 2	---	---	---	**23.5**	**6.5**	**0.6**	**40.8**	**16.3**	**31.8**	**20.4**	**7.7**	**44.6**	**25.1**	**0.7**	**1.4**	**14.6**
Particle/Grain Size, Phi Scale 2 to 3	---	---	---	**14.7**	**36.9**	**1**	**52.5**	**69.4**	**44.5**	**35.7**	**7.1**	**34.6**	**57**	**1.1**	**6.8**	**40.7**
Particle/Grain Size, Phi Scale 3 to 4	---	---	---	**2.6**	**40.2**	**1.2**	**1.2**	**5.1**	**2.6**	**12.6**	**2.7**	**1.9**	**3.8**	**16.4**	**39.5**	**26.6**
Particle/Grain Size, Phi Scale 4 to 5	---	---	---	**3.5**	**2.9**	**6.6**	**0.6**	**2.1**	**0.6**	**3.3**	**0.2**	**2.2**	**1.1**	**43.1**	**27.8**	**6.7**
Particle/Grain Size, Phi Scale 5 to 6	---	---	---	**5**	**2**	**21.3**	**0.3**	**0.6**	**0.6**	**5.1**	**1.1**	**0.5**	**0.8**	**20.6**	**10.5**	**1.8**
Particle/Grain Size, Phi Scale 6 to 7	---	---	---	**5.6**	**1.8**	**19.1**	**0.5**	**0.8**	**0.8**	**2.1**	**1.2**	**0.6**	**1.1**	**7.4**	**4.2**	**0.8**
Particle/Grain Size, Phi Scale 7 to 8	---	---	---	**4**	**1.2**	**8.2**	**0.5**	**0.9**	**1.2**	**1.3**	**0.5**	**0.7**	**1.3**	**2.1**	**1.7**	**0.5**
Particle/Grain Size, Phi Scale 8 to 9	---	---	---	**2.2**	**1.4**	**3.1**	**0.6**	**0.9**	**1**	**1.2**	**0.6**	**0.7**	**0.9**	**1.8**	**1.7**	**0.6**
Particle/Grain Size, Phi Scale 9 to 10	---	---	---	**1.5**	**1.4**	**1.8**	**0.6**	**0.9**	**1**	**1.3**	**0.4**	**0.7**	**0.9**	**1.7**	**2**	**0.7**
Total Volatile Solids %	---	---	---											**2.6**	**2.26**	**1.13**
Ammonia (mg/kg)	---	---	---	**1.07**	**6.55**	**7.75**	**10.1**	**0.77**	**7.82**	**5.68**	**0.99**	**5.83**	**3.24**	**11.9**	**9.95**	**14.4**
Sulfide	---	---	---	**3.41**	**203**	**5.19**	**17.7**	0.01 U	**9.65**	**258**	**179**	**1.3**	**4.49**	**320**	**166**	**16.7**
Total organic carbon (%)	---	---	---	**0.829**	**1.45**	**0.206**	**0.625**	**0.622**	**0.799**	**2.43**	**0.657**	**0.68**	**0.456**	**0.639**	**0.589**	**0.273**
Total solids (%)	---	---	---	**80.1**	**68.2**	**70.6**	**72.7**	**73.5**	**74.2**	**67.5**	**84.8**	**74.1**	**77.4**	**60**	**65.3**	**72.2**
Metals (mg/kg dry weight)																
Antimony	150	---	---		**0.16 J**		**0.074 J**		**0.14 J**	**0.15 J**		**0.13 J**		**0.16 J**	**0.16 J**	**0.1 J**
Arsenic	57	57	93		**5.1**		**2.2**		**3.2**	**6.3**		**2.4**		**3.1**	**3.2**	**1.5**
Cadmium	5.1	5.1	6.7		**0.63**		**0.12 J**		**0.14 J**	**0.43**		**0.16 J**		**0.41**	**0.42**	**0.098 J**
Chromium	260	260	270		**29**		**17**		**25**	**24**		**21**		**26**	**23**	**12**
Copper	390	390	390		**18**		**9.9**		**15**	**16**		**14**		**16**	**14**	**4.3**
Lead	450	450	530		**14**		**2.2**		**3.2**	**4**		**2.6**		**4.6**	**4.5**	**2.6**
Mercury	0.41	0.41	0.59		**0.037**		**0.0075 J**		**0.02 J**	**0.02 J**		**0.01 J**		**0.012 J**	**0.016 J**	**0.0081 J**
Nickel	140	---	---		**29**		**20**		**24**	**23**		**24**		**28**	**25**	**11**
Silver	6.1	6.1	6.1		**0.06 J**		**0.022 J**		**0.024 J**	**0.054 J**		**0.024 J**		**0.075 J**	**0.064 J**	**0.023 J**
Zinc	410	410	960		**55**		**28**		**36**	**42**		**32**		**36**	**32**	**14**
Butyltins (ug/kg dry weight)																
Butyltin Ion	---	---	---											3.6 U	3.5 U	3.4 U
Dibutyltin Ion	---	---	---											2.8 U	2.7 U	2.6 U
Tributyltin Ion	---	---	---											1.6 U	1.5 U	1.5 U
Aromatic Hydrocarbons (ug/kg dry weight or mg/kg OC)																
LPAHs																
2-Methylnaphthalene (dry)	670	---	---		7.9 U		8.0 U		8.0 U	7.9 U		7.9 U		8.1 U	8.0 U	8.0 U
2-Methylnaphthalene (OC)	---	38	64		0.54 U		1.3 U		1.0 U	0.33 U		1.2 U		1.3 U	1.4 U	2.9 U
Acenaphthene (dry)	500	---	---		7.9 U		8.0 U		8.0 U	7.9 U		8.0 U		8.1 U	8.0 U	8.0 U
Acenaphthene (OC)	---	16	57		0.54 U		1.3 U		1.0 U	0.33 U		1.2 U		1.3 U	1.4 U	2.9 U
Acenaphthylene (dry)	560	---	---		8.4 U		8.4 U		8.5 U	8.4 U		8.4 U		8.6 U	8.4 U	8.4 U
Acenaphthylene (OC)	---	66	66		0.58 U		1.3 U		1.1 U	0.35 U		1.2 U		1.3 U	1.4 U	3.1 U
Anthracene (dry)	960	---	---		7.5 U		7.5 U		7.6 U	7.5 U		7.5 U		7.7 U	7.5 U	7.5 U
Anthracene (OC)	---	220	1,200		0.52 U		1.2 U		1.0 U	0.31 U		1.1 U		1.2 U	1.3 U	2.7 U
Fluorene (dry)	540	---	---		8.7 U		8.7 U		8.7 U	8.7 U		8.7 U		8.9 U	8.7 U	8.7 U
Fluorene (OC)	---	23	79		0.60 U		1.4 U		1.1 U	0.36 U		1.3 U		1.4 U	1.5 U	3.2 U
Naphthalene (dry)	2,100	---	---		8.4 U		8.5 U		8.5 U	8.4 U		8.4 U		8.6 U	8.5 U	8.5 U
Naphthalene (OC)	---	99	170		0.58 U		1.4 U		1.1 U	0.35 U		1.2 U		1.3 U	1.4 U	3.1 U
Phenanthrene (dry)	1500	---	---		8.1 U		8.2 U		8.2 U	8.1 U		8.1 U		8.3 U	8.2 U	8.2 U
Phenanthrene (OC)	---	100	480		0.56 U		1.3 U		1.0 U	0.33 U		1.2 U		1.3 U	1.4 U	3.0 U
Total LPAHs (dry) [c]	5200	---	---		19 U		20 U		20 U	19 U		19 U		20 U	20 U	20 U
Total LPAHs (OC) [c]	---	370	780		1.3 U		3.2 U		2.5 U	0.78 U		2.8 U		3.1 U	3.4 U	7.3 U
HPAHs																
Benzo(a)anthracene (dry)	1,300	---	---		5.7 U		5.8 U		5.8 U	5.7 U		5.7 U		5.9 U	5.8 U	5.8 U
Benzo(a)anthracene (OC)	---	110	270		0.4 U		0.93 U		0.73 U	0.23 U		0.84 U		0.92 U	1.0 U	2.1 U
Benzo(a)pyrene (dry)	1,600	---	---		7.9 U		8.0 U		8.0 U	7.9 U		7.9 U		8.1 U	7.9 U	7.9 U
Benzo(a)pyrene (OC)	---	99	210		0.5 U		1.3 U		1.0 U	0.33 U		1.2 U		1.3 U	1.3 U	2.9 U
Benzo(b)fluoranthene (dry)	---	---	---		9.2 U		9.3 U		9.3 U	9.2 U		9.2 U		9.4 U	9.3 U	9.3 U
Benzo(b)fluoranthene (OC)	---	---	---		0.6 U		1.5 U		1.2 U	0.38 U		1.4 U		1.5 U	1.6 U	3.4 U
Benzo(g,h,i)perylene (dry)	670	---	---		6.5 U		6.6 U		6.6 U	6.5 U		6.5 U		6.7 U	6.6 U	6.6 U
Benzo(g,h,i)perylene (OC)	---	31	78		0.4 U		1.1 U		0.83 U	0.27 U		1.0 U		1.0 U	1.1 U	2.4 U
Benzo(k)fluoranthene (dry)	---	---	---		9 U		9.0 U		9.0 U	8.9 U		9.0 U		9.2 U	9.0 U	9.0 U
Benzo(k)fluoranthene (OC)	---	---	---		0.6 U		1.4 U		1.1 U	0.37 U		1.3 U		1.4 U	1.5 U	3.3 U
Benzofluoranthenes, Total (b+k+j) (dry)	3,200	---	---		19 U		20 U		20 U	19 U		19 U		20 U	20 U	20 U
Benzofluoranthenes, Total (b+k+j) (OC)	---	230	450		1.3 U		3.2 U		2.5 U	0.78 U		2.8 U		3.1 U	3.4 U	7.3 U
Chrysene (dry)	1,400	---	---		**12 J**		6.5 U		6.5 U	6.4 U		6.4 U		6.6 U	6.5 U	6.5 U
Chrysene (OC)	---	110	460		**0.8 J**		1.0 U		0.81 U	0.26 U		0.94 U		1.0 U	1.1 U	2.4 U
Dibenz(a,h)anthracene (dry)	230	---	---		8.3 U		8.3 U		8.4 U	8.3 U		8.3 U		8.5 U	8.3 U	8.3 U
Dibenz(a,h)anthracene (OC)	---	12	33		0.6 U		1.3 U		1.1 U	0.34 U		1.2 U		1.3 U	1.4 U	3.0 U
Fluoranthene (dry)	1,700	---	---		**16 J**		7.7 U		7.7 U	7.6 U		7.7 U		7.8 U	7.7 U	7.7 U
Fluoranthene (OC)	---	160	1,200		**1.1 J**		1.2 U		1.0 U	0.31 U		1.1 U		1.2 U	1.3 U	2.8 U
Indeno(1,2,3-cd)pyrene (dry)	600	---	---		8.3 U		8.4 U		8.4 U	8.3 U		8.3 U		8.5 U	8.4 U	8.4 U
Indeno(1,2,3-cd)pyrene (OC)	---	34	88		0.6 U		1.3 U		1.1 U	0.3 U		1.2 U		1.3 U	1.4 U	3.1 U
Pyrene (dry)	2,600	---	---		**16 J**		7.6 U		7.6 U	7.5 U		7.5 U		7.7 U	7.6 U	7.6 U
Pyrene (OC)	---	1,000	1,400		**1.1 J**		1.2 U		1.0 U	0.31 U		1.1 U		1.2 U	1.3 U	2.8 U
Total HPAHs (dry) [c]	12,000	---	---		**44 J**		20 U		20 U	19 U		19 U		20 U	20 U	20 U
Total HPAHs (OC) [c]	---	960	5,300		**3 J**		3.2 U		2.5 U	0.78 U		2.8 U		3.1 U	3.4 U	7.3 U

Parameter	Freshwater Sediment Apparent Effects Threshold[a]	Marine Sediment Management Standard[b]		Hammersley Inlet										Reference		
				HI-02-SC-12	HI-03-SS-00	HI-03-SC-12 [d]	HI-04-SS-00	HI-04-SC-12	HI-05-SS-00	HI-06-SS-00	HI-06-SC-12	HI-07-SS-00	HI-07-SC-12 [d]	RF-01-SS-00	RF-02-SS-00	RF-03-SS-00 [d]
	LAET	SQS	CSL	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	1 to 2 ft	0 to 10 cm	1 to 2 ft	0 to 10 cm	0 to 10 cm	0 to 10 cm
Chlorinated Benzenes (ug/kg dry weight or mg/kg OC)																
1,2,4-Trichlorobenzene (dry)	31	---	---		8.8 U		8.8 U		8.9 U	8.8 U		8.8 U		9 U	8.8 U	8.8 U
1,2,4-Trichlorobenzene (OC)	---	0.81	1.8		0.61 U		1.4 U		1.1 U	0.36 U		1.3 U		1.4 U	1.5 U	3.2 U
1,2-Dichlorobenzene (dry)	35	---	---		7.6 U		7.7 U		7.7 U	7.6 U		7.6 U		7.8 U	7.7 U	7.7 U
1,2-Dichlorobenzene (OC)	---	2.3	2.3		0.52 U		1.2 U		1.0 U	0.31 U		1.1 U		1.2 U	1.3 U	2.8 U
1,4-Dichlorobenzene (dry)	110	---	---		7.1 U		7.2 U		7.2 U	7.1 U		7.1 U		7.3 U	7.2 U	7.2 U
1,4-Dichlorobenzene (OC)	---	3.1	9		0.49 U		1.2 U		0.90 U	0.29 U		1.0 U		1.1 U	1.2 U	2.6 U
Phthalates (ug/kg dry weight or mg/kg OC)																
bis(2-Ethylhexyl)phthalate (dry)	1,300	---	---		11 U		11 U		11 U	11 U		11 U		**25**	11 U	11 U
bis(2-Ethylhexyl)phthalate (OC)	---	47	78		0.76 U		1.8 U		1.4 U	0.45 U		1.6 U		**3.9**	1.9 U	4.0 U
Butylbenzylphthalate (dry)	63	---	---		11 U		11 U		11 U	11 U		11 U		11 U	11 U	11 U
Butylbenzylphthalate (OC)	---	4.9	64		0.76 U		1.8 U		1.4 U	0.45 U		1.6 U		1.7 U	1.9 U	4.0 U
Di-n-Butylphthalate (dry)	1400	---	---		12 U		12 U		12 U	12 U		12 U		12 U	12 U	12 U
Di-n-Butylphthalate (OC)	---	220	1,700		0.83 U		1.9 U		1.5 U	0.49 U		1.8 U		1.9 U	2.0 U	4.4 U
Di-n-Octyl phthalate (dry)	6200	---	---		8.1 U		8.1 U		8.1 U	8.1 U		8.1 U		8.3 U	8.1 U	8.1 U
Di-n-Octyl phthalate (OC)	---	58	4,500		0.6 U		1.3 U		1.0 U	0.33 U		1.2 U		1.3 U	1.4 U	3.0 U
Diethylphthalate (dry)	200	---	---		16 U		16 U		16 U	16 U		16 U		16 U	16 U	16 U
Diethylphthalate (OC)	---	61	110		1.1 U		2.6 U		2.0 U	0.66 U		2.4 U		2.5 U	2.7 U	5.9 U
Dimethylphthalate (dry)	71	---	---		7.5 U		7.6 U		7.6 U	7.5 U		7.5 U		7.7 U	7.6 U	7.6 U
Dimethylphthalate (OC)	---	53	53		0.52 U		1.2 U		1.0 U	0.31 U		1.1 U		1.2 U	1.3 U	2.8 U
Ionizable Organic Compounds (ug/kg dry weight)																
2,4-Dimethylphenol	29	29	29		14 U		14 U		14 U	14 U		14 U		15 U	14 U	14 U
Benzoic Acid	650	650	650		110 U		110 U		110 U	110 U		110 U		110 U	110 U	110 U
Benzyl Alcohol	57	57	73		14 U		14 U		14 U	14 U		14 U		14 U	14 U	14 U
Pentachlorophenol	360	360	690		46 U		46 U		46 U	46 U		46 U		47 U	46 U	46 U
Phenol	420	420	1,200		13 U		**200**		13 U	**30**		13 U		14 U	13 U	**140**
Miscellaneous Extractables (ug/kg dry weight or mg/kg OC)																
Dibenzofuran (dry)	540	---	---		7.3 U		7.4 U		7.4 U	7.3 U		7.3 U		7.5 U	7.4 U	7.4 U
Dibenzofuran (OC)	---	15	58		0.50 U		1.2 U		0.93 U	0.30 U		1.1 U		1.2 U	1.3 U	2.7 U
Hexachlorobenzene (dry)	22	---	---		7.8 U		7.8 U		7.8 U	7.7 U		7.8 U		7.9 U	7.8 U	7.8 U
Hexachlorobenzene (OC)	---	0.38	2.3		0.54 U		1.2 U		1.0 U	0.32 U		1.1 U		1.2 U	1.3 U	2.9 U
Hexachlorobutadiene (dry)	11	---	---		7.9 U		7.9 U		7.9 U	7.8 U		7.9 U		8.0 U	7.9 U	7.9 U
Hexachlorobutadiene (OC)	---	3.9	6.2		0.54 U		1.3 U		1.0 U	0.32 U		1.2 U		1.3 U	1.3 U	2.9 U
N-Nitrosodiphenylamine (dry)	28	---	---		8.4 U		8.5 U		8.5 U	8.4 U		8.4 U		8.6 U	8.5 U	8.5 U
N-Nitrosodiphenylamine (OC)	---	11	11		0.58 U		1.4 U		1.1 U	0.35 U		1.2 U		1.3 U	1.4 U	3.1 U
2-Methylphenol	---	63	63		14 U		14 U		14 U	14 U		14 U		14 U	14 U	14 U
4-Methylphenol	---	670	670		12 U		12 U		12 U	**140**		12 U		13 U	12 U	12 U
Polychlorinated Biphenyls (ug/kg dry weight or mg/kg OC)																
Total PCBs (OC) [c]	---	12	65		0.27 UJ		0.56 UJ		0.5 U	**2.5 J**		0.57 U		0.59 U	0.68 U	1.4 U
Total PCBs (dry) [c]	130	---	---		3.9 UJ		3.5 UJ		4.0 U	**60 J**		3.9 U		3.8 U	4.0 U	3.8 U
Aroclor 1016	---	---	---		1.6 UJ		1.6 UJ		1.6 U	**50 J**		1.5 U		1.5 U	1.6 U	1.5 U
Aroclor 1221	---	---	---		3.9 UJ		4.0 UJ		4.0 U	4.0 UJ		3.9 U		3.8 U	4.0 U	3.8 U
Aroclor 1232	---	---	---		3.4 UJ		3.5 UJ		3.5 U	3.5 UJ		3.4 U		3.3 U	3.5 U	3.3 U
Aroclor 1242	---	---	---		1.0 UJ		1.0 UJ		1.0 U	1.1 UJ		1.0 U		1.0 U	1.1 U	0.99 U
Aroclor 1248	---	---	---		0.63 UJ		0.64 UJ		0.65 U	0.65 UJ		0.63 U		0.62 U	0.65 U	0.61 U
Aroclor 1254	---	---	---		1.0 UJ		1.0 UJ		1.0 U	1.1 UJ		1.0 U		1.0 U	1.1 U	0.99 U
Aroclor 1260	---	---	---		1.5 UJ		1.5 UJ		1.5 U	**9.9 J**		1.4 U		1.4 U	1.5 U	1.4 U
Chlorinated Pesticides (ug/kg dry weight)																
4,4'-DDD	16	---	---		0.14 U		**0.19 J**		0.15 U	0.14 U		**0.33 J**		0.14 U	**0.15 J**	0.13 U
4,4'-DDE	9	---	---		0.14 U		0.14 U		0.14 U	0.14 U		**1.2 J**		0.14 U	0.14 U	0.13 U
4,4'-DDT	34	---	---		0.15 U		**4.5**		0.15 U	0.15 U		0.15 U		**0.57 J**	0.15 U	0.14 U
Aldrin	---	---	---		0.22 U		0.22 U		0.22 U	0.22 U		0.21 U		0.22 U	0.22 U	0.2 U
alpha-Chlordane	---	---	---		0.13 U		0.13 U		0.13 U	0.13 U		0.13 U		**0.49 J**	0.13 U	**0.19 J**
Dieldrin	---	---	---		0.12 U		0.12 U		0.12 U	0.12 U		**0.13 J**		0.12 U	0.12 U	0.11 U
gamma-BHC	---	---	---		0.077 U		0.077 U		0.077 U	0.077 U		**0.25 J**		0.076 U	0.077 U	0.072 U
Heptachlor	---	---	---		0.46 U		0.46 U		0.46 U	0.46 U		0.45 U		0.45 U	0.46 U	0.43 U
Petroleum Hydrocarbons (mg/kg dry weight)																
Gasoline	---	---	---											31 UJ	29 UJ	25 U
Diesel Range	---	---	---											76 UJ	72 UJ	63 U
Motor Oil	---	---	---											150 UJ	140 UJ	130 U
Dioxins/Furans (ng/kg dry weight)																
DX TOTAL (TEQ ND=1/2 DL)	---	---	---		**13**		**1.77**		**2.09**	**9.74**		**2.71**		**0.692**	**0.508**	**0.245**
1,2,3,4,6,7,8-HPCDD	---	---	---		**224 B**		**40 B**		**48.8 B**	**184 B**		**64.2 B**		**15.9 B**	**10.3 B**	**4.17 B**
1,2,3,4,6,7,8-HPCDF	---	---	---		**71.7 B**		**14.2 B**		**18.3 B**	**64.1 B**		**24.7 B**		**3.36 B**	**2.4 B**	**0.96 B**
1,2,3,4,7,8,9-HPCDF	---	---	---		**4.96**		**0.911**		**1.15**	**3.98**		**1.59**		**0.23 J**	**0.148 J**	**0.071 J**
1,2,3,4,7,8-HXCDD	---	---	---		**3.51**		**0.538**		**0.684**	**2.85**		**0.708**		**0.31 J**	**0.225 J**	**0.081 J**
1,2,3,4,7,8-HXCDF	---	---	---		**9.8**		**1.37**		**1.64**	**7.96**		**2.31**		**0.412 J**	**0.352 J**	**0.145 J**
1,2,3,6,7,8-HXCDD	---	---	---		**18.5**		**2.41**		**2.63**	**13.4**		**3.44**		**1.11**	**0.841**	**0.289 J**
1,2,3,6,7,8-HXCDF	---	---	---		**3.27**		**0.457**		**0.523**	**2.59**		**0.717**		**0.174 J**	**0.137 J**	**0.043 J**
1,2,3,7,8,9-HXCDD	---	---	---		**12.4**		**1.59**		**1.8**	**9.59**		**2.22**		**1**	**0.683**	**0.229 J**
1,2,3,7,8,9-HXCDF	---	---	---		**0.318 J**		**0.048 J**		**0.048 J**	**0.229 J**		**0.078 J**		0.0256 U	0.0243 U	0.0244 U
1,2,3,7,8-PECDD	---	---	---		**2.65**		**0.305 J**		**0.34 J**	**1.86**		**0.377 J**		**0.261 J**	**0.165 J**	**0.078 J**
1,2,3,7,8-PECDF	---	---	---		**1.79**		**0.183 J**		**0.213 J**	**1.12**		**0.23 J**		**0.173 J**	**0.123 J**	**0.057 J**
2,3,4,6,7,8-HXCDF	---	---	---		**2.9**		**0.442 J**		**0.55**	**2.24**		**0.684**		**0.19 J**	**0.134 J**	**0.054 J**
2,3,4,7,8-PECDF	---	---	---		**3.22 B**		**0.279 BJ**		**0.358 J**	**1.96**		**0.369 J**		**0.225 BJ**	**0.193 BJ**	**0.080 BJ**
2,3,7,8-TCDD	---	---	---		**0.515**		**0.068 J**		**0.068 J**	**0.277**		**0.082 J**		**0.091 J**	**0.052 J**	**0.033 J**
2,3,7,8-TCDF	---	---	---		**1.86**		**0.19**		**0.199**	**1.2**		**0.197**		**0.366**	**0.342**	**0.161**
OCDD	---	---	---		**1,790 B**		**330 B**		**420 B**	**1370 B**		**577 B**		**129 B**	**74.1 B**	**28.9 B**
OCDF	---	---	---		**193 B**		**41.4 B**		**53.1 B**	**152 B**		**73.8 B**		**8.07 B**	**5.63 B**	**1.98 B**

Parameter	Freshwater Sediment Apparent Effects Threshold[a] LAET	Marine Sediment Management Standard[b] SQS	CSL	Hammersley Inlet HI-02-SC-12 1 to 2 ft	HI-03-SS-00 0 to 10 cm	HI-03-SC-12 [d] 1 to 2 ft	HI-04-SS-00 0 to 10 cm	HI-04-SC-12 1 to 2 ft	HI-05-SS-00 0 to 10 cm	HI-06-SS-00 0 to 10 cm	HI-06-SC-12 1 to 2 ft	HI-07-SS-00 0 to 10 cm	HI-07-SC-12 [d] 1 to 2 ft	Reference RF-01-SS-00 0 to 10 cm	RF-02-SS-00 0 to 10 cm	RF-03-SS-00 [d] 0 to 10 cm
TOTAL HEPTA-DIOXINS	---	---	---		**787 B**		**95.5 B**		**123 B**	**529 B**		**150 B**		**46.6 B**	**29.2 B**	**10.5 B**
TOTAL HEPTA-FURANS	---	---	---		**285**		**45.7**		**68.2 B**	**278 B**		**88.7 B**		**11.2**	**7.68**	**2.41**
TOTAL HEXA-DIOXINS	---	---	---		**322**		**35.6**		**43.5**	**227**		**53.7**		**12.5**	**8.92**	**3.27**
TOTAL HEXA-FURANS	---	---	---		**162**		**20.4**		**24.1**	**112**		**35.1**		**4.84**	**3.71**	**1.04**
TOTAL PENTA-DIOXINS	---	---	---		**101**		**10.5**		**15.5**	**83.8**		**16.9**		**2.33**	**1.9**	**0.41**
TOTAL PENTA-FURANS	---	---	---		**81.9**		**6**		**7.32**	**49.3**		**9.71**		**3.52**	**2.49**	**0.5**
TOTAL TETRA-DIOXINS	---	---	---		**91.3**		**6.51**		**10.2**	**65.5**		**10.5**		**2.26**	**1.53**	**0.359**
TOTAL TETRA-FURANS	---	---	---		**55.5**		**3.4**		**4.22**	**35.6**		**4.22**		**4.33**	**3.38**	**0.591**
Guaicols and Resin Acids (ug/kg dry weight)																
12-Chlorodehydroabietic Acid	---	---	---				98 U							99 U	98 U	98 U
14-Chlorodehydroabietic Acid	---	---	---				98 U							99 U	98 U	98 U
3,4,5-Trichloroguaiacol	---	---	---											20 U	20 U	20 U
3,4,6-Trichloroguaiacol	---	---	---											20 U	20 U	20 U
3,4-Dichloroguaiacol	---	---	---											20 U	20 U	20 U
4,5,6-Trichloroguaiacol	---	---	---											20 U	20 U	20 U
4,5-Dichloroguaiacol	---	---	---											20 U	20 U	20 U
4,6-Dichloroguaiacol	---	---	---											20 U	20 U	20 U
4-Chloroguaiacol	---	---	---											20 U	20 U	20 U
9,10-Dichlorostearic Acid	---	---	---				98 U							99 U	98 U	98 U
Abietic Acid	---	---	---				98 U							99 U	**730 J**	98 U
Dehydroabietic Acid	---	---	---				98 U							99 U	98 U	98 U
Dichlorodehydroabietic Acid	---	---	---				98 U							99 U	98 U	98 U
Guaiacol	---	---	---											20 U	20 U	20 U
Isopimaric Acid	---	---	---				98 U							99 U	98 U	98 U
Linolenic Acid	---	---	---				**290**							99 U	98 U	98 U
Neoabietic Acid	---	---	---				98 U							99 UJ	98 UJ	98 UJ
Oleic Acid	---	---	---				**2,500**							**120**	98 U	98 U
Palustric Acid	---	---	---				98 U							99 U	98 U	98 U
Pimaric Acid	---	---	---				98 U							99 U	98 U	98 U
Retene	---	---	---											20 U	20 U	20 U
Sandaracopimaric Acid	---	---	---				160 U							99 U	98 U	98 U
Tetrachloroguaiacol	---	---	---											20 U	20 U	20 U
Total resin acids [c]	---	---	---				**2,800**							**120**	**730 J**	98 U

[a] Lowest and second lowest apparent effects thresholds for freshwater sediments in Washington State 2003).

[b] Washington State Marine Sediment Management Standards, Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) (WAC Chapter 173-204).

[c] Totals only include detected and estimated values

[d] Sample has organic carbon content less than 0.5 percent or greater than 4.0 percent and should be compared to LAET criteria rather than organic-carbon normalized SMS criteria.

ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram.
mg/kg	milligrams per kilogram.
PCBs	polychlorinated biphenyls.

Bold type indicates the sample result is greater than the laboratory detection limit.

Underlined	value indicates the sample result or detection limit is greater than the LAET or SQS value.
Shaded	value indicates the sample result or detection limit is greater than the CSL value.
U	The material was analyzed for, but was not detected. The associated numerical value is the detection limit. For petroleum hydrocarbons, guaiacols and resin acids, the associated numerical value is the reporting limit.
J	The associated numerical value is considered an estimated concentration.
G	Bias is high.
B	Specifyied compound was detected in the associated method blank.

LPAH represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH sum.

HPAH represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes represents the sum of the concentrations of the "b" and "k" isomers.

Total PAHs (carcinogenic) represents the sum of the following PAH compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene.

DOH 2009 Oakland Bay Shellfish Tissue Chemical Data

Abbreviations for dioxins/furans

1,2,3,4,6,7,8-HPCDD	Heptachlorodibenzo-*p*-dioxin
1,2,3,4,6,7,8-HPCDF	Heptachlorodibenzofuran
1,2,3,4,7,8,9-HPCDF	Heptachlorodibenzofuran
1,2,3,4,7,8-HXCDD	Hexachlorodibenzo-*p*-dioxin
1,2,3,4,7,8-HXCDF	Hexachlorodibenzofuran
1,2,3,6,7,8-HXCDD	Hexachlorodibenzo-*p*-dioxin
1,2,3,6,7,8-HXCDF	Hexachlorodibenzofuran
1,2,3,7,8,9-HXCDD	Hexachlorodibenzo-*p*-dioxin
1,2,3,7,8,9-HXCDF	Hexachlorodibenzofuran
1,2,3,7,8-PECDD	Pentachlorodibenzo-*p*-dioxin
1,2,3,7,8-PECDF	Pentachlorodibenzofuran
2,3,4,6,7,8-HXCDF	Hexachlorodibenzofuran
2,3,4,7,8-PECDF	Pentachlorodibenzofuran
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-*p*-dioxin
2,3,7,8-TCDF	2,3,7,8-tetrachlorodibenzo-*p*-furan
OCDD	Octachlorodibenzo-*p*-dioxin
OCDF	Octachlorodibenzofuran

Table A1. Shellfish dioxin/furan congeners (wet weight basis) at Oakland Bay and Shelton Harbor, Oakland Bay site - Shelton, Mason County, Washington.

Congener	ATDM 001 (Manila clams) pg/g	BTDM 002 (Manila clams) pg/g	BTDM 003 (Manila clams) pg/g	BTDP 004 (Pacific oysters) pg/g	CDRM 005 (Manila clams) pg/g	CDRM 006 (Manila clams) pg/g
2,3,7,8-TCDD	0.008	0.025	0.008	0.081	0.067	0.006
1,2,3,7,8-PeCDD	0.031	0.032	0.023	0.064	0.052	0.031
1,2,3,4,7,8-HxCDD	0.003	0.003	0.001	0.005	0.004	0.002
1,2,3,6,7,8-HxCDD	0.003	0.004	0.001	0.057 JK	0.005	0.003
1,2,3,7,8,9-HxCDD	0.003	0.003	0.001	0.006	0.004	0.002
1,2,3,4,6,7,8-HpCDD	0.003 BJK	0.004 BJK	0.003 BJ	0.023 BJ	0.015 BJK	0.009 BJ
OCDD	0.000 BJ	0.001 BJ	0.001 BJ	0.003 BJ	0.003 BJ	0.001 BJ
2,3,7,8-TCDF	0.003	0.003	0.002	0.011	0.005	0.002
1,2,3,7,8-PeCDF	0.001	0.001	0.001	0.002	0.001	0.001
2,3,4,7,8-PeCDF	0.008	0.009	0.006	0.016	0.013	0.005
1,2,3,4,7,8-HxCDF	0.002	0.002	0.002	0.009	0.008	0.003
1,2,3,6,7,8-HxCDF	0.002	0.003	0.002	0.010	0.008	0.003
1,2,3,7,8,9-HxCDF	0.003	0.003	0.002	0.011	0.009	0.003
2,3,4,6,7,8-HxCDF	0.002	0.002	0.002	0.007	0.007	0.003
1,2,3,4,6,7,8-HpCDF	0.001 BJ	0.000	0.001 BJK	0.004 JK	0.005 J	0.003 BJ
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000	0.001	0.001	0.000
OCDF	0.000	0.000 BJK	0.000 BJK	0.000 J	0.000 J	0.000 BJ
Total TEQ ND ½ DL	**0.07257**	**0.09569**	**0.05428**	**0.3087**	**0.20688**	**0.0766**

B Indicates the associated analyte is found in the method blank, as well as in the sample.
J Indicates an estimated value – used when the analyte concentration is below the method-reporting limit (MRL) and above the estimated detection limit (EDL).
K EMPC (estimated maximum possible concentration) - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.
Results with qualifiers were detected. All other results were non-detected and calculated based on half the detection limit.
DL = detection limit
pg/g – picograms per grams

Congener	CDRP 007 (Pacific oysters) pg/g	CDRP 008 (Pacific oysters) pg/g	ESDM 009 (Manila clams) pg/g	ESDM 010 (Manila clams) pg/g	GSHM 011 (Mussels) pg/g	HTCM 012 (Manila clams) pg/g
2,3,7,8-TCDD	0.032	0.019	0.009	0.036	0.035	0.026
1,2,3,7,8-PeCDD	0.044	0.021	0.018	0.029	0.038	0.025
1,2,3,4,7,8-HxCDD	0.003	0.007 J	0.001	0.003	0.003	0.002
1,2,3,6,7,8-HxCDD	0.085 J	0.030 J	0.002	0.004	0.004	0.003
1,2,3,7,8,9-HxCDD	0.031 J	0.008 JK	0.001	0.003	0.003	0.002
1,2,3,4,6,7,8-HpCDD	0.034 BJ	0.011 BJK	0.003 BJ	0.004 BJ	0.036 BJ	0.003 BJK
OCDD	0.004 BJ	0.002 BJ	0.001 BJ	0.001 BJ	0.006 B	0.001 BJ
2,3,7,8-TCDF	0.009	0.003	0.002	0.005	0.003	0.002
1,2,3,7,8-PeCDF	0.001	0.001	0.001	0.001	0.001	0.000
2,3,4,7,8-PeCDF	0.071 JK	0.008	0.006	0.006	0.008	0.004
1,2,3,4,7,8-HxCDF	0.008	0.003	0.002	0.002	0.005	0.004
1,2,3,6,7,8-HxCDF	0.009	0.003	0.002	0.002	0.006	0.001
1,2,3,7,8,9-HxCDF	0.022 J	0.003	0.002	0.003	0.006	0.002
2,3,4,6,7,8-HxCDF	0.008	0.003	0.002	0.002	0.005	0.001
1,2,3,4,6,7,8-HpCDF	0.007 J	0.003 BJ	0.001 BJK	0.002 BJ	0.011 J	0.001 BJK
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000	0.000	0.000	0.000
OCDF	0.000 JK	0.000 BJ	0.000 BJK	0.000 BJ	0.001 JK	0.000 BJ
Total TEQ ND ½ DL	**0.36986**	**0.12526**	**0.05323**	**0.10455**	**0.1709**	**0.07875**

B Indicates the associated analyte is found in the method blank, as well as in the sample.
J Indicates an estimated value – used when the analyte concentration is below the method-reporting limit (MRL) and above the estimated detection limit (EDL).
K EMPC (estimated maximum possible concentration) - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.
Results with qualifiers were detected. All other results were non-detected and calculated based on half the detection limit.
DL = detection limit
pg/g – picograms per grams

Congener	IDPM 013 (Manila clams) pg/g	DTBM 014 (Manila clams) pg/g	DTBM 015 (Manila clams) pg/g	DTBM 016 field duplicate (Manila clams) pg/g	DTBP 017 (Pacific oysters) pg/g	DTBP 018 (Pacific oysters) pg/g
2,3,7,8-TCDD	0.016	0.019	0.022	0.045	0.014	0.017
1,2,3,7,8-PeCDD	0.016	0.027	0.025	0.040	0.150 JK	0.088 JK
1,2,3,4,7,8-HxCDD	0.001	0.002	0.003	0.002	0.003	0.003
1,2,3,6,7,8-HxCDD	0.002	0.008 J	0.023 J	0.003	0.044 J	0.014 JK
1,2,3,7,8,9-HxCDD	0.002	0.002	0.017 J	0.002	0.013 JK	0.003
1,2,3,4,6,7,8-HpCDD	0.004 BJ	0.009 BJ	0.043 BJ	0.075 BJ	0.023 BJ	0.011 BJ
OCDD	0.001 BJ	0.002 BJ	0.009 B	0.015 B	0.003 BJ	0.001 BJ
2,3,7,8-TCDF	0.001	0.002	0.002	0.004	0.018 J	0.003
1,2,3,7,8-PeCDF	0.000	0.000	0.000	0.001	0.001	0.001
2,3,4,7,8-PeCDF	0.003	0.003	0.003	0.011	0.038 J	0.010
1,2,3,4,7,8-HxCDF	0.001	0.006 J	0.020 J	0.024 JK	0.005 J	0.002
1,2,3,6,7,8-HxCDF	0.001	0.001	0.002	0.008	0.007 J	0.002
1,2,3,7,8,9-HxCDF	0.002	0.002	0.002	0.009	0.002	0.003
2,3,4,6,7,8-HxCDF	0.001	0.001	0.011 JK	0.008	0.013 J	0.002
1,2,3,4,6,7,8-HpCDF	0.001 BJ	0.004 BJ	0.017 BJ	0.024 J	0.006 BJ	0.003 BJ
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.001 BJK	0.001	0.000	0.000
OCDF	0.000 BJ	0.000 BJ	0.001 BJ	0.002 J	0.000 BJ	0.000 BJ
Total TEQ ND ½ DL	**0.05297**	**0.09018**	**0.20136**	**0.27487**	**0.34000**	**0.16384**

B Indicates the associated analyte is found in the method blank, as well as in the sample.
J Indicates an estimated value – used when the analyte concentration is below the method-reporting limit (MRL) and above the estimated detection limit (EDL).
K EMPC (estimated maximum possible concentration)- When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.
Results with qualifiers were detected. All other results were non-detected and calculated based on half the detection limit.
DL = detection limit
pg/g – picograms per grams

Congener	FTTM 019 (Manila clams) pg/g	FTTM 020 (Manila clams) pg/g	FTTK 021 (Kumo oysters) pg/g	FTTK 022 (Kumo oysters) pg/g
2,3,7,8-TCDD	0.015	0.015	0.045	0.015
1,2,3,7,8-PeCDD	0.020	0.020	0.045	0.280 J
1,2,3,4,7,8-HxCDD	0.002	0.001	0.007	0.017 J
1,2,3,6,7,8-HxCDD	0.003	0.002	0.088 J	0.069 J
1,2,3,7,8,9-HxCDD	0.002	0.001	0.007	0.030 J
1,2,3,4,6,7,8-HpCDD	0.003 BJ	0.009 BJ	0.022 BJ	0.039 BJ
OCDD	0.000 BJ	0.002 BJ	0.002 BJ	0.006 B
2,3,7,8-TCDF	0.002	0.001	0.015	0.037 JK
1,2,3,7,8-PeCDF	0.000	0.000	0.002	0.001
2,3,4,7,8-PeCDF	0.003	0.003	0.020	0.062 JK
1,2,3,4,7,8-HxCDF	0.001	0.001	0.009	0.004
1,2,3,6,7,8-HxCDF	0.002	0.001	0.010	0.011 J
1,2,3,7,8,9-HxCDF	0.002	0.002	0.011	0.005
2,3,4,6,7,8-HxCDF	0.002	0.001	0.009	0.017 J
1,2,3,4,6,7,8-HpCDF	0.001 BJ	0.003 BJ	0.004 J	0.007 J
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000	0.000
OCDF	0.000 BJ	0.000 BJ	0.000 J	0.000 J
Total TEQ ND ½ DL	**0.05913**	**0.06544**	**0.29609**	**0.59838**

B Indicates the associated analyte is found in the method blank, as well as in the sample.
J Indicates an estimated value – used when the analyte concentration is below the method-reporting limit (MRL) and above the estimated detection limit (EDL).
K EMPC (estimated maximum possible concentration) - When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag indicates an estimated maximum possible concentration for the associated compound.
Results with qualifiers were detected. All other results were non-detected and calculated based on half the detection limit.
DL = detection limit
pg/g – picograms per grams

Appendix C

Simpson 2017 RI SPI Survey Report

Shelton Harbor SPI Survey

Data Report

September 15, 2017

NewFields
115 2nd Ave N, Suite 100
Edmonds, WA 98020

Table of Contents

List of Figures

1.0 Introduction

This report presents the results of the 2017 Sediment Profile Imaging (SPI) survey conducted in Shelton Harbor, WA, in support of the Shelton Harbor Remedial Investigation and Feasibility Study (RI/FS). NewFields, Edmonds, WA, was contracted by Simpson Timber Company to conduct the survey on July 10 and 11, 2017. Technical direction for the survey was provided by Anchor QEA, Seattle, WA. The focus of the SPI investigation was to determine the presence of woody debris in surface sediments, determine the presence of methane gas and bacterial mats, and measure the depth of the apparent redox potential discontinuity (RPD) in Shelton Harbor. The apparent RPD depth approximates the depth of oxygenation and biological mixing in surface sediments. Sampling methods and analysis protocols used for conducting the SPI survey are provided in Section 2.0. Results are presented in Section 3.0 and a summary is provided in Section 4.0.

2.0 Methods

2.1 Sediment Profile Imaging

SPI images were collected using an Ocean Imaging System model 3731 sediment-profile camera deployed from the research vessel (R/V) *Nancy Ann*, owned and operated by Marine Sampling Systems, Burley, WA. The sediment-profile camera consisted of a wedge-shaped prism with a Plexiglas face plate and a back mirror mounted at a 45 degree angle. Light was provided by an internal strobe. The camera obtained images of up to 20 cm of the upper sediment column in profile (Figure 2-1).

Over the course of two days (July 10 and 11, 2017), SPI images were collected at 62 stations throughout Shelton Harbor (Figure 2-2). A minimum of one SPI image was collected at each station.

2.2 SPI Image Analysis

Computer image analysis of SPI images apparent RPD depths followed a formal and standardized technique developed by Rhoads and Germano (1982, 1986). Physical and biological parameters were measured directly from the digital SPI images by an analyst using computer image analysis software. A minimum of one SPI image was analyzed at each station and a duplicate image was analyzed at 21 stations (33% of stations).The image analysis parameters for the Shelton Harbor survey included:

- Wood debris (presence and percent coverage)
- Presence of methane
- Presence of bacterial mats
- Depth of the apparent RPD (cm)

All data were edited and verified by a senior-level scientist before final data synthesis, statistical analysis, and interpretation. Final SPI image analysis results are provided in Appendix A.

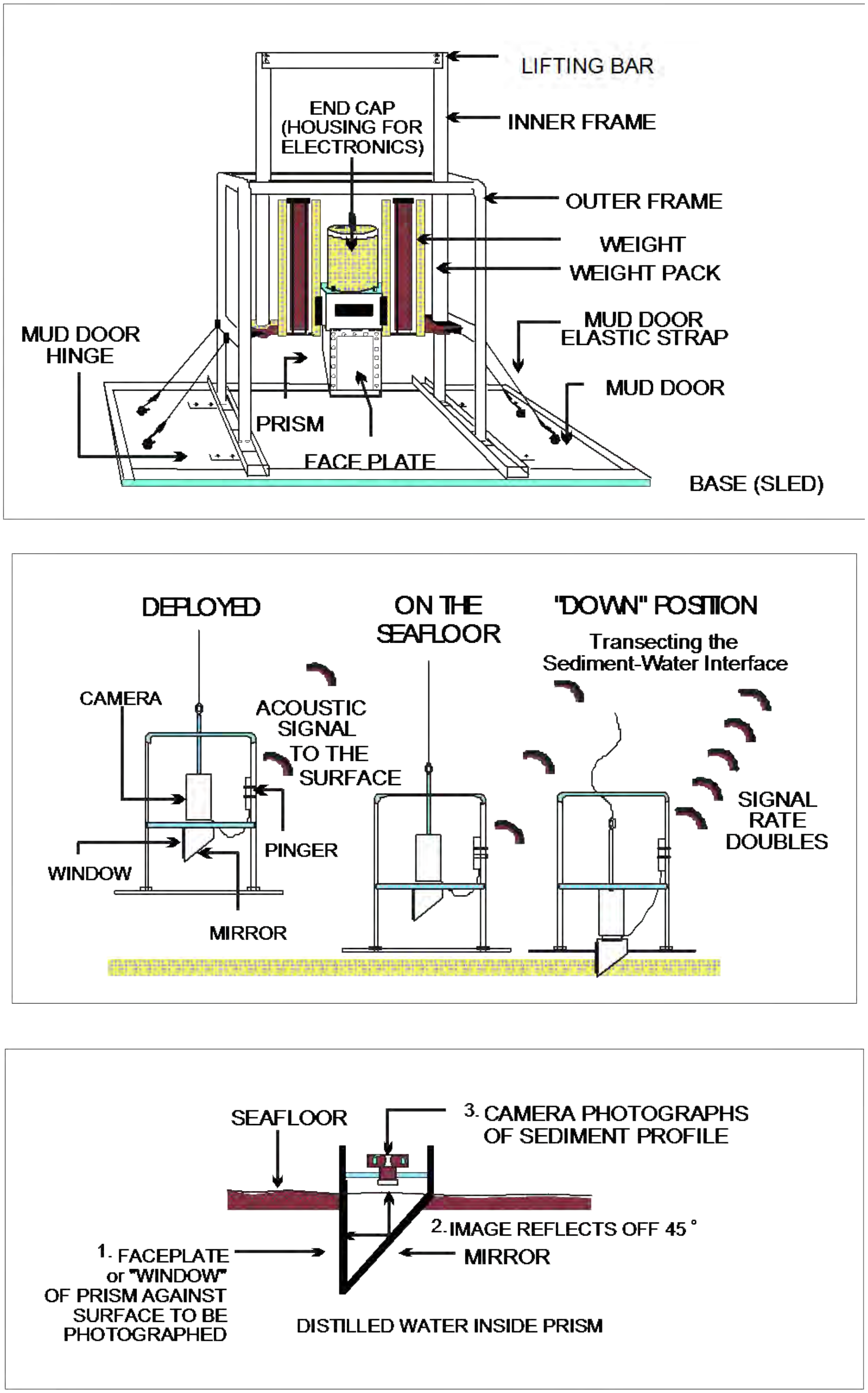

Figure 2-1. Schematic diagram of the sediment profile camera and sequence of operation on deployment.

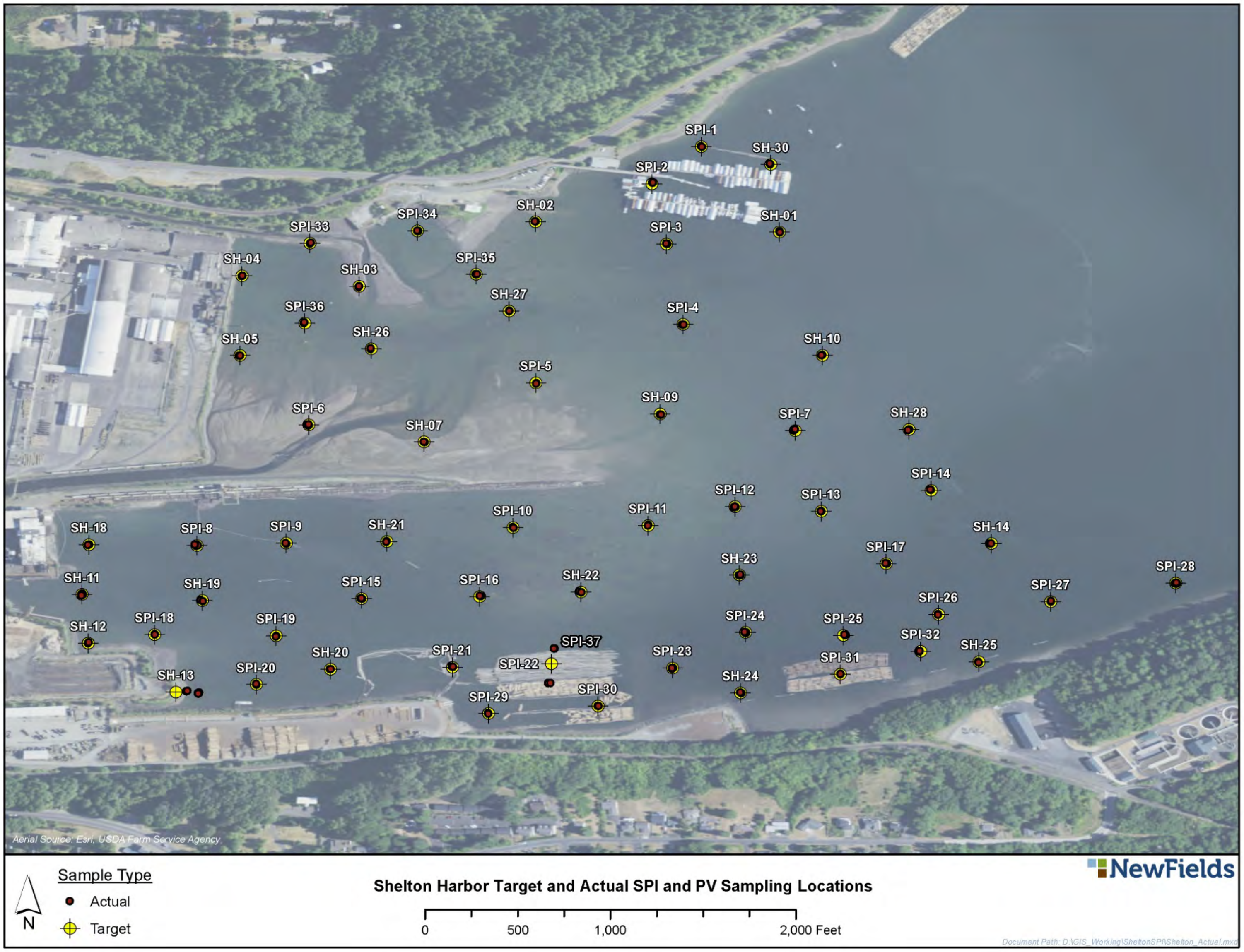

Figure 2-2. Shelton Harbor target and actual SPI and PV sampling locations.

2.2.1 Presence of Wood Debris

Presence of wood debris relies on the visual identification of wood-like particles in surface sediments that contrast with the surrounding sedimentary texture. Wood debris can consist of dark or brown particles, shards, bark, or larger wood pieces. The estimate of percent wood debris in SPI images was determined visually using Munsell charts for estimating proportions of mottles and coarse fragments (GretagMacbeth 2000).

2.2.2 Presence of Methane

Gas-filled voids in sediment are identifiable in SPI images because of their irregular, generally circular shape and glassy appearance (due to the reflection of the camera strobe off the gas). The presence of sedimentary methane indicates high organic matter loading to a system as methanogenesis predominates where sulfate is depleted by organic overloading.

2.2.3 Presence of Bacterial Mats

Sulfate-reducing bacterial mats such as *Beggiatoa* can be visually identified in SPI images. *Beggiatoa* can exist at the interface between oxic and anoxic conditions. It usually lives within sediments and its presence on the surface indicates the lack of oxygen in underlying sediments. In SPI images, the bacterial mats can appear as layers of white fibrous material or accumulations of light gray organic aggregations. Sediments below these layers generally appeared black and anoxic, devoid of any organisms or evidence of biological activity.

2.2.4 Apparent Redox Potential Discontinuity (RPD) Depth

The depth of the apparent RPD, which is the change from oxidized to reduced sediment, can be measured using SPI and computer image analysis. The upper surface of aerobic fine-grained sediments has a higher light reflectance value than underlying hypoxic or anoxic sediments. This is readily apparent in SPI images and is due to oxidized surface sediment that contains minerals in an oxidized state (typically an olive brown color), while the reduced sediments below this oxygenated layer are generally green, gray, blue, or black. The boundary between the colored ferric hydroxide surface sediment and underlying sediment is called the apparent redox potential discontinuity (RPD). The apparent RPD is a sensitive indicator of infaunal succession, sediment bioturbation activity, and sediment oxygen demand. The depth of the apparent RPD has proven to be a useful parameter for mapping gradients of enrichment on the seafloor (Rhoads and Germano 1982, Lyle 1983).

The actual RPD is the boundary that separates the positive Eh region (presence of free oxygen) of the sediment column from the underlying negative Eh region (absence of free oxygen). The exact location of the Eh boundary (where Eh = 0) can only be determined with microelectrodes. Therefore, the reflectance boundary observed in the SPI images is termed the apparent RPD. In general, the depth of the actual RPD will be shallower than the depth of the apparent RPD, because organisms cause bioturbation of ferric hydroxide-coated particles downward below the Eh = 0 horizon. As a result, the apparent RPD depth provides an estimate of the degree of biogenic sediment mixing. This variable is important in evaluating the effect of colonizing benthos. Bioturbation vertically transports buried reduced compounds to the sediment surface and exposes them to an oxidizing water column (Aller 1982). Bioturbation also affects sediment transport by changing the physical properties of sediments and their mechanical behavior (Rhoads and Boyer 1982).

Another important characteristic of the apparent RPD is the contrast in reflectance values at this boundary. This contrast is related to the interactions among the degree of organic-loading in the sediment, bioturbation, and bottom-water dissolved oxygen levels. A high input of labile organic material increases sediment oxygen demand, stimulates the sulfate reduction rate, and results in sulfitic products. This results in more highly reduced (lower-reflectance) sediments at depth and higher RPD contrasts. In a region where generally low RPD contrasts exist, images with high RPD contrasts indicate localized sites of relatively high inputs of organic-rich material, such as wood debris.

2.3 Plan View Imaging

Plan view (surface) imaging was conducted using a downward facing underwater Chimaera MKII camera with external flash, manufactured by SubC Control, Newfoundland, Canada. The plan view (PV) camera and external flash were mounted on the frame of the SPI camera in a downward-looking orientation. Images were collected just before the SPI camera touched the seafloor, using a lead ball and cable attached to a bounce trigger.

Collection of PV images were attempted at the same 62 stations in Shelton Harbor where SPI images were collected (Figure 2-2). Turbidity in the water column affected PV image quality. A minimum of one PV image was collected at each station, with the exception of seven stations (SH-02, SH-09, SH-14, SPI-13, SPI-26, SPI-27, and SPI-35). Useable PV images were not collected at these stations due to high turbidity in the water column.

2.4 Plan View Image Analysis

Image analysis of the PV images consisted primarily of evaluating the images for the presence of wood debris on the sediment surface. Percent estimates of wood debris for the PV images were not determined due to turbidity affecting image quality. However, where wood debris was documented the percent cover was at least 50% or greater in most cases. Final PV image analysis results are provided in Appendix A.

3.0 Results

3.1 Wood Debris

Wood debris observed in SPI images in Shelton Harbor ranged from very fine wood particles to large wood pieces and bark. Wood debris was observed at 52 percent of the stations surveyed (32 of 62 stations) (Figure 3-1). Of the 32 stations showing wood debris, 78 percent of the stations (25 stations) showed trace amounts of fine, black, wood-like particles in the surface sediments[1]. The amount of this type of wood debris was characterized as less than 1 percent by area in the SPI images (Figure 3-2). Fine wood debris particles were not evident in the PV images.

Higher concentrations of wood debris (2 to 15 percent by area in the SPI images) were observed at four stations surrounding the Manke log storage site, along the southern shoreline of Shelton Harbor (SH-22, SPI-23, SPI-31, and SPI-37) (see Figure 3-1). The wood debris consisted of large to small wood pieces or particles visible on the surface or in the sediment column. This wood debris was also visible in PV images (Figures 3-3 and 3-4).

The highest concentrations of wood debris (30 to 50 percent by area in the SPI images) consisted of large wood pieces and bark, and were observed at three stations located in areas within the Manke log storage site (stations SPI-21, SPI-22, and SPI-29) (Figures 3-5 and 3-6). This wood debris was clearly evident in PV images.

Presence of larger wood debris in PV images was generally consistent with SPI observations. The PV image at station SPI-02 showed the presence of wood debris on the sediment surface (Figure 3-7). However, the SPI image did not show clear evidence of wood debris. Station SPI-02 is located within the Oakland Bay Marina and the wood debris was likely attributed to activities within the marina.

3.2 Sedimentary Methane

Sedimentary methane was observed in SPI images at 5 stations (SH-02, SH-07, SH-14, SH-21, and SH-25) within Shelton Harbor (Figure 3-1). The methane was observed as gas-filled voids within the sediment column, and the methane had a glassy appearance due to reflection from the camera strobe (Figure 3-8). Benthic habitat quality did not appear to be impacted at the stations where methane was observed (i.e., apparent RPD depths were well developed and feeding voids were visible, indicating the presence of head-down deposit feeding organisms). This suggested that the organic loading at these locations may be related to deposition of natural organic materials versus impacts from recent wood debris accumulation.

3.3 Distribution of Bacterial Mats (*Beggiatoa*)

Sulfate-reducing bacteria (likely *Beggiatoa*) were observed at 8 stations along the southern shoreline of Shelton Harbor where wood debris was observed (stations SPI-21, SPI-22, SPI-23, SPI-29, SPI-30, SPI-31, and SPI-32). The *Beggiatoa* bacteria generally consisted of a white-colored layer or coating visible on wood debris in SPI and PV images (Figure 3-1). The presence of bacterial mats at these locations suggested the lack of oxygen in underlying sediments. In

[1] The trace amounts of fine organic black particles mixed into the sediments were presumed to be related to wood debris, but could be from other natural sources in Shelton Harbor.

most instances, the underlying sediments observed in SPI images were black in color, indicating low oxygen sedimentary conditions (see Figures 3-5 and 3-6).

3.4 Apparent Redox Potential Discontinuity

The apparent RPD depth estimates the depth of oxygenation in the upper sediment column and provides an estimate of the biological mixing depth by infaunal organisms. Overall, mean apparent RPD depths were well developed throughout most of Shelton Harbor, and ranged from 0.16 to 5.48 cm, with an average depth of 2.51 (±1.20 cm; n=83) for the 62 SPI stations (Figure 3-9). The presence of fine wood debris in low concentrations (less than 1 percent by area in SPI images) did not appear to affect benthic habitat quality in Shelton Harbor. Apparent RPD depths at these stations averaged 2.95 cm (±0.94 cm; n=36).

The shallowest apparent RPD depths were measured in areas within the Manke log storage site where the highest accumulation of wood debris was observed (Figures 3-9 and 3-10). Within the log storage site, apparent RPD depths averaged 0.34 cm (±0.28 cm; n=7) at stations SPI-21, SPI-22, SPI-29, SPI-30, and SPI-37. Outside of the log storage site, apparent RPD depths averaged 2.72 cm (±1.05 cm; n=69).

Apparent RPD contrast was also higher in areas within and around the Manke log storage site, suggesting benthic habitat stress due to input of organic-rich material (likely wood debris) (see Figure 3-10).

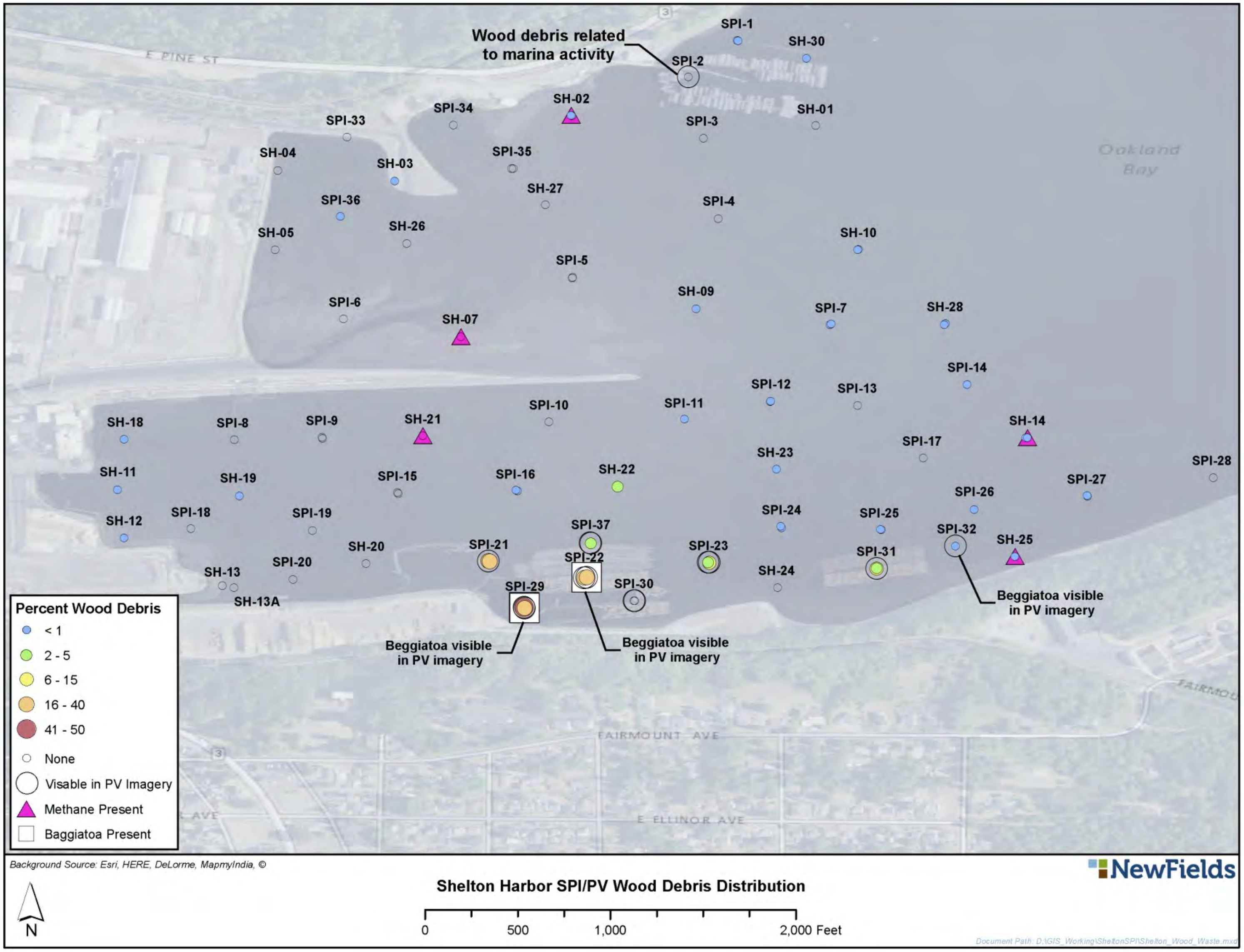

Figure 3-1. Shelton Harbor SPI/PV wood debris distribution.

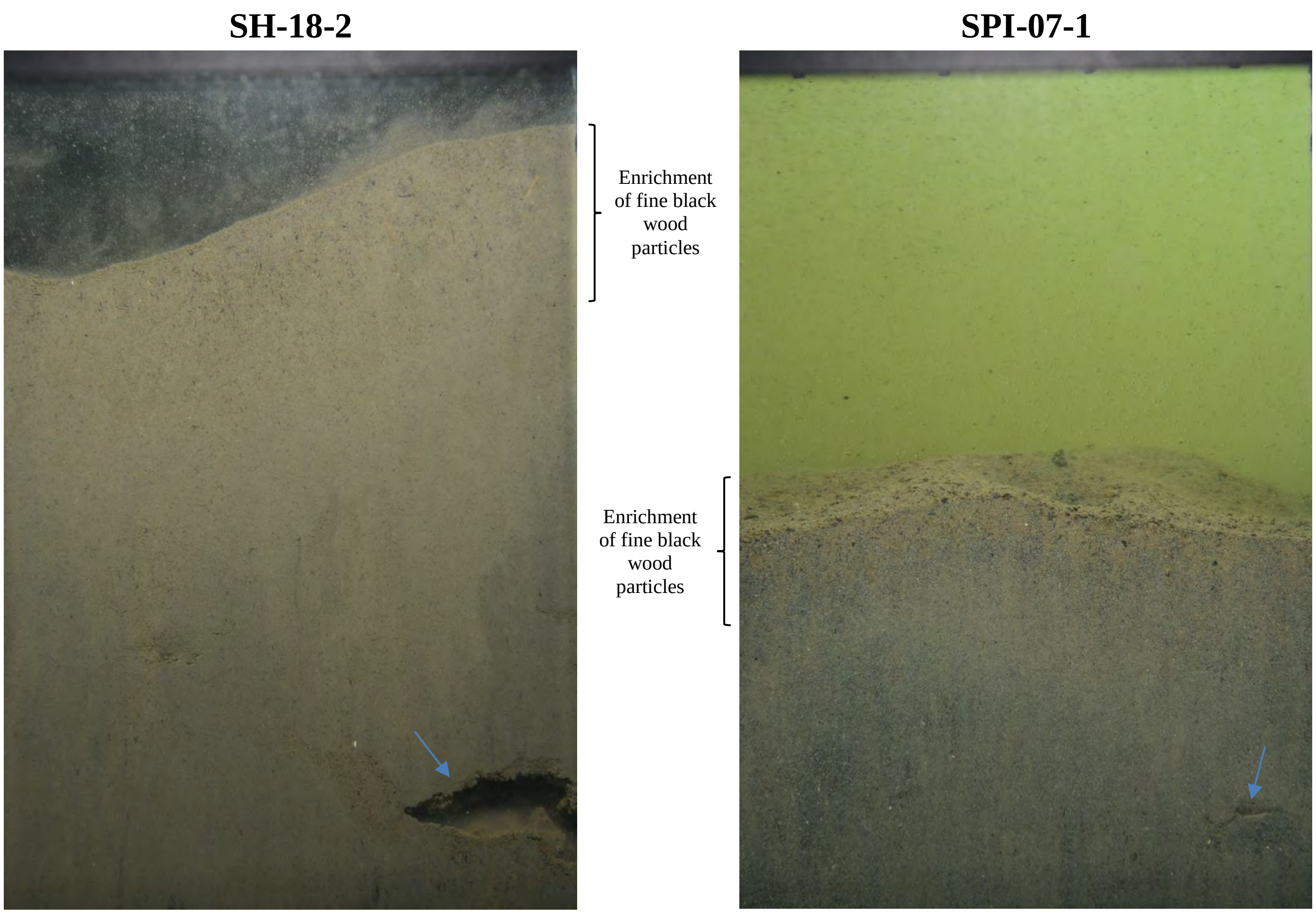

Figure 3-2. SPI images from station SH-18 and SPI-07 showed very fine wood debris.

SPI images from stations SH-18 replicate 2 (SH-18-2) and SPI-07 replicate 1 (SPI-07-1) showed very fine, black particles in fine-grained surface sediments. The black particles were presumed to be wood debris. Feeding voids were visible at depth at both stations (blue arrow), which were created by head-down deposit feeders. Presence of feeding voids is an indicator of healthy and well established benthic habitat. SPI image width = 15 cm.

SPI-23-2 (SPI) **SPI-23-4 (PV)**

Figure 3-3. SPI and PV images from station SPI-23.

The SPI image from SPI-23-2 showed silt covered wood pieces protruding from the sediment surface (blue arrows). The surface PV image showed scattered wood pieces, branches, and bark on the sediment surface. A crab (likely *Cancer gracilis*) was present (white arrow). SPI image width = 15 cm. PV image area = 0.7 square meters.

SPI-37-1 (SPI) **SPI-37-1 (PV)**

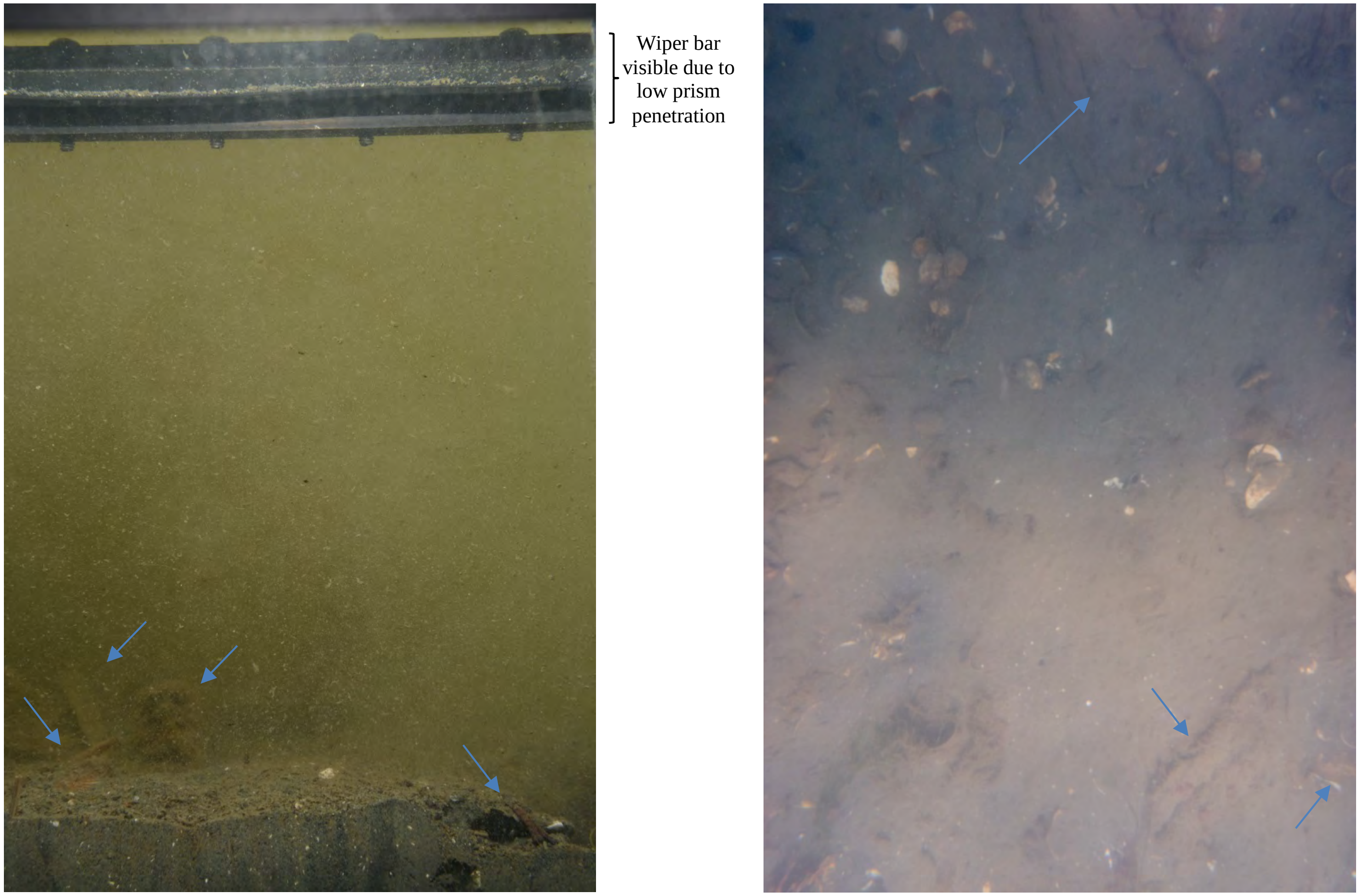

Figure 3-4. SPI and PV images from station SPI-37.

The SPI image from SPI-37-1 showed scattered pieces of wood debris on the sediment surface (blue arrows). Compact sands were present and SPI camera prism penetration was low. The surface PV image showed scattered pieces of larger wood debris (blue arrows) and shells. SPI image width = 15 cm. PV image area = 0.7 square meters.

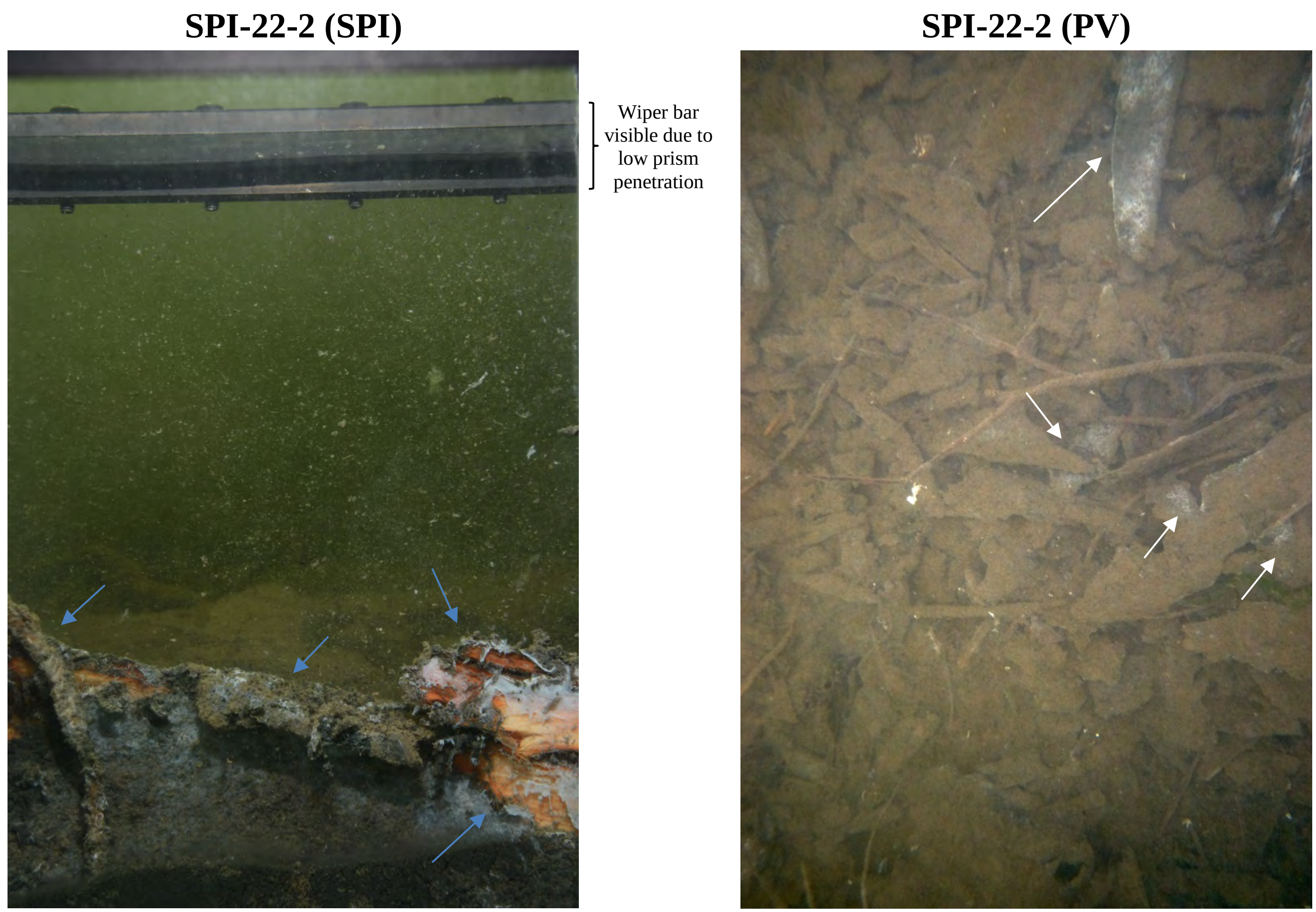

Figure 3-5. SPI and PV images from station SPI-22.

The SPI image from SPI-22-2 showed wood pieces and branches (blue arrows), overlying black anoxic sediments. The white coating present on the wood debris was likely *Beggiatoa* bacteria. The surface PV image showed a dense mat of wood debris consisting of wood pieces, branches, and bark. The white coating visible on some wood pieces was likely *Beggiatoa* bacteria (white arrows). SPI image width = 15 cm. PV image area = 0.7 square meters.

SPI-29-1 (SPI)

SPI-29-3 (PV)

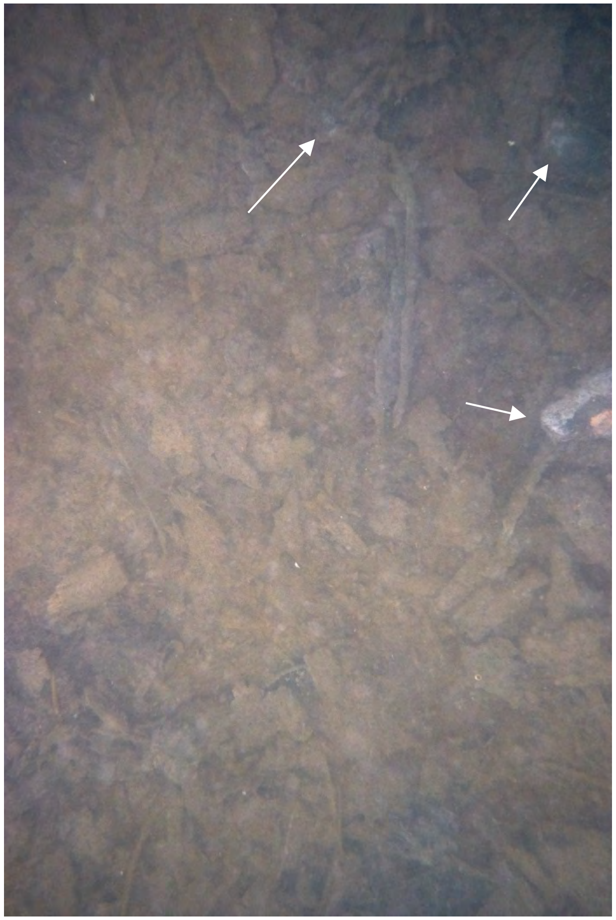

Figure 3-6. SPI and PV images from station SPI-29.

The SPI image from SPI-29-1 also showed wood pieces (blue arrows), overlying black anoxic sediments. The white coating present on the wood debris was likely *Beggiatoa* bacteria. The PV image showed a mat of wood debris consisting of wood pieces, branches, and bark. The white coating visible on some wood pieces was likely *Beggiatoa* bacteria (white arrows). SPI image width = 15 cm. PV image area = 0.7 square meters.

SPI-02-1 (SPI)

SPI-02-1 (PV)

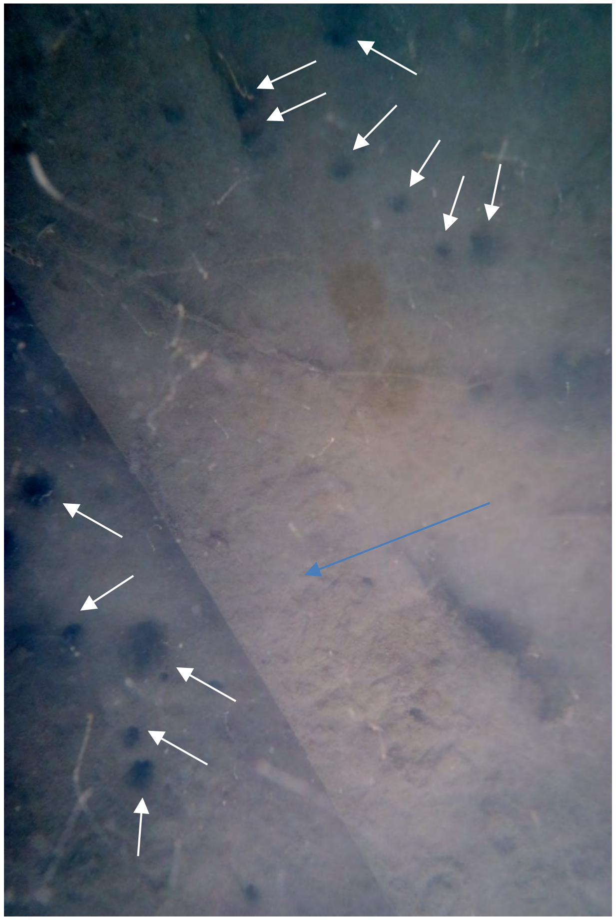

Figure 3-7. SPI and PV images from station SPI-02.

The SPI image from SPI-02-1 showed fine grained sediments with no apparent evidence of wood debris. A large feeding void was visible at depth (blue arrow). The surface PV image appeared to show a wooden board lying on the sediment surface (blue arrow). Large surface burrows were visible (white arrows). The board was likely related to activities at the marina. SPI image width = 15 cm. PV image area = 0.7 square meters.

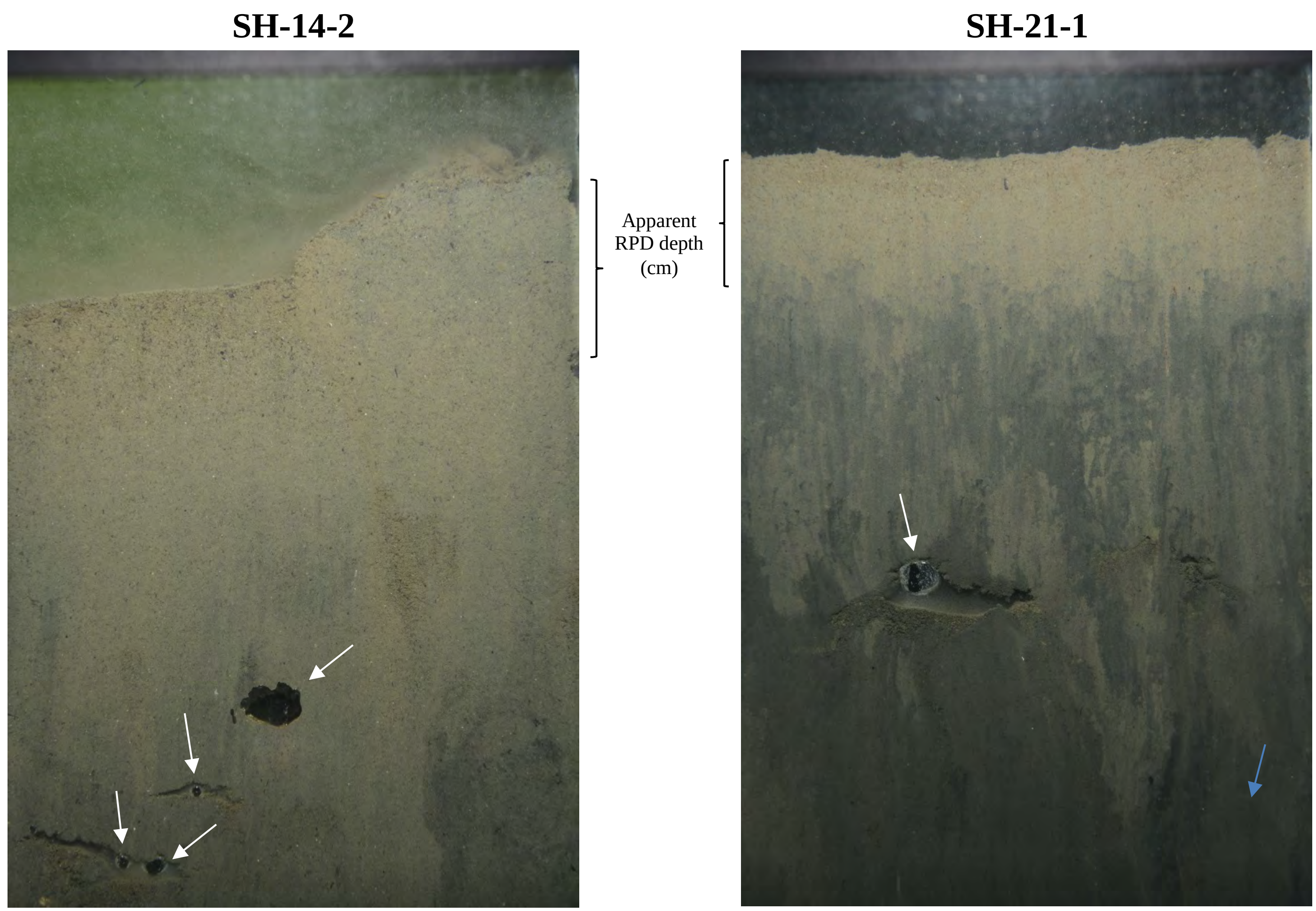

Figure 3-8. SPI images from station SH-14 and SPI-07 showing methane.

SPI images from stations SH-14-2 and SH-21-1 (SPI-07-1) showed fine grained silt/clay sediments with sedimentary methane bubbles at depth (white arrows). In several cases the methane bubbles were present within active feeding voids. The apparent RPD depth was relatively well developed in both images. SPI image width = 15 cm.

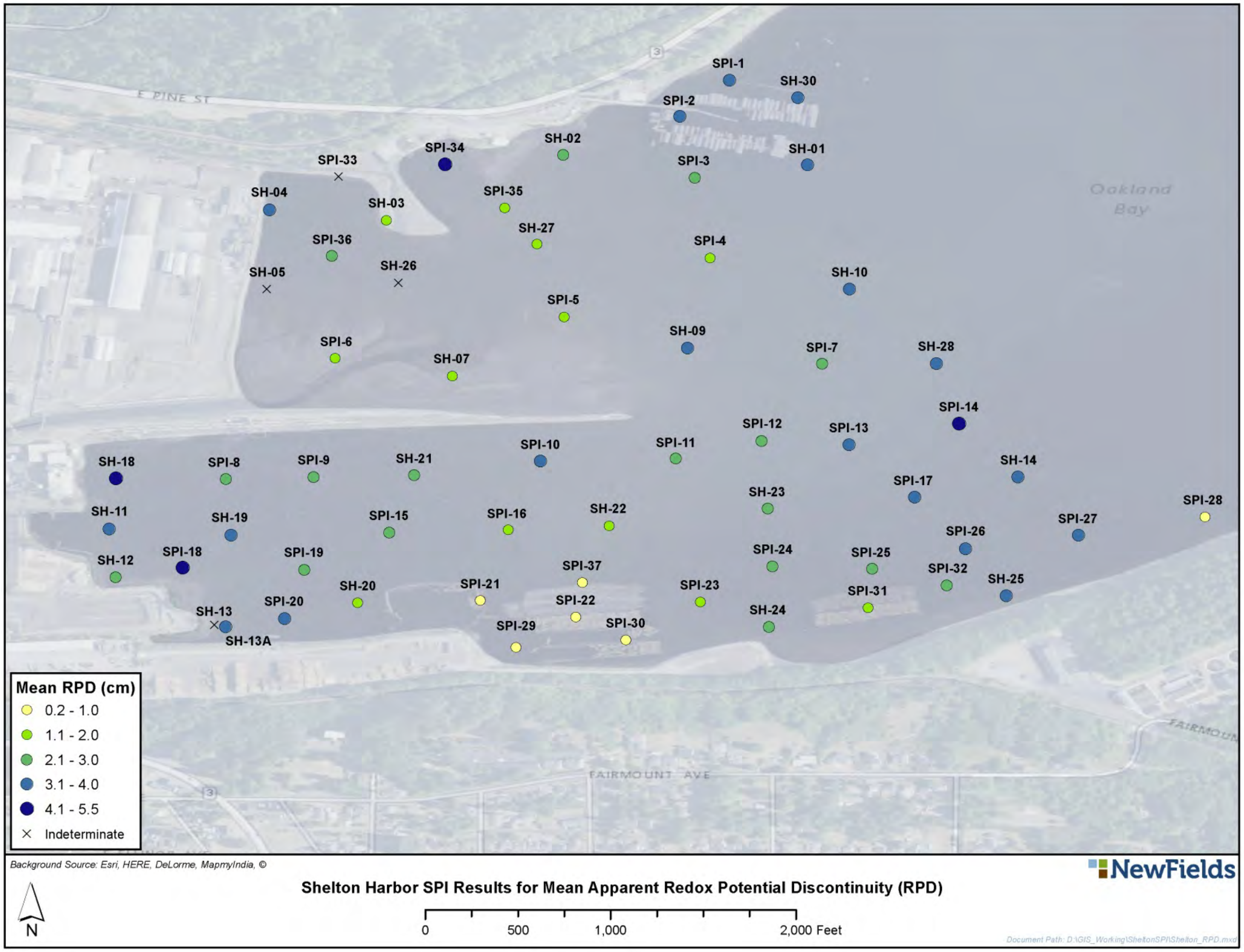

Figure 3-9. Shelton Harbor SPI results for mean apparent RPD.

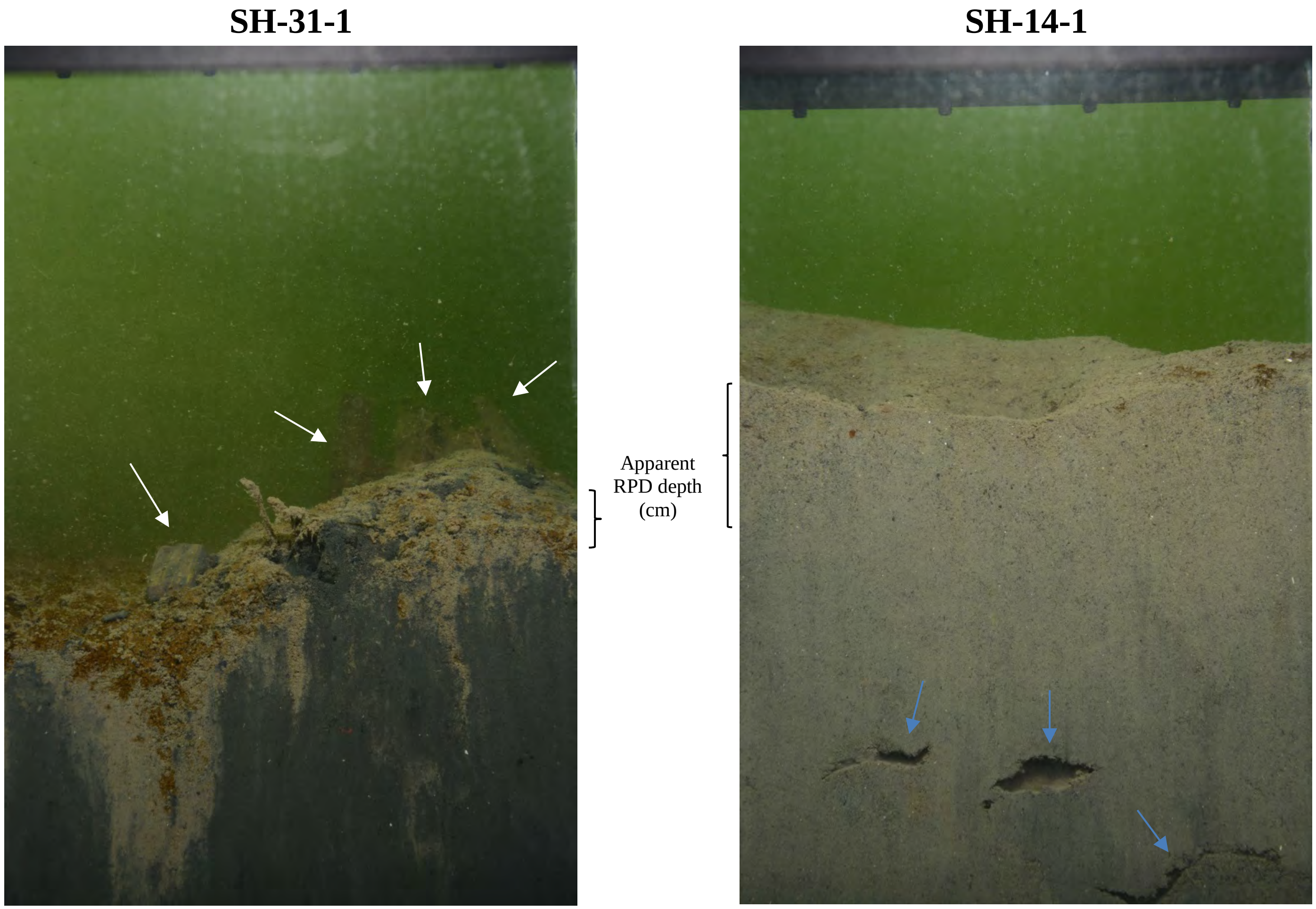

Figure 3-10. SPI images from stations SPI-31 and SH-14.

The SPI image from station SPI-31-1 showed high apparent RPD contrast (thin apparent RPD layer of light colored oxidized sediment contrasted with the underlying black anoxic sediments). Sediment oxygen demand was high at this station. Wood debris was visible on the sediment surface (white arrows). In comparison, the SPI image from station SH-14 showed a deeper apparent RPD with underlying sediments that were much lighter in color (higher oxygen penetration and lower concentrations of sulfides). Feeding voids were visible at depth (blue arrows) indicating the presence of head-down deposit feeders. SPI image width = 15 cm.

4.0 Summary

- Wood debris observed in SPI images in Shelton Harbor ranged from very fine wood particles to large wood pieces and bark. The highest concentrations of wood debris (30 to 50 percent by area in the SPI images) consisted of large wood pieces and bark, and were observed in areas within the Manke log storage site.
- Fine, black particles were observed in surface sediments throughout Shelton Harbor and presumed to be wood debris. This type of wood debris was characterized as less than 1 percent by area in the SPI images and did not affect benthic habitat quality.
- Sedimentary methane was observed in SPI images at 5 stations but did not appear to affect benthic habitat quality. Apparent RPD depths were well developed and feeding voids were visible, indicating the presence of head-down deposit feeding organisms.
- Sulfate-reducing bacteria (likely *Beggiatoa*) were observed at 8 stations along the southern shoreline of Shelton Harbor where wood debris was observed.
- Mean apparent RPD depths were well developed throughout most of Shelton Harbor, and ranged from 0.16 to 5.48 cm, with an average depth of 2.51 cm. The shallowest apparent RPD depths (average of 0.34 cm) were measured in areas within the Manke log storage site where the highest accumulation of wood debris was observed.

5.0 References

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NewFields Sediment Profile Image Analysis

Project: Shelton Harbor **Pixel Calib. Factor: 0.3619175**

Analyst (Initials)	Station	Replicate	Date	Time	Apparent RPD Thickness (cm)				Wood Debris		Methane				Bacterial Mats	Comments
					Area	Min	Max	Mean	Present	Percent	Present	Count	Mean Depth	Diameter		
JSN	SH-01	1	7/11/17	14:56	49.26	2.48	4.37	3.41	FALSE							Silty sands, feeding voids at depth
JSN	SH-02	1	7/10/17	10:40	41.75	0.35	5.81	2.89	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SH-02	2	7/10/17	10:42	31.66	0.00	3.55	2.19	TRUE	< 1.00	TRUE	8	10.42	0.32		Methane gas bubbles at depth, traces of very fine organic black particles mixed in the sediment column
JSN	SH-03	1	7/11/17	8:17	22.3	0.67	2.19	1.54	TRUE	< 1.00						Low pen, surface tubes, feeding void at depth, scattered small black particles on surface
JSN	SH-04	1	7/11/17	8:08	46.66	1.1	6.12	3.23	FALSE							Unconsolidated fine grained sediments
JSN	SH-05	1	7/11/17	8:42				indet	FALSE							Low pen, gravel bottom coated with organics/fines
JSN	SH-07	1	7/11/17	9:11	20.34	0.38	2.33	1.41	FALSE		TRUE	26	1.56	0.19		Low pen, compact sand bottom with organic filamentous mat coating, apparent methane gas bubbles at depth
JSN	SH-09	1	7/10/17	11:22	44.82	1.82	4.62	3.10	TRUE	< 1.00						Fine sands and silts, possible scattered small wood particles on surface? Large feeding void at depth
JSN	SH-10	1	7/11/17	14:40	51.36	1.29	6.59	3.55	TRUE	< 1.00						Traces of small organic black particles mixed in the surface (possible wood origins?)
JSN	SH-10	2	7/11/17	14:41	36.54	0.85	4.53	2.53	TRUE	< 1.00						Scattered wood particles on surface (brown and black), feeding voids at depth
JSN	SH-11	4	7/11/17	14:00	47.83	2.07	6.30	3.31	TRUE	< 1.00						Unconsolidated fine grained sediments, traces of fine black particles mixed in the surface sediment column
JSN	SH-12	1	7/11/17	10:54	34.27	1.43	5.04	2.37	TRUE	< 1.00						Fine grained sediments, reduced at depth (higher RPD contrast), traces of fine black particles mixed in the surface
JSN	SH-13	1	7/11/17	11:07				indet	FALSE							Gravel bottom - intertidal area
JSN	SH-13A	3	7/11/17	11:32	49.02	1.55	6.86	3.39	FALSE							Unconsolidated fine grained sediments, numerous feeding voids at depth
JSN	SH-14	1	7/10/17	15:35	48.61	1.19	6.66	3.36	TRUE	< 1.00						Unconsolidated fine grained sediments, feeding voids at depth
JSN	SH-14	2	7/10/17	15:36	59.14	1.10	7.80	4.09	TRUE	< 1.00	TRUE	5	12.57	0.56		Unconsolidated fine graine sediments, methane bubbles at depth in feeding voids, traces of small organic black particles mixed into sediment column
JSN	SH-18	2	7/11/17	10:38	74.8	3.72	6.24	5.17	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SH-19	2	7/11/17	13:48	48.45	1.33	7.53	3.35	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SH-20	1	7/11/17	13:16	28.11	0.38	5.24	1.94	FALSE							Fine grained sediments, small feeding void at depth center
JSN	SH-21	1	7/10/17	18:37	35.79	1.61	3.17	2.47	FALSE		TRUE	1	10.63	1.00		Fine grained sediments, feeding voids at depth, methane gas bubble in void
JSN	SH-22	2	7/10/17	17:39	28.44	0.56	3.2	1.97	TRUE	2.00						Consolidated bottom, scattered black wood particles on surface, polychaete visible at depth
JSN	SH-23	4	7/10/17	13:31	30.92	1.19	4.3	2.14	TRUE	< 1.00						Fine grained sediments, traces of very fine organic black particles mixed in the sediment column
JSN	SH-24	1	7/10/17	18:17	35.48	1.10	4.05	2.45	FALSE							Low pen, compact sediments, high RPD contrast, organic coating (algae?) on surface
JSN	SH-25	1	7/11/17	9:54	46.46	2.04	7.02	3.21	TRUE	< 1.00	TRUE	6	10.47	0.26		Fine grained sediments, methane bubbles, traces of very fine organic black particles mixed in the sediment column
JSN	SH-26	1	7/11/17	8:48				indet	FALSE							Compact silt/sand bottom, numerous surface tubes, twigs, crab far field
JSN	SH-27	1	7/10/17	11:03	28.07	0.72	2.61	1.94	FALSE							Compact sand bottom
JSN	SH-28	1	7/10/17	16:32	62.42	1.23	10.12	4.32	TRUE	< 1.00						Scattered fine organic black particles mixed in the sediment column, feeding voids at depth
JSN	SH-28	2	7/10/17	16:33	47.78	1.23	5.20	3.30	TRUE	< 1.00						Scattered fine organic black particles mixed in the sediment column, numerous feeding voids at depth
JSN	SH-30	1	7/11/17	15:04	44.32	2.07	4.2	3.06	TRUE	< 1.00						silty fine sands, traces of fine organic black particles near surface, feeding void
JSN	SPI-01	1	7/11/17	15:11	56.59	1.61	7.49	3.91	TRUE	< 1.00						silty fine sands, numerous feeding voids, scattered shell particles, traces of fine organic black particles
JSN	SPI-01	2	7/11/17	15:13	44.27	1.27	6.14	3.06	TRUE	< 1.00						silty fine sands, numerous feeding voids, scattered shell particles, traces of fine organic black particles
JSN	SPI-02	1	7/11/17	15:21	52.67	2.45	4.50	3.64	FALSE							Fine grained sediments, void at depth
JSN	SPI-03	1	7/11/17	14:49	43.29	1.23	6.85	2.99	FALSE							Fine grained sediments, voids at depth, burrow right surface
JSN	SPI-04	1	7/11/17	9:28	27	0.91	2.98	1.87	FALSE							Fine sands, lower pen, surface tubes
JSN	SPI-05	1	7/11/17	9:21	25.58	0.58	3.74	1.77	FALSE							Fine sands, lower pen
JSN	SPI-05	2	7/11/17	9:22	20.9	0.61	1.95	1.45	FALSE							Fine sands, lower pen

NewFields Sediment Profile Image Analysis

Project: Shelton Harbor **Pixel Calib. Factor: 0.3619175**

Analyst (Initials)	Station	Replicate	Date	Time	Apparent RPD Thickness (cm)				Wood Debris		Methane				Bacterial Mats	Comments
					Area	Min	Max	Mean	Present	Percent	Present	Count	Mean Depth	Diameter		
JSN	SPI-06	3	7/11/17	9:06	17.54	0.45	1.56	1.21	FALSE							Low pen, consolidated fine sands, organic filamentous algae coating
JSN	SPI-07	1	7/10/17	11:30	42.17	0.88	3.63	2.92	TRUE	< 1.00						silty fine sands, scattered black particles on surface (possible woody debris)
JSN	SPI-07	2	7/10/17	11:32	41.02	0.55	4.86	2.84	TRUE	< 1.00						silty fine sands, scattered black particles on surface (possible woody debris), voids at depth
JSN	SPI-08	5	7/11/17	13:52	42.72	2.14	4.30	2.95	FALSE							Unconslidated fine grained sediments
JSN	SPI-09	1	7/10/17	18:46	31.47	0.87	3.47	2.18	FALSE							Fine grained sediments, higher RPD contrast
JSN	SPI-09	2	7/10/17	18:47	33.17	1.13	4.04	2.29	FALSE							Fine grained sediments, higher RPD contrast
JSN	SPI-10	1	7/10/17	18:56	55.24	1.23	7.05	3.82	FALSE							Fine grained unconsolidated sediments, feeding voids at depth
JSN	SPI-11	1	7/10/17	19:09	29.82	1.38	2.69	2.06	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-12	1	7/10/17	12:01	37.67	0.41	4.23	2.60	TRUE	< 1.00						Traces of very fine organic black particles, voids at depth, scattered fine shell particles
JSN	SPI-12	3	7/10/17	18:00	36.53	1.71	2.91	2.53	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-13	1	7/10/17	11:37	53.43	1.88	6.12	3.69	FALSE							Fine grained sediments, voids at depth
JSN	SPI-14	1	7/10/17	16:23	79.28	3.50	11.36	5.48	TRUE	< 1.00						Scattered fine organic black particles, scattered fine shell particles
JSN	SPI-15	3	7/11/17	13:09	34.7	0.8	3.72	2.40	FALSE							Unconsolidated fine grained sediments
JSN	SPI-15	4	7/11/17	13:10	39.88	1.65	4.24	2.76	FALSE							Unconsolidated fine grained sediments
JSN	SPI-16	1	7/10/17	18:25	19	0.39	2.30	1.31	TRUE	< 1.00						Low pen, consolidated fine sands with shell particles, scattered organic black particles on surface
JSN	SPI-16	2	7/10/17	18:27	14.98	0.23	3.94	1.04	TRUE	< 1.00						consolidated fine sands with shell particles, scattered organic black particles on surface
JSN	SPI-17	1	7/10/17	13:37	56.41	0.61	10.38	3.90	FALSE							Unconsolidated fine grained sediments
JSN	SPI-18	1	7/11/17	11:00	74.15	2.85	7.35	5.13	FALSE							Unconsolidated fine grained sediments, feeding voids at depth, burrow left surface
JSN	SPI-19	1	7/11/17	13:39	37.46	1.04	4.70	2.59	FALSE							Fine grained sediments, voids at depth
JSN	SPI-20	1	7/11/17	13:20	51.38	2.07	8.09	3.55	FALSE							Fine grained sediments, voids at depth
JSN	SPI-21	1	7/10/17	13:04	11.89	0.00	2.74	0.82	TRUE	30.00						Larger wood pieces
JSN	SPI-21	2	7/10/17	13:05	6.65	0.00	1.66	0.46	TRUE	40.00						Larger wood pieces
JSN	SPI-22	1	7/10/17	16:57	4.3	0.00	1.06	0.30	TRUE	30.00						
JSN	SPI-22	2	7/10/17	16:58				indet	TRUE	40.00					TRUE	Bacterial mat coating on wood (white) likely beggiatoa. Some "fresher" wood exposed
JSN	SPI-23	3	7/10/17	13:13	21.81	0.07	3.34	1.51	TRUE	15.00						Sed-covered wood pieces protruding from sediment
JSN	SPI-23	4	7/10/17	13:14	10.28	0.00	2.68	0.71	TRUE	3.00						Small scattered black wood particles
JSN	SPI-24	3	7/10/17	13:21	31.93	0.68	3.20	2.21	TRUE	< 1.00						Trace fine small woody particles near surface
JSN	SPI-24	4	7/10/17	13:23	33.3	1.29	3.20	2.30	TRUE	< 1.00						Trace fine small woody particles near surface
JSN	SPI-25	1	7/10/17	15:25	34.74	1.56	3.63	2.40	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-25	2	7/10/17	15:27	31.52	0.42	3	2.18	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-26	2	7/10/17	15:19	50.78	2.27	4.55	3.51	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-27	1	7/10/17	15:10	48.18	1.62	4.92	3.33	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column, reddish-brown particles at depth possible wood debris
JSN	SPI-27	2	7/10/17	15:12	54.07	1.81	8.00	3.74	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-28	3	7/10/17	14:49	8.14	0.00	1.72	0.56	FALSE							Low penetration, compact sand bottom with shell debris
JSN	SPI-29	1	7/10/17	17:16				indet	TRUE	50.00					TRUE	Wood debris in black sediments at depth, white coating on wood likely beggiatoa bacteria
JSN	SPI-29	2	7/10/17	17:18	2.85	0.00	0.25	0.20	TRUE	30.00					TRUE	White coated wood particle likely beggiatoa bacteria
JSN	SPI-30	1	7/10/17	17:30	2.25	0.00	0.55	0.16	FALSE							Thin RPD, high contrast with reduced black fine-grained sediments, stressed habitat
JSN	SPI-30	2	7/10/17	17:31	3.73	0.00	0.51	0.26	FALSE							Thin RPD, high contrast, possible burrow center?

NewFields Sediment Profile Image Analysis

Project: Shelton Harbor **Pixel Calib. Factor:** **0.3619175**

Analyst (Initials)	Station	Replicate	Date	Time	Apparent RPD Thickness (cm)				Wood Debris		Methane				Bacterial Mats	Comments
					Area	Min	Max	Mean	Present	Percent	Present	Count	Mean Depth	Diameter		
JSN	SPI-31	1	7/11/17	10:05	5.42	0.00	0.85	0.37	TRUE	10.00						High RPD contrast, wood pieces on surface
JSN	SPI-31	2	7/11/17	10:05	28.39	0.00	3.50	1.96	TRUE	5.00						Deeper RPD, but strong contrast, scattered wood particles
JSN	SPI-32	1	7/11/17	9:59	40.88	1.07	5.65	2.83	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-33	2	7/11/17	8:02				indet	FALSE							Gravels on bottom, no penetration
JSN	SPI-34	3	7/11/17	8:23	62.65	1.43	7.34	4.33	FALSE							Fine-grained unconsolidated sediments
JSN	SPI-35	1	7/10/17	10:56				indet	FALSE							Low penetration, clams and/or shells on surface, consolidated bottom
JSN	SPI-35	2	7/10/17	10:57	23.34	1.00	2.19	1.61	FALSE							Low penetration, consolidated bottom
JSN	SPI-36	2	7/11/17	8:31	36.51	1.27	4.37	2.52	TRUE	< 1.00						Traces of very fine organic black particles mixed in the sediment column
JSN	SPI-37	1	7/11/17	14:25	11.38	0.00	1.56	0.79	TRUE	5.00						Low penetration, compact, sandy bottom, wood pieces on surface

Table A.2 - Plan View Image Summary

NewFields Sediment Profile Image Analysis
Project: Shelton Harbor

OID	image file	Station	Rep	Date	time	Image Area (sqft)	Class	Wood Waste Present	Wood Waste Type	Turbidity	Notes
132	SH01A.ARW	SH01	1/1/00	0:00	42928	7.80	-			high	suspended organics masking bottom
133	SH01B.ARW	SH01	1/2/00	0:00	42928	7.80	soft mud, silt			high	suspended organics, can make out ghost shrimp holes so likely very soft bottom
61	SH03A.ARW	SH03	1	7/11/2017	8:17	7.8	sands, rocks			moderate	suspended organics, a few large rocks are visible on the sand
62	SH03B.ARW	SH03	1/2/00	0:00	42927	7.80	sands			high	suspended organics
59	SH04A.ARW	SH04	1	7/11/2017	8:07	7.8	-			high	sediment plume masking the bottom, air bubble trapped on camera face
60	SH04B.ARW	SH04	2	7/11/2017	8:08	7.8	-			high	sediment plume masking the bottom, air bubble trapped on camera face
67	SH05A.ARW	SH05	1	7/11/2017	8:41	7.8	hard bottom			moderate	suspended organics, cobble covering the bottom
68	SH05B.ARW	SH05	2	7/11/2017	8:42	7.8	hard bottom			moderate	suspended organics, cobble covering the bottom
77	SH07A.ARW	SH07	1	7/11/2017	9:11	7.8	sands, silt				ghost shrimp hole
78	SH07B.ARW	SH07	2	7/11/2017	9:13	7.8	sands, silt				ghost shrimp holes, air bubble trapped on camera face
129	SH10A.ARW	SH10	1/1/00	0:00	42928	7.80	soft mud, silt				ghost shrimp holes
130	SH10B.ARW	SH10	2	7/11/2017	14:41	7.8	soft mud, silt				ghost shrimp holes
106	SH11A.ARW	SH11	1	7/11/2017	11:47	7.8	-			high	high turbidity masking bottom
107	SH11B.ARW	SH11	2	7/11/2017	11:48	7.8	-			high	high turbidity masking bottom
125	SH11C.ARW	SH11	3	7/11/2017	13:59	7.8	-			high	suspended organics masking the bottom, air bubble trapped in camera face
126	SH11D.ARW	SH11	4	7/11/2017	14:00	7.8	-			high	high turbidity masking bottom
94	SH12A.ARW	SH12	1	7/11/2017	10:53	7.8	soft mud, silt				some organic leafy material and green algae, sediment transition from dark grey to light reddish
95	SH12B.ARW	SH12	2	7/11/2017	10:54	7.8	-			high	sediment plume masking bottom
98	SH13A.ARW	SH13	1	7/11/2017	11:07	7.8	rocks				
99	SH13B.ARW	SH13	2	7/11/2017	11:08	7.8	rocks				
100	SH13A-A.ARW	SH13A	1	7/11/2017	11:10	7.8	soft mud, silt				ghost shrimp holes
101	SH13A-C.ARW	SH13A	3	7/11/2017	11:31	7.8	-			high	suspended organics masking the bottom
102	SH13A-D.ARW	SH13A	4	7/11/2017	11:32	7.8	-			high	sediment plume masking bottom
93	SH18B.ARW	SH18	2	7/11/2017	10:37	7.8	-			high	sediment plume masking bottom
121	SH19A.ARW	SH19	1	7/11/2017	13:46	7.8	-			high	suspended organics masking the bottom
122	SH19B.ARW	SH19	2	7/11/2017	13:47	7.8	-			high	suspended organics masking the bottom, image out of focus
112	SH20A.ARW	SH20	1	7/11/2017	13:14	7.8	soft mud, silt			high	high suspended organics in water column, ghost shrimp holes so likely very soft
113	SH20B.ARW	SH20	2	7/11/2017	13:15	7.8	soft mud, silt			high	suspended organics, ghost shrimp holes
114	SH20C.ARW	SH20	3	7/11/2017	13:15	7.8	soft mud, Silt			high	high suspended organics in water column, ghost shrimp holes so likely very soft
115	SH20D.ARW	SH20	4	7/11/2017	13:16	7.8	-				image too dark
47	SH21A.ARW	SH21	1	7/10/2017	18:36	7.8	sands, silt			moderate	suspended organics, ghost shrimp holes
48	SH21B.ARW	SH21	2	7/10/2017	18:37	7.8	-			high	sediment plume masking the bottom
37	SH22A.ARW	SH22	1	7/10/2017	17:37	7.8	sands?			high	high in suspended organics
38	SH22B.ARW	SH22	2	7/10/2017	17:38	7.8	-			high	high in suspended organics, unable to resolve the bottom
39	SH22C.ARW	SH22	3	7/10/2017	17:42	7.8	sands			high	high in suspended organics
7	SH23A.ARW	SH23	1	7/10/2017	12:16	13.8	soft mud, silt			high	high in suspended organics, ghost shrimp holes visible so likely very soft bottom
8	SH23B.ARW	SH23	2	7/10/2017	12:17	13.8	soft mud, silt			high	high in suspended organics, ghost shrimp holes visible so likely very soft bottom
42	SH24A.ARW	SH24	1	7/10/2017	18:17	7.8	-			high	high in suspended organics, unable to resolve the bottom

OID	image file	Station	Rep	Date	time	Image Area (sqft)	Class	Wood Waste Present	Wood Waste Type	Turbidity	Notes
43	SH24B.ARW	SH24	2	7/10/2017	18:18	7.8	-			high	sediment plume masking the bottom
83	SH25A.ARW	SH25	1	7/11/2017	9:53	7.8	soft mud, silt				ghost shrimp holes, crab (Cancer gracilis)
84	SH25B.ARW	SH25	2	7/11/2017	9:54	7.8	-				sediment plume masking bottom
69	SH26A.ARW	SH26	1	7/11/2017	8:48	7.8	sands, hard bottom			moderate	few broken shells, crab (Cancer gracilis), air bubble trapped on camera face
70	SH26B.ARW	SH26	2	7/11/2017	8:48	7.8	sands hard bottom			moderate	few broken shells, air bubble trapped on camera face
1	SH27A.ARW	SH27	1	7/10/2017	11:02	13.8	soft mud, silt			high	high in suspended organics, ghost shrimp holes visible so likely very soft bottom
2	SH27B.ARW	SH27	2	7/10/2017	11:03	13.8	-			high	high in suspended organics masking bottom
27	SH28A.ARW	SH28	1	7/10/2017	16:31	7.8	soft mud, Silt			high	high in suspended organics
28	SH28B.ARW	SH28	2	7/10/2017	16:33	7.8	soft mud, Silt			high	high in suspended organics
134	SH30A.ARW	SH30	1	7/11/2017	15:04	7.8	soft mud, silt			high	suspended organics, can make out ghost shrimp holes so likely very soft bottom
135	SH30B.ARW	SH30	2	7/11/2017	15:05	7.8	soft mud, silt			high	suspended organics, can make out ghost shrimp holes so likely very soft bottom
136	SPI01A.ARW	SPI01	1	7/11/2017	15:11	7.8	soft mud, silt				ghost shrimp holes, air bubble trapped on camera face
137	SPI01B.ARW	SPI01	2	7/11/2017	15:12	7.8	soft mud, silt			high	ghost shrimp holes
138	SPI02A.ARW	SPI02	1	7/11/2017	15:21	7.8	soft mud, wood waste	yes	board		ghost shrimp holes
139	SPI02B.ARW	SPI02	2	7/11/2017	15:22	7.8	-				image too dark
131	SPI03A.ARW	SPI03	1	7/11/2017	14:48	7.8	soft mud, silt			moderate	suspended organics, ghost shrimp holes
81	SPI04A.ARW	SPI04	1	7/11/2017	9:27	7.8	sands, silt				
82	SPI04B.ARW	SPI04	2	7/11/2017	9:28	7.8	-				sediment plume masking bottom
79	SPI05A.ARW	SPI05	1	7/11/2017	9:21	7.8	sands, silt				few suspended organics, ghost shrimp holes
80	SPI05B.ARW	SPI05	2	7/11/2017	9:22	7.8	-				sediment plume masking bottom
71	SPI06A.ARW	SPI06	1	7/11/2017	8:53	7.8	sands, hard bottom				few suspended organics, air bubble trapped on camera face
72	SPI06B.ARW	SPI06	2	7/11/2017	8:54	7.8	sands, hard bottom			moderate	suspended organics
74	SPI06C.ARW	SPI06	3	7/11/2017	9:06	7.8	sands, hard bottom			moderate	few suspended organics
75	SPI06D.ARW	SPI06	4	7/11/2017	9:06	7.8	-			high	sediment plume masking bottom
76	SPI06E.ARW	SPI06	5	7/11/2017	9:06	7.8	sands hard bottom				white object likely a bone of some type
3	SPI07A.ARW	SPI07	1	7/10/2017	11:30	13.8	Sands			high	high in suspended organics
4	SPI07B.ARW	SPI07	2	7/10/2017	11:31	13.8	Sands			high	high in suspended organics
91	SPI08A.ARW	SPI08	1	7/11/2017	10:29	7.8	-			high	sediment plume masking bottom
92	SPI08B.ARW	SPI08	2	7/11/2017	10:36	7.8	-			high	sediment plume masking bottom
103	SPI08C.ARW	SPI08	3	7/11/2017	11:39	7.8	-			high	sediment plume masking bottom
104	SPI08D.ARW	SPI08	4	7/11/2017	11:40	7.8	soft mud, silt			high	sediment plume masking bottom, likely very soft bottom given organics in sediment plume
105	SPI08E.ARW	SPI08	5	7/11/2017	11:43	7.8	-			high	suspended organics masking the bottom
123	SPI08F.ARW	SPI08	6	7/11/2017	13:51	7.8	-			high	suspended organics masking the bottom
124	SPI08G.ARW	SPI08	7	7/11/2017	13:53	7.8	-			high	suspended organics masking the bottom
49	SPI09A.ARW	SPI09	1	7/10/2017	18:45	7.8	silts, soft sed			high	suspended organics, ghost shrimp holes
50	SPI09B.ARW	SPI09	2	7/10/2017	18:46	7.8	-			high	sediment plume masking the bottom
51	SPI10A.ARW	SPI10	1	7/10/2017	18:56	7.8	silts, soft sed			high	suspended organics, ghost shrimp holes
52	SPI10B.ARW	SPI10	2	7/10/2017	18:58	7.8	-				image too dark
53	SPI11A.ARW	SPI11	1	7/10/2017	19:08	7.8	silts, soft sed			moderate	suspended organics, ghost shrimp holes
54	SPI11B.ARW	SPI11	2	7/10/2017	19:11	7.8	silts, soft sed			moderate	suspended organics, ghost shrimp holes, mud clast
5	SPI12A.ARW	SPI12	1	7/10/2017	12:00	13.8	soft mud, silt			high	high in suspended organics, ghost shrimp holes
6	SPI12B.ARW	SPI12	2	7/10/2017	12:02	13.8	-			high	high in suspended organics, air bubble trapped in camera face

OID	image file	Station	Rep	Date	time	Image Area (sqft)	Class	Wood Waste Present	Wood Waste Type	Turbidity	Notes
40	SPI12C.ARW	SPI12	3	7/10/2017	18:00	7.8	sands, silt			moderate	suspended organics, ghost shrimp holes
41	SPI12D.ARW	SPI12	4	7/10/2017	18:01	7.8	sands, silt			moderate	suspended organics, ghost shrimp holes
25	SPI14A.ARW	SPI14	1	7/10/2017	16:23	7.8	-			high	sediment plume masking the bottom
26	SPI14B.ARW	SPI14	2	7/10/2017	16:24	7.8	-			high	sediment plume masking the bottom
108	SPI15A.ARW	SPI15	1	7/11/2017	11:55	7.8	soft mud, silt			high	high turbidity, can just make out the bottom, ghost shrimp holes so likely very soft
109	SPI15B.ARW	SPI15	2	7/11/2017	11:56	7.8	soft mud, silt			high	sediment plume masking bottom, likely very soft bottom given organics in sediment plume
110	SPI15C.ARW	SPI15	3	7/11/2017	13:08	7.8	soft mud, silt			high	suspended organics, ghost shrimp holes so likely very soft
111	SPI15D.ARW	SPI15	4	7/11/2017	13:09	7.8	soft mud, silt			high	sediment plume, ghost shrimp holes so likely very soft
44	SPI16A.ARW	SPI16	1	7/10/2017	18:25	7.8	sands, shell debris			moderate	
45	SPI16B.ARW	SPI16	2	7/10/2017	18:27	7.8	sands, shell debris			high	sediment plume masking portion of the bottom
46	SPI16C.ARW	SPI16	3	7/10/2017	18:29	7.8	sands, shell debris				
19	SPI17A.ARW	SPI17	1	7/10/2017	13:37	7.8	-			high	high in suspended organics masking bottom
20	SPI17B.ARW	SPI17	2	7/10/2017	13:39	7.8	soft mud, Silt				image is out of focus, likely camera triggered late due to weight sinking in very soft sediment
96	SPI18A.ARW	SPI18	1	7/11/2017	10:59	7.8	soft mud, silt			moderate	some suspended organics, ghost shrimp holes
97	SPI18B.ARW	SPI18	2	7/11/2017	11:00	7.8	-			high	sediment plume masking bottom
118	SPI19A.ARW	SPI19	1	7/11/2017	13:39	7.8	soft mud, silt			high	high suspended organics in water column, ghost shrimp holes so likely very soft
119	SPI19B.ARW	SPI19	2	7/11/2017	13:40	7.8	-			high	sediment plume masking the bottom
120	SPI19C.ARW	SPI19	3	7/11/2017	13:44	7.8	-			high	sediment plume masking the bottom, image out of focus
116	SPI20A.ARW	SPI20	1	7/11/2017	13:20	7.8	soft mud, silt			high	suspended organics
117	SPI20B.ARW	SPI20	2	7/11/2017	13:21	7.8	-				image too dark
13	SPI21A.ARW	SPI21	1	7/10/2017	13:04	7.8	soft mud, wood waste	possible	sticks	high	high in suspended organics, can just make out possible wood waste debris
14	SPI21B.ARW	SPI21	2	7/10/2017	13:05	7.8	-			high	high in suspended organics
29	SPI22A.ARW	SPI22	1	7/10/2017	16:57	7.8	wood waste	yes	wood chunks, bark, sticks		Beggiatoa present on wood waste
30	SPI22B.ARW	SPI22	2	7/10/2017	16:58	7.8	wood waste	yes	wood chunks, bark, sticks		Beggiatoa present on wood waste
9	SPI23C.ARW	SPI23	3	7/10/2017	12:18	13.8	-			high	image too dark, unable to resolve the bottom
12	SPI23A.ARW	SPI23	1	7/10/2017	12:28	13.8	wood waste	yes	sticks, bark	high	high in suspended organics
15	SPI23D.ARW	SPI23	4	7/10/2017	13:13	7.8	wood waste	yes	sticks, bark	moderate	crab (Cancer gracilis)
16	SPI23E.ARW	SPI23	5	7/10/2017	13:14	7.8	-			high	sediment plume of turbidity masking the bottom
17	SPI23F.ARW	SPI23	6	7/10/2017	13:14	7.8	wood waste	yes	wood chunks, bark	moderate	crab (Cancer gracilis) , turbidity plum masking portion of the image
10	SPI24A.ARW	SPI24	1	7/10/2017	12:22	13.8	soft mud, silt			high	high in suspended organics, ghost shrimp holes visible so likely very soft bottom
11	SPI24B.ARW	SPI24	2	7/10/2017	12:23	13.8	-			high	high in suspended organics masking bottom
18	SPI24C.ARW	SPI24	3	7/10/2017	13:22	7.8	-			high	high in suspended organics masking bottom
24	SPI25A.ARW	SPI25	1	7/10/2017	15:25	7.8	-			high	sediment plume masking the bottom
21	SPI28A.ARW	SPI28	1	7/10/2017	14:32	7.8	hard Sands, shell debris			moderate	broken shells litter the bottom
22	SPI28B.ARW	SPI28	2	7/10/2017	14:34	7.8	hard Sands, shell debris			moderate	broken shells litter the bottom
23	SPI28C.ARW	SPI28	3	7/10/2017	14:52	7.8	hard Sands, shell debris			moderate	broken shells litter the bottom
31	SPI29A.ARW	SPI29	1	7/10/2017	17:15	7.8	wood waste	yes	wood chunks, bark		Beggiatoa present on wood waste
32	SPI29A1.ARW	SPI29	2	7/10/2017	17:15	7.8	wood waste	yes	wood chunks, bark		
33	SPI29A2.ARW	SPI29	3	7/10/2017	17:15	7.8	wood waste	yes	wood chunks, bark		
34	SPI29E.ARW	SPI29	5	7/10/2017	17:17	7.8	wood waste	yes	wood chunks	high	high in suspended organics
35	SPI30A.ARW	SPI30	1	7/10/2017	17:30	7.8	wood waste	possible	wood chunks	high	high in suspended organics
36	SPI30B.ARW	SPI30	2	7/10/2017	17:31	7.8	wood waste	possible	wood chunks	high	high in suspended organics

Table A.2 - Plan View Image Summary

OID	image file	Station	Rep	Date	time	Image Area (sqft)	Class	Wood Waste Present	Wood Waste Type	Turbidity	Notes
87	SPI31A.ARW	SPI31	1	7/11/2017	10:04	7.8	soft mud, wood waste	yes	fibrous, wood chunks	moderate	high concentration of organics on bottom, few chunks of wood
88	SPI31B.ARW	SPI31	2	7/11/2017	10:05	7.8	-			high	sediment plume masking bottom
89	SPI31C.ARW	SPI31	3	7/11/2017	10:05	7.8	-			high	sediment plume masking bottom, extra image
90	SPI31D.ARW	SPI31	4	7/11/2017	10:06	7.8	-			high	sediment plume masking bottom, extra image
85	SPI32A.ARW	SPI32	1	7/11/2017	9:59	7.8	soft mud, wood waste	yes	fibrous	moderate	high concentration of organics on bottom, Beggiatoa present on wood waste
86	SPI32B.ARW	SPI32	2	7/11/2017	10:00	7.8	-				sediment plume masking bottom
57	SPI33A.ARW	SPI33	1	7/11/2017	8:00	7.8	rocky				large cobles and rocks
58	SPI33B.ARW	SPI33	2	7/11/2017	8:01	7.8	rocky				large cobles and rocks
55	SPI34A.ARW	SPI34	1	7/11/2017	7:46	7.8	silts, soft sed			moderate	suspended organics, ghost shrimp holes
56	SPI34B.ARW	SPI34	2	7/11/2017	7:47	7.8	-				image too dark
63	SPI34C.ARW	SPI34	3	7/11/2017	8:23	7.8	soft mud, Silt			high	suspended organics and sediment plume, image out of focus, camera may have sunk in soft sediment
64	SPI34D.ARW	SPI34	4	7/11/2017	8:24	7.8	soft mud, Silt			high	suspended organics and sediment plume, image out of focus, camera may have sunk in soft sediment
65	SPI36A.ARW	SPI36	1	7/11/2017	8:30	7.8	hard bottom			high	suspended organics and sediment plume, possible rocks in image, likely hard bottom
66	SPI36B.ARW	SPI36	2	7/11/2017	8:31	7.8	-			high	sediment plume masking the bottom
127	SPI37A.ARW	SPI37	1	7/11/2017	14:24	7.8	sand, wood waste	yes	wood chunks, bark		wood debris and other organics cover bottom, some broken shells
128	SPI37B.ARW	SPI37	2	7/11/2017	14:26	7.8	sand, wood waste	possible			some organics cover bottom, possible wood waste, some broken shells

Appendix D

Simpson 2017 RI Bioassay Report

ECOANALYSTS, INC.

TOXICOLOGY TESTING RESULTS

SHELTON HARBOR SEDIMENT CLEANUP SITE
SHELTON, WASHINGTON

Prepared for
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Seattle, WA 98101

On behalf of:
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All testing reported herein was performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and EcoAnalysts is not responsible for use of less than the complete report. The test results summarized in this report apply only to the sample(s) evaluated.

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ACRONYMS AND ABBREVIATIONS

AFDW:	Ash-free dry weight
ARI:	Analytical Resources, Inc., Tukwila, WA
cm:	Centimeter
CSL:	Cleanup Screening Level
°C:	Degrees Celsius
EC_{50}:	Effective Concentration that results in a 50% reduction in a sub-lethal endpoint
g:	Grams
LC_{50}:	Lethal Concentration that results in a 50% reduction in survival
L:	Liter
µm:	Micrometer
mg:	Milligram
mg/L:	Milligrams per liter
mL:	Milliliter
mm:	Millimeter
NELAP:	National Environmental Laboratory Accreditation Program
NOEC:	No Observed Effect Concentration
OR:	Oregon
ppt:	parts per thousand
PSEP:	Puget Sound Estuary Protocols (PSEP 1995)
SCO:	Sediment Cleanup Objective
SMS:	Sediment Management Standards
SOP:	Standard operation procedure
SSAPA:	Sediment Sampling and Analysis Plan Appendix (SSAPA; WDOE 2008)
SMARM:	Sediment Management Annual Review Meeting
UIA:	Un-ionized ammonia
USACE:	United States Army Corps of Engineers
USEPA:	United States Environmental Protection Agency
WA:	Washington State
WAC:	Washington Administrative Code
WDOE:	Washington (State) Department of Ecology

1. INTRODUCTION

EcoAnalysts conducted biological toxicity testing with sediment samples collected by Anchor QEA, LLC. as part of a Remedial Investigation/Feasibility Study (RI/FS) being performed at the Shelton Harbor Cleanup Site in Shelton, Washington. Sediments were evaluated for biological effects following guidance provided by the Washington State Department of Ecology (WDOE) Sediment Management Standards (SMS) under the Washington Administrative Code (WAC) 173-204-315. This report presents the results of the toxicity testing portion of the Shelton Harbor sediment investigation.

2. METHODS

This section summarizes the test methods followed for this biological characterization. Test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995), the Sediment Cleanup User's Manual II (SCUM II; WDOE 2015), and the various updates presented during the Sediment Management Annual Review Meeting (SMARM). Sediment toxicity was evaluated using three standard PSEP bioassays; the 10-day amphipod test, the 20-day juvenile polychaete survival and growth test, and the 48-hour benthic larval development test.

2.1 Sample Collection and Organism Receipt

Eleven test sediments were collected on July 12 – 13, 2017 and were received at EcoAnalysts on July 15, 2017. Reference sediments from Carr Inlet, WA were collected by EcoAnalysts on July 22, 2017 and received on the same day. Sediment samples were stored in a walk-in cold room at 4 ± 2°C in the dark. The test sediment was not sieved prior to testing. All tests were conducted within the eight-week holding time.

Amphipods (*Eohaustorius estuarius*) were supplied by Northwestern Aquatic Sciences in Newport, Oregon. Animals were held in native sediment at 15°C prior to test initiation. Juvenile polychaete worms (*Neanthes arenaceodentata*) were obtained from Aquatic Toxicology Support in Bremerton, Washington. Juvenile polychaetes were held in seawater at 20°C (Neanthes were cultured in water-only and were not held in sediment prior to testing). *Mytilus galloprovincialis* (mussel) broodstock were provided by Taylor Shellfish in Shelton, WA. Broodstock were held in unfiltered seawater at 14 – 16°C prior to spawning.

Native *Eohaustorius* sediment from Yaquina Bay, Oregon was also provided by Northwest Aquatic Sciences for use as control sediment treatments for the amphipod and juvenile polychaete tests.

2.2 Sample Testing Plan

Based on historical data of the Shelton Harbor Cleanup Unit, Ecology approved a modified testing approach. Larval and polychaete bioassays were conducted at sample locations where historical SMS exceedances had occurred. Areas with higher wood debris content than historical sampling locations received full suite bioassay testing (larval, polychaete, and amphipod). Sample locations and their corresponding bioassays are outlined in Table 2-1.

Table 2-1. Bioassay Sample Assignments

Sample ID	Benthic Larval Development Test	Juvenile Polychaete Survival and Growth Test	Amphipod Survival Test
SH-04	X		
SH-13A		X	
SH-14	X		
SH-19	X	X	
SH-21	X		
SH-22	X	X	
SH-24	X		
SH-28		X	
SPI-22	X	X	X
SPI-30	X	X	X
SPI-31	X	X	X

X = Indicates test to be conducted with associated samples

2.3 Sample Grain Size and Reference Comparison

Sediment grain size is one of the characteristics used in selecting the appropriate reference sediment(s) to compare the chemical and biological responses of project sediments. The percent fines value is defined as the amount of sediment that passes through a 62.5-µm sieve, expressed as a percentage of the total sample analyzed. This is also the sum of the silt and clay fraction of sediment. Wet-sieve grain size results for the reference sample was conducted in the field (at the time of collection) and after receipt at the EcoAnalysts laboratory. The percent-fines determination of the project sediments are summarized in Table 2-2.

Table 2-2. Sample and Reference Grain Size Comparison.

Treatment	Percent Fines[1]	Treatment Compared To:
SH-Ref-1 (Reference)	10%	
CARR/SH-Ref-1 (Reference)	28%	
CARR (Reference)	52%	
CR-022 (Reference)	72%	
SH-04	48%	CARR
SH-13A	46%	CARR
SH-14	32%	CARR/SH-Ref-1
SH-19	48%	CARR
SH-21	62%	CARR or CR-022
SH-22	36%	CARR/SH-Ref-1
SH-24	38%	CARR/SH-Ref-1
SH-28	28%	CARR/SH-Ref-1
SPI-22	10%	SH-Ref-1
SPI-30	34%	CARR/SH-Ref-1
SPI-31	56%	CARR

[1] Wet sieve results

2.4 10-day Amphipod Bioassay

The 10-day acute toxicity test with *E. estuarius* was initiated on July 28, 2017. To prepare the test exposures, approximately 175 mL of sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 28 ppt. The control and reference sediment were tested concurrently with the test treatment. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure porewater and overlying ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as porewater and overlying ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR/2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a 15°C water bath and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

Immediately prior to test initiation, water quality parameters were measured in the surrogate chamber for each treatment. Dissolved oxygen (DO), temperature, pH, and salinity were then monitored in the surrogate chambers daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥5.1 mg/L
Temperature:	15 ± 1°C
Salinity:	28 ± 1 ppt
pH:	7 - 9 units

The tests were initiated by randomly allocating 20 *E. estuarius* into each test chamber, ensuring that each of the amphipods successfully buried into the sediment. Amphipods that did not bury within approximately one hour were replaced with healthy amphipods. The 10-day amphipod bioassay was conducted as a static test with no feeding during the exposure period. At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered amphipods transferred into a Petri dish. The number of surviving and dead amphipods was then determined under a dissecting microscope.

To evaluate the relative sensitivity of the organisms, reference toxicity tests were performed using standard reference toxicants (Lee 1980). A water-only, 4-day reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to any ammonia concentrations that might be present in the sediments.

2.5 20-day Juvenile Polychaete Bioassay

The 20-day chronic toxicity test with *N. arenaceodentata* was initiated on July 28, 2017. Test exposures were prepared with approximately 175 mL of sediment placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 28 ppt. The control and reference sediment were tested concurrently with the test treatment. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure overlying and interstitial ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as overlying and interstitial ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR/2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a water bath at 20°C and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

Immediately prior to test initiation, water quality parameters were measured. Dissolved oxygen, temperature, pH, and salinity were then monitored in the surrogates daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥4.6 mg/L
Temperature:	20 ± 1°C
Salinity:	28 ± 2 ppt
pH:	7 - 9 units

The juvenile polychaete test was initiated by randomly allocating five *N. arenaceodentata* into each test chamber, and observing whether each of the worms successfully buried into the sediment. Worms that did not bury within approximately one hour were replaced with healthy worms. The 20-day test was conducted as a static-renewal test, with exchanges of 300 mL of water occurring every third day. *N. arenaceodentata* were fed every other day with 40 mg of TetraMarin® (approximately 8 mg dry weight per worm).

At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered worms transferred into a Petri dish. The number of surviving and dead worms was determined. All surviving worms were then transferred to pre-weighed, aluminum foil weigh-boats, and dried in a drying oven at 60°C for approximately 24 hours. Each weigh-boat was removed, cooled in a desiccator, and then weighed on a microbalance to 0.01 mg. Each of the weigh boats was then heated to 550°C for 2 hours to determine the ashed weight. Ash-free dry weights (AFDW) were calculated to correct for the influence of sediment grain size differences between treatments. The ashed boats were weighed to 0.01 mg and the ashed weight was subtracted from the dry weight to calculate the AFDW. Both dry weight and AFDW were used to determine individual worm weight and growth rates.

To evaluate the relative sensitivity of the organisms, reference toxicity tests were performed using standard reference toxicants (Lee 1980). A water-only, 4-day reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to any ammonia concentrations that might be present in the sediments.

2.6 Larval Developmental Bioassay

Test sediment was evaluated using the larval benthic toxicity test with the mussel, *M. galloprovincialis*. The mussel larval test was initiated on August 1, 2017. The control and reference sediment were tested with the test treatments. To prepare the test exposures, 18 g (±1 g) of test sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled to 900 mL with 0.45-µm filtered seawater. Six replicate chambers were prepared for the test treatment, reference sediment, and the native sediment control treatment. Five of the replicates were used to evaluate the test; the sixth replicate was used as a water quality surrogate. Each chamber was shaken for 10 seconds and then placed in predetermined randomly-assigned positions in a water bath at 16°C.

To collect gametes for each test, mussels were placed in clean seawater and acclimated at 16°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 20°C. Mussels were held at 20°C and monitored for spawning individuals. Spawning females and males were removed from the water bath and placed in individual containers with seawater. These individuals were allowed to spawn until sufficient gametes were available to initiate the test. After the spawning period, eggs are transferred to fresh seawater and filtered through a 0.5 mm Nitex® mesh screen to remove large debris, feces, and excess gonadal matter. A composite was made of the sperm and diluted with fresh seawater. The fertilization process was initiated by adding sperm to the isolated egg containers. Egg-sperm solutions were periodically homogenized with a perforated plunger during the fertilization process and sub-samples observed under the microscope for egg and sperm viability. Approximately one to one and a half hours after fertilization, embryo solutions were checked for fertilization rate. Only those embryo stocks with >90% fertilization were used to initiate the tests. Embryo solutions were rinsed free of excess sperm and then combined to create one embryo stock solution. Density of the embryo stock solution was determined by counting the number of embryos in a subsample of homogenized stock solution. This was used to determine the volume of embryo stock solution to deliver approximately 20,000 to 40,000 embryos to each test chamber.

Dissolved oxygen, temperature, pH, and salinity were monitored in water quality surrogates to prevent loss or transfer of larvae by adhesion to water-quality probes. Ammonia and sulfides in the overlying water were measured on Day 0 and Day 2 (test termination). Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{-2} were monitored using a HACH DR/2800V Spectrophotometer. Target test parameters were as follows:

Dissolved Oxygen:	≥5.0 mg/L
Temperature:	16 ± 1°C
Salinity:	28 ± 1ppt
pH:	7 - 9 units

The development test was conducted as a static test without aeration. The protocol calls for test termination when 95% of the embryos in the control have reached the prodissoconch I stage (approximately 48-60 hours). At termination, the overlying seawater was decanted into a clean 1-L jar and mixed with a perforated plunger. From this container, a 10 mL subsample was transferred to a scintillation vial and preserved in 5% buffered formalin. Larvae were subsequently stained with a dilute solution of Rose Bengal in 70% alcohol to help visualization of larvae. The number of normal and abnormal larvae was enumerated on an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

To evaluate the relative sensitivity of the organisms, reference toxicity tests were performed using standard reference toxicants (Lee 1980). A water-only reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to ammonia concentrations that would possibly be present in the sediments.

2.7 Data Analysis and QA/QC

All water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment.

All hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of all calculations and data sorting were reviewed for errors. Review counts were conducted on any apparent outliers.

For the larval test, the normalized combined mortality and abnormality endpoint was used to evaluate the test sediment. This was based on the number of normal larvae in each treatment and reference sample divided by the mean number of normal larvae in the control replicates, as defined in the SCUM II guidance document (Ecology 2015).

Experiment-wide survival, growth, and development data were analyzed using one-way analysis of variance (ANOVA). When ANOVA showed a significant difference, multiple comparison t-tests then compared survival in each of the control and test sediments against survival in the reference sediments. Prior to analyses, normality and homogeneity of variance was assessed. When necessary to satisfy these assumptions, proportional survival data were arcsine square-root transformed. Solid-phase analyses were performed with GraphPad Prism, Version 7.03. Statistical analyses of all dose-response tests were performed using CETIS Comprehensive Toxicity Data Analysis and Database Software version 1.9.2.6. Comparisons between the lab control and each test concentration were performed following recommended USEPA decision matrices (USEPA 2002).

3. RESULTS

The results of the sediment testing, including a summary of test results and water quality observations are presented in this section. Data for each of the replicates, as well as laboratory bench sheets are provided Appendix A and statistical analyses are provided in Appendix B.

3.1 10-day Amphipod Bioassay

The bioassay test with *E. estuarius* was validated with 1% mortality in the native sediment control, which met the performance criterion of ≤10% mortality for SMS evaluations. This result indicates that the test conditions were suitable for adequate amphipod survival. Mean mortality in the reference treatments CARR, SH-Ref-1 and CARR/SH-Ref-1 was between 1 – 5% which met the performance criteria (≤25% mortality) and indicated that the reference sediment was acceptable for suitability determination. Mean mortality in the three project samples was between 8 – 9%. All endpoint results are summarized in Table 3-1. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-2, Table 3-3, and Table 3-4.

Temperature was recorded above the targeted range of 15 ± 1°C (Max value of 16.8°C) on Day 9 among all treatments. The temperature control system was adjusted upon discovery and temperatures were returned to the targeted range for the duration of the test. The pH of replicate 5 of sample SPI-31 was 6.7 units on Day 10. This was slightly outside the expected range of 7 – 9 pH units. No corrective action is warranted for instances of pH variance. Survival within this replicate was 100%, indicating that the pH did not impair organism survival. All other water quality parameters were within the acceptable limits throughout the duration of the test. Given the high level of survival among all treatments (≥91%), these deviations did not affect the significance of the test results.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was within ±2 standard deviations from the laboratory historical mean. This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at EcoAnalysts.

Ammonia concentrations observed in the *E. estuarius* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-3; compare to NOEC of 151 mg/L). Values were also below the published threshold concentration of 15 mg/L total ammonia (Barton 2002). Therefore, ammonia concentrations within the sediment samples should not have been a contributor to any adverse biological effects observed in the test treatments. Initial sulfide concentrations in interstitial water ranged from 0.090 – 25.9 mg/L. Project samples SPI-22 and SPI -30 expressed elevated porewater sulfide values of 15.0 and 25.9 mg/L total sulfides, respectively. While these values exceeded the potential trigger values for purging (1.9 mg/L total sulfides / 0.122 mg/L hydrogen sulfide) (Inouye 2015), this evaluation did not require sample purging prior to testing (Soccorsy 2017). Given the high survival observed in all test treatments, these values did not appear to affect the test results.

Table 3-1. Test Results for *Eohaustorius estuarius*.

Treatment	Replicate	Number Initiated	Number Surviving	Number Missing or Dead	Percentage Survival	Mean Percentage Survival	SD
Control	1	20	20	0	100	99.0	2.2
	2	20	19	1	95		
	3	20	20	0	100		
	4	20	20	0	100		
	5	20	20	0	100		
SH-Ref-1	1	20	18	2	90	95.0	5.0
	2	20	19	1	95		
	3	20	18	2	90		
	4	20	20	0	100		
	5	20	20	0	100		
CARR	1	20	20	0	100	96.0	4.2
	2	20	19	1	95		
	3	20	18	2	90		
	4	20	20	0	100		
	5	20	19	1	95		
CARR / SH-Ref-1	1	20	20	0	100	99.0	2.2
	2	20	20	0	100		
	3	20	20	0	100		
	4	20	20	0	100		
	5	20	19	1	95		
SPI-22	1	20	20	0	100	91.0	5.5
	2	20	17	3	85		
	3	20	18	2	90		
	4	20	18	2	90		
	5	20	18	2	90		
SPI-30	1	20	20	0	100	91.0	10.8
	2	20	17	3	85		
	3	20	20	0	100		
	4	20	15	5	75		
	5	20	19	1	95		
SPI-31	1	20	18	2	90	92.0	5.7
	2	20	17	3	85		
	3	20	19	1	95		
	4	20	18	2	90		
	5	20	20	0	100		

Table 3-2. Water Quality Summary for *Eohaustorius estuarius*.

Treatment	Dissolved Oxygen (mg/L) ≥5.1 mg/L			Temperature (°C) 15 ± 1°C			Salinity (ppt) 28 ± 1 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	8.3	7.7	8.5	15.0	14.1	**16.6**	29	28	29	8.1	8.0	8.2
SH-Ref-1	8.3	8.1	8.5	15.0	14.2	**16.6**	29	29	29	8.2	8.0	8.5
CARR	8.3	8.1	8.4	15.1	14.2	**16.7**	29	28	29	8.1	8.0	8.3
CARR / SH-Ref-1	8.3	7.9	8.5	15.1	14.3	**16.7**	29	29	29	8.1	8.0	8.3
SPI-22	8.2	7.9	8.4	15.1	14.4	**16.8**	29	28	29	8.2	7.8	8.6
SPI-30	8.2	7.9	8.4	15.1	14.2	**16.7**	28	28	29	8.3	7.8	8.6
SPI-31	8.3	8.0	8.5	15.2	14.4	**16.8**	28	27	29	8.2	**6.7**	8.6

Bold = Values that fell outside of the targeted water quality criteria

Table 3-3. Ammonia and Sulfide Summary for *Eohaustorius estuarius*.

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 151 mg/L		Interstitial Ammonia (mg/L Total) [1]NOEC = 151 mg/L		Overlying Sulfides (mg/L Total) [2]Trigger Value = 1.9 mg/L		Interstitial Sulfides (mg/L Total) [2]Trigger Value = 1.9 mg/L	
	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10
Control	0.00	0.00	NM	NM	0.011	0.020	NM	NM
SH-Ref-1	0.365	0.588	NM	2.61	0.082	0.005	NM	NM
CARR	0.226	0.00	3.80	1.46	0.037	0.02	0.090	0.069
CARR / SH-Ref-1	0.432	0.163	5.10	1.43	0.061	0.011	0.11	0.122
SPI-22	0.522	0.674	6.00	2.81	0.031	0.035	**15.0**	0.298
SPI-30	0.805	2.42	8.50	2.90	0.009	0.012	**25.9**	0.198
SPI-31	0.603	0.252	5.30	2.20	0.021	0.043	0.1	0.196

[1]NOEC (concurrent reference-toxicant test derived) = 151 mg/L total ammonia
[2]Inouye 2015: Total sulfide value 1.9 mg/L derived from hydrogen sulfide dissociation (0.122 mg/L H_2S @ 15°C, 28 ppt, and 8.1 pH)
NM = not measured; insufficient porewater recovered for analysis
Bold = Values that fell outside of the targeted water quality criteria

Table 3-4.Test Condition Summary for *Eohaustorius estuarius*.

Test Conditions: PSEP *E. estuarius*		
Date sampled	July 12 – 13, 2017	
Date received	July 15, 2017	
Test dates	July 28 – August 7, 2017	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	15 – 16 Days	
Source of control sediment	Yaquina Bay, OR	
Test Species	*E. estuarius*	
Supplier	Northwestern Aquatic Sciences, Newport, OR	
Date acquired	July 27, 2017	
Age class	Mature adult, 3-5 mm	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2015) SOP No. SED002.09	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	10-Day static	
Control water	North Hood Canal seawater, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 5.1 mg/L	Observed: 7.7 – 8.5 mg/L
Test temperature	Recommended: 15 ± 1 °C	Observed: 14.1 – 16.8°C
Test Salinity	Recommended: 28 ± 1 ppt	Observed: 27 – 29 ppt
Test pH	Recommended: 7 - 9	Observed: 6.7 – 8.6
Control Performance Standard SMS	Recommended: Control ≤ 10% mortality	Observed: 1% mortality; Pass
Reference Performance Standard SMS	Recommended: Reference ≤ 25% mortality	Observed mortality: 1 – 5%; Pass
Reference Toxicant LC50 (total ammonia)	LC_{50} = 196.9 mg/L	
Mean; Acceptable Range (total ammonia)	151.1; 55.5 – 246.7 mg/L	
NOEC (total ammonia)	151 mg/L	
NOEC (unionized ammonia)	1.74 mg /L	
Test Lighting	50 – 100 foot candles (ambient and constant)	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	20	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	Temperature, pH	

3.2 20-day Juvenile Polychaete Bioassay

No mortality was observed in the *N. arenaceodentata* control sediment and mean individual growth (MIG) in the control was 0.397 mg/ind/day (dry weight) and 0.261 mg/ind/day (AFDW). These values fall within the test acceptability criteria of <10% mean mortality and ≥0.38 mg/ind/day dry weight (Kendall 1996), indicating that the test conditions were suitable for adequate polychaete survival and growth. A summary of the test results for all samples is shown in Table 3-5. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-6, Table 3-7, Table 3-8, and Table 3-9.

Mean mortality in the reference treatments ranged from 0 – 4%, meeting the reference performance standard of ≤10% (WDOE 2015; USACE 2015). Mean individual growth for the reference treatments ranged from 0.362 to 0.417 mg/ind/day (dry weight) and 0.274 to 0.305 mg/ind/day (AFDW). When compared to the control, MIG expressed as AFDW ranged from 1.049 to 1.169, which met the reference performance standard of ≥0.80 (WDOE 2015).

Mortality in the project sediments ranged from 0% to 16%. Mean individual growth (as dry weight) in the test treatments ranged from 0.250 to 0.428 mg/ind/day. Mean individual growth in the AFDW assessment, which removes variability caused by gut contents, ranged from 0.198 to 0.341 mg/ind/day as AFDW.

All water quality parameters were within the acceptable limits throughout the duration of the test. Initial mean individual biomass (pretest) of the test organisms was below the recommended criterion of 0.25 – 0.50 mg/individual at 0.111 mg/ind; however, the test organisms were within the recommended age for testing (2 -3 weeks old). The control growth criterion was met (0.397; ≥0.38 mg/ind/day), indicating a valid test.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at EcoAnalysts.

Ammonia concentrations observed in the *N. arenaceodentata* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-7; compare to NOEC of 99.9 mg/L). Initial sulfide concentrations in the interstitial water were below the NOEC of 3.4 mg/L total sulfides (Kendall and Barton 2004) for all samples except SPI-30 and SPI-31, which had measured sulfide levels of 3.5 and 7.8 mg/L, respectively. While these values exceeded established trigger values, this evaluation did not warrant sample purging prior to testing (Soccorsy 2017).

Table 3-5. Test Results for *Neanthes arenaceodentata*.

Treatment	Rep	Number Initiated	Survivors	Mean Mortality (%)	Individual Growth (mg/ind/day)					
					Dry Weight	Mean	Std Dev	AFDW	Mean	Std Dev
Control	1	5	5	0	0.669	0.397	0.154	0.411	0.261	0.089
	2	5	5		0.312			0.199		
	3	5	5		0.373			0.272		
	4	5	5		0.317			0.201		
	5	5	5		0.317			0.224		
SH-Ref-1	1	5	5	0	0.322	0.362	0.059	0.234	0.274	0.054
	2	5	5		0.320			0.230		
	3	5	5		0.333			0.261		
	4	5	5		0.460			0.364		
	5	5	5		0.376			0.277		
CARR	1	5	5	0	0.432	0.417	0.030	0.301	0.305	0.029
	2	5	5		0.419			0.330		
	3	5	5		0.407			0.307		
	4	5	5		0.454			0.330		
	5	5	5		0.372			0.260		
CARR / SH-Ref-1	1	5	5	4.0	0.353	0.410	0.033	0.258	0.301	0.031
	2	5	4		0.427			0.326		
	3	5	5		0.416			0.313		
	4	5	5		0.416			0.281		
	5	5	5		0.438			0.330		
SH-13A	1	5	5	0	0.160	0.250	0.052	0.132	0.198	0.037
	2	5	5		0.278			0.220		
	3	5	5		0.276			0.209		
	4	5	5		0.283			0.221		
	5	5	5		0.254			0.207		
SH-19	1	5	5	0	0.295	0.262	0.050	0.249	0.216	0.041
	2	5	5		0.206			0.174		
	3	5	5		0.282			0.218		
	4	5	5		0.316			0.265		
	5	5	5		0.212			0.176		
SH-22	1	5	5	0	0.397	0.326	0.060	0.301	0.253	0.038
	2	5	5		0.378			0.275		
	3	5	5		0.313			0.253		
	4	5	5		0.257			0.201		
	5	5	5		0.285			0.238		
SH-28	1	5	5	0	0.282	0.307	0.129	0.213	0.219	0.089
	2	5	5		0.438			0.293		
	3	5	5		0.127			0.086		
	4	5	5		0.264			0.197		
	5	5	5		0.426			0.307		
SPI-22	1	5	5	0	0.416	0.415	0.076	0.334	0.329	0.061
	2	5	5		0.537			0.427		
	3	5	5		0.405			0.311		
	4	5	5		0.385			0.313		
	5	5	5		0.330			0.260		

Treatment	Rep	Number Initiated	Survivors	Mean Mortality (%)	Individual Growth (mg/ind/day)					
					Dry Weight	Mean	Std Dev	AFDW	Mean	Std Dev
SPI-30	1	5	5	4.0	0.395	0.428	0.062	0.307	0.341	0.055
	2	5	5		0.527			0.433		
	3	5	4		0.443			0.348		
	4	5	5		0.409			0.325		
	5	5	5		0.367			0.292		
SPI-31	1	5	5	16.0	0.402	0.324	0.096	0.295	0.245	0.061
	2	5	5		0.226			0.174		
	3	5	5		0.317			0.244		
	4	5	3		0.438			0.315		
	5	5	3		0.235			0.196		

Table 3-6. Water Quality Summary for *Neanthes arenaceodentata*.

Treatment	Dissolved Oxygen (mg/L) ≥4.6 mg/L			Temperature (°C) 20 ± 1°C			Salinity (ppt) 28 ± 2 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.5	7.3	7.8	19.3	18.9	19.8	29	29	29	8.1	7.2	8.2
SH-Ref-1	7.5	7.3	7.7	19.3	18.9	19.9	29	29	29	8.2	7.4	8.4
CARR	7.5	6.7	7.7	19.4	19.0	19.9	29	28	29	8.0	7.1	8.1
CARR / SH-Ref-1	7.5	7.2	7.7	19.4	19.1	19.9	29	29	29	8.1	7.3	8.2
SH-13A	7.5	7.0	7.7	19.5	19.2	20.0	29	28	29	8.0	7.2	8.1
SH-19	7.5	7.1	7.7	19.4	19.0	19.9	28	27	29	8.0	7.2	8.1
SH-22	7.4	7.1	7.7	19.6	19.3	20.1	29	28	29	8.2	7.5	8.3
SH-28	7.5	7.0	8.0	19.5	19.0	19.9	29	28	29	8.0	7.2	8.2
SPI-22	7.1	5.4	7.6	19.5	19.1	19.8	29	28	29	7.9	7.2	8.2
SPI-30	7.4	7.0	7.6	19.5	19.1	19.9	29	28	29	8.1	7.4	8.3
SPI-31	7.0	6.6	7.5	19.6	19.0	20.1	29	28	29	8.0	7.7	8.4

Bold = Values that fell outside of the targeted water quality criteria

Table 3-7. Ammonia Summary for *Neanthes arenaceodentata*.

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 99.9 mg/L		Interstitial Ammonia (mg/L Total) [1]NOEC = 99.9 mg/L	
	Day 0	Day 20	Day 0	Day 20
Control	0.00	1.94	NM	1.39
SH-Ref-1	0.897	0.00	NM	1.01
CARR	0.541	0.103	NM	1.21
CARR / SH-Ref-1	0.549	0.006	4.60	1.09
SH-13A	0.426	0.00	3.04	0.335
SH-19	0.318	0.00	2.25	0.566
SH-22	1.59	0.00	12.9	1.94
SH-28	0.217	0.00	1.69	0.586
SPI-22	0.629	0.431	4.90	3.15
SPI-30	1.15	2.42	5.40	3.86
SPI-31	0.765	0.066	7.60	0.995

[1]NOEC (concurrent reference-toxicant test derived) = 99.9 mg/L total ammonia
NM = not measured; insufficient porewater recovered for analysis
Bold = Values that fell outside of the targeted water quality criteria

Table 3-8. Sulfide Summary for *Neanthes arenaceodentata*.

Treatment	Overlying Sulfides (mg/L Total) [1]Trigger Value = 3.4 mg/L		Interstitial Sulfides (mg/L Total) [1]Trigger Value = 3.4 mg/L	
	Day 0	Day 20	Day 0	Day 20
Control	0.000	0.017	0.010	0.043
SH-Ref-1	0.035	0.006	0.180	0.111
CARR	0.014	0.011	0.050	0.037
CARR / SH-Ref-1	0.066	0.026	0.130	0.051
SH-13A	0.008	0.014	0.060	0.040
SH-19	0.021	0.013	0.070	0.104
SH-22	0.049	0.006	0.140	0.052
SH-28	0.018	0.004	0.090	0.066
SPI-22	0.014	0.012	**3.530**	0.168
SPI-30	0.035	0.010	**7.780**	0.182
SPI-31	0.014	0.003	0.160	0.134

[1]Kendall and Barton 2004

Bold = Values that fell outside of the targeted water quality criteria

Table 3-9. Test Condition Summary for *Neanthes arenaceodentata*.

Test Conditions: PSEP *N. arenaceodentata*		
Date sampled	July 12 - 13, 2017	
Date received	July 15, 2017	
Test dates	July 28 – August 17, 2017	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	15 – 16 days	
Source of control sediment	Yaquina Bay, OR	
Test Species	*N. arenaceodentata*	
Supplier	Aquatic Toxicology Support	
Date acquired	July 28, 2017	
Age class	Juvenile; 14 - 18 Days post emergence	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2015) SOP No. SED009.08	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	20-Day static renewal	
Control water	North Hood Canal seawater, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 4.6 mg/L	Observed: 5.4 – 8.0 mg/L
Test temperature	Recommended: 20 ± 1 °C	Observed: 18.9 – 20.1 °C
Test Salinity	Recommended: 28 ± 2 ppt	Observed: 27 – 29 ppt
Test pH	Recommended: 7 - 9	Observed: 7.1 – 8.4
Initial biomass	Recommended: 0.5 - 1.0 mg Minimum: 0.25 mg	0.111 mg
Control Performance Standard	Recommended: Control < 10% mortality	Observed: 0% Pass
	Recommended: ≥ 0.72 mg/ind/day Minimum: ≥ 0.38 mg/ind/day (as Dry Weight)	Observed: 0.397 mg/ind/day; Pass
Reference performance standard (SMS)	Recommended: Mortality ≤20% $MIG_{Reference}/MIG_{Control}$ ≥ 80%	0 – 4%; Pass 91.0% (mean); Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 183.1 mg/L	
Mean; Acceptable Range (total ammonia)	163.7; 90.1 – 237.3 mg/L	
NOEC (total ammonia)	99.9 mg/L	
NOEC (unionized ammonia)	1.532 mg /L	
Test Lighting	50 – 100 foot candles	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	5	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	40 mg/jar every other day (8 mg/ind every other day)	
Water renewal	Water renewed every third day (1/3 volume of exposure chamber)	
Deviations from Test Protocol	Initial biomass	

3.3 Larval Development Bioassay

The larval development test with *M. galloprovincialis* was validated by 93.1% normal survivorship, defined as the mean number of normal larvae within the control divided by the stocking density. This value was within both the SMS acceptability criteria of >70%. A summary of the test results for all samples is shown in Table 3-10. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in, Table 3-11, Table 3-12, and Table 3-13.

Mean normal survival of the reference sediments were between 79.6 and 92.0% of the control response, which met the SMS reference acceptability criteria (N_R/N_C) of ≥65%. This is defined as the number of normal larvae in the reference sample(s) divided by the number of normal larvae in the control. The test mean chamber stocking density (measured at test initiation) was 27.9 embryos/mL and was within the test objective of 20 – 40 embryos/mL.

Water quality parameters were within acceptable limits throughout the duration of the test, except for dissolved oxygen on the final day of testing.

The reference-toxicant test EC_{50} for total ammonia was 9.27 mg/L, which fell slightly above the confidence limits of 2.31 – 8.59 mg/L. While it is useful to report results in terms of total ammonia because these values are directly measured by ion-selective electrode, the calculated unionized ammonia (UIA) values can sometimes be a better predictor of aquatic toxicity. This is primarily a reflection that slight differences within test pH have a significant effect on the expression of UIA. After correction for actual test conditions (pH, salinity, temperature) the unionized ammonia LC_{50} value was calculated to be 0.136 mg/L UIA, which was within two standard deviations of the running mean (0.017 – 0.184 mg/L UIA). Given these results it is unlikely that the test organisms were unhealthy or less sensitive than usual.

Ammonia concentrations observed in the *M. galloprovincialis* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-12; compare to NOEC 6.4 mg/L). This indicates that ammonia concentrations within the sediment samples should not have contributed to any adverse biological effects observed in the test treatments.

Table 3-10. Test Results for *Mytilus galloprovincialis*.

Treatment	Rep	Number Normal	Number Abnormal	Mean # Normal (N)	Std. Dev.	Control Normal Survival N_C/I	Reference Normal Survival Relative to Control N_R/N_C	Performance Standard
Control	1	286	8	259.6	1.6	93.1		>0.70; Meets Criterion
	2	253	15					
	3	236	17					
	4	252	12					
	5	271	10					
SH-Ref-1	1	224	5	238.8	1.4		92.0	≥0.65; Meets Criterion
	2	273	13					
	3	232	12					
	4	233	7					
	5	232	4					
CARR / SH-Ref-1	1	224	28	224.4	2.4		86.4	≥0.65; Meets Criterion
	2	225	27					
	3	228	25					
	4	236	43					
	5	209	34					
CARR	1	228	8	236.6	0.7		91.1	≥0.65; Meets Criterion
	2	257	7					
	3	240	7					
	4	225	7					
	5	233	11					
CR-022	1	211	9	206.6	3.1		79.6	≥0.65; Meets Criterion
	2	207	6					
	3	225	3					
	4	221	11					
	5	169	18					
SH-04	1	218	13	236.2	1.2	See Section 4.3 for Larval Test Suitability Determination		
	2	252	7					
	3	264	8					
	4	213	8					
	5	234	8					
SH-14	1	233	18	231.4	1.3			
	2	230	13					
	3	221	14					
	4	228	9					
	5	245	12					
SH-19	1	196	32	182.0	3.1			
	2	189	24					
	3	177	29					
	4	185	17					
	5	163	13					
SH-21	1	207	2	220.0	0.9			
	2	217	3					
	3	225	5					
	4	243	8					
	5	208	5					

Treatment	Rep	Number Normal	Number Abnormal	Mean # Normal (N)	Std. Dev.	Control Normal Survival N_C/I	Reference Normal Survival Relative to Control N_R/N_C	Performance Standard
SH-22	1	213	9	208.6	1.4			
	2	190	8					
	3	247	13					
	4	203	3					
	5	190	5					
SH-24	1	231	10	222.6	1.0			
	2	227	9					
	3	208	4					
	4	230	6					
	5	217	8					
SPI-22	1	174	19	177.6	2.1			
	2	184	10					
	3	175	12					
	4	194	13					
	5	161	7					
SPI-30	1	214	8	211.8	0.9			
	2	210	11					
	3	229	13					
	4	224	9					
	5	182	6					
SPI-31	1	230	10	230.8	1.0			
	2	236	7					
	3	241	4					
	4	236	9					
	5	211	8					

I = Mean Initial count (Stocking density); 278.8
N_C = Mean Control Normal
N_R = Mean Reference Normal

Table 3-11. Water Quality Summary for *Mytilus galloprovincialis*.

Treatment	Dissolved Oxygen (mg/L) ≥5.0 mg/L			Temperature (°C) 16± 1°C			Salinity (ppt) 28 ± 2 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.2	7.1	7.2	16.0	15.9	16.2	28	28	28	7.8	7.8	7.8
SH-Ref-1	6.1	5.5	7.1	16.2	16.0	16.3	28	28	28	7.7	7.7	7.8
CARR/SH-Ref-1	6.2	5.5	6.9	16.1	16.0	16.3	28	28	28	7.7	7.7	7.8
CARR	6.3	5.9	6.9	16.3	16.0	16.5	28	28	28	7.8	7.7	7.8
CR-022	6.1	5.6	6.4	16.3	16.0	16.5	28	28	28	7.8	7.8	7.8
SH-04	5.9	5.3	6.3	16.4	16.0	16.7	28	28	28	7.6	7.6	7.7
SH-14	6.2	5.8	6.8	16.3	16.1	16.7	28	28	28	7.7	7.6	7.7
SH-19	5.9	5.0	7.0	16.1	16.0	16.2	28	28	28	7.6	7.6	7.7
SH-21	5.5	**4.4**	6.2	16.1	15.9	16.2	28	28	28	7.8	7.7	7.8
SH-22	6.3	5.7	6.7	16.1	16.0	16.3	28	28	28	7.7	7.6	7.7
SH-24	5.8	5.3	6.2	16.3	15.8	16.7	28	28	28	7.7	7.6	7.7
SPI-22	5.4	**3.6**	6.3	16.4	16.1	16.6	28	28	28	7.6	7.5	7.7
SPI-30	5.0	**4.6**	5.5	16.4	16.3	16.5	28	28	28	7.6	7.6	7.7
SPI-31	6.2	5.0	6.8	16.2	15.9	16.5	28	28	28	7.7	7.7	7.8

Bold = Values that fell outside of the targeted water quality criteria

Table 3-12. Ammonia and Sulfide Summary for *Mytilus galloprovincialis*.

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 6.4 mg/L		Overlying Sulfides (mg/L Total) [2]Trigger Value = 0.009 mg/L	
	Day 0	Final (Day 2)	Day 0	Final (Day 2)
Control	0.00	0.00	0.008	0.001
SH-Ref-1	0.00	0.00	**0.101**	**0.023**
CARR/SH-Ref-1	0.00	0.00	**0.202**	**0.029**
CARR	0.00	0.00	**0.084**	**0.025**
CR-022	0.00	0.00	**0.156**	**0.031**
SH-04	0.00	0.00	ND	**0.018**
SH-14	0.00	0.00	0.003	**0.024**
SH-19	0.00	0.00	**0.091**	**0.024**
SH-21	0.00	0.00	ND	**0.020**
SH-22	0.00	0.00	**0.054**	**0.017**
SH-24	0.00	0.00	ND	**0.013**
SPI-22	0.01	0.00	ND	**0.014**
SPI-30	0.14	0.00	ND	**0.012**
SPI-31	0.00	0.00	ND	**0.029**

[1]NOEC (concurrent reference-toxicant test derived) = 6.4 mg/L total ammonia
[2]Inouye 2015: Total sulfide value 0.009 mg/L derived from hydrogen sulfide dissociation (0.0025 mg/L H_2S @ 16°C, 28 ppt, and 7.7 pH)
ND = Non-detect
Bold = Values that fell outside of the targeted water quality criteria

Table 3-13. Test Condition Summary for *Mytilus galloprovincialis*.

Test Conditions: PSEP *M. galloprovincialis*		
Date sampled	July 12 - 13, 2017	
Date received	July 15, 2017	
Test dates	August 1 – 3, 2017	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	20 Days	
Test Species	*M. galloprovincialis*	
Supplier	Taylor Shellfish, Shelton, Wa	
Date acquired	July 25, 2017	
Age class	<4-h old embryos	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2015) SOP No. SED005.06	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	48-60 Hour static test (Actual: 48 hours)	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 4.8 mg/L	Observed: 3.6 – 7.2 mg/L
Test temperature	Recommended: 16 ± 1 °C	Observed: 15.8 – 16.7 °C
Test Salinity	Recommended: 28 ± 1 ppt	Observed: 28 ppt
Test pH	Recommended: 7 - 9	Observed: 7.5 – 7.8
Stocking Density	Recommended: 20 – 40 embryos/mL	Observed: 27.9 embryos/mL
Control performance standard (SMS)	Recommended: Control normal survival ≥ 70%	Observed: 93.1%; Pass
Reference performance standard (SMS)	Recommended: Reference normal survival relative to control ≥ 65%	Observed: 79.6 – 92.0%; Pass
Reference Toxicant	Total Ammonia	Unionized Ammonia
Reference Toxicant EC_{50} (total ammonia)	EC_{50} = 9.27 mg/L	EC_{50} = 0.136 mg/L
Mean; Acceptable Range (total ammonia)	5.45; 2.31 – 8.59 mg/L	0.100; 0.017 – 0.184 mg/L
NOEC Combined proportion normal (total ammonia)	6.4 mg/L	0.094 mg /L
Test Lighting	50 – 100 foot candles	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 1 surrogate (used for WQ measurements throughout the test)	
Exposure volume	18 g sediment/ 900 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	Dissolved oxygen	

4. DISCUSSION

Sediments were evaluated based on Sediment Management Standards (SMS) criteria. The biological criteria are based on both statistical significance (a statistical comparison) and the degree of biological response (a numerical comparison). The SMS criteria are derived from the Washington Department of Ecology's Sediment Cleanup User's Manual II (SCUM II; WDOE 2015). Comparisons were made for each treatment against the reference sample. Two numerical comparisons were made under SMS, the Sediment Cleanup Objective (SCO) and the Cleanup Screening Level (CSL).

4.1 Amphipod Test Suitability Determination

Under the SMS program, a treatment will fail SCO if mean mortality in the test sediment relative to the reference sediment is >25% and the difference between mean mortality in the treatment compared to mean mortality in the reference is statistically significant ($p < 0.05$). Treatments fail the CSL if mean mortality in the test treatment >30% relative to the reference sediment and the difference is statistically significant.

Project sediments from the Shelton Harbor Site do not fail the SCO and CSL criteria for the amphipod test as shown in Table 4-1.

Table 4-1. SMS Comparison for *Eohaustorius estuarius*.

Treatment	Mean Mortality (%)	Compared To:	Statistically Different than Reference? (P=0.05)	Mortality Comparison to Reference M_T-M_R (%)	Fails SCO?[1] > 25 %	Fails CSL?[2] > 30 %
Control	1					
SH-Ref-1	5					
CARR	4					
CARR/SH-Ref-1	1					
SPI-22	9	SH-Ref-1	No	4	No	No
SPI-30	9	CARR/SH-Ref-1	No	8	No	No
SPI-31	8	CARR	No	4	No	No

[1]SCO: Statistical Significance and M_T >25%
[2]CSL: Statistical Significance and M_T-M_R >30%
M_T = Treatment Mortality
M_R = Reference Mortality

4.2 Juvenile Polychaete Test Suitability Determination

Suitability determinations for the juvenile polychaete test were based on mean individual growth (MIG). A test treatment fails SCO criteria if MIG is statistically lower in the test treatment, relative to the reference, and the ratio of the MIG in the test treatment is <0.70 that of the reference. The treatments will fail CSL criteria if the MIG is significantly lower than the reference treatment and the ratio between the MIG of the treatment and the MIG of the reference is <0.50.

Project sediments SH-13A and SH-19 fail the SCO criteria for both dry weight and AFDW. Additionally, sample SH-28 fails the SCO criteria for AFDW. All other Shelton Harbor project sediments do not fail the SCO and CSL criteria when evaluated on the dry weight and AFDW basis (Table 4-2).

Table 4-2. SMS Comparison for *Neanthes arenaceodentata*.

Treatment	MIG (mg/ind/day)	Comparison To:	Statistically Less than Reference? (p=0.05)	MIG Relative to Reference MIG_T/MIG_R	Fails SCO?[1] < 0.70	Fails CSL?[2] < 0.50
Dry Weight						
Control	0.397					
SH-Ref-1	0.362					
CARR	0.417					
CARR/SH-Ref-1	0.410					
SH-13A	0.250	CARR	Yes	0.60	**Yes**	No
SH-19	0.262	CARR	Yes	0.63	**Yes**	No
SH-22	0.326	CARR/SH-Ref-1	No	0.80	No	No
SH-28	0.307	CARR/SH-Ref-1	No	0.75	No	No
SPI-22	0.415	SH-Ref-1	No	1.15	No	No
SPI-30	0.428	CARR/SH-Ref-1	No	1.04	No	No
SPI-31	0.324	CARR	No	0.78	No	No
Ash-Free Dry Weight						
Control	0.261					
SH-Ref-1	0.274					
CARR	0.305					
CARR/SH-Ref-1	0.301					
SH-13A	0.198	CARR	Yes	0.65	**Yes**	No
SH-19	0.216	CARR	No	0.71	No	No
SH-22	0.253	CARR/SH-Ref-1	No	0.84	No	No
SH-28	0.219	CARR/SH-Ref-1	No	0.73	No	No
SPI-22	0.329	SH-Ref-1	No	1.20	No	No
SPI-30	0.341	CARR/SH-Ref-1	No	1.13	No	No
SPI-31	0.245	CARR	No	0.80	No	No

[1]SCO: Statistical Significance and MIG_T/MIG_R <70%
[2]CSL: Statistical Significance and MIG_T/MIG_R <50%
MIG_T = Treatment Mean Individual Growth
MIG_R = Reference Mean Individual Growth

4.3 Larval Test Suitability Determination

Larval test treatments fail SCO criteria if the number of normal larvae in the test treatment is significantly lower ($p < 0.10$) than that of the reference and if the ratio between the normal larval development in the test treatment is less than 0.85 of the normal development in the reference. Treatments fail CSL criteria if the number of normal larvae in the test treatment is significantly lower ($p < 0.10$) than that of the reference and if the ratio between the normal larval development in the test treatment is less than 0.70 of the normal development in the reference.

Project sediments SH-19 and SH-22 fail the SCO criteria for larval development, but do not exceed the CSL criteria. All other project sediments from the Shelton Harbor Site pass the SCO and CSL criteria for the bivalve development evaluation (Table 4-3).

Table 4-3. SMS Comparison for *Mytilus galloprovincialis*.

Treatment	Mean Normal Survival (%)[1]	Mean Number Normal	Compared To:	Statistically Less than Reference? (p=0.10)	Normal Survival to Reference N_T/N_R	Fails SCO?[2] <0.85	Fails CSL?[3] <0.70
Control	93.1	260					
SH-Ref-1	92.0	239					
CARR/SH-Ref-1	86.4	224					
CARR	91.1	237					
CR022	79.6	207					
SH-04	93.4	236	CARR	No	0.996	No	No
SH-14	94.2	231	CARR/SH-Ref-1	No	1.03	No	No
SH-19	79.0	182	CARR	Yes	0.768	**Yes**	No
SH-21	86.5	220	CR022	No	1.06	No	No
SH-22	83.3	209	CARR/SH-Ref-1	No	0.933	No	No
SH-24	88.6	223	CARR/SH-Ref-1	No	0.996	No	No
SPI-22	73.1	178	SH-Ref-1	Yes	0.745	**Yes**	No
SPI-30	85.2	212	CARR/SH-Ref-1	No	0.946	No	No
SPI-31	91.8	231	CARR	No	0.975	No	No

[1] Control data is normalized to the stocking density; reference and project treatments are normalized to the control

[2] SCO: Statistical Significance and (N_T/N_R) <0.85

[3] CSL: Statistical Significance and (N_T/N_R) <0.70

N_T =Treatment Mean Number Normal

N_R =Reference Mean Number Normal

N_C =Control Mean Number Normal

5. SUMMARY

A summary of the biological tests conducted on the Shelton Harbor Site sediments evaluated under the SMS sediment quality criteria (Table 5-1) are provided below.

Samples SH-13A and SH-19 fail SCO criteria for polychaete growth and SH-19 and SPI-22 fail SCO for bivalve normality. All other project samples pass the SCO and CSL performance criteria for all tests performed on the Shelton Harbor Site sediments.

Table 5-1. Summary of SMS Evaluation.

Treatment	Sediment Cleanup Objectives			Cleanup Screening Levels		
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval
SH-04		Pass	Pass		Pass	Pass
SH-13A		**Fail**	Pass		Pass	Pass
SH-14			Pass			Pass
SH-19		**Fail**	**Fail**		Pass	Pass
SH-21			Pass			Pass
SH-22		Pass	Pass		Pass	Pass
SH-24			Pass			Pass
SH-28		Pass			Pass	
SPI-22	Pass	Pass	**Fail**	Pass	Pass	Pass
SPI-30	Pass	Pass	Pass	Pass	Pass	Pass
SPI-31	Pass	Pass	Pass	Pass	Pass	Pass

*Shaded cells represent tests not conducted as part of the test design

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Appendix E

Simpson 2017 RI Chemical Data

Table 1
Surface Bulk Sediment Results

			Task	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**
			Location ID	**SG-01-170713**	**SH-03-170809**	**SH-04-170713**	**SH-13A-170713**	**SH-14-170712**	**SH-19-170712**	**SH-21-170712**	**SH-22-170712**	**SH-24-170713**
			Sample ID	**SG-01-SG-170713**	**SH-03-SC-0-10-170809**	**SH-04-SG-170713**	**SH-13A-SG-170713**	**SH-14-SG-170712**	**SH-19-SG-170712**	**SH-21-SG-170712**	**SH-22-SG-170712**	**SH-24-SG-170713**
			Sample Date	**7/13/2017**	**8/9/2017**	**7/13/2017**	**7/13/2017**	**7/12/2017**	**7/12/2017**	**7/12/2017**	**7/12/2017**	**7/13/2017**
			Depth	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**
			Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
			X	**1078804.278**	**1079571.097**	**1079142.371**	**1078917.959**	**1081852.952**	**1078945.317**	**1079632.45**	**1079632.45**	**1080908.296**
			Y	**86149.22393**	**85744.088**	**85824.72775**	**83577.94747**	**84299.87451**	**84076.30474**	**84373.99247**	**84373.99247**	**83520.27469**
		AET_Marine_ SCO_SCUMII	**AET_Marine_ CSL_SCUMII**									
Conventional Parameters (pct)												
Total volatile solids	D2974			**8.37**	--	**12.13**	**13.3**	**6.71**	**15.09**	**13.82**	**8.66**	**11.73**
Black Carbon	Ghosh			--	--	--	--	--	**1.23**	--	--	--
Grain Size (pct)												
Gravel	PSEP			**38.36**	--	**1.61 J**	**0 J**	**0.65 J**	**2.67 J**	**3.4 J**	**5.51 J**	**8.55 J**
Sand, very coarse	PSEP			**7.09**	--	**2.19**	**0.32**	**1.27**	**2.31**	**5.75**	**2.65**	**2.52**
Sand, coarse	PSEP			**6.16**	--	**2.2**	**3.68**	**1.65**	**2.85**	**6.57**	**4.24**	**3.29**
Sand, medium	PSEP			**4.61**	--	**3.86**	**5.15**	**3**	**4.91**	**7.34**	**19.69**	**11.82**
Sand, fine	PSEP			**6.81**	--	**6.92**	**6.45**	**14.07**	**4.75**	**11.44**	**21.85**	**12.55**
Sand, very fine	PSEP			**11.7**	--	**15.23**	**13.55**	**33.79**	**8.15**	**10.79**	**11.41**	**8.95**
Percent retained 31.25 micron sieve	PSEP			**5.06**	--	**33.3**	**36.74**	**14.78**	**27.94**	**27.64**	**11.88**	**20.07**
Percent retained 62.5 micron sieve	PSEP			**8.43**	--	**3.49 J**	**3.27 J**	**6.29 J**	**0.68 J**	**1.03 J**	**2.26 J**	**3.97 J**
Percent retained 15.6 micron sieve	PSEP			**2.33**	--	**10.65**	**12.07**	**6.52**	**13.6**	**11.82**	**4.15**	**8.36**
Percent retained 7.8 micron sieve	PSEP			**2.22**	--	**8.39**	**6.54**	**5.73**	**11.7**	**6.94**	**4.12**	**7.07**
Percent retained 3.9 micron sieve	PSEP			**1.61**	--	**5.08**	**3.38**	**3.88**	**8.2**	**4**	**3.27**	**4.79**
Percent retained 1.95 micron sieve	PSEP			**0.97**	--	**4.98**	**4.31**	**3.69**	**6.79**	**4.76**	**2.64**	**3.48**
Percent retained 0.98 micron sieve	PSEP			**1.06**	--	**7.8**	**7.76**	**5.73**	**10.19**	**8.97**	**3.91**	**5.58**
Total Fines (sum of all sieves)				**21.68**		**73.69**	**74.07**	**46.62**	**79.1**	**65.16**	**32.23**	**53.32**
Polycyclic Aromatic Hydrocarbons (µg/kg)												
2-Methylnaphthalene	SW8270DSIM	670	670	--	--	--	--	**5.1**	**24**	--	**4.8**	--
Acenaphthene	SW8270DSIM	500	500	--	--	--	--	**5.5**	**23**	--	**11**	--
Acenaphthylene	SW8270DSIM	1300	1300	--	--	--	--	**4.7**	**22**	--	**6.1**	--
Anthracene	SW8270DSIM	960	960	--	--	--	--	**8.3**	**53**	--	**240**	--
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	--	--	--	**15**	**43**	--	**150**	--
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	--	--	--	**13**	**65**	--	**100**	--
Benzo(b,j)fluoranthene	SW8270DSIM			--	--	--	--	**24**	**99**	--	**250**	--
Benzo(e)pyrene	SW8270DSIM			--	--	--	--	**16**	**55**	--	--	--
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	--	--	--	**10**	**43**	--	**45**	--
Benzo(k)fluoranthene	SW8270DSIM			--	--	--	--	**8.4**	**33**	--	**100**	--
Chrysene	SW8270DSIM	1400	2800	--	--	--	--	**52**	**73**	--	**590 J**	--
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	--	--	--	**2.2**	**8.4**	--	**11**	--
Dibenzofuran	SW8270DSIM	540	540	--	--	--	--	--	--	--	**14**	--
Fluoranthene	SW8270DSIM	1700	2500	--	--	--	--	**95**	**270**	--	**710**	--
Fluorene	SW8270DSIM	540	540	--	--	--	--	**5.2**	**26**	--	**20**	--

Table 1
Surface Bulk Sediment Results

			Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
			Location ID	SG-01-170713	SH-03-170809	SH-04-170713	SH-13A-170713	SH-14-170712	SH-19-170712	SH-21-170712	SH-22-170712	SH-24-170713
			Sample ID	SG-01-SG-170713	SH-03-SC-0-10-170809	SH-04-SG-170713	SH-13A-SG-170713	SH-14-SG-170712	SH-19-SG-170712	SH-21-SG-170712	SH-22-SG-170712	SH-24-SG-170713
			Sample Date	7/13/2017	8/9/2017	7/13/2017	7/13/2017	7/12/2017	7/12/2017	7/12/2017	7/12/2017	7/13/2017
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
			Sample Type	N	N	N	N	N	N	N	N	N
			X	1078804.278	1079571.097	1079142.371	1078917.959	1081852.952	1078945.317	1079632.45	1079632.45	1080908.296
			Y	86149.22393	85744.088	85824.72775	83577.94747	84299.87451	84076.30474	84373.99247	84373.99247	83520.27469
		AET_Marine_ SCO_SCUMII	AET_Marine_ CSL_SCUMII									
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	600	690	--	--	--	--	**7.8**	**36**	--	**51**	--
Naphthalene	SW8270DSIM	2100	2100	--	--	--	--	**46**	**170**	--	**23**	--
Perylene	SW8270DSIM			--	--	--	--	**9.4**	**31**	--	--	--
Phenanthrene	SW8270DSIM	1500	1500	--	--	--	--	**37**	**200**	--	**120**	--
Pyrene	SW8270DSIM	2600	3300	--	--	--	--	**83**	**330**	--	**580**	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)				--	--	--	--	**19.26**	**87.67**	--	**162.1 J**	--
Total Benzofluoranthenes (b,j,k) (U = 0)		3200	3600	--	--	--	--	**8.4**	**33**	--	**100**	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)				--	--	--	--	**19.26**	**87.67**	--	**162.1 J**	--
Total HPAH (SMS) (U = 0)		12000	17000	--	--	--	--	**310.4**	**1000.4**	--	**2587 J**	--
Total LPAH (SMS) (U = 0)		5200	5200	--	--	--	--	**106.7**	**494**	--	**420.1**	--
Dioxin Furans (ng/kg)												
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B			**1.06**	**3.76 J**	0.506 U	**2.68**	**0.432 J**	**0.884**	0.382 U	0.258 U	0.447 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B			**4.2**	**26.4**	**2.7 J**	**7.49**	**2.47 J**	**2.17 J**	**1.77 J**	**1.5 J**	**3.02 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**7.11**	**41.2**	**5.3 J**	**14.1 J**	**3.42**	**3.16**	**3.97 J**	**4.3**	**6.37**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**26.9**	**346**	**25.5**	**55.9**	**17.7**	**17.3**	**19.6**	**30.4**	**27.3**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**12.7**	**108**	**8.92 J**	**21.6 J**	**5.54**	**5.04**	**7.17**	**7.41**	**10.9**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B			**488**	**8990 J**	**613**	**913**	**295**	**296**	**528**	**960**	**574**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B			**4000**	**108000 J**	**6420**	**8200**	**2480**	**2390**	**4650**	**7940**	**4670**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B			**89.5 J**	**713 J**	**147 J**	**861**	**212 J**	**85.3 J**	**107 J**	**73 J**	**212**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B			**144 J**	**913 J**	**157 J**	**841 J**	**138 J**	**101 J**	**137 J**	**93.9**	**187 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**263**	**3260**	**370 J**	**992 J**	**275**	**193**	**332**	**489 J**	**433**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B			**941**	**21200**	**1310**	**2280**	**835**	**832**	**1670**	**4940**	**1290**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B			**3.12**	**13.4**	**1.54**	**8.81**	**1.88 J**	**4.16**	**1.41 J**	**1.8**	**2.61**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B			**2.95**	**19.5**	**1.53 J**	**6.19**	**1.56 J**	**2.96 J**	**1.39 J**	**1.98 J**	**2.29 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B			**7.23**	**60.4**	**4.26**	**11.7**	**5.44**	**6.44**	**3.38 J**	**4.46**	**5.42**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**11.8**	**181**	**11.8**	**19.6**	**8.79**	**11.3**	**7.46**	**7.86**	**13.1**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**6.16**	**58**	**3.58**	**8.5**	**2.92**	**4.27**	**2.9 J**	**2.71**	**4.76**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B			**1.03 J**	2.77 U	1.47 U	1.34 U	**0.431 J**	0.623 U	0.563 U	**0.681 J**	0.767 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**9.06**	**102**	**5.83 J**	**12.8**	**5.09**	**6.6**	**4.76**	**4.95**	**8.24**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B			**126**	**2600**	**164**	**245**	**75.1**	**158**	**99**	**81.1**	**169**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B			**8.66**	**146**	**11.9**	**14.5**	**4.92**	6.66 U	**5.52**	**4.61**	**9.64**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B			**370**	**11800**	**806**	**795**	**300**	**359**	**415**	**256**	**701**
Total Tetrachlorodibenzofuran (TCDF)	E1613B			**61.2 J**	**341 J**	**22.3 J**	**202 J**	**64.1 J**	**106 J**	**35.1 J**	**37.2 J**	**64 J**
Total Pentachlorodibenzofuran (PeCDF)	E1613B			**79.9 J**	**575 J**	**43.3 J**	**141 J**	**60.2 J**	**87 J**	**38.8 J**	**48.5**	**62.1 J**
Total Hexachlorodibenzofuran (HxCDF)	E1613B			**231 J**	**3710**	**263 J**	**370 J**	**159 J**	**216**	**136 J**	**149 J**	**236**
Total Heptachlorodibenzofuran (HpCDF)	E1613B			**466**	**11200**	**732 J**	**937**	**303**	**501 J**	**374**	**283**	**676**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)				**22.8431 J**	**287.2635 J**	**20.6542 J**	**42.4872 J**	**13.7421 J**	**15.68695 J**	**15.61655 J**	**21.9534 J**	**21.44225 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)				**22.8431 J**	**287.125 J**	**20.3277 J**	**42.4202 J**	**13.7421 J**	**15.6225 J**	**15.3974 J**	**21.8244 J**	**21.1804 J**

Table 1
Surface Bulk Sediment Results

			Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
			Location ID	SH-28-170712	SPI-22-170713	SPI-30-170713	SPI-31-170713	SPI-31-170713
			Sample ID	SH-28-SG-170712	SPI-22-SG-170713	SPI-30-SG-170713	SPI-131-SG-170713	SPI-31-SG-170713
			Sample Date	7/12/2017	7/13/2017	7/13/2017	7/13/2017	7/13/2017
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
			Sample Type	N	N	N	FD	N
			X	1081568.517	1080205.879	1080380.919	1081277.578	1081277.578
			Y	84922.72201	83592.417	83461.02485	83610.71742	83610.71742
		AET_Marine_ SCO_SCUMII	AET_Marine_ CSL_SCUMII					
Conventional Parameters (pct)								
Total volatile solids	D2974			**5.61**	**26.69**	**15.87**	**13.13**	**12.56**
Black Carbon	Ghosh			--	--	--	--	--
Grain Size (pct)								
Gravel	PSEP			**7.55 J**	**16.63 J**	**7.59 J**	--	**2.24 J**
Sand, very coarse	PSEP			**3.39**	**4.15**	**2.12**	--	**1.44**
Sand, coarse	PSEP			**2.49**	**2.95**	**1.94**	--	**1.45**
Sand, medium	PSEP			**2.99**	**4.33**	**3.13**	--	**4.09**
Sand, fine	PSEP			**17.37**	**5.45**	**6.18**	--	**7.6**
Sand, very fine	PSEP			**31.07**	**7.43**	**8.52**	--	**10.26**
Percent retained 31.25 micron sieve	PSEP			**11.08**	**28.66**	**29.88**	--	**32.34**
Percent retained 62.5 micron sieve	PSEP			**3.22 J**	**2.94 J**	**2.23 J**	--	**5.16 J**
Percent retained 15.6 micron sieve	PSEP			**4.7**	**10.23**	**13.25**	--	**13**
Percent retained 7.8 micron sieve	PSEP			**4.42**	**6.13**	**7.73**	--	**9.87**
Percent retained 3.9 micron sieve	PSEP			**3.3**	**4.17**	**4.72**	--	**5.71**
Percent retained 1.95 micron sieve	PSEP			**3.02**	**4.31**	**5.11**	--	**5.33**
Percent retained 0.98 micron sieve	PSEP			**4.39**	**9.36**	**9.23**	--	**8.93**
Total Fines (sum of all sieves)				**34.13**	**65.8**	**72.15**	--	**80.34**
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene	SW8270DSIM	670	670	--	**1.6 J**	--	--	--
Acenaphthene	SW8270DSIM	500	500	--	**4.4**	--	--	--
Acenaphthylene	SW8270DSIM	1300	1300	--	**1.7**	--	--	--
Anthracene	SW8270DSIM	960	960	--	**17**	--	--	--
Benzo(a)anthracene	SW8270DSIM	1300	1600	--	**68**	--	--	--
Benzo(a)pyrene	SW8270DSIM	1600	1600	--	**32**	--	--	--
Benzo(b,j)fluoranthene	SW8270DSIM			--	**57**	--	--	--
Benzo(e)pyrene	SW8270DSIM			--	**26**	--	--	--
Benzo(g,h,i)perylene	SW8270DSIM	670	720	--	**15**	--	--	--
Benzo(k)fluoranthene	SW8270DSIM			--	**23**	--	--	--
Chrysene	SW8270DSIM	1400	2800	--	**100**	--	--	--
Dibenzo(a,h)anthracene	SW8270DSIM	230	230	--	**5.1**	--	--	--
Dibenzofuran	SW8270DSIM	540	540	--	--	--	--	--
Fluoranthene	SW8270DSIM	1700	2500	--	**140**	--	--	--
Fluorene	SW8270DSIM	540	540	--	**7.1**	--	--	--

Table 1
Surface Bulk Sediment Results

			Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
			Location ID	SH-28-170712	SPI-22-170713	SPI-30-170713	SPI-31-170713	SPI-31-170713
			Sample ID	SH-28-SG-170712	SPI-22-SG-170713	SPI-30-SG-170713	SPI-131-SG-170713	SPI-31-SG-170713
			Sample Date	7/12/2017	7/13/2017	7/13/2017	7/13/2017	7/13/2017
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
			Sample Type	N	N	N	FD	N
			X	1081568.517	1080205.879	1080380.919	1081277.578	1081277.578
			Y	84922.72201	83592.417	83461.02485	83610.71742	83610.71742
		AET_Marine_ SCO_SCUMII	AET_Marine_ CSL_SCUMII					
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	600	690	--	**17**	--	--	--
Naphthalene	SW8270DSIM	2100	2100	--	**2.2**	--	--	--
Perylene	SW8270DSIM			--	**11**	--	--	--
Phenanthrene	SW8270DSIM	1500	1500	--	**45**	--	--	--
Pyrene	SW8270DSIM	2600	3300	--	**110**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)				--	**50.01**	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)		3200	3600	--	**23**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)				--	**50.01**	--	--	--
Total HPAH (SMS) (U = 0)		12000	17000	--	**567.1**	--	--	--
Total LPAH (SMS) (U = 0)		5200	5200	--	**77.4**	--	--	--
Dioxin Furans (ng/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B			**0.365 J**	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B			**1.6 J**	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**2.25 J**	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**12.2**	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**4.77**	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B			**219**	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B			**1790**	--	--	--	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B			**93.9 J**	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B			**85.9 J**	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B			**206 J**	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B			**587**	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B			**1.62**	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B			**1.34 J**	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B			**3.47**	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**6.12**	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**2.53**	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B			**0.38 J**	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B			**4.36**	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B			**62.5**	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B			**3.98**	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B			**208**	--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B			**35.1 J**	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B			**41.4 J**	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B			**112**	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B			**215**	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)				**9.9234 J**	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)				**9.9234 J**	--	--	--	--

Table 1
Surface Bulk Sediment Results

Notes
Bold: detected result
µg/kg: micrograms per kilogram
CAEPA: California EPA
cPAH: carcinogenic polycyclic aromatic hydrocarbons
FD: field duplicate
J: estimated value
HPAH: high-molecular-volumen polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
N: normal sample
ng/kg: nanograms per kilogram
pct: percent
TEQ: Toxic Equivalence Quotient
U: compound analyzed, but not detected above detection limit

Table 2
Surface Sediment Porewater Results

Station ID	DGT Gel Thickness (mm)	Trap Sample Sulfide Mass (µmol)	Trap Sample Sulfide Concentration (mg/L)	Hours of Deployment	Calculated Porewater Free Sulfide Concentration (mg/L)	Sampling notes
Free hydrosulfide ion (HS^-) and Hydrogen Sulfide (H_2S)						
SH-04	0.78	R	R	48.1	R	Rejected - DGT observed lying flat on sediment surface
SH-13A	0.78	11	0.18	45.3	0.4	Sediment observed on appuratus to ~ 3.5 inches
SH-14	0.78	NA	NA	NA	NA	Sampler Lost
SH-19	0.78	0.11	0.0018	41.6	0.005	Sediment observed to top of appuratus
SH-21	0.78	21.5	0.34	46.5	0.8	Sediment observed to top of appuratus
SH-22	0.78	1	0.016	47.3	0.04	Sediment observed on appuratus to ~ 3.5 inches
SPI-31	0.78	36	0.58	39.6	1.6	Visual confirmation of full insertion

Notes:

Example Calculation:

$$PW\ concentration = \frac{\text{mass of sulfide sorbed by DGT}(35.7\ \mu\text{mol}) * 0.001\frac{\text{mmol}}{\mu\text{mol}} * 32\frac{\text{mg}}{\text{mmol}} * \text{thickness of diffusion layer }(0.78\text{mm}) * 0.1\text{ cm/mm}}{\text{Diffusion coefficient of sulfide in gel }(1.48 * \frac{10^{-5}cm^2}{\text{s}}) * \text{surface area of the gel }(27\ cm^2) * \text{exposure time}(48\text{ hours} = 172800\text{ s}) * \frac{ml}{cm^3} * 0.001L/ml}$$

Bold: detected result

µmol: micromole

DGT: diffusive gradient thin

mg/L: milligrams per liter

mm: millimeter

NA: not available

R: result rejected

Table 3
Radiochemistry Results

		SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-0-2-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-10-12-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-12-14-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-14-16-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-16-18-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-18-20-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-22-24-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-2-4-170809	SheltonRI_FS_2017 SH-14-170808 SH-14-GEO-28-30-170809
	Sample Date	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**
	Depth	**0–2 cm**	**10–12 cm**	**12–14 cm**	**14–16 cm**	**16–18 cm**	**18–20 cm**	**22–24 cm**	**2–4 cm**	**28–30 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**
	Y	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**
Radionuclides (pci/g)										
Beryllium 7	E901.1	--	--	--	--	--	--	--	--	--
Cesium 137	E901.1	--	0.0986 U	0.0847 U	0.0981 U	0.0893 U	--	--	0.0993 U	--
Lead 210	TBE-2015	0.126 U	**0.253**	--	**0.293**	--	**0.429**	**0.13**	**0.634**	0.133 U

Table 3
Radiochemistry Results

		SheltonRI_FS_2017	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**
		SH-14-170808	**SH-14-170808**	**SH-14-170808**	**SH-14-170808**	**SH-14-170808**	**SH-14-170808**	**SH-19-170712**	**SH-19-170712**
		SH-14-GEO-38-40-170809	**SH-14-GEO-4-6-170809**	**SH-14-GEO-48-50-170809**	**SH-14-GEO-6-8-170809**	**SH-14-GEO-78-80-170809**	**SH-14-GEO-8-10-170809**	**SH-19-GEO-000002-170714**	**SH-19-GEO-002004-170714**
	Sample Date	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/9/2017**	**7/14/2017**	**7/14/2017**
	Depth	**38–40 cm**	**4–6 cm**	**48–50 cm**	**6–8 cm**	**70–80 cm**	**8–10 cm**	**0–2 cm**	**2–4 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**	**1078945.317**	**1078945.317**
	Y	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84302.015**	**84076.30474**	**84076.30474**
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	--	--	--	0.99 U	--
Cesium 137	E901.1	--	0.0643 U	--	0.089 U	--	0.0958 U	--	0.196 U
Lead 210	TBE-2015	0.13 U	--	0.135 U	**0.404**	**0.309**	0.126 U	**0.854 J**	**0.6**

Table 3
Radiochemistry Results

		SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
		SH-19-170712	SH-19-170712	SH-19-170712	SH-19-170712	SH-19-170712	SH-19-170712	SH-19-170712	SH-19-170712
		SH-19-GEO-004006-170714	SH-19-GEO-006008-170714	SH-19-GEO-008010-170714	SH-19-GEO-010012-170714	SH-19-GEO-012014-170714	SH-19-GEO-014016-170714	SH-19-GEO-016018-170714	SH-19-GEO-018020-170714
	Sample Date	7/14/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017
	Depth	4–6 cm	6–8 cm	8–10 cm	10–12 cm	12–14 cm	14–16 cm	16–18 cm	18–20 cm
	Sample Type	N	N	N	N	N	N	N	N
	Matrix	SE	SE	SE	SE	SE	SE	SE	SE
	X	1078945.317	1078945.317	1078945.317	1078945.317	1078945.317	1078945.317	1078945.317	1078945.317
	Y	84076.30474	84076.30474	84076.30474	84076.30474	84076.30474	84076.30474	84076.30474	84076.30474
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	--	--	--	--	--
Cesium 137	E901.1	0.0921 U	0.0969 U	0.0979 U	0.0892 U	0.0652 U	0.098 U	0.0843 U	--
Lead 210	TBE-2015	--	**0.823**	**0.812 J**	**0.154**	--	**0.267**	--	**0.221 J**

Table 3
Radiochemistry Results

		SheltonRI_FS_2017	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**
		SH-19-170712	**SH-19-170712**	**SH-19-170712**	**SH-19-170712**	**SH-19-170712**	**SH-19-170712**	**SH-19-170712**	**SH-19-170712**
		SH-19-GEO-020022-170714	**SH-19-GEO-022024-170714**	**SH-19-GEO-024026-170714**	**SH-19-GEO-028030-170714**	**SH-19-GEO-032034-170714**	**SH-19-GEO-038040-170714**	**SH-19-GEO-044046-170714**	**SH-19-GEO-048050-170714**
	Sample Date	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**
	Depth	**20–22 cm**	**22–24 cm**	**24–26 cm**	**28–30 cm**	**32–34 cm**	**38–40 cm**	**44–46 cm**	**48–50 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1078945.317**	**1078945.317**	**1078945.317**	**1078945.317**	**1078945.317**	**1078945.317**	**1078945.317**	**1078945.317**
	Y	**84076.30474**	**84076.30474**	**84076.30474**	**84076.30474**	**84076.30474**	**84076.30474**	**84076.30474**	**84076.30474**
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	--	--	--	--	--
Cesium 137	E901.1	0.056 U	--	0.0951 U	--	0.0752 U	0.0949 U	0.0914 U	--
Lead 210	TBE-2015	--	**0.159**	--	0.0949 UJ	--	**0.232 J**	--	**0.231 J**

Table 3
Radiochemistry Results

		SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
		SH-19-170712	SH-19-170712	SH-19-170809	SH-22-170712	SH-22-170712	SH-22-170712	SH-22-170712	SH-22-170712
		SH-19-GEO-050052-170714	SH-19-GEO-052054-170714	SH-19-GEO-98-100-170810	SH-22-GEO-000002-170714	SH-22-GEO-002004-170714	SH-22-GEO-004006-170714	SH-22-GEO-006008-170714	SH-22-GEO-008010-170714
	Sample Date	7/14/2017	7/14/2017	8/10/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017	7/14/2017
	Depth	50–52 cm	52–54 cm	98–100 cm	0–2 cm	2–4 cm	4–6 cm	6–8 cm	8–10 cm
	Sample Type	N	N	N	N	N	N	N	N
	Matrix	SE	SE	SE	SE	SE	SE	SE	SE
	X	1078945.317	1078945.317	1078962.382	1079632.45	1079632.45	1079632.45	1079632.45	1079632.45
	Y	84076.30474	84076.30474	84090.036	84373.99247	84373.99247	84373.99247	84373.99247	84373.99247
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	0.731 U	--	--	--	--
Cesium 137	E901.1	0.0819 U	0.0982 U	--	--	0.0962 U	0.0976 U	0.0862 U	**0.0657**
Lead 210	TBE-2015	--	--	0.126 U	**0.882 J**	**0.651**	--	**0.443**	**0.543 J**

Table 3
Radiochemistry Results

		SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-010012-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-012014-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-014016-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-016018-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-018020-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-020022-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-022024-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-024026-170714
	Sample Date	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**
	Depth	**10–12 cm**	**12–14 cm**	**14–16 cm**	**16–18 cm**	**18–20 cm**	**20–22 cm**	**22–24 cm**	**24–26 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**
	Y	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	--	--	--	--	--
Cesium 137	E901.1	0.0905 U	0.0749 U	0.0946 U	0.0955 U	--	0.0772 U	--	0.098 U
Lead 210	TBE-2015	**0.764**	--	**0.381**	--	**0.351 J**	--	0.101 U	--

Table 3
Radiochemistry Results

		SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-028030-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-032034-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-038040-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-044046-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-048050-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-050052-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-052054-170714	SheltonRI_FS_2017 SH-22-170712 SH-22-GEO-058060-170714
	Sample Date	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**
	Depth	**28–30 cm**	**32–34 cm**	**38–40 cm**	**44–46 cm**	**48–50 cm**	**50–52 cm**	**52–54 cm**	**58–60 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**
	Y	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**
Radionuclides (pci/g)									
Beryllium 7	E901.1	--	--	--	--	--	--	--	--
Cesium 137	E901.1	--	**0.0934**	0.0936 U	0.0939 U	--	0.0916 U	0.0725 U	--
Lead 210	TBE-2015	**0.309 J**	--	**0.102 J**	--	**0.248 J**	--	--	**0.128 J**

Table 3
Radiochemistry Results

		SheltonRI_FS_2017	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**	**SheltonRI_FS_2017**
		SH-22-170712	**SH-22-170712**	**SH-22-170712**	**SH-22-170712**	**SH-22-170809**
		SH-22-GEO-060062-170714	**SH-22-GEO-066068-170714**	**SH-22-GEO-068070-170714**	**SH-22-GEO-078080-170714**	**SH-22-GEO-118-120-170809**
	Sample Date	**7/14/2017**	**7/14/2017**	**7/14/2017**	**7/14/2017**	**8/9/2017**
	Depth	**60–62 cm**	**66–68 cm**	**68–70 cm**	**78–80 cm**	**118–120 cm**
	Sample Type	**N**	**N**	**N**	**N**	**N**
	Matrix	**SE**	**SE**	**SE**	**SE**	**SE**
	X	**1079632.45**	**1079632.45**	**1079632.45**	**1079632.45**	**1080337.853**
	Y	**84373.99247**	**84373.99247**	**84373.99247**	**84373.99247**	**84082.176**
Radionuclides (pci/g)						
Beryllium 7	E901.1	--	--	--	--	--
Cesium 137	E901.1	0.0468 U	0.0996 U	--	--	--
Lead 210	TBE-2015	--	--	**0.191 J**	**0.22 J**	**0.36**

Table 3
Radiochemistry Results

Notes:
Bold: detected result
cm: centimeter
J: estimated value
N: normal
pci/g: picocuries per gram
SE: sediment
U: compound analyzed, but not detected above detection limit
UJ: compound analyzed, but not detected above estimated detection limit

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	SH-03-170809	SH-03-170809	SH-03-170809	SH-14-170808	SH-14-170808	SH-14-170808	SH-14-170808
	Sample ID	SH-03-SC-00-1.9-170809	SH-03-SC-1.9-3.75-170809	SH-03-SC-3.75-4.6-170809	SH-14-10-20-170810	SH-14-20-30-170810	SH-14-GEO-52-70-170810	SH-14-GEO-60-88-170810
	Sample Date	8/9/2017	8/9/2017	8/9/2017	8/10/2017	8/10/2017	8/10/2017	8/10/2017
	Depth	0–1.9 ft	1.9–3.75 ft	3.75–4.6 ft	0.3-0.7 ft	0.7-1 ft	1.7-2.3 ft	2-2.9 ft
	Sample Type	N	N	N	N	N	N	N
	X	1079571.097	1079571.097	1079571.097	1081852.559	1081852.559	1081852.559	1081852.559
	Y	85744.088	85744.088	85744.088	84302.015	84302.015	84302.015	84302.015
Conventional Parameters (pct)								
Total volatile solids	D2974	--	--	**3.41**	--	--	**6.92**	--
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene	SW8270DSIM	--	--	--	**28**	**22**	--	--
Acenaphthene	SW8270DSIM	--	--	--	**26**	**16**	--	--
Acenaphthylene	SW8270DSIM	--	--	--	**34**	**32**	--	--
Anthracene	SW8270DSIM	--	--	--	**30**	**32**	--	--
Benzo(a)anthracene	SW8270DSIM	--	--	--	**32**	**22 J**	--	--
Benzo(a)pyrene	SW8270DSIM	--	--	--	**54**	**24**	--	--
Benzo(b,j)fluoranthene	SW8270DSIM	--	--	--	**33**	**27**	--	--
Benzo(e)pyrene	SW8270DSIM	--	--	--	**57**	**22**	--	--
Benzo(g,h,i)perylene	SW8270DSIM	--	--	--	**52**	**25**	--	--
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	**9.2**	**8.2**	--	--
Chrysene	SW8270DSIM	--	--	--	**49**	**31**	--	--
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	--	**8.5**	**2.7**	--	--
Fluoranthene	SW8270DSIM	--	--	--	**150**	**180**	--	--
Fluorene	SW8270DSIM	--	--	--	**24**	**19**	--	--
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	--	**20**	**15**	--	--
Naphthalene	SW8270DSIM	--	--	--	**320**	**240**	--	--
Perylene	SW8270DSIM	--	--	--	**78**	**94**	--	--
Phenanthrene	SW8270DSIM	--	--	--	**190**	**180**	--	--
Pyrene	SW8270DSIM	--	--	--	**170**	**210**	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)		--	--	--	**64.76**	**31.8 J**	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)		--	--	--	**9.2**	**8.2**	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)		--	--	--	**64.76**	**31.8 J**	--	--
Total HPAH (SMS) (U = 0)		--	--	--	**577.7**	**544.9 J**	--	--
Total LPAH (SMS) (U = 0)		--	--	--	**624**	**519**	--	--
Dioxin Furans (ng/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	**5.57**	0.214 U	0.0702 U	**3.31**	**2.72**	--	0.117 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	**29.6**	0.275 U	0.0797 U	**17.9**	**13.3**	--	0.154 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**50.9**	0.322 U	0.0937 U	**32.9**	**23.7**	--	0.204 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**350**	**0.546 J**	0.1 U	**365**	**229**	--	0.192 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**118**	**0.5 J**	0.0922 U	**80.4**	**47.3**	--	0.232 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**10,200 J**	**8.59**	**1.09 J**	**10,400 J**	**5,160 J**	--	0.557 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	**74,700 J**	**54**	**8.23**	**78,900 J**	**36,700 J**	--	6.36 U

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	**SH-03-170809**	**SH-03-170809**	**SH-03-170809**	**SH-14-170808**	**SH-14-170808**	**SH-14-170808**	**SH-14-170808**
	Sample ID	**SH-03-SC-00-1.9-170809**	**SH-03-SC-1.9-3.75-170809**	**SH-03-SC-3.75-4.6-170809**	**SH-14-10-20-170810**	**SH-14-20-30-170810**	**SH-14-GEO-52-70-170810**	**SH-14-GEO-60-88-170810**
	Sample Date	**8/9/2017**	**8/9/2017**	**8/9/2017**	**8/10/2017**	**8/10/2017**	**8/10/2017**	**8/10/2017**
	Depth	**0–1.9 ft**	**1.9–3.75 ft**	**3.75–4.6 ft**	**0.3-0.7 ft**	**0.7-1 ft**	**1.7-2.3 ft**	**2-2.9 ft**
	Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**
	X	**1079571.097**	**1079571.097**	**1079571.097**	**1081852.559**	**1081852.559**	**1081852.559**	**1081852.559**
	Y	**85744.088**	**85744.088**	**85744.088**	**84302.015**	**84302.015**	**84302.015**	**84302.015**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	**388 J**	**7.42 J**	0.0702 U	**513 J**	**255 J**	--	0.117 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	**505**	**7.22 J**	0.0797 U	**645**	**257**	--	0.154 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**2,340**	**7.73 J**	0.0952 U	**2,950**	**1,860**	--	**0.282 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**20,900**	**17.8**	**2.48**	**21,000**	**11,600**	--	**1.46 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	**11.3**	**0.733**	0.0683 U	**12**	**8.58**	--	0.118 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	**12.5**	0.336 U	0.0499 U	**16.1**	**11.6**	--	0.0838 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	**45.3**	0.343 U	0.0547 U	**49.5**	**27.3**	--	0.0925 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**150**	0.363 U	0.0835 U	**217**	**176**	--	0.0701 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**51.7**	0.367 U	0.0729 U	**64.1**	**40.5**	--	0.0672 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	**9.45**	0.467 U	0.0996 U	**12.1**	**7.98**	--	0.13 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**103**	0.36 U	0.078 U	**112**	**76.6**	--	0.0724 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	**4,170**	**2.57 J**	**0.418 J**	**4,770**	**3250**	--	0.209 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	**170**	0.392 U	0.0923 U	**237**	**159**	--	0.113 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	**13,800 J**	**7.36**	**0.976 J**	**18,900 J**	**9,430 J**	--	0.436 U
Total Tetrachlorodibenzofuran (TCDF)	E1613B	**380 J**	**12.2 J**	0.0683 U	**315 J**	**294 J**	--	0.118 U
Total Pentachlorodibenzofuran (PeCDF)	E1613B	**814**	0.34 U	0.0522 U	**743 J**	**765 J**	--	0.088 U
Total Hexachlorodibenzofuran (HxCDF)	E1613B	**4,550**	**2.64 J**	**0.305 J**	**5,530**	**4,030**	--	0.0815 U
Total Heptachlorodibenzofuran (HpCDF)	E1613B	**17,000**	**8.34**	**1.3**	**22,000**	**12,900**	--	**0.578 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)		**305.52 J**	**0.704808 J**	**0.1366168 J**	**309.503 J**	**185.053 J**	--	0.154 U
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**305.52 J**	**0.307908 J**	**0.0178418 J**	**309.503 J**	**185.053 J**	--	0.154 U

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	SH-19-170809	SH-19-170809	SH-19-170809	SH-19-170809	SH-22-170809	SH-22-170809	SH-22-170809
	Sample ID	SH-19-10-20-170810	SH-19-20-30-170810	SH-19-GEO-28-46-170810	SH-19-GEO-60-90-170810	SH-22-10-20-170809	SH-22-20-30-170809	SH-22-GEO-3.1-4.2-170809
	Sample Date	8/10/2017	8/10/2017	8/10/2017	8/10/2017	8/9/2017	8/9/2017	8/9/2017
	Depth	0.3-0.7 ft	0.7-1 ft	0.9-1.5 ft	2-3 ft	0.3-0.7 ft	0.7-1 ft	3.1–4.2 ft
	Sample Type	N	N	N	N	N	N	N
	X	1078962.382	1078962.382	1078962.382	1078962.382	1080337.853	1080337.853	1080337.853
	Y	84090.036	84090.036	84090.036	84090.036	84082.176	84082.176	84082.176
Conventional Parameters (pct)								
Total volatile solids	D2974	--	--	**3.46**	--	--	--	**5.65**
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene	SW8270DSIM	**33**	**24 J**	--	--	**40**	**70**	--
Acenaphthene	SW8270DSIM	**36**	**30**	--	--	**52**	**48**	--
Acenaphthylene	SW8270DSIM	**49**	**25**	--	--	**27**	**62**	--
Anthracene	SW8270DSIM	**82**	**48**	--	--	**61**	**66**	--
Benzo(a)anthracene	SW8270DSIM	**73 J**	**39 J**	--	--	**82**	**63**	--
Benzo(a)pyrene	SW8270DSIM	**87**	**44 J**	--	--	**100**	**110**	--
Benzo(b,j)fluoranthene	SW8270DSIM	**100**	**47 J**	--	--	**100**	**66**	--
Benzo(e)pyrene	SW8270DSIM	**72**	**34 J**	--	--	**110**	**120**	--
Benzo(g,h,i)perylene	SW8270DSIM	**92**	**48 J**	--	--	**85**	**110**	--
Benzo(k)fluoranthene	SW8270DSIM	**34**	**15**	--	--	**39**	**20**	--
Chrysene	SW8270DSIM	**100**	**48**	--	--	**260**	**110**	--
Dibenzo(a,h)anthracene	SW8270DSIM	**7.4**	**3.7**	--	--	**18**	**20 J**	--
Fluoranthene	SW8270DSIM	**580**	**290 J**	--	--	**320**	**340**	--
Fluorene	SW8270DSIM	**44**	**31**	--	--	**55**	**57**	--
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	**56**	**29**	--	--	**42**	**44**	--
Naphthalene	SW8270DSIM	**350**	**200 J**	--	--	**350**	**830**	--
Perylene	SW8270DSIM	**47**	**90 J**	--	--	**96**	**140**	--
Phenanthrene	SW8270DSIM	**480**	**250 J**	--	--	**270**	**410**	--
Pyrene	SW8270DSIM	**750**	**350 J**	--	--	**310**	**330**	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)		**115.04 J**	**57.85 J**	--	--	**130.7**	**132.4 J**	--
Total Benzofluoranthenes (b,j,k) (U = 0)		**34**	**15**	--	--	**39**	**20**	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)		**115.04 J**	**57.85 J**	--	--	**130.7**	**132.4 J**	--
Total HPAH (SMS) (U = 0)		**1,879.4 J**	**913.7 J**	--	--	**1356**	**1213 J**	--
Total LPAH (SMS) (U = 0)		**1041**	**584 J**	--	--	**815**	**1473**	--
Dioxin Furans (ng/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	**3.44**	**2.19**	--	0.128 U	**1.34**	**2.42**	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	**9.79**	**6.27**	--	0.108 U	**5.82**	**13.7**	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**12.7**	**8**	--	0.0891 U	**11.4**	**23.8**	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**43.4**	**23.2**	--	0.0904 U	**87.7**	**269**	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**17.7**	**11.8**	--	0.101 U	**22.3**	**58.1**	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**730**	**331**	--	1.1 U	**2490**	**7,650 J**	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	**6,180**	**2240**	--	8.51 U	**20,400 J**	**62,700 J**	--

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	SH-19-170809	SH-19-170809	SH-19-170809	SH-19-170809	SH-22-170809	SH-22-170809	SH-22-170809
	Sample ID	SH-19-10-20-170810	SH-19-20-30-170810	SH-19-GEO-28-46-170810	SH-19-GEO-60-90-170810	SH-22-10-20-170809	SH-22-20-30-170809	SH-22-GEO-3.1-4.2-170809
	Sample Date	8/10/2017	8/10/2017	8/10/2017	8/10/2017	8/9/2017	8/9/2017	8/9/2017
	Depth	0.3-0.7 ft	0.7-1 ft	0.9-1.5 ft	2-3 ft	0.3-0.7 ft	0.7-1 ft	3.1–4.2 ft
	Sample Type	N	N	N	N	N	N	N
	X	1078962.382	1078962.382	1078962.382	1078962.382	1080337.853	1080337.853	1080337.853
	Y	84090.036	84090.036	84090.036	84090.036	84082.176	84082.176	84082.176
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	**465 J**	**356 J**	--	**0.179 J**	**217 J**	**294 J**	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	**511 J**	**389 J**	--	0.108 U	**249**	**328**	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**690**	**499**	--	**0.588**	**860**	**1,770**	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**1630**	**763**	--	**2.78 J**	**6,960**	**17,900**	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	**17.6**	**10.2**	--	0.0756 U	**5.9**	**9.69**	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	**11.3**	**6.12**	--	0.104 U	**6.76**	**14.5**	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	**19.5**	**10.4**	--	0.0827 U	**21.7**	**50.8**	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**23.3**	**11.5**	--	0.0475 U	**63**	**208**	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**11.7**	**6.38**	--	0.0435 U	**17.8**	**53.9**	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	**1.82 J**	**1.05 J**	--	0.0788 U	**4.28**	**13.5**	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	**16.5**	**8.35**	--	0.0488 U	**29**	**93.7**	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	**296**	**129**	--	0.262 U	**778**	**3,180**	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	**16.3**	**7.31**	--	0.0982 U	**45.5**	**182**	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	**861**	**310**	--	**0.928 J**	**2,990**	**11,900 J**	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	**358 J**	**206 J**	--	0.0756 U	**119 J**	**250 J**	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	**226 J**	**123 J**	--	**0.199 J**	**242 J**	**639 J**	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	**417 J**	**199**	--	**0.185 J**	**1,120**	**4,040**	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	**1090**	**444**	--	**0.915 J**	**3,380**	**14,300**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)		**46.4263 J**	**25.2497 J**	--	**0.1695559 J**	**78.1628 J**	**237.264 J**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**46.4263 J**	**25.2497 J**	--	**0.0002784 J**	**78.1628 J**	**237.264 J**	--

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	SH-22-170809	SPI-22A-170810	SPI-31-170809	SPI-31-170809	SPI-131-170809
	Sample ID	SH-22-GEO-60-90-170810	SPI-22A-SC-6.7-7.6-170810	SPI-31-SC-3-5-170809	SPI-31-SC-5-7-170809	SPI-131-SC-5-7-170809
	Sample Date	8/9/2017	8/10/2017	8/9/2017	8/9/2017	8/9/2017
	Depth	2-3 ft	6.7–7.6 ft	3–5 ft	5–7 ft	5–7 ft
	Sample Type	N	N	N	N	FD
	X	1080337.853	1080479.550	1081265.397	1081265.397	1081265.397
	Y	84082.176	83563.844	83607.691	83607.691	83607.691
Conventional Parameters (pct)						
Total volatile solids	D2974	--	**5.2**	**5.38**	**6.32**	**6.08**
Polycyclic Aromatic Hydrocarbons (µg/kg)						
2-Methylnaphthalene	SW8270DSIM	--	--	--	--	--
Acenaphthene	SW8270DSIM	--	--	--	--	--
Acenaphthylene	SW8270DSIM	--	--	--	--	--
Anthracene	SW8270DSIM	--	--	--	--	--
Benzo(a)anthracene	SW8270DSIM	--	--	--	--	--
Benzo(a)pyrene	SW8270DSIM	--	--	--	--	--
Benzo(b,j)fluoranthene	SW8270DSIM	--	--	--	--	--
Benzo(e)pyrene	SW8270DSIM	--	--	--	--	--
Benzo(g,h,i)perylene	SW8270DSIM	--	--	--	--	--
Benzo(k)fluoranthene	SW8270DSIM	--	--	--	--	--
Chrysene	SW8270DSIM	--	--	--	--	--
Dibenzo(a,h)anthracene	SW8270DSIM	--	--	--	--	--
Fluoranthene	SW8270DSIM	--	--	--	--	--
Fluorene	SW8270DSIM	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	SW8270DSIM	--	--	--	--	--
Naphthalene	SW8270DSIM	--	--	--	--	--
Perylene	SW8270DSIM	--	--	--	--	--
Phenanthrene	SW8270DSIM	--	--	--	--	--
Pyrene	SW8270DSIM	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)		--	--	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)		--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)		--	--	--	--	--
Total HPAH (SMS) (U = 0)		--	--	--	--	--
Total LPAH (SMS) (U = 0)		--	--	--	--	--
Dioxin Furans (ng/kg)						
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	0.145 U	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	0.322 U	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	0.206 U	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	0.193 U	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	0.224 U	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**6.33**	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613B	**50.2**	--	--	--	--

Table 4
Subsurface Bulk Sediment Results

	Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
	Location ID	SH-22-170809	SPI-22A-170810	SPI-31-170809	SPI-31-170809	SPI-131-170809
	Sample ID	SH-22-GEO-60-90-170810	SPI-22A-SC-6.7-7.6-170810	SPI-31-SC-3-5-170809	SPI-31-SC-5-7-170809	SPI-131-SC-5-7-170809
	Sample Date	8/9/2017	8/10/2017	8/9/2017	8/9/2017	8/9/2017
	Depth	2-3 ft	6.7–7.6 ft	3–5 ft	5–7 ft	5–7 ft
	Sample Type	N	N	N	N	FD
	X	1080337.853	1080479.550	1081265.397	1081265.397	1081265.397
	Y	84082.176	83563.844	83607.691	83607.691	83607.691
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613B	**4.62 J**	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613B	**3.56 J**	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613B	**6.47 J**	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613B	**15.8**	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613B	0.366 U	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	**0.187 J**	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613B	0.11 U	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	0.187 U	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	0.164 U	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613B	0.338 U	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613B	0.199 U	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613B	**3.67**	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613B	0.541 U	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	E1613B	**9.68 J**	--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	E1613B	**2.37**	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	E1613B	**1.29 J**	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	E1613B	**4.39 J**	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	E1613B	**13.6**	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)		**0.470129 J**	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**0.123574 J**	--	--	--	--

Table 4
Subsurface Bulk Sediment Results

Notes:
Bold: detected result
µg/kg: micrograms per kilogram
CAEPA: California EPA
cPAH: carcinogenic polycyclic aromatic hydrocarbons
FD: field duplicate
J: estimated value
HPAH: high-molecular-volumen polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
N: normal sample
ng/kg: nanograms per kilogram
pct: percent
TEQ: Toxic Equivalence Quotient
U: compound analyzed, but not detected above detection limit
UJ: compound analyzed, but not detected above estimated detection limit

Appendix F

Simpson 2018 PDI Chemical Data

Table A-1
As-Collected PDI Stations and Testing Parameters

Station	Date	X	Y	Estimated Elevation	Replicate	Dioxin/Furan	TBT/TOC/Cu	Porewater Hydrogen Sulfide	Archive
SMA1									
PDI-SMA1-SG01	4/25/2018	996619.831	695940.295	-1.9	--	X	--	--	--
PDI-SMA1-SG02	4/25/2018	996755.765	696003.341	2.2	--	X	--	--	--
PDI-SMA1-SG03	4/25/2018	996890.457	696066.43	2.3	--	X	--	--	--
PDI-SMA1-SG04	4/25/2018	996950.435	695936.733	3.1	--	X	--	--	--
PDI-SMA1-SG05	4/25/2018	997018.1	695801.31	3.9	--	X	--	--	--
PDI-SMA1-SG06	4/25/2018	996882.773	695731.551	1.9	--	X	--	--	--
PDI-SMA1-SG07	4/25/2018	996747.999	695666.032	-0.4	X	X	--	--	--
PDI-SMA1-SG1007	4/25/2018	996742.677	695668.032	-0.5					
PDI-SMA1-SG2007	4/25/2018	996746.957	695672.149	-0.3					
PDI-SMA1-SG08	4/25/2018	996682.919	695804.413	-1.2	--	X	--	--	--
PDI-SMA1-SG09	4/25/2018	996687.215	696136.97	3.9	--	X	--	--	--
PDI-SMA1-SG10	4/25/2018	997025.861	696138.619	0.2	--	X	--	--	--
PDI-SMA1-SG11	4/25/2018	997089.167	695996.649	0.6	--	X	--	--	--
PDI-SMA1-SG12	4/25/2018	997155.176	695861.281	2.2	--	X	--	--	--
PDI-SMA1-SG13	4/25/2018	997082.534	695668.426	1.3	--	X	--	--	--
PDI-SMA1-SG14	4/25/2018	996953.062	695600.299	0.3	--	X	--	--	--
PDI-SMA1-SG15	4/25/2018	996812.058	695534.377	1.4	--	X	--	--	--
PDI-SMA1-SG16	4/25/2018	996610.112	695606.699	1.2	--	X	--	--	--
PDI-SMA1-SG17	4/25/2018	996551.123	695741.231	-1.4	--	X	--	--	--
PDI-SMA1-SG18	4/25/2018	996483.007	695875.454	-4.0	--	X	--	--	--
PDI-SMA1-SG19	4/25/2018	996553.491	696078.109	-0.6	--	X	--	--	--
PDI-SMA1-SG20	4/25/2018	996419.366	696007.097	22.5	--	X	--	--	--
SMA2									
PDI-SMA2-SG01	4/27/2018	997351.751	696303.863	8.2	--	--	X	--	X
PDI-SMA2-SG02	4/30/2018	997437.526	696294.191	3.2	--	X	X	--	--
PDI-SMA2-SG03	4/27/2018	997503.611	696266.504	3.0	--	X	X	--	--
PDI-SMA2-SG04[a]	4/27/2018	997342.032	696271.649	7.1	--	--	X	--	X
PDI-SMA2-SG04-C1	4/24/2018	997330.903	696280.175	8.4	na	na	na	na	na
PDI-SMA2-SG04-C2	4/24/2018	997348.776	696275.198	6.7					
PDI-SMA2-SG04-C3	4/24/2018	997360.871	696275.418	5.8					
PDI-SMA2-SG04-C4	4/24/2018	997328.973	696268.056	7.9					
PDI-SMA2-SG04-C5	4/24/2018	997343.391	696263.272	6.4					
PDI-SMA2-SG04-C6	4/24/2018	997355.884	696261.824	5.3					
PDI-SMA2-SG05	4/24/2018	997335.904	696251.542	5.5	--	--	X	--	X
PDI-SMA2-SG06	4/30/2018	997405.082	696219.846	2.6	--	X	X	--	--
PDI-SMA2-SG07	4/30/2018	997487.7	696194.012	1.2	--	X	X	--	--
PDI-SMA2-SG08	4/27/2018	997444.248	696333.293	4.6	--	--	--	--	X
PDI-SMA2-SG09	4/27/2018	997516.486	696324.236	1.5	--	--	--	--	X
PDI-SMA2-SG10	4/30/2018	997591.469	696236.832	2.2	--	--	--	--	X
PDI-SMA2-SG11	4/30/2018	997575.394	696214.247	1.1	--	--	--	--	X
PDI-SMA2-SG12	4/30/2018	997557.979	696138.182	0.0	--	--	--	--	X
PDI-SMA2-SG13	4/30/2018	997475.68	696156.088	1.0	--	X	X	--	--
PDI-SMA2-SG14	4/30/2018	997402.883	696173.075	1.8	--	--	--	--	X
PDI-SMA2-SG15	4/27/2018	997322.776	696194.002	4.3	--	--	--	--	X
SMA3									
PDI-SMA3-OG01	5/2/2018	995842.972	693659.884	8.7	--	X	--	--	--
PDI-SMA3-SG01	4/26/2018	995703.931	694164.595	-9.1	--	X	--	--	--
PDI-SMA3-SG02	4/26/2018	995910.095	694106.722	-5.3	--	X	--	--	--
PDI-SMA3-SG03	4/26/2018	996110.857	694048.42	-4.2	--	X	--	X	--
PDI-SMA3-SG04	4/26/2018	996185.782	693919.446	-1.9	X	X	--	--	--
PDI-SMA3-SG1004	4/26/2018	996184.854	693916.436	-1.9					
PDI-SMA3-SG2004	4/26/2018	996188.995	693916.3	-1.9					
PDI-SMA3-SG05	4/26/2018	996258.992	693788.704	-5.9	--	X	--	X	--
PDI-SMA3-SG06	4/26/2018	996332.697	693660.38	10.8	--	X	--	--	--
PDI-SMA3-SG07	4/26/2018	995776.783	694035.687	0.2	--	--	--	X	X
PDI-SMA3-SG08	4/26/2018	995978.848	693979.166	1.2	--	--	--	X	X
PDI-SMA3-SG09	4/26/2018	996054.755	693842.253	4.7	--	--	--	--	X
PDI-SMA3-SG10	4/26/2018	996126.702	693710.944	-0.3	--	--	--	X	X
PDI-SMA3-SG11	4/26/2018	996463.525	693731.499	-6.9	--	--	--	--	X
PDI-SMA3-SG12	4/26/2018	996392.264	693858.527	-6.1	--	--	--	X	X
PDI-SMA3-SG13	4/26/2018	996317.023	693990.551	-4.5	--	--	--	--	X
PDI-SMA3-SG14	4/26/2018	996243.814	694121.293	-6.8	--	--	--	X	X
PDI-SMA3-SG15	4/26/2018	996169.917	694256.315	-7.6	--	--	--	--	X
PDI-SMA3-SG16	4/26/2018	996039.465	694183.969	-8.4	--	--	--	--	X
PDI-SMA3-SG17	4/26/2018	995968.603	694310.377	-8.7	--	--	--	--	X
PDI-SMA3-SG18	4/26/2018	995836.08	694238.1	-10.3	--	--	--	X	X
PDI-SMA3-SG19	4/26/2018	995894.983	694441.133	-7.8	--	--	--	X	X
PDI-SMA3-SG20	4/26/2018	995632.856	694297.093	19.1	--	--	--	--	X
PDI-SMA3-DGT01	4/30/2018	995749.471	693938.622	6.2	--	--	--	X	--
PDI-SMA3-DGT02	4/26/2018	995755.822	693967.201	2.9	--	--	--	X	--
PDI-SMA3-DGT03	4/26/2018	995922.007	693934.388	12.6	--	--	--	X	--
PDI-SMA3-DGT04	4/26/2018	995949.529	693956.616	5.6	--	--	--	X	--
PDI-SMA3-DGT05	4/26/2018	996082.104	693691.99	8.1	--	--	--	X	--
PDI-SMA3-DGT06	4/26/2018	996103.581	693703.613	4.6	--	--	--	X	--

Notes:
Horizontal datum is Washington State Plane South North American Datum 1983 US feet
Elevation is mean lower low water (feet)
a. centroid of six point composite (C1 to C6)
Cu: copper
na: not applicable
PDI: pre-remedial design investigation
SMA: sediment management area
TOC: total organic carbon
TBT: tributyl tin

Table A-2
Summary of Sediment Matrix and Observations

Station ID	Sediment Matrix	H_2S Odor Present?	Wood Present?	Comments
SMA1				
SMA1-SG01	sandy silt	No	Yes	Trace organic material – stick and twigs
SMA1-SG02	sandy silt	No	Yes	Trace wood
SMA1-SG03	sandy silt	No	Yes	Abundant organic material – wood and leaves
SMA1-SG04	sandy silt	Yes	Yes	Substantial wood
SMA1-SG05	sandy silt	Yes	Yes	Abundant wood
SMA1-SG06	sandy silt	No	Yes	Trace wood
SMA1-SG07	sandy silt	No	Yes	Trace wood
SMA1-SG08	sandy silt	No	Yes	Trace wood
SMA1-SG09	silty sand	No	No	--
SMA1-SG10	sandy silt	No	No	--
SMA1-SG11	sandy silt	No	Yes	Trace organic material – leaves and twigs
SMA1-SG12	sandy silt	No	Yes	Moderate wood
SMA1-SG13	silt	Yes	Yes	Abundant wood
SMA1-SG14	sandy silt	Yes	Yes	Abundant wood
SMA1-SG15	sandy silt	No	Yes	Trace wood
SMA1-SG16	sandy silt	No	Yes	Moderate woody
SMA1-SG17	sandy silt	No	Yes	Trace woody
SMA1-SG18	sandy silt	No	Yes	Trace organic material – leaves and twigs
SMA1-SG19	sandy silt	No	No	Trace organic material – leaves
SMA1-SG20	sandy silt	No	Yes	Trace organic material – sticks, leaves, and twigs
SMA2				
SMA2-SG01	gravely sand	No	No	--
SMA2-SG02	silt	No	No	--
SMA2-SG03	silt	No	No	--
SMA2-SG04	sand	No	No	--
SMA2-SG05	sandy silt	No	No	--
SMA2-SG06	silt	No	No	--
SMA2-SG07	silt	No	No	--
SMA2-SG08	silt	No	No	--
SMA2-SG09	silt	No	No	--
SMA2-SG10	silt	No	No	--
SMA2-SG11	silt	No	No	--
SMA2-SG12	sandy silt	No	No	--
SMA2-SG13	silt	No	No	--
SMA2-SG14	silt	No	No	--
SMA2-SG15	silt	No	No	Trace organic material

Table A-2
Summary of Sediment Matrix and Observations

Station ID	Sediment Matrix	H_2S Odor Present?	Wood Present?	Comments
SMA3				
SMA3-0G01	silty sand	No	No	--
SMA3-SG01	sandy silt	No	No	--
SMA3-SG02	silt	No	No	--
SMA3-SG03	silt	No	No	--
SMA3-SG04	sandy silt	No	No	--
SMA3-SG05	silt	No	No	--
SMA3-SG06	sandy silt	No	Yes	Trace wood
SMA3-SG07	sandy silt	No	No	--
SMA3-SG08	sandy silt	No	No	--
SMA3-SG09	silty sand	No	No	--
SMA3-SG10	silt	No	No	--
SMA3-SG11	sandy silt	No	Yes	Trace wood
SMA3-SG12	sandy silt	No	No	--
SMA3-SG13	sandy silt	No	No	--
SMA3-SG14	sandy silt	No	No	--
SMA3-SG15	silt	No	Yes	Trace organic material – roots and sticks
SMA3-SG16	sandy silt	No	No	--
SMA3-SG17	sandy silt	No	No	--
SMA3-SG18	sandy silt	No	Yes	Trace wood
SMA3-SG19	sandy silt	No	No	--
SMA3-SG20	sandy silt	No	No	--

Note:

H_2S: hydrogen sulfide

Table A-3
SMA-1 PDI Sediment Results

Task		**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**
Location ID		**PDI-SMA1-SG01-180425**	**PDI-SMA1-SG02-180425**	**PDI-SMA1-SG03-180425**	**PDI-SMA1-SG04-180425**	**PDI-SMA1-SG05-180425**	**PDI-SMA1-SG06-180425**	**PDI-SMA1-SG07-180425**	**PDI-SMA1-SG1007-1804**	**PDI-SMA1-SG2007-1804**
Sample ID		**PDI-SMA1-SG01-180425**	**PDI-SMA1-SG02-180425**	**PDI-SMA1-SG03-180425**	**PDI-SMA1-SG04-180425**	**PDI-SMA1-SG05-180425**	**PDI-SMA1-SG06-180425**	**PDI-SMA1-SG07-180425**	**PDI-SMA1-SG1007-180425**	**PDI-SMA1-SG2007-180425**
Sample Date		**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**
Depth		**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**
Sample Type		**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Matrix		**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
X		**996619.831**	**996755.765**	**996890.457**	**996950.435**	**997018.1**	**996882.773**	**996747.999**	**996742.677**	**996746.957**
Y		**695940.295**	**696003.341**	**696066.43**	**695936.733**	**695801.31**	**695731.551**	**695666.032**	**695668.032**	**695672.149**
	RAL									
Dioxin Furans (ng/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		**1.57 J**	**1.92 J**	**3.38 J**	**6.24**	**5.11**	**2.46 J**	0.273 U	**0.317 J**	**0.309 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)		**8.84 J**	**8.43 J**	**20.1 J**	**30.4**	**25.4**	**10.6 J**	**0.269 J**	**0.441 J**	0.333 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**16.2 J**	**15.8 J**	**33.9**	**53.9**	**48.2**	**16.9 J**	**0.517 J**	**0.612 J**	**0.6 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**54.3**	**62.2**	**122**	**233**	**132**	**59.1**	**1.33 J**	**1.63 J**	**1.31 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		**28.9**	**27.2**	**54.3**	**100**	**80.1**	**32.7**	0.792 U	1.22 U	0.945 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		**1250**	**1150**	**2220**	**5720**	**1760**	**891**	**26.2**	**37.7**	**29.9**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		**13400**	**10100**	**18400**	**48200**	**12100**	**7090**	**217**	**321**	**274**
Total Tetrachlorodibenzo-p-dioxin (TCDD)		**604 J**	**514 J**	**1370 J**	**2750 J**	**2210 J**	**754 J**	**12.5 J**	**9.9 J**	**13.8 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)		**591 J**	**612 J**	**1370 J**	**2180 J**	**2550 J**	**771 J**	**10.9 J**	**14.5 J**	**11.9 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)		**1050**	**1020**	**2140**	**2740**	**3420**	**1350 J**	**25.8 J**	**32.6 J**	**25.8 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)		**3200**	**2930**	**5480**	**12500**	**4310**	**2140**	**62.8 J**	**89.6**	**74.1**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		**4.33 J**	**4.3 J**	**8.26**	**11.3**	**13.3**	**6**	0.252 U	0.255 U	0.256 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		**4.03 J**	**4.66 J**	**8.63 J**	**12.8 J**	**11.8 J**	**4.76 J**	0.252 U	0.255 U	0.346 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)		**6.65 J**	**6.25 J**	**14.3 J**	**31.9**	**15.9 J**	**7.54 J**	0.252 U	**0.288 J**	0.346 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		**28.8**	**30**	**51.7**	**155**	**42.4**	**21.2 J**	**0.874 J**	**0.782 J**	**0.741 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		**10.8 J**	**11.8 J**	**20.4 J**	**46.8**	**21.7 J**	**10.4 J**	**0.349 J**	**0.356 J**	**0.419 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		**1.08 J**	**0.96 J**	**1.71 J**	**2.72 J**	**2.03 J**	**1.44 J**	0.252 U	0.347 U	0.256 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		**8.22 J**	**9.38 J**	**17.2 J**	**33.3**	**16.7 J**	**7.62 J**	**0.268 J**	0.347 U	0.256 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		**367**	**352**	**660**	**1800**	**433**	**238**	**8.18 J**	**15.2 J**	**9.82 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		**22.7 J**	**22.5 J**	**31**	**72.2**	**24 J**	**13.8 J**	**0.49 J**	**0.677 J**	**0.804 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		**1360**	**1070**	**1670**	**5590**	**1060**	**724**	**22.3 J**	**40.2 J**	**29.5 J**
Total Tetrachlorodibenzofuran (TCDF)		**101 J**	**108 J**	**223 J**	**313 J**	**309 J**	**140 J**	**2.28 J**	**1.83 J**	**3.61 J**
Total Pentachlorodibenzofuran (PeCDF)		**143 J**	**157 J**	**324 J**	**658 J**	**317 J**	**159 J**	**2.31 J**	**4.36 J**	**3.24 J**
Total Hexachlorodibenzofuran (HxCDF)		**497 J**	**562 J**	**1000 J**	**2310 J**	**670 J**	**377 J**	**9.73 J**	**15.5 J**	**12.8 J**
Total Heptachlorodibenzofuran (HpCDF)		**1490 J**	**1360 J**	**2390**	**6760**	**1480**	**934**	**26.3 J**	**52 J**	**34.7**
Dioxin Furans (ng/kg)										
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**48.6139 J**	**47.1248 J**	**94.1069 J**	**202.255 J**	**97.395 J**	**44.773 J**	**1.02329 J**	**1.82653 J**	**1.11229 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	*	**48.6139 J**	**47.1248 J**	**94.1069 J**	**202.255 J**	**97.395 J**	**44.773 J**	**1.26617 J**	**1.938805 J**	**1.42153 J**

Notes:
Bold: detected result
*Surface-weighted average concentration RAL (42 ng/kg TEQ)
cm: centimeter
FD: field duplicate
J: estimated value
N: normal sample
ng/kg: nanograms per kilogram
PDI: pre-remedial design investigation
RAL: Remedial Action Level
SE: sediment matrix
SMA: sediment management area
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-3
SMA-1 PDI Sediment Results

Task		SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018
Location ID		PDI-SMA1-SG08-180425	PDI-SMA1-SG08-180425	PDI-SMA1-SG09-180425	PDI-SMA1-SG10-180425	PDI-SMA1-SG11-180425	PDI-SMA1-SG11-180425	PDI-SMA1-SG12-180425	PDI-SMA1-SG13-180425	PDI-SMA1-SG14-180425
Sample ID		PDI-SMA1-SG08-180425	PDI-SMA1-SG108-180425	PDI-SMA1-SG09-180425	PDI-SMA1-SG10-180425	PDI-SMA1-SG111-180425	PDI-SMA1-SG11-180425	PDI-SMA1-SG12-180425	PDI-SMA1-SG13-180425	PDI-SMA1-SG14-180425
Sample Date		4/25/2018	4/25/2018	4/25/2018	4/25/2018	4/25/2018	4/25/2018	4/25/2018	4/25/2018	4/25/2018
Depth		0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type		N	FD	N	N	FD	N	N	N	N
Matrix		SE	SE	SE	SE	SE	SE	SE	SE	SE
X		996682.919	996682.919	996687.215	997025.861	997089.167	997089.167	997155.177	997082.534	996953.062
Y		695804.413	695804.413	696136.97	696138.619	695996.649	695996.649	695861.281	695668.426	695600.299
	RAL									
Dioxin Furans (ng/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		**1.84 J**	**1.85 J**	**0.539 J**	**2.27 J**	**1.85 J**	**2.46 J**	**1.58 J**	**2.87 J**	**0.581 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)		**8.72 J**	**7.5 J**	**1.17 J**	**11.4 J**	**11.5 J**	**12.4 J**	**6.77 J**	**8.33 J**	**2.79 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**16.5 J**	**14.4 J**	**2.04 J**	**22.9 J**	**24.1**	**22.4 J**	**13.7 J**	**7.18 J**	**8.1 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**61.8**	**51.9**	**5.86 J**	**66.8**	**69.1**	**71.2**	**45.5**	**21.7 J**	**181**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		**37.3 J**	**26.8**	**3.12 J**	**36.5**	**43.9**	**39.4**	**22.3 J**	**12.3 J**	**17.8 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		**1130**	**1100**	**112**	**1170**	**1160**	**1270**	**930**	**283**	**5730**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		**11000**	**10600**	**896**	**9460**	**9140**	**9660**	**7200**	**1970**	**42600**
Total Tetrachlorodibenzo-p-dioxin (TCDD)		**678 J**	**521 J**	**44.6 J**	**921 J**	**1090 J**	**1490 J**	**542 J**	**313 J**	**135 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)		**703 J**	**535 J**	**50 J**	**915 J**	**1020 J**	**1260**	**528 J**	**298 J**	**126 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)		**1340**	**976**	**88.8**	**1410**	**1580**	**1560**	**971**	**411**	**675**
Total Heptachlorodibenzo-p-dioxin (HpCDD)		**2750**	**2810**	**233**	**2900**	**2860**	**3160**	**3210**	**650**	**9580**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		**4.1 J**	**4.66 J**	**0.711 J**	**5.07**	**6.93**	**6.14**	**3.91 J**	**9.31**	**5.22**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		**3.77 J**	**3.7 J**	**0.773 J**	**4.85 J**	**6.93 J**	**6.39 J**	**4.4 J**	**6.52 J**	**12.2 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)		**5.47 J**	**5.46 J**	**0.808 J**	**6.8 J**	**8.73 J**	**9.29 J**	**5.78 J**	**9.09 J**	**35.5**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		**25.3**	**25**	**3.01 J**	**29.8**	**30.5**	**31.1**	**21.1 J**	**11.3 J**	**210**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		**10.4 J**	**9.71 J**	**1.35 J**	**12.8 J**	**13.1 J**	**14.1 J**	**8.7 J**	**7.9 J**	**40.1**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		**0.844 J**	**1.14 J**	0.246 U	**1.02 J**	**1.18 J**	**1.37 J**	**0.898 J**	**0.965 J**	**4.2 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		**7.46 J**	**8.06 J**	**1.14 J**	**9.98 J**	**10.2 J**	**10.8 J**	**6.68 J**	**7.04 J**	**17.6 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		**334**	**338**	**32.8**	**328**	**353**	**370**	**229**	**109**	**2360**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		**18.5 J**	**25**	**2.31 J**	**19.7 J**	**20.5 J**	**20.5 J**	**13.4 J**	**5.33 J**	**159**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		**1160**	**1030**	**106**	**942**	**944**	**973**	**552**	**247**	**17100**
Total Tetrachlorodibenzofuran (TCDF)		**95.4 J**	**94.7 J**	**15.1 J**	**123 J**	**162 J**	**158 J**	**95.4 J**	**272 J**	**46.8 J**
Total Pentachlorodibenzofuran (PeCDF)		**129 J**	**135 J**	**16.8 J**	**165 J**	**193 J**	**207 J**	**137 J**	**263 J**	**399 J**
Total Hexachlorodibenzofuran (HxCDF)		**437 J**	**454 J**	**50.2 J**	**478 J**	**504 J**	**519 J**	**349 J**	**215 J**	**3150**
Total Heptachlorodibenzofuran (HpCDF)		**1310**	**1300**	**128 J**	**1230 J**	**1260**	**1330**	**836**	**342 J**	**16300**
Dioxin Furans (ng/kg)										
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**47.1575 J**	**43.385 J**	**5.46939 J**	**52.6401 J**	**54.4381 J**	**57.2846 J**	**36.5444 J**	**26.5305 J**	**163.189 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	*	**47.1575 J**	**43.385 J**	**5.48169 J**	**52.6401 J**	**54.4381 J**	**57.2846 J**	**36.5444 J**	**26.5305 J**	**163.189 J**

Notes:
Bold: detected result
*Surface-weighted average concentration RAL (42 ng/kg TEQ)
cm: centimeter
FD: field duplicate
J: estimated value
N: normal sample
ng/kg: nanograms per kilogram
PDI: pre-remedial design investigation
RAL: Remedial Action Level
SE: sediment matrix
SMA: sediment management area
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-3
SMA-1 PDI Sediment Results

	RAL						
Task		**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**	**SheltonRI_FS_2018**
Location ID		**PDI-SMA1-SG15-180425**	**PDI-SMA1-SG16-180425**	**PDI-SMA1-SG17-180425**	**PDI-SMA1-SG18-180425**	**PDI-SMA1-SG19-180425**	**PDI-SMA1-SG20-180425**
Sample ID		**PDI-SMA1-SG15-180425**	**PDI-SMA1-SG16-180425**	**PDI-SMA1-SG17-180425**	**PDI-SMA1-SG18-180425**	**PDI-SMA1-SG19-180425**	**PDI-SMA1-SG20-180425**
Sample Date		**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**	**4/25/2018**
Depth		**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**
Sample Type		**N**	**N**	**N**	**N**	**N**	**N**
Matrix		**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
X		**996812.058**	**996610.112**	**996551.123**	**996483.007**	**996553.49**	**996419.366**
Y		**695534.376**	**695606.699**	**695741.231**	**695875.454**	**696078.109**	**696007.097**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		**0.284 J**	0.625 U	**1.61 J**	**1.55 J**	**2.42 J**	**2.13 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)		**0.392 J**	**1.32 J**	**6.52 J**	**7.56 J**	**9.66 J**	**9.6 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**0.605 J**	**3.34 J**	**13.5 J**	**14.7 J**	**18.3 J**	**16.6 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**1.92 J**	**11.3 J**	**64**	**53.3**	**62.2**	**55.3**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		**1.06 J**	**5.55 J**	**23.2 J**	**28.6**	**34.8**	**28.7**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		**35.7**	**260**	**1530**	**1150**	**1240**	**1190**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		**317**	**3130**	**14000**	**13800**	**12900**	**14300**
Total Tetrachlorodibenzo-p-dioxin (TCDD)		**11.7 J**	**63.8 J**	**285 J**	**467 J**	**599 J**	**504 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)		**14.3 J**	**82 J**	**316 J**	**522 J**	**690 J**	**537 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)		**35.9 J**	**186 J**	**709 J**	**1050**	**1240**	**1040**
Total Heptachlorodibenzo-p-dioxin (HpCDD)		**87.5**	**639**	**3410**	**3190**	**3160**	**3240**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		**0.258 J**	**0.9 J**	**3.95 J**	**4.33 J**	**5.11**	**5.08**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		**0.259 J**	**1.32 J**	**4.54 J**	**4.82 J**	**4.84 J**	**5.23 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)		0.246 U	**1.7 J**	**6.64 J**	**6.9 J**	**7.51 J**	**7.47 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		**1.08 J**	**7.41 J**	**45.7**	**29.3**	**29**	**29**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		**0.531 J**	**2.8 J**	**12.4 J**	**11.1 J**	**13 J**	**12.4 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		0.246 U	0.699 U	**1.39 J**	**0.926 J**	**1.47 J**	**1.43 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		**0.459 J**	**2.29 J**	**8.08 J**	**8.54 J**	**9.38 J**	**9.15 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		**13.8 J**	**90.3**	**549**	**339**	**402**	**349**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		**0.743 J**	**5.56 J**	**38.3**	**21 J**	**21.7 J**	**20 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		**30 J**	**363**	**2430**	**1030**	**1170**	**957**
Total Tetrachlorodibenzofuran (TCDF)		**3.15 J**	**15.8 J**	**85.6 J**	**98.1 J**	**115 J**	**105 J**
Total Pentachlorodibenzofuran (PeCDF)		**3.78 J**	**26 J**	**140 J**	**149 J**	**166 J**	**167 J**
Total Hexachlorodibenzofuran (HxCDF)		**15.5 J**	**114 J**	**644 J**	**500 J**	**534 J**	**514 J**
Total Heptachlorodibenzofuran (HpCDF)		**41**	**361 J**	**2830**	**1350**	**1530**	**1300 J**
Dioxin Furans (ng/kg)							
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**1.8816 J**	**9.8351 J**	**53.5822 J**	**45.9532 J**	**52.6622 J**	**50.061 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	*	**1.9308 J**	**10.18255 J**	**53.5822 J**	**45.9532 J**	**52.6622 J**	**50.061 J**

Notes:
Bold: detected result
*Surface-weighted average concentration RAL (42 ng/kg TEQ)
cm: centimeter
FD: field duplicate
J: estimated value
N: normal sample
ng/kg: nanograms per kilogram
PDI: pre-remedial design investigation
RAL: Remedial Action Level
SE: sediment matrix
SMA: sediment management area
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-4
SMA-2 PDI Sediment Results

Task		SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018
Location ID		PDI-SMA2-SG01-180427	PDI-SMA2-SG02-180430	PDI-SMA2-SG03-180427	PDI-SMA2-SG04-180427	PDI-SMA2-SG05-180501	PDI-SMA2-SG06-180427	PDI-SMA2-SG06-180427	PDI-SMA2-SG07-180430	PDI-SMA2-SG13-180430
Sample ID		PDI-SMA2-SG01-180427	PDI-SMA2-SG02-180430	PDI-SMA2-SG03-180427	PDI-SMA2-SG04-180427	PDI-SMA2-SG05-180501	PDI-SMA2-SG06-180427	PDI-SMA2-SG106-180427	PDI-SMA2-SG07-180430	PDI-SMA2-SG13-180430
Sample Date		4/27/2018	4/30/2018	4/27/2018	4/27/2018	5/1/2018	4/27/2018	4/27/2018	4/30/2018	4/30/2018
Depth		0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type		N	N	N	N	N	N	FD	N	N
Matrix		SE	SE	SE	SE	SE	SE	SE	SE	SE
X		997351.751	997437.526	997503.611	997342.032	997335.904	997405.082	997405.082	997487.7	997475.68
Y		696303.863	696294.191	696266.504	696271.649	696251.542	696219.846	696219.846	696194.012	696156.088
	RAL									
Conventional Parameters (pct)										
Total organic carbon		**0.63**	**3.25**	**0.81**	**0.74**	**2.41**	**2**	**2.66**	**1.92**	**1.96**
Total solids		**89.13**	**43.02**	**68**	**64.05**	**55.29**	**45.39**	**45.53**	**45.1**	**36.18**
Metals (mg/kg)										
Copper	390	**106**	**49.6**	**34.1**	**119**	**59.7**	**47.1**	**46.3**	**47.7**	**48.8**
Organometallic Compounds (µg/kg)										
Butyltin (ion)		4.46 U	**3.26 J**	6 U	**10.8**	**7.74**	**8.75**	9.19 U	**2.26 J**	**2.73 J**
Dibutyltin (ion)		**2.98 J**	**6.39**	8.5 U	**68.9**	**60.7**	**24.2**	**8.42 J**	**5.99**	**5.03 J**
Tetrabutyltin		5.46 U	4.93 U	7.35 U	7.52 U	4.81 U	10.6 U	11.3 U	4.82 U	4.76 U
Tributyltin (ion)		**1.74 J**	**6.88**	**0.716 J**	**33.8**	**79**	**9.2**	**4.99 J**	**10**	**7.65**
Organometallic Compounds (mg/kg-OC)										
Tributyltin (ion)	7.5	**0.27619 J**	**0.21169**	**0.088395 J**	**4.5676**	**3.278**	**0.46**	**0.18759 J**	**0.5208**	**0.39031**
Dioxin Furans (ng/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		--	**1.91 J**	**1.03 J**	--	--	**5.6**	**4 J**	**4.99 J**	**4.39 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)		--	**10.4 J**	**6.18 J**	--	--	**21.7 J**	**20.5 J**	**21 J**	**19.2 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	**20.4 J**	**12 J**	--	--	**48.8**	**42.5**	**41.6**	**37.2**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	**62.3**	**35.9**	--	--	**121**	**107**	**104**	**95.8**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		--	**33.3**	**19.5 J**	--	--	**71.7**	**65.9**	**60.6**	**48.8**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		--	**1190**	**656**	--	--	**1450**	**1320**	**1310**	**1330**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		--	**9430**	**5050**	--	--	**9590**	**8880**	**8760**	**8810**
Total Tetrachlorodibenzo-p-dioxin (TCDD)		--	**867 J**	**554 J**	--	--	**3160 J**	**3480 J**	**3470 J**	**2800**
Total Pentachlorodibenzo-p-dioxin (PeCDD)		--	**815 J**	**509**	--	--	**2620**	**2980 J**	**2790**	**2390**
Total Hexachlorodibenzo-p-dioxin (HxCDD)		--	**1340**	**830**	--	--	**3430**	**3340**	**3070**	**2700**
Total Heptachlorodibenzo-p-dioxin (HpCDD)		--	**3160**	**1730**	--	--	**3600**	**3300**	**3260**	**3800**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		--	**5.37**	**3.55 J**	--	--	**11.4**	**9.58**	**10.5**	**9.63**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		--	**5.53 J**	**3.31 J**	--	--	**9.68 J**	**8.66 J**	**9.66 J**	**8.12 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)		--	**7.98 J**	**4.49 J**	--	--	**15.6 J**	**13 J**	**14.3 J**	**14.1 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		--	**27.5**	**17.6 J**	--	--	**36.6**	**35.7**	**36.7**	**38.5**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	**12.5 J**	**7.72 J**	--	--	**18.2 J**	**16.1 J**	**17.4 J**	**16.1 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		--	**1.3 J**	**0.754 J**	--	--	**2.04 J**	**1.28 J**	**1.74 J**	**1.8 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	**9.77 J**	**6.04 J**	--	--	**13.5 J**	**12.2 J**	**13.4 J**	**12.8 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		--	**338**	**208**	--	--	**360**	**326**	**337**	**348**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		--	**19.3 J**	**15.5 J**	--	--	**24.5**	**20.4 J**	**20.2 J**	**21.7 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		--	**845**	**513**	--	--	**954**	**841**	**808**	**888**
Total Tetrachlorodibenzofuran (TCDF)		--	**128 J**	**80.4 J**	--	--	**311 J**	**270 J**	**286 J**	**252 J**
Total Pentachlorodibenzofuran (PeCDF)		--	**174 J**	**105 J**	--	--	**305 J**	**266 J**	**291 J**	**307 J**
Total Hexachlorodibenzofuran (HxCDF)		--	**456 J**	**290**	--	--	**583 J**	**546 J**	**574 J**	**650**
Total Heptachlorodibenzofuran (HpCDF)		--	**1210**	**760**	--	--	**1340**	**1210**	**1220**	**1330**
Dioxin Furans (ng/kg)										
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		--	**50.6694 J**	**29.4266 J**	--	--	**86.1026 J**	**77.2661 J**	**78.7062 J**	**74.033 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	*	--	**50.6694 J**	**29.4266 J**	--	--	**86.1026 J**	**77.2661 J**	**78.7062 J**	**74.033 J**

Notes:

Bold: detected result
* Surface-weighted average concentration RAL (42 ng/kg TEQ)
µg/kg: micrograms per kilogram
cm: centimeter
FD: field duplicate
J: estimated value
mg/kg: milligrams per kilogram
N: normal sample
ng/kg: nanograms per kilogram
-OC: organic carbon normalized
pct: percent
PDI: pre-remedial design investigation
RAL: Remedial Action Level
SE: sediment matrix
SMA: sediment management area
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-5
SMA-3 PDI Sediment Results

Task		SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018	SheltonRI_FS_2018
Location ID		PDI-SMA3-OG01-180502	PDI-SMA3-SG01-180426	PDI-SMA3-SG01-180426	PDI-SMA3-SG02-180426	PDI-SMA3-SG03-180426	PDI-SMA3-SG04-180426	PDI-SMA3-SG1004-1804	PDI-SMA3-SG2004-1804	PDI-SMA3-SG05-180426	PDI-SMA3-SG06-180426
Sample ID		PDI-SMA3-OG01-180502	PDI-SMA3-SG01-180426	PDI-SMA3-SG101-180426	PDI-SMA3-SG02-180426	PDI-SMA3-SG03-180426	PDI-SMA3-SG04-180426	PDI-SMA3-SG1004-180426	PDI-SMA3-SG2004-180426	PDI-SMA3-SG05-180426	PDI-SMA3-SG06-180426
Sample Date		5/2/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018	4/26/2018
Depth		0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type		N	N	FD	N	N	N	N	N	N	N
Matrix		SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
X		995842.972	995703.931	995703.931	995910.095	996110.857	996185.782	996184.854	996188.995	996258.992	996332.697
Y		693659.884	694164.595	694164.595	694106.722	694048.42	693919.446	693916.436	693916.3	693788.704	693660.38
	RAL										
Dioxin Furans (ng/kg)											
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		**0.248 J**	**3.57 J**	**3.94 J**	**3.75 J**	**3.6 J**	**6.36**	**7.34**	**5.42**	**3.23 J**	**2.6 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)		**1.39 J**	**13.3 J**	**13.7 J**	**15.9 J**	**14.8 J**	**27.3**	**29.4**	**18.8 J**	**15 J**	**11.2 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**2.06 J**	**21.3 J**	**24.7**	**27.5**	**22.9 J**	**52**	**60.8**	**34.3**	**24.6**	**20.9 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		**11**	**83.5**	**86**	**91.4**	**89.3**	**161**	**157**	**114**	**82.8**	**70.5**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		**3.58 J**	**36.6**	**47.2**	**43**	**38.7**	**72.9**	**89.2**	**43.6**	**42.4**	**34**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		**276**	**1700**	**1840**	**1890**	**1760**	**2910**	**2150**	**1780**	**1560**	**1410**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		**3740**	**14700**	**15000**	**15000**	**14300**	**20300**	**14300**	**14100**	**13700**	**12200**
Total Tetrachlorodibenzo-p-dioxin (TCDD)		**53.7 J**	**652 J**	**870 J**	**1800 J**	**1150 J**	**4220 J**	**3520**	**2240**	**987 J**	**468 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)		**48.2 J**	**702**	**842**	**1210**	**921**	**3320**	**2860**	**1780**	**984**	**659 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)		**102**	**1380**	**1550**	**1730**	**1590**	**3410**	**4160**	**2420**	**1580**	**1330**
Total Heptachlorodibenzo-p-dioxin (HpCDD)		**664**	**4850**	**4890**	**5140**	**4950**	**6940**	**5420**	**4780**	**4290**	**3770**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		**0.836 J**	**12.9**	**15**	**13.4**	**14**	**21.8**	**23.1**	**13.6**	**11.2**	**8.46**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		**0.827 J**	**9.95 J**	**10.7 J**	**11.3 J**	**10.5 J**	**16.8 J**	**18.1 J**	**14.5 J**	**10.3 J**	**8.06 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)		**0.941 J**	**14.2 J**	**14.5 J**	**15 J**	**15 J**	**26.7**	**26.2**	**20 J**	**12.8 J**	**11.4 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		**4.32 J**	**49.9**	**48.6**	**51.6**	**54.1**	**104**	**63.3**	**56.9**	**44.4**	**38.1**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		**2.23 J**	**20 J**	**19.9 J**	**21 J**	**21.1 J**	**32.4**	**27.2**	**23.3 J**	**18.4 J**	**16.7 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		0.263 U	**1.81 J**	**1.73 J**	**2.09 J**	**2.1 J**	**2.99 J**	**2.52 J**	**2.04 J**	**1.73 J**	**1.5 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		**1.51 J**	**15.4 J**	**15 J**	**15.7 J**	**15.5 J**	**22.7 J**	**21 J**	**16.4 J**	**13.8 J**	**12.5 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		**90.9**	**608**	**650**	**674**	**829**	**1030**	**637**	**652**	**507**	**467**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		**7.37**	**41.4**	**47.5**	**36.3**	**51.1**	**78.1**	**38.7**	**34.3**	**28.7**	**26.5**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		**213**	**1700**	**1950**	**2070**	**1570**	**4150**	**1370**	**1670**	**1340**	**1140**
Total Tetrachlorodibenzofuran (TCDF)		**16.7 J**	**290 J**	**321 J**	**309 J**	**319 J**	**595 J**	**593 J**	**457 J**	**279 J**	**183 J**
Total Pentachlorodibenzofuran (PeCDF)		**25.2 J**	**290 J**	**285 J**	**317 J**	**327 J**	**522 J**	**529 J**	**413 J**	**282 J**	**223 J**
Total Hexachlorodibenzofuran (HxCDF)		**95.6 J**	**776**	**786 J**	**835**	**872**	**1470**	**1020**	**949**	**696**	**620**
Total Heptachlorodibenzofuran (HpCDF)		**355**	**2380**	**2670**	**2730**	**2600**	**4880**	**2260**	**2730**	**1830**	**1660**
Dioxin Furans (ng/kg)											
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)		**9.42731 J**	**73.9835 J**	**78.584 J**	**82.182 J**	**80.147 J**	**136.669 J**	**122.513 J**	**90.463 J**	**71.781 J**	**60.7648 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)		**9.44046 J**	**73.9835 J**	**78.584 J**	**82.182 J**	**80.147 J**	**136.669 J**	**122.513 J**	**90.463 J**	**71.781 J**	**60.7648 J**

Notes:
Bold: detected result
* Surface-weighted average concentration RAL (42 ng/kg TEQ)
cm: centimeter
FD: field duplicate
J: estimated value
N: normal sample
ng/kg: nanograms per kilograms
PDI: pre-remedial design investigation
RAL: Remedial Action Level
SE: sediment matrix
SMA: sediment management area
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-6
SMA-3 PDI Porewater Hydrogen Sulfide Results

Sample ID	Sulfide (mg/L as H_2S)
PDI-SMA3-DGT01	0.004 U
PDI-SMA3-DGT02	0.004 U
PDI-SMA3-DGT1002 (duplicate)	0.004 U
PDI-SMA3-DGT2002 (triplicate)	0.004 U
PDI-SMA3-DGT03	0.004 U
PDI-SMA3-DGT04	0.004 U
PDI-SMA3-DGT05	0.004 U
PDI-SMA3-DGT1005 (duplicate)	0.004 U
PDI-SMA3-DGT2005 (triplicate)	0.004 U
PDI-SMA3-DGT06	0.004 U
PDI-SMA3-DGT106 (duplicate)	0.004 U
PDI-SMA3-SG03	0.032
PDI-SMA3-SG05	0.004 U
PDI-SMA3-SG07	0.006
PDI-SMA3-SG08	0.01
PDI-SMA3-SG10	0.004 U
PDI-SMA3-SG12	0.005
PDI-SMA3-SG14	0.012
PDI-SMA3-SG18	0.004 U
PDI-SMA3-SG19	0.012

Notes:

H_2S: hydrogen sulfide

mg/L: milligrams per liter

PDI: pre-remedial design investigation

SMA: sediment management area

U: not detected above the method detection limit

Table A-7
Shelton SCU Surface Sediment Dioxin/Furan 2017 Retest Results

Task	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017	SheltonRI_FS_2017
Location ID	SG-01-170713	SH-03-170809	SH-04-170713	SH-13A-170713	SH-14-170712	SH-19-170712	SH-21-170712	SH-22-170712	SH-24-170713	SH-28-170712
Sample ID	SG-01-SG-170713	SH-03-SC-0-10-170809	SH-04-SG-170713	SH-13A-SG-170713	SH-14-SG-170712	SH-19-SG-170712	SH-21-SG-170712	SH-22-SG-170712	SH-24-SG-170713	SH-28-SG-170712
Sample Date	7/13/2017	8/9/2017	7/13/2017	7/13/2017	7/12/2017	7/12/2017	7/12/2017	7/12/2017	7/13/2017	7/12/2017
Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type	N	N	N	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
X	996049.125	996814.446	996383.079	996153.767	999092.728	996183.628	996872.434	997441.609	998145.069	998803.183
Y	696269.737	695861.948	695943.332	693698.315	694408.1	694198.083	694494.339	693708.26	693633.613	695034.68
Dioxin Furans (ng/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1.35 U	**8.38 J**	1.38 U	**4.55**	1.55 U	2.51 U	1.56 U	0.936 U	1.58 U	1.81 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**2.5 J**	**37.2**	**7.88**	**15.1**	**3.53 J**	**6.39 J**	**7.79**	0.892 U	**1.69 J**	1.17 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**4.09**	**74.8**	**16.5 J**	**20.8**	**6.17**	**11.1**	**18.6**	**5.2 J**	**2.42 J**	**1.57 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**26.6**	**471**	**68.5**	**55.3**	**29.4**	**50.8**	**63.4**	**31.2**	**11.1**	**9.98**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**8.14**	**151**	**29.2**	**28.2**	**10.2 J**	**16.1 J**	**29.7**	**7.81 J**	**4.26 J**	**3.63 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**596**	**13300 J**	**1350**	**796**	**493**	**925**	**1510**	**1190**	**230**	**174**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**2240**	**145000 J**	**14700**	**7420**	**4160**	**7310**	**12700**	**7900**	**1960**	**1550**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**46.5 J**	**1170 J**	**492 J**	**1160 J**	**210 J**	**387**	**514 J**	**76.3 J**	**45.6**	**73.4 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**57 J**	**1430 J**	**681 J**	**1050**	**235 J**	**359 J**	**663 J**	**93.1 J**	**75 J**	**64.1 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**147 J**	**4800**	**1060 J**	**1050**	**461 J**	**581 J**	**1200**	**616 J**	**156 J**	**208 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**915**	**35100**	**3200**	**2170**	**1370**	**2150**	**4350**	**6540**	**557**	**567**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	1.75 U	**21.8**	**3.94 J**	**12.7**	**3.72 J**	**10.9**	**4.66**	1.21 U	2.09 U	1.84 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**1.89 J**	**28.3**	**4.89**	**7.6**	**2.59 J**	**7.43**	**6**	**1.46 J**	**1.42 J**	**1.36 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**3.01 J**	**55**	**6.75**	**13.1**	**4.83**	**9.56 J**	**7.8**	**2.54 J**	**2.53 J**	1.03 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**27.2**	**282**	**32.4**	**22.3**	**16.3**	**26.1**	**31.7**	**7.33**	**6.54**	**4.83**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**5.7 J**	**88.3**	**12.9**	**11.1**	**5.93**	**10 J**	**11.9**	**3.02 J**	**1.81 J**	**2.33 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	1.27 U	4.83 U	2.03 U	2.07 U	1.13 U	2.93 U	2.23 U	1.19 U	1.5 U	1.58 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**10.2**	**151**	**19.7**	**15.1**	**8.49 J**	**17.1**	**18**	**5.56**	**4.74**	**3.02 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**271**	**4100**	**395**	**237**	**171**	**444**	**441**	**80.2**	**85.5**	**55.9**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**21.5**	**242**	**25**	**14.9**	**9.97**	**19.9**	**24.4**	**4.33 J**	**4.2 J**	**3.26 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**950**	**18800 J**	**1540**	**736**	**536**	**1410**	**1770**	**220**	**272**	**149**
Total Tetrachlorodibenzofuran (TCDF)	**5.51**	**480 J**	**86 J**	**300 J**	**89.9 J**	**273 J**	**112 J**	1.21 U	2.09 U	1.84 U
Total Pentachlorodibenzofuran (PeCDF)	**47.5 J**	**890 J**	**126 J**	**168 J**	**93.3 J**	**188 J**	**132 J**	**40 J**	**26 J**	**28.2 J**
Total Hexachlorodibenzofuran (HxCDF)	**394 J**	**5390**	**545 J**	**368**	**281 J**	**546 J**	**525 J**	**146**	**113 J**	**87.6 J**
Total Heptachlorodibenzofuran (HpCDF)	**1350 J**	**18300**	**1590**	**846 J**	**598**	**1620**	**1670**	**268 J**	**255 J**	**163 J**
Dioxin Furans (ng/kg)										
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**21.4947 J**	**412.479 J**	**50.9377 J**	**53.2838**	**21.2262 J**	**40.1959 J**	**52.201**	**21.9991 J**	**9.4452 J**	**5.4181 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**22.3207 J**	**412.7205 J**	**51.7292 J**	**53.3873**	**22.0577 J**	**41.5974 J**	**53.0925**	**23.0331 J**	**10.4147 J**	**7.2336 J**

Notes:
Bold: detected result
* Surface-weighted average concentration RAL (42 ng/kg TEQ)
cm: centimeter
J: estimated value
N: normal sample
ng/kg: nanograms per kilogram
RAL: Remedial Action Level
SCU: sediment cleanup unit
SE: sediment matrix
TEQ: toxicity equivalence
U: compound analyzed, but not detected above detection limit

Table A-8
Summary of Initial and Retest Dioxin/Furan TEQ Results

Station	Dioxin/Furan TEQ Mammal (ng/kg dw)	
	2017 Initial Test Results	2018 Retest Results
SG-01	22.8	22.3
SH-03	287	413
SH-04	20.7	51.8
SH-13A	42.5	53.4
SH-14	13.7	22.1
SH-19	15.7	41.6
SH-21	15.6	53.1
SH-22	22.0	23.0
SH-24	21.4	10.4
SH-28	9.92	7.23

Notes:
ng/kg dw: nanograms per kilogram on a dry weight basis

Appendix G

Manke 2019 PDI Chemical Data

Table 1
Manke 2019 PDI Chemical Data

Sample Location	Coordinates		Sampling Date	Depth Interval	Wood Content (% by volume)	Total Volatile Solids (PSEP; % by dry wt)	Porewater H_2S Conc. (mg/L)	Beggiatoa Present?
	Latitude	Longitude						
SG01	47.20694998	-123.0893177	9-May-19	0-10 cm	<5%	39%	0.071	No
SG02	47.20660653	-123.08928	9-May-19	0-10 cm	10 to 15%	21%	0.030	No
SG03	47.20645973	-123.0885669	9-May-19	0-10 cm	70 to 80%	54%	3.3	Yes
SG05	47.20721088	-123.0883679	08-May-19	0-10 cm	5 to 10%	14%	0.065	No
SG06	47.20691779	-123.0879793	08-May-19	0-10 cm	10 to 20%	17%	0.63	No
SG08	47.20646686	-123.0855846	08-May-19	0-10 cm	20 to 30%	31%	4.6	No
SG09	47.20607722	-123.0876657	09-May-19	0-10 cm	50 to 60%	37%	5.1	No
SG10	47.20611719	-123.0871761	09-May-19	0-10 cm	25 to 30%	23%	0.18	No
SG11	47.20632432	-123.0871717	09-May-19	0-10 cm	30 to 40%	38%	3.7	Yes
SG12	47.20720651	-123.0872188	08-May-19	0-10 cm	<5%	6.4%	0.020	No
SG13	47.2066848	-123.0867592	08-May-19	0-10 cm	30 to 50%	38%	4.5	No
SG14	47.20726717	-123.086102	08-May-19	0-10 cm	<5%	5.2%	0.089	No
SG15	47.2067588	-123.0858113	08-May-19	0-10 cm	20%	24%	0.33	No
SG16	47.20654589	-123.0850246	11-May-19	0-10 cm	15 to 20%	19%	0.90	No
SPI21	47.20684502	-123.0887908	09-May-19	0-10 cm	25 to 30%	25%	2.7	Yes
SPI-22-SG	47.20666133	-123.0872825	08-May-19	0-10 cm	20 to 30%	44%	2.4	Yes
SH-23-SG	47.20826717	-123.0844578	09-May-19	0-10 cm	<5%	13%	0.067	No
SPI29	47.20620722	-123.0881843	09-May-19	0-10 cm	50 to 60%	49%	4.4	Yes

Appendix H

Simpson 2020 RI/OMMP Chemical Data

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	NHRA-SMA5-SG-COMP-05	OMMP-SMA3-SG-COMP-05	RIFS-SMA4-SC01	RIFS-SMA4-SC02	RIFS-SMA4-SG01
Sample ID	NHRA-SMA5-SG-COMP-05-062520	OMMP-SMA3-SG-COMP-05-062520	RIFS-SMA4-SC01-100110-071020	RIFS-SMA4-SC02-060070-071020	RIFS-SMA4-SG01-062420
Sample Date	6/25/2020	6/25/2020	7/10/2020	7/10/2020	6/24/2020
Depth	0 - 10 cm	0 - 10 cm	10 - 11 ft	6 - 7 ft	0 - 10 cm
Sample Type	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE
X	996540.230974	996024.669013	997210.34	997451.96	996701.27
Y	695266.520673	693974.192878	693643.04	693625.2074	693748.26
Conventional Parameters (pct)					
Total organic carbon	--	**0.47**	--	--	--
Loss on ignition	--	--	**42.8**	**22.1**	**11.1**
Moisture (water) content	--	--	**236.8**	**125.5**	**54.3**
Total solids	--	**76.44**	--	--	--
Metals (mg/kg)					
Copper	--	--	--	--	--
Organometallic Compounds (µg/kg)					
Butyltin (ion)	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene	**0.6**	**3.04**	--	--	--
Acenaphthene	0.36 U	**4.49**	--	--	--
Acenaphthylene	0.36 UJ	**1.93 J**	--	--	--
Anthracene	**0.24 J**	**7.21**	--	--	--
Benzo(a)anthracene	0.52 U	**11.3**	--	--	--
Benzo(a)pyrene	0.46 U	**11.6**	--	--	--
Benzo(b)fluoranthene	0.6 U	**13.8**	--	--	--
Benzo(e)pyrene	**0.57**	**11.4**	--	--	--
Benzo(g,h,i)perylene	0.89 U	11.7 U	--	--	--
Benzo(k)fluoranthene	0.36 U	5.49 U	--	--	--
Chrysene	0.8 U	**15.7**	--	--	--
Dibenzo(a,h)anthracene	0.36 U	1.73 UJ	--	--	--
Fluoranthene	1.19 U	**53.9**	--	--	--
Fluorene	**0.19 J**	**4.95**	--	--	--
Indeno(1,2,3-c,d)pyrene	0.36 U	**7.11**	--	--	--
Naphthalene	**0.7**	**19.3**	--	--	--
Perylene	**4.95**	**8.36**	--	--	--
Phenanthrene	**1.23**	**28.7**	--	--	--
Pyrene	1.46 U	**65.1**	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)	0.6 U	**13.8**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	0.46 U	**14.978 J**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	0.46 U	**15.339 J**	--	--	--
Total HPAH (SMS) (U = 0)	1.46 U	**178.51 J**	--	--	--
Total LPAH (SMS) (U = 0)	**2.36 J**	**66.58 J**	--	--	--
Dioxin Furans (ng/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0984 U	**0.498 J**	**3.38**	**4.3 J**	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**0.15 J**	**1.75 J**	**27.8 J**	**13.8 J**	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**0.214 J**	**3.36 J**	**71.1**	**25**	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**0.611 J**	**10.8**	**654**	**169**	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**0.382 J**	**5.58**	**123**	**53.9**	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**13.6**	**221**	**13100**	**4620**	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**110**	**1800**	**113000**	**45500 J**	--

Table 1
Simpson 2020 RI Chemical Data

Task	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**
Location ID	**NHRA-SMA5-SG-COMP-05**	**OMMP-SMA3-SG-COMP-05**	**RIFS-SMA4-SC01**	**RIFS-SMA4-SC02**	**RIFS-SMA4-SG01**
Sample ID	**NHRA-SMA5-SG-COMP-05-062520**	**OMMP-SMA3-SG-COMP-05-062520**	**RIFS-SMA4-SC01-100110-071020**	**RIFS-SMA4-SC02-060070-071020**	**RIFS-SMA4-SG01-062420**
Sample Date	**6/25/2020**	**6/25/2020**	**7/10/2020**	**7/10/2020**	**6/24/2020**
Depth	**0 - 10 cm**	**0 - 10 cm**	**10 - 11 ft**	**6 - 7 ft**	**0 - 10 cm**
Sample Type	**N**	**N**	**N**	**N**	**N**
Matrix	**SE**	**SE**	**SE**	**SE**	**SE**
X	**996540.230974**	**996024.669013**	**997210.34**	**997451.96**	**996701.27**
Y	**695266.520673**	**693974.192878**	**693643.04**	**693625.2074**	**693748.26**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**7.69**	**119 J**	**466**	**509**	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**6.29 J**	**124 J**	**414 J**	**540 J**	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**10.3**	**209**	**3040**	**1660**	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**30.3**	**580**	**25700**	**11200**	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.0984 U	**1.3**	**11**	**10.6**	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**0.138 J**	**1.22 J**	**12**	**15.1 J**	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**0.113 J**	**1.47 J**	**21.9**	**19 J**	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**0.418 J**	**6.02**	**257**	**131**	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**0.174 J**	**2.55 J**	**86**	**42**	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	4.92 U	4.24 U	**5.89**	**3.75 J**	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**0.158 J**	**1.81 J**	**58.8**	**26.2**	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**4.32 J**	**84.9**	**6580**	**1750**	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**0.249 J**	**3.99 J**	**203 J**	**79.5**	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**13.7**	**238**	**23200**	**6160 J**	--
Total Tetrachlorodibenzofuran (TCDF)	**1.09 J**	**29.3 J**	**297 J**	**271 J**	--
Total Pentachlorodibenzofuran (PeCDF)	**1.97 J**	**32.2 J**	**903**	**500 J**	--
Total Hexachlorodibenzofuran (HxCDF)	**5.71 J**	**106**	**7790**	**2280 J**	--
Total Heptachlorodibenzofuran (HpCDF)	**14.9**	**302**	**49700**	**7270**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**0.90266 J**	**9.7899 J**	**404.479 J**	**150.391 J**	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**0.60254 J**	**9.5779 J**	**404.479 J**	**150.391 J**	--

Notes:
Bold: Detected result
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equavilency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection limit

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA4-SG02	RIFS-SMA4-SG03	RIFS-SMA4-SG04	RIFS-SMA4-SG05	RIFS-SMA4-SG06	RIFS-SMA4-SG06	RIFS-SMA4-SG07
Sample ID	RIFS-SMA4-SG02-062420	RIFS-SMA4-SG03-062420	RIFS-SMA4-SG04-062420	RIFS-SMA4-SG05-062420	RIFS-SMA4-SG06-062420	RIFS-SMA4-SG106-062420	RIFS-SMA4-SG07-062420
Sample Date	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	FD	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	996757.57	997017.34	997658.02	997920.95	997949.35	997949.35	998080.11
Y	693925.54	693958.37	693578.49	693784.44	693900.19	693900.19	693647.24
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Loss on ignition	**9.6**	**7.8**	**17.5**	**9.9**	**3.7**	**4.6**	**18.7**
Moisture (water) content	**66**	**56**	**53.7**	**53.1**	**32.6**	**32.7**	**57**
Total solids	--	--	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	--	--	--	--	--	--	--
Total HPAH (SMS) (U = 0)	--	--	--	--	--	--	--
Total LPAH (SMS) (U = 0)	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	--	--	--

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA4-SG02	RIFS-SMA4-SG03	RIFS-SMA4-SG04	RIFS-SMA4-SG05	RIFS-SMA4-SG06	RIFS-SMA4-SG06	RIFS-SMA4-SG07
Sample ID	RIFS-SMA4-SG02-062420	RIFS-SMA4-SG03-062420	RIFS-SMA4-SG04-062420	RIFS-SMA4-SG05-062420	RIFS-SMA4-SG06-062420	RIFS-SMA4-SG106-062420	RIFS-SMA4-SG07-062420
Sample Date	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020	6/24/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	FD	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	996757.57	997017.34	997658.02	997920.95	997949.35	997949.35	998080.11
Y	693925.54	693958.37	693578.49	693784.44	693900.19	693900.19	693647.24
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	--	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	--	--	--	--	--	--	--

Notes:
Bold: Detected result
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equavilency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG01	RIFS-SMA5-SG02	RIFS-SMA5-SG03	RIFS-SMA5-SG04	RIFS-SMA5-SG05	RIFS-SMA5-SG06	RIFS-SMA5-SG07
Sample ID	RIFS-SMA5-SG01-062620	RIFS-SMA5-SG02-062620	RIFS-SMA5-SG03-062620	RIFS-SMA5-SG04-062620	RIFS-SMA5-SG05-062420	RIFS-SMA5-SG06-062620	RIFS-SMA5-SG07-062620
Sample Date	6/26/2020	6/26/2020	6/26/2020	6/26/2020	6/24/2020	6/26/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	995552.24	995685.51	995968.83	996206.76	996417.36	996358.49	996663.72
Y	694245.65	694423.68	694247.61	694553.53	694063.72	693651.21	694448.35
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Loss on ignition	**27.1**	--	--	--	--	--	--
Moisture (water) content	**63.3**	--	--	--	--	--	--
Total solids	--	--	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	**12.2**	--	--	**12.4**	--	**10.5**	**20.5**
Acenaphthene	**24.1**	--	--	**15.4**	--	**8.63**	**23.4**
Acenaphthylene	**13.8 J**	--	--	**8.4 J**	--	**9.19 J**	**14.6 J**
Anthracene	**49.1**	--	--	**27.1**	--	**32.4**	**80.3**
Benzo(a)anthracene	**86.6**	--	--	**61.3**	--	**68.3**	**181**
Benzo(a)pyrene	**81.2**	--	--	**60.6**	--	**75**	**147**
Benzo(b)fluoranthene	**84.9**	--	--	**89**	--	**86.5**	**251**
Benzo(e)pyrene	**74.3**	--	--	**67.2**	--	**74**	**168**
Benzo(g,h,i)perylene	79.9 U	--	--	**59.7**	--	**83.7**	**72.2**
Benzo(k)fluoranthene	**42.7**	--	--	**34.4**	--	**37.1**	**144**
Chrysene	**153**	--	--	**116**	--	**125**	**603**
Dibenzo(a,h)anthracene	11.7 U	--	--	9.98 UJ	--	10.8 UJ	**21.4**
Fluoranthene	**254**	--	--	**208**	--	**178**	**1440**
Fluorene	**23.5**	--	--	**17.7**	--	**14.1**	**32.4**
Indeno(1,2,3-c,d)pyrene	**50**	--	--	**40.9 J**	--	**49.8 J**	**64**
Naphthalene	**79.4**	--	--	**60.7**	--	**50.9**	**164**
Perylene	**44.4**	--	--	**46.8**	--	**62.8**	**62.6**
Phenanthrene	**166**	--	--	**166**	--	**129**	**352**
Pyrene	**373**	--	--	**303**	--	**303**	**1170**
Total Benzofluoranthenes (b,j,k) (U = 0)	**127.6**	--	--	**123.4**	--	**123.6**	**395**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**109.15**	--	--	**84.32 J**	--	**100.42 J**	**219.17**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**109.735**	--	--	**84.819 J**	--	**100.96 J**	**219.17**
Total HPAH (SMS) (U = 0)	**1125.4**	--	--	**972.9 J**	--	**1006.4 J**	**4093.6**
Total LPAH (SMS) (U = 0)	**355.9 J**	--	--	**295.3 J**	--	**244.22 J**	**666.7 J**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**3.05 J**	**2.72 J**	**2.3 J**	**1.05 J**	**2.01 J**	**1.84 J**	**1.91 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**10.5 J**	**15.6**	**9.78 J**	**4.96 J**	**8.1 J**	**7.52 J**	**6.92 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**20.9**	**22.9**	**17.5**	**11.8**	**15.8**	**15.7**	**14.1**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**72.5**	**86.4**	**72.6**	**41.9**	**64.9**	**58.7**	**51.1**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**35.4**	**50.5 J**	**32**	**16.9**	**29.3**	**23.9**	**24.9**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**1710**	**1910**	**1650**	**1090**	**1500**	**1500**	**1280**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**13700**	**15400**	**12900**	**9080**	**12300**	**12400**	**9570**

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG01	RIFS-SMA5-SG02	RIFS-SMA5-SG03	RIFS-SMA5-SG04	RIFS-SMA5-SG05	RIFS-SMA5-SG06	RIFS-SMA5-SG07
Sample ID	RIFS-SMA5-SG01-062620	RIFS-SMA5-SG02-062620	RIFS-SMA5-SG03-062620	RIFS-SMA5-SG04-062620	RIFS-SMA5-SG05-062420	RIFS-SMA5-SG06-062620	RIFS-SMA5-SG07-062620
Sample Date	6/26/2020	6/26/2020	6/26/2020	6/26/2020	6/24/2020	6/26/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	995552.24	995685.51	995968.83	996206.76	996417.36	996358.49	996663.72
Y	694245.65	694423.68	694247.61	694553.53	694063.72	693651.21	694448.35
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**817 J**	**481 J**	**572**	**279**	**544 J**	**397 J**	**391 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**842 J**	**576**	**556**	**289 J**	**552**	**442 J**	**407**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**1380**	**1220**	**1180**	**715**	**1100**	**1050**	**929**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**4430**	**5740**	**4310**	**3100**	**3930**	**3950**	**4160**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**9.33**	**8.89**	**8.72**	**3.38**	**5.51**	**5.02**	**4.43**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**7.7 J**	**8.03 J**	**7.89 J**	**3.51 J**	**5.6 J**	**5.38 J**	**4.57 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**10.1 J**	**12.2 J**	**10.7 J**	**4.59 J**	**7.94 J**	**7.05 J**	**6.02 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**42.2**	**51.7**	**43.9**	**21.8**	**38.2**	**33.4**	**27.2**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**16.9**	**20.6**	**16.4**	**8.94**	**14.5**	**13.4**	**11.2 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**1.5 J**	**1.79 J**	**1.58 J**	**0.813 J**	**1.36 J**	**1.54 J**	**1.05 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**12.9**	**14.3**	**12.3**	**6.65**	**10.9 J**	**10 J**	**9.2 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**587**	**635**	**547**	**315**	**516**	**471**	**354**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**27.7**	**32.4**	**27.2**	**16.3**	**25**	**30.1**	**18.8**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**1540**	**1570**	**1390**	**999**	**1390**	**1980**	**863**
Total Tetrachlorodibenzofuran (TCDF)	**233 J**	**224 J**	**216 J**	**81.5 J**	**135 J**	**131 J**	**114 J**
Total Pentachlorodibenzofuran (PeCDF)	**233**	**265 J**	**232 J**	**113**	**181**	**177 J**	**159 J**
Total Hexachlorodibenzofuran (HxCDF)	**745**	**986**	**738**	**394 J**	**667 J**	**638 J**	**502**
Total Heptachlorodibenzofuran (HpCDF)	**2020**	**2290**	**1940**	**1150**	**1850**	**1940**	**1230**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**65.793 J**	**78.7939 J**	**62.5557 J**	**35.9473 J**	**55.224 J**	**52.1274 J**	**44.749 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**65.793 J**	**78.7939 J**	**62.5557 J**	**35.9473 J**	**55.224 J**	**52.1274 J**	**44.749 J**

Notes:
Bold: Detected result
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equavilency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG08	RIFS-SMA5-SG09	RIFS-SMA5-SG36	RIFS-SMA5-SG37	RIFS-SMA5-SG38	RIFS-SMA5-SG39	RIFS-SMA5-SG10
Sample ID	RIFS-SMA5-SG08-062420	RIFS-SMA5-SG09-062220	RIFS-SMA5-SG36-062220	RIFS-SMA5-SG37-062220	RIFS-SMA5-SG38-062220	RIFS-SMA5-SG39-062220	RIFS-SMA5-SG10-062620
Sample Date	6/24/2020	6/22/2020	6/22/2020	6/22/2020	6/22/2020	6/22/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	996900.35	997061.97	996492.06	996683.59	995947.22	996231.98	997281.19
Y	693993.09	694746.86	694735.43	694731.91	694689.4	694686.33	694219.91
Conventional Parameters (pct)							
Total organic carbon	--	5.23	--	--	--	--	--
Loss on ignition	--	14.8	7.5	22.2	8.5	23.5	--
Moisture (water) content	--	52.6	36.4	58.3	56.4	62.9	--
Total solids	--	50.5	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	20.3	16.6	--	--	--	--	12.6
Acenaphthene	20.8	17.3	--	--	--	--	16.9
Acenaphthylene	16.4 J	14.8 J	--	--	--	--	10.1 J
Anthracene	34.2	68	--	--	--	--	34.9
Benzo(a)anthracene	41.3	391 J	--	--	--	--	140
Benzo(a)pyrene	45.9	281 J	--	--	--	--	91.5
Benzo(b)fluoranthene	65.4	600 J	--	--	--	--	193 U
Benzo(e)pyrene	49.4	379 J	--	--	--	--	129
Benzo(g,h,i)perylene	45.5	178 UJ	--	--	--	--	55.6
Benzo(k)fluoranthene	28.8	222 J	--	--	--	--	103 U
Chrysene	99.1	707 J	--	--	--	--	416
Dibenzo(a,h)anthracene	9.68	52.4 J	--	--	--	--	13.6 UJ
Fluoranthene	241	768 J	--	--	--	--	1440
Fluorene	17.9	23.4	--	--	--	--	21.1
Indeno(1,2,3-c,d)pyrene	32.3	151 J	--	--	--	--	56.4 J
Naphthalene	225	52.6	--	--	--	--	93.9
Perylene	49.9	89.1 J	--	--	--	--	47.2
Phenanthrene	135	164 J	--	--	--	--	288
Pyrene	275	691 J	--	--	--	--	1130
Total Benzofluoranthenes (b,j,k) (U = 0)	94.2	822 J	--	--	--	--	193 U
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	64.639	429.71 J	--	--	--	--	115.3 J
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	64.639	429.71 J	--	--	--	--	130.78 J
Total HPAH (SMS) (U = 0)	883.98	3863.4 J	--	--	--	--	3329.5 J
Total LPAH (SMS) (U = 0)	449.3 J	340.1 J	--	--	--	--	464.9 J
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1.58	2.16 J	--	--	--	--	0.74 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	7.1 J	9.67 J	--	--	--	--	3.33 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	12	21.4	--	--	--	--	7.82
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	48.6	113	--	--	--	--	36.2
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	22.3	39.2	--	--	--	--	13.5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1050	3980	--	--	--	--	1040
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	8070	36600	--	--	--	--	7110

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG08	RIFS-SMA5-SG09	RIFS-SMA5-SG36	RIFS-SMA5-SG37	RIFS-SMA5-SG38	RIFS-SMA5-SG39	RIFS-SMA5-SG10
Sample ID	RIFS-SMA5-SG08-062420	RIFS-SMA5-SG09-062220	RIFS-SMA5-SG36-062220	RIFS-SMA5-SG37-062220	RIFS-SMA5-SG38-062220	RIFS-SMA5-SG39-062220	RIFS-SMA5-SG10-062620
Sample Date	6/24/2020	6/22/2020	6/22/2020	6/22/2020	6/22/2020	6/22/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	996900.35	997061.97	996492.06	996683.59	995947.22	996231.98	997281.19
Y	693993.09	694746.86	694735.43	694731.91	694689.4	694686.33	694219.91
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**395**	**503**	--	--	--	--	**190**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**412 J**	**561**	--	--	--	--	**209 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**842**	**1900**	--	--	--	--	**683**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**2830**	**16000**	--	--	--	--	**4850**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**4.59**	**6.77 J**	--	--	--	--	**2.57**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**5.02**	**8.71 J**	--	--	--	--	**2.63 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**6.43**	**9.86 J**	--	--	--	--	**3.79 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**27.8**	**37.9**	--	--	--	--	**16.3**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**10.5**	**15.9**	--	--	--	--	**5.91**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.943 J**	**1.76 J**	--	--	--	--	**0.609 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**7.54**	**14.5**	--	--	--	--	**4.77 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**334**	**536**	--	--	--	--	**235**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**17.2**	**24.2**	--	--	--	--	**10.3**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**1040**	**1300**	--	--	--	--	**521**
Total Tetrachlorodibenzofuran (TCDF)	**121 J**	**170 J**	--	--	--	--	**66.8 J**
Total Pentachlorodibenzofuran (PeCDF)	**151 J**	**224 J**	--	--	--	--	**98.1**
Total Hexachlorodibenzofuran (HxCDF)	**468**	**781**	--	--	--	--	**318**
Total Heptachlorodibenzofuran (HpCDF)	**1250**	**1700**	--	--	--	--	**828**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**40.9319 J**	**96.8643 J**	--	--	--	--	**29.1961 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**40.9319 J**	**96.8643 J**	--	--	--	--	**29.1961 J**

Notes:
Bold: Detected result
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equivalency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG10	RIFS-SMA5-SG10	RIFS-SMA5-SG10	RIFS-SMA5-SG11	RIFS-SMA5-SG12	RIFS-SMA5-SG13
Sample ID	RIFS-SMA5-SG10-062620-RE	RIFS-SMA5-SG110-062620	RIFS-SMA5-SG110-062620-RE	RIFS-SMA5-SG11-062420	RIFS-SMA5-SG12-062320	RIFS-SMA5-SG13-062520
Sample Date	6/26/2020	6/26/2020	6/26/2020	6/24/2020	6/23/2020	6/25/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	FD	N	N	N
Matrix	SE	SE	SE	SE	SE	SE
X	997281.19	997281.19	997281.19	997440.11	997233.364758	997207.08
Y	694219.91	694219.91	694219.91	693661.54	696134.702336	695842.87
Conventional Parameters (pct)						
Total organic carbon	--	--	--	--	--	--
Loss on ignition	--	--	--	--	--	--
Moisture (water) content	--	--	--	--	--	--
Total solids	--	--	--	--	--	--
Metals (mg/kg)						
Copper	--	--	--	--	--	--
Organometallic Compounds (µg/kg)						
Butyltin (ion)	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)						
2-Methylnaphthalene	**33.5**	333 U	500 U	--	**7.72**	--
Acenaphthene	**39.2**	333 U	**331 J**	--	**94.6**	--
Acenaphthylene	**29 J**	333 UJ	**489 J**	--	**7.62 J**	--
Anthracene	**94.5**	**258 J**	**1770**	--	**99.1**	--
Benzo(a)anthracene	**212**	**4020**	**7100**	--	**317**	--
Benzo(a)pyrene	**157**	**2230**	**4390**	--	**244**	--
Benzo(b)fluoranthene	**274**	3590 U	**8920**	--	269 U	--
Benzo(e)pyrene	**191**	**2210**	**5220**	--	**199**	--
Benzo(g,h,i)perylene	**70**	879 U	**1460**	--	144 U	--
Benzo(k)fluoranthene	**178**	2010 U	**5540**	--	135 U	--
Chrysene	**723**	**11100**	**25100**	--	**445**	--
Dibenzo(a,h)anthracene	**23.5**	288 U	**203 J**	--	**38.1 J**	--
Fluoranthene	**2250**	**29900**	**130000**	--	**1290**	--
Fluorene	**48.2**	333 U	**675**	--	**52.4**	--
Indeno(1,2,3-c,d)pyrene	**63.5**	1050 U	**1550**	--	139 U	--
Naphthalene	**331**	399 U	600 U	--	**79**	--
Perylene	**55.5**	**435**	**886**	--	**81.3**	--
Phenanthrene	**614**	**489**	**17300**	--	**145**	--
Pyrene	**1680**	**19800**	**79200**	--	**1360**	--
Total Benzofluoranthenes (b,j,k) (U = 0)	**452**	3590 U	**14460**	--	269 U	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**239.33**	**2743**	**6972.3 J**	--	**283.96 J**	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**239.33**	**3089.9**	**6972.3 J**	--	**311.11 J**	--
Total HPAH (SMS) (U = 0)	**5631**	**67050**	**263463 J**	--	**3694.1 J**	--
Total LPAH (SMS) (U = 0)	**1155.9 J**	**747 J**	**20565 J**	--	**477.72 J**	--
Dioxin Furans (ng/kg)						
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.951 J**	--	**1.22 J**	**1.07 J**	**1.1 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**3.91 J**	--	**5.15 J**	**5.3 J**	**6.01**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**8.78**	--	**10.6**	**10.9**	**10.8**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**39.1**	--	**45.1**	**40.4**	**46.1**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**14.1**	--	**21.5**	**22**	**21**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**1110**	--	**1040**	**922**	**1040**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**7430**	--	**8630**	**6640**	**8720**

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG10	RIFS-SMA5-SG10	RIFS-SMA5-SG10	RIFS-SMA5-SG11	RIFS-SMA5-SG12	RIFS-SMA5-SG13
Sample ID	RIFS-SMA5-SG10-062620-RE	RIFS-SMA5-SG110-062620	RIFS-SMA5-SG110-062620-RE	RIFS-SMA5-SG11-062420	RIFS-SMA5-SG12-062320	RIFS-SMA5-SG13-062520
Sample Date	6/26/2020	6/26/2020	6/26/2020	6/24/2020	6/23/2020	6/25/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	FD	N	N	N
Matrix	SE	SE	SE	SE	SE	SE
X	997281.19	997281.19	997281.19	997440.11	997233.364758	997207.08
Y	694219.91	694219.91	694219.91	693661.54	696134.702336	695842.87
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**284**	--	**274 J**	**434 J**	**460**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**211 J**	--	**302 J**	**502 J**	**482**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**676**	--	**781**	**793**	**776**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**4630**	--	**2690**	**2090**	**2250**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**3.01**	--	**3.18**	**2.5**	**3.07**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**3.05 J**	--	**3.6 J**	**3.31 J**	**2.73 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**4.43 J**	--	**4.91 J**	**4.12 J**	**4.94**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**17.6**	--	**27.2**	**20.5**	**26**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**6.6**	--	**10.1**	**8.51 J**	**9.2**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**0.663 J**	--	**0.894 J**	**0.931 J**	**0.72 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**5.07**	--	**8.03**	**6.57 J**	**8.66**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**211**	--	**368**	**314**	**400**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**12.3**	--	**28.8**	**17.5**	**15.5**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**533**	--	**930**	**1020**	**1080**
Total Tetrachlorodibenzofuran (TCDF)	--	**77.4 J**	--	**80.5 J**	**78.2 J**	**77.3 J**
Total Pentachlorodibenzofuran (PeCDF)	--	**112**	--	**136**	**115 J**	**120**
Total Hexachlorodibenzofuran (HxCDF)	--	**341 J**	--	**505**	**386 J**	**479**
Total Heptachlorodibenzofuran (HpCDF)	--	**766**	--	**1320**	**1140**	**1100**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	**31.4957 J**	--	**37.8474 J**	**33.7694 J**	**38.7239 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	--	**31.4957 J**	--	**37.8474 J**	**33.7694 J**	**38.7239 J**

Notes:
Bold: Detected result
μg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equavilency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG14	RIFS-SMA5-SG15	RIFS-SMA5-SG16	RIFS-SMA5-SG17	RIFS-SMA5-SG18	RIFS-SMA5-SG19	RIFS-SMA5-SG20
Sample ID	RIFS-SMA5-SG14-062520	RIFS-SMA5-SG15-062520	RIFS-SMA5-SG16-062520	RIFS-SMA5-SG17-062520	RIFS-SMA5-SG18-062520	RIFS-SMA5-SG19-062520	RIFS-SMA5-SG20-062620
Sample Date	6/25/2020	6/25/2020	6/25/2020	6/25/2020	6/25/2020	6/25/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	997551.47	997777.06	997707.49	997913.62	997946.92	998268.22	998773.22
Y	695963.43	695710.68	696232.76	696522.78	695986.69	695710.24	695213.73
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Loss on ignition	--	--	--	--	--	--	--
Moisture (water) content	--	--	--	--	--	--	--
Total solids	--	--	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--
Perylene	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	--	--	--	--	--	--	--
Total HPAH (SMS) (U = 0)	--	--	--	--	--	--	--
Total LPAH (SMS) (U = 0)	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**1.47 J**	0.0928 U	**9**	**2.31**	**1.21 J**	**0.653 J**	**0.754 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**7.33**	**0.197 J**	**19.3 J**	**11.6**	**5.03**	**2.83 J**	**3.51 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**12.5**	**0.27 J**	**41.5**	**20.4**	**8.24**	**4.88**	**6.81 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**59.1**	**1.05 J**	**105**	**71.8**	**35.1**	**21.2**	**53.7 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**23.8**	**0.681 J**	**57.1**	**34.4**	**15.1**	**10.3**	**13 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**1370**	**23.2**	**1570**	**1340**	**819**	**492**	**1620 J**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**10600**	**206**	**10100**	**10700**	**6790**	**4210**	**11200**

Table 1

Simpson 2020 RI Chemical Data

Task	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**
Location ID	**RIFS-SMA5-SG14**	**RIFS-SMA5-SG15**	**RIFS-SMA5-SG16**	**RIFS-SMA5-SG17**	**RIFS-SMA5-SG18**	**RIFS-SMA5-SG19**	**RIFS-SMA5-SG20**
Sample ID	**RIFS-SMA5-SG14-062520**	**RIFS-SMA5-SG15-062520**	**RIFS-SMA5-SG16-062520**	**RIFS-SMA5-SG17-062520**	**RIFS-SMA5-SG18-062520**	**RIFS-SMA5-SG19-062520**	**RIFS-SMA5-SG20-062620**
Sample Date	**6/25/2020**	**6/25/2020**	**6/25/2020**	**6/25/2020**	**6/25/2020**	**6/25/2020**	**6/26/2020**
Depth	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**
Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
X	**997551.47**	**997777.06**	**997707.49**	**997913.62**	**997946.92**	**998268.22**	**998773.22**
Y	**695963.43**	**695710.68**	**696232.76**	**696522.78**	**695986.69**	**695710.24**	**695213.73**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**433**	**8.89**	**2940**	**1150**	**426**	**131 J**	**146 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**486**	**9.89 J**	**2570 J**	**1070**	**391**	**152**	**203 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**917**	**20.1**	**2730**	**1490**	**671**	**368**	**703 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**3180**	**54.5**	**3540**	**3410**	**2310**	**1200**	**3250 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**4.37**	**0.126 J**	**11.3**	**7.58**	**3.29**	**1.77**	**3.25 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**4.46 J**	0.0928 U	**9.49 J**	**6.45**	**2.78 J**	**1.85 J**	**2.75 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**7.02**	**0.143 J**	**14.7**	**9.18**	**3.93 J**	**2.58 J**	**4.53 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**34.2**	**0.673 J**	**38.5**	**32.5**	**18.3**	**13**	**30.4 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**12.2**	**0.312 J**	**17**	**13.9**	**7.05**	**4.46 J**	**8.51 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.961 J**	0.0928 U	**1.76 J**	**1.41 J**	**0.631 J**	0.442 U	**0.547 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**12.5**	**0.216 J**	**12.6**	**10.9**	**5.55**	**3.8 J**	**10.4 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**513**	**8.54**	**432**	**334**	**257**	**183**	**1030 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**21.2**	**0.422 J**	**23.8**	**17.1**	**11.6**	**8.75**	**42.3 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**1380**	**21.5**	**1370**	**839**	**770**	**614**	**5460**
Total Tetrachlorodibenzofuran (TCDF)	**117 J**	**1.89**	**324 J**	**201 J**	**73.4 J**	**40.5 J**	**64.6 J**
Total Pentachlorodibenzofuran (PeCDF)	**191 J**	**2.81**	**297 J**	**212**	**105 J**	**66.6**	**108 J**
Total Hexachlorodibenzofuran (HxCDF)	**692**	**10.5**	**668 J**	**589**	**343**	**233**	**729 J**
Total Heptachlorodibenzofuran (HpCDF)	**1570**	**24.6**	**1800**	**1040**	**864**	**668**	**4490 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**49.6389 J**	**1.015002 J**	**85.1697 J**	**56.5192 J**	**29.9725 J**	**18.5603 J**	**50.2882 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**49.6389 J**	**0.96257 J**	**85.1697 J**	**56.5192 J**	**29.9725 J**	**18.5382 J**	**50.2882 J**

Notes:

Bold: Detected result

µg/kg: microgram per kilogram

CAEPA: California Environmental Protection Agency

HpCDD: Heptachlorodibenzo-p-dioxin

HpCDF: Heptachlorodibenzofuran

HxCDD: Hexachlorodibenzo-p-dioxin

HxCDF: Hexachlorodibenzofuran

J: Estimated value

mg/kg: miligrams per kilogram

ng/kg: nanogram per kilogram

PeCDD: Pentachlorodibenzo-p-dioxin

PeCDF: Pentachlorodibenzofuran

TCDD: Tetrachlorodibenzo-p-dioxin

TCDF: Tetrachlorodibenzofuran

TEQ: Toxic equavilency units

U: Compound analyzed for, but not detected above detection limit

UJ: Compound analyzed for, but not detected above estimated detection

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG21	RIFS-SMA5-SG22	RIFS-SMA5-SG23	RIFS-SMA5-SG24	RIFS-SMA5-SG25	RIFS-SMA5-SG26	RIFS-SMA5-SG27
Sample ID	RIFS-SMA5-SG21-062520	RIFS-SMA5-SG22-062620	RIFS-SMA5-SG23-062620	RIFS-SMA5-SG24-062720	RIFS-SMA5-SG25-062620	RIFS-SMA5-SG26-062620	RIFS-SMA5-SG27-062620
Sample Date	6/25/2020	6/26/2020	6/26/2020	6/27/2020	6/26/2020	6/26/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	998274.49	997774.41	997276.12	997779.92	998274.45	998772.72	999282.36
Y	695215.38	695216.92	695214.3	694714.11	694711.89	694710.12	694717.19
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Loss on ignition	--	--	--	--	--	--	--
Moisture (water) content	--	--	--	--	--	--	--
Total solids	--	--	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	--	--	--	25 U	--	--	--
Acenaphthene	--	--	--	**7.57 J**	--	--	--
Acenaphthylene	--	--	--	**7.2 J**	--	--	--
Anthracene	--	--	--	**37.1**	--	--	--
Benzo(a)anthracene	--	--	--	**133**	--	--	--
Benzo(a)pyrene	--	--	--	**126**	--	--	--
Benzo(b)fluoranthene	--	--	--	**181**	--	--	--
Benzo(e)pyrene	--	--	--	**127**	--	--	--
Benzo(g,h,i)perylene	--	--	--	**56.1**	--	--	--
Benzo(k)fluoranthene	--	--	--	**112**	--	--	--
Chrysene	--	--	--	**413**	--	--	--
Dibenzo(a,h)anthracene	--	--	--	**8.91 J**	--	--	--
Fluoranthene	--	--	--	**548**	--	--	--
Fluorene	--	--	--	25 U	--	--	--
Indeno(1,2,3-c,d)pyrene	--	--	--	**46.6**	--	--	--
Naphthalene	--	--	--	30.3 U	--	--	--
Perylene	--	--	--	**48.2**	--	--	--
Phenanthrene	--	--	--	**99.4**	--	--	--
Pyrene	--	--	--	**553**	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)	--	--	--	**293**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	**178.281 J**	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	--	--	--	**178.281 J**	--	--	--
Total HPAH (SMS) (U = 0)	--	--	--	**2177.61 J**	--	--	--
Total LPAH (SMS) (U = 0)	--	--	--	**151.27 J**	--	--	--
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**0.335 J**	**0.382 J**	**0.732 J**	**0.49 J**	**0.457 J**	**1.01 J**	**0.822 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**1.61 J**	**1.86 J**	**3.64 J**	**3.03 J**	**2.33 J**	**5.33**	**3.47 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**2.51 J**	**3.54 J**	**6.67**	**5.85**	**3.58 J**	**7.79**	**5.04**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**14.1**	**15.5**	**27**	**21.8**	**17.3**	**37.3**	**24.6**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**4.87**	**7.47**	**14.4**	**11.5**	**7.87**	**15.7**	**9.89**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**312**	**373**	**614**	**530**	**366**	**775**	**462**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**2560**	**3190**	**5230**	**3920**	**3030**	**6050**	**3680**

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG21	RIFS-SMA5-SG22	RIFS-SMA5-SG23	RIFS-SMA5-SG24	RIFS-SMA5-SG25	RIFS-SMA5-SG26	RIFS-SMA5-SG27
Sample ID	RIFS-SMA5-SG21-062520	RIFS-SMA5-SG22-062620	RIFS-SMA5-SG23-062620	RIFS-SMA5-SG24-062720	RIFS-SMA5-SG25-062620	RIFS-SMA5-SG26-062620	RIFS-SMA5-SG27-062620
Sample Date	6/25/2020	6/26/2020	6/26/2020	6/27/2020	6/26/2020	6/26/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	998274.49	997774.41	997276.12	997779.92	998274.45	998772.72	999282.36
Y	695215.38	695216.92	695214.3	694714.11	694711.89	694710.12	694717.19
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**62.3 J**	**98.4**	**194**	**218 J**	**138**	**425**	**173**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**76.2**	**130**	**244**	**244**	**129**	**345**	**182**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**222**	**294**	**495**	**475**	**292**	**691**	**412**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**765**	**850**	**1380**	**1970**	**895**	**1990**	**1190**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**1.31**	**1.13**	**2.02**	**1.85**	**1.43**	**4**	**2.86**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**1.1 J**	**1.41 J**	**2.35 J**	**1.65 J**	**1.66 J**	**3.48 J**	**2.55 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**1.66 J**	**1.68 J**	**3.02 J**	**2.42 J**	**2.39 J**	**5.64**	**3.84 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**6.67**	**9.77**	**18.4**	**8.97**	**12.7**	**21.7**	**13.9**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**2.68 J**	**3.83 J**	**6.72**	**3.83 J**	**4.14 J**	**8.61**	**5.38**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.272 U	0.399 U	**0.609 J**	0.484 U	0.403 U	**0.784 J**	0.473 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**1.95 J**	**3.22 J**	**5.25**	**3.45 J**	**3.32 J**	**6.48**	**4.32 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**111**	**148**	**228**	**119**	**145**	**281**	**169**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**5.14**	**6.81**	**11.8**	**5.7**	**6.55**	**12.1**	**7.03**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**404**	**423**	**554**	**274**	**355**	**777**	**367**
Total Tetrachlorodibenzofuran (TCDF)	**27.5 J**	**25.2**	**43.7**	**40.8 J**	**33.8**	**92.7**	**66.4 J**
Total Pentachlorodibenzofuran (PeCDF)	**40.2 J**	**45.3**	**73.3**	**55.5**	**58.2**	**135**	**91.4**
Total Hexachlorodibenzofuran (HxCDF)	**142**	**178**	**272**	**161**	**188**	**397**	**242**
Total Heptachlorodibenzofuran (HpCDF)	**416**	**421**	**646**	**374**	**455**	**947**	**507**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**11.0692 J**	**13.61625 J**	**23.7286 J**	**17.8499 J**	**14.79895 J**	**31.1019 J**	**19.73755 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**11.0556 J**	**13.5963 J**	**23.7286 J**	**17.8257 J**	**14.7788 J**	**31.1019 J**	**19.7139 J**

Notes:

Bold: Detected result

µg/kg: microgram per kilogram

CAEPA: California Environmental Protection Agency

HpCDD: Heptachlorodibenzo-p-dioxin

HpCDF: Heptachlorodibenzofuran

HxCDD: Hexachlorodibenzo-p-dioxin

HxCDF: Hexachlorodibenzofuran

J: Estimated value

mg/kg: miligrams per kilogram

ng/kg: nanogram per kilogram

PeCDD: Pentachlorodibenzo-p-dioxin

PeCDF: Pentachlorodibenzofuran

TCDD: Tetrachlorodibenzo-p-dioxin

TCDF: Tetrachlorodibenzofuran

TEQ: Toxic equavilency units

U: Compound analyzed for, but not detected above detection limit

UJ: Compound analyzed for, but not detected above estimated detection

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG28	RIFS-SMA5-SG29	RIFS-SMA5-SG30	RIFS-SMA5-SG31	RIFS-SMA5-SG32	RIFS-SMA5-SG33	RIFS-SMA5-SG34
Sample ID	RIFS-SMA5-SG28-062720	RIFS-SMA5-SG29-062720	RIFS-SMA5-SG30-062720	RIFS-SMA5-SG31-062620	RIFS-SMA5-SG32-062620	RIFS-SMA5-SG33-062720	RIFS-SMA5-SG34-062720
Sample Date	6/27/2020	6/27/2020	6/27/2020	6/26/2020	6/26/2020	6/27/2020	6/27/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	997773.82	998265.07	998769.88	999278.08	999777	997779.65	998278.49
Y	694215.17	694212.52	694214.11	694216.08	694215.35	693715.02	693712.92
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Loss on ignition	--	--	--	--	--	--	--
Moisture (water) content	--	--	--	--	--	--	--
Total solids	--	--	--	--	--	--	--
Metals (mg/kg)							
Copper	--	--	--	--	--	--	--
Organometallic Compounds (µg/kg)							
Butyltin (ion)	--	--	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	**21.4**	--	--	--	--	--	--
Acenaphthene	**19.4**	--	--	--	--	--	--
Acenaphthylene	**20.5 J**	--	--	--	--	--	--
Anthracene	**37.8**	--	--	--	--	--	--
Benzo(a)anthracene	**69.2**	--	--	--	--	--	--
Benzo(a)pyrene	**69.5**	--	--	--	--	--	--
Benzo(b)fluoranthene	**94.7**	--	--	--	--	--	--
Benzo(e)pyrene	**75.7**	--	--	--	--	--	--
Benzo(g,h,i)perylene	**48.2**	--	--	--	--	--	--
Benzo(k)fluoranthene	**54.8**	--	--	--	--	--	--
Chrysene	**171**	--	--	--	--	--	--
Dibenzo(a,h)anthracene	**7.12 J**	--	--	--	--	--	--
Fluoranthene	**355**	--	--	--	--	--	--
Fluorene	**23.4**	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	**32.6**	--	--	--	--	--	--
Naphthalene	**242**	--	--	--	--	--	--
Perylene	**73.1**	--	--	--	--	--	--
Phenanthrene	**165**	--	--	--	--	--	--
Pyrene	**362**	--	--	--	--	--	--
Total Benzofluoranthenes (b,j,k) (U = 0)	**149.5**	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**97.052 J**	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**97.052 J**	--	--	--	--	--	--
Total HPAH (SMS) (U = 0)	**1264.12 J**	--	--	--	--	--	--
Total LPAH (SMS) (U = 0)	**508.1 J**	--	--	--	--	--	--
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**0.872 J**	**1.38 J**	**2.1**	**1.48 J**	**0.812 J**	**0.772 J**	**1.28 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**5.53**	**5.83**	**10.6**	**6.77**	**4.01 J**	**4.4 J**	**6.44**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**9.48**	**10.7**	**14.8**	**10.9**	**6.76**	**7.99**	**11.7**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**45.8**	**44.5**	**129**	**54.8**	**32.9**	**34.5**	**54.5**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**19.7**	**20.8**	**34.9**	**20.7**	**13.5**	**15.8**	**24**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**1080**	**1050**	**2930**	**1200**	**794**	**855**	**1340**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**8600**	**8630**	**24300**	**10100**	**6490**	**6990**	**11400**

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG28	RIFS-SMA5-SG29	RIFS-SMA5-SG30	RIFS-SMA5-SG31	RIFS-SMA5-SG32	RIFS-SMA5-SG33	RIFS-SMA5-SG34
Sample ID	RIFS-SMA5-SG28-062720	RIFS-SMA5-SG29-062720	RIFS-SMA5-SG30-062720	RIFS-SMA5-SG31-062620	RIFS-SMA5-SG32-062620	RIFS-SMA5-SG33-062720	RIFS-SMA5-SG34-062720
Sample Date	6/27/2020	6/27/2020	6/27/2020	6/26/2020	6/26/2020	6/27/2020	6/27/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE
X	997773.82	998265.07	998769.88	999278.08	999777	997779.65	998278.49
Y	694215.17	694212.52	694214.11	694216.08	694215.35	693715.02	693712.92
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**380**	**414**	**382**	**380**	**187 J**	**231**	**289**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**389**	**423**	**399**	**390**	**212**	**266**	**357**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**805**	**817**	**1200**	**881**	**533**	**581**	**883**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**3210**	**2910**	**6920**	**2940**	**2040**	**2080**	**3260**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**3.81**	**4.38**	**7.83**	**5.03**	**3.03**	**3.04**	**4.22**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**3.88 J**	**4.07 J**	**8.22**	**4.52 J**	**2.62 J**	**3.14 J**	**4.41 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**5.62**	**6.07**	**17.1**	**6.53**	**3.88 J**	**4.24 J**	**6.12**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**25**	**28.1**	**100**	**34.6**	**19.8**	**22.8**	**36.5**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**9.56**	**10.5**	**28**	**12.4**	**7.49**	**8.58**	**13**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.862 J**	**0.909 J**	**1.77 J**	**1 J**	0.598 U	**0.826 J**	**1.11 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**7.48**	**7.7**	**21.7**	**10.2**	**5.92**	**7.87**	**10.8**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**334**	**344**	**1370**	**510**	**306**	**306**	**504**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**14.9**	**17.2**	**57.6**	**20.3**	**12.9**	**14.3**	**23.7**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**844**	**1030**	**3920**	**1200**	**746**	**784**	**1430**
Total Tetrachlorodibenzofuran (TCDF)	**83.7**	**101**	**212**	**120 J**	**65.7 J**	**67.9**	**95.2**
Total Pentachlorodibenzofuran (PeCDF)	**130**	**142**	**440**	**183**	**107 J**	**114**	**159**
Total Hexachlorodibenzofuran (HxCDF)	**451**	**463**	**1850**	**642**	**381**	**393**	**620**
Total Heptachlorodibenzofuran (HpCDF)	**960**	**1240**	**4800**	**1640**	**981**	**903**	**1740**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**37.4958 J**	**38.922 J**	**103.9186 J**	**46.0006 J**	**28.3343 J**	**30.764 J**	**47.7973 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**37.4958 J**	**38.922 J**	**103.9186 J**	**46.0006 J**	**28.3044 J**	**30.764 J**	**47.7973 J**

Notes:

Bold: Detected result

µg/kg: microgram per kilogram

CAEPA: California Environmental Protection Agency

HpCDD: Heptachlorodibenzo-p-dioxin

HpCDF: Heptachlorodibenzofuran

HxCDD: Hexachlorodibenzo-p-dioxin

HxCDF: Hexachlorodibenzofuran

J: Estimated value

mg/kg: miligrams per kilogram

ng/kg: nanogram per kilogram

PeCDD: Pentachlorodibenzo-p-dioxin

PeCDF: Pentachlorodibenzofuran

TCDD: Tetrachlorodibenzo-p-dioxin

TCDF: Tetrachlorodibenzofuran

TEQ: Toxic equavilency units

U: Compound analyzed for, but not detected above detection limit

UJ: Compound analyzed for, but not detected above estimated detection

Table 1

Simpson 2020 RI Chemical Data

Task	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**	**SheltonRI_FS_2020**
Location ID	**RIFS-SMA5-SG35**	**RIFS-SMA5-SG40**	**RIFS-SMA5-SG-COMP-05**	**RIFS-SMA5-SG-COMP-07**	**RIFS-SMA5-SG-COMP-10**
Sample ID	**RIFS-SMA5-SG35-062720**	**RIFS-SMA5-SG40-062220**	**RIFS-SMA5-SG-COMP-05-062520**	**RIFS-SMA5-SG-COMP-07-062720**	**RIFS-SMA5-SG-COMP-10-062620**
Sample Date	**6/27/2020**	**6/22/2020**	**6/25/2020**	**6/27/2020**	**6/26/2020**
Depth	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**
Sample Type	**N**	**N**	**N**	**N**	**N**
Matrix	**SE**	**SE**	**SE**	**SE**	**SE**
X	**998773.84**	**997327.71**	**997679.230008**	**998202.953042**	**998575.107154**
Y	**693696.29**	**694762.11**	**696005.289865**	**694068.591311**	**694914.120132**
Conventional Parameters (pct)					
Total organic carbon	--	--	--	--	--
Loss on ignition	--	--	--	--	--
Moisture (water) content	--	--	--	--	--
Total solids	--	--	--	--	--
Metals (mg/kg)					
Copper	--	--	--	--	--
Organometallic Compounds (µg/kg)					
Butyltin (ion)	--	--	--	--	--
Dibutyltin (ion)	--	--	--	--	--
Tetrabutyltin	--	--	--	--	--
Tributyltin (ion)	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene	--	**23.8**	**16.2**	**14.1**	**4.92**
Acenaphthene	--	**64.8**	**23.2**	**12.1**	**6.6**
Acenaphthylene	--	**18.5 J**	**7 J**	**10.2 J**	**5.56 J**
Anthracene	--	**81.7**	**25**	**19.5**	**5.2**
Benzo(a)anthracene	--	**247**	**36.3**	**36.1**	**7.24**
Benzo(a)pyrene	--	**188**	**34.4**	**37.8**	**6.9**
Benzo(b)fluoranthene	--	383 U	**40.6**	**50.8**	7.79 U
Benzo(e)pyrene	--	**246**	**33.8**	**43.3**	**7.77**
Benzo(g,h,i)perylene	--	104 U	**31.9**	35.7 U	7.46 U
Benzo(k)fluoranthene	--	209 U	**16.7**	24.6 U	3.37 U
Chrysene	--	**730**	**65**	**82.1**	**11.7**
Dibenzo(a,h)anthracene	--	**33.1 J**	5.76 UJ	6.47 U	1.1 U
Fluoranthene	--	**1240**	**205**	**132**	**22.2**
Fluorene	--	**49.3**	**24**	**13.4**	**5.46**
Indeno(1,2,3-c,d)pyrene	--	102 U	**21.8 J**	23.8 U	4.29 U
Naphthalene	--	**114**	**90.3**	**117**	**51.7**
Perylene	--	**61.8**	**38.8**	**47.1**	**9.21**
Phenanthrene	--	**250**	**130**	**90.1**	**25.1**
Pyrene	--	**1180**	**295**	**188**	**46**
Total Benzofluoranthenes (b,j,k) (U = 0)	--	383 U	**57.3**	**50.8**	7.79 U
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	**223.31 J**	**46.59 J**	**47.311**	**7.741**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	--	**258.01 J**	**46.878 J**	**50.0545**	**8.5685**
Total HPAH (SMS) (U = 0)	--	**3618.1 J**	**746.7 J**	**526.8**	**94.04**
Total LPAH (SMS) (U = 0)	--	**578.3 J**	**299.5 J**	**262.3 J**	**99.62 J**
Dioxin Furans (ng/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**0.942 J**	--	**1.17 J**	**1.24 J**	**0.692 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**5.46**	--	**5.08 J**	**5.76 J**	**3.03 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**9.65**	--	**9.93**	**10.5**	**5.08**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**40.1**	--	**37.5**	**55.9**	**25.4**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**18.5**	--	**17.4**	**20.4**	**10**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**917**	--	**728**	**1360**	**540**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**7730**	--	**5420**	**10300**	**4450**

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG35	RIFS-SMA5-SG40	RIFS-SMA5-SG-COMP-05	RIFS-SMA5-SG-COMP-07	RIFS-SMA5-SG-COMP-10
Sample ID	RIFS-SMA5-SG35-062720	RIFS-SMA5-SG40-062220	RIFS-SMA5-SG-COMP-05-062520	RIFS-SMA5-SG-COMP-07-062720	RIFS-SMA5-SG-COMP-10-062620
Sample Date	6/27/2020	6/22/2020	6/25/2020	6/27/2020	6/26/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE
X	998773.84	997327.71	997679.230008	998202.953042	998575.107154
Y	693696.29	694762.11	696005.289865	694068.591311	694914.120132
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**284**	--	**557**	**292**	**129**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**319**	--	**447 J**	**315 J**	**146**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**644**	--	**733**	**826**	**430**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**2140**	--	**1860**	**4030**	**1430**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**3.5**	--	**2.96**	**3.75**	**2.44**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**3.46 J**	--	**2.9 J**	**3.95 J**	**2.28 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**4.89**	--	**4.43 J**	**6.38**	**3.46 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**24.6**	--	**18.5**	**32.3**	**15.6**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**9.97**	--	**6.86**	**10.8**	**5.43**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.696 J**	--	**0.733 J**	**0.864 J**	4.73 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**7.83**	--	**5.21**	**8.06**	**4.09 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**361**	--	**247**	**458**	**193**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**16.5**	--	**11.2**	**21.1**	**9.16**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**910**	--	**608**	**1280**	**500**
Total Tetrachlorodibenzofuran (TCDF)	**81.1**	--	**78.8 J**	**95 J**	**63.1 J**
Total Pentachlorodibenzofuran (PeCDF)	**125**	--	**110**	**159**	**85.9**
Total Hexachlorodibenzofuran (HxCDF)	**429**	--	**344**	**610**	**275**
Total Heptachlorodibenzofuran (HpCDF)	**1090**	--	**882**	**1620**	**671**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**34.9944 J**	--	**29.2457 J**	**45.1549 J**	**20.7755 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**34.9944 J**	--	**29.2457 J**	**45.1549 J**	**20.539 J**

Notes:

Bold: Detected result

µg/kg: microgram per kilogram

CAEPA: California Environmental Protection Agency

HpCDD: Heptachlorodibenzo-p-dioxin

HpCDF: Heptachlorodibenzofuran

HxCDD: Hexachlorodibenzo-p-dioxin

HxCDF: Hexachlorodibenzofuran

J: Estimated value

mg/kg: miligrams per kilogram

ng/kg: nanogram per kilogram

PeCDD: Pentachlorodibenzo-p-dioxin

PeCDF: Pentachlorodibenzofuran

TCDD: Tetrachlorodibenzo-p-dioxin

TCDF: Tetrachlorodibenzofuran

TEQ: Toxic equavilency units

U: Compound analyzed for, but not detected above detection limit

UJ: Compound analyzed for, but not detected above estimated detection

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG-COMP-10	OMMP-SMA1-SG-COMP-07	OMMP-SMA1-SG-COMP-07	OMMP-SMA1-SG-COMP-07	OMMP-SMA2-SG-COMP-02
Sample ID	RIFS-SMA5-SG-COMP-110-062620	OMMP-SMA1-SG-COMP-07-062520	OMMP-SMA1-SG-COMP-107-062520	OMMP-SMA1-SG-DCOMP-06-062520	OMMP-SMA2-SG-COMP-02-062220
Sample Date	6/26/2020	6/25/2020	6/25/2020	6/25/2020	6/22/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	FD	N	FD	N	N
Matrix	SE	SE	SE	DS	SE
X	998575.107154	996804.21437	996804.21437	996804.21437	997435.430299
Y	694914.120132	695878.200881	695878.200881	695878.200881	696175.103502
Conventional Parameters (pct)					
Total organic carbon	--	**1.13**	**0.76**	**3.26**	**1.32**
Loss on ignition	--	--	--	--	--
Moisture (water) content	--	--	--	--	--
Total solids	--	**73.77**	**75.77**	**39**	**60.34**
Metals (mg/kg)					
Copper	--	--	--	--	**50.6 J**
Organometallic Compounds (µg/kg)					
Butyltin (ion)	--	--	--	--	4.1 U
Dibutyltin (ion)	--	--	--	--	5.8 U
Tetrabutyltin	--	--	--	--	5.02 U
Tributyltin (ion)	--	--	--	--	3.88 U
Polycyclic Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene	**13.6**	**1.46**	**2**	**4.85**	**2.74**
Acenaphthene	**14**	**0.8**	**1.08**	**3.25**	**2.76**
Acenaphthylene	**9.67 J**	**0.77 J**	**1.16 J**	**2.82 J**	**2.04 J**
Anthracene	**10.2**	**2.98**	**2.97**	**8.35**	**7.11**
Benzo(a)anthracene	**11.1**	**7.2**	**10.3**	**18.1**	**16**
Benzo(a)pyrene	**12.9**	**7.99**	**10.3**	**22.9**	**18.2**
Benzo(b)fluoranthene	**14.1**	**9.35**	**12.9**	**26.9**	**21.5**
Benzo(e)pyrene	**15.3**	**8.82**	**11.2**	**24.7**	**19.3**
Benzo(g,h,i)perylene	15.9 U	9.56 U	13.4 U	**29.2**	19.5 U
Benzo(k)fluoranthene	5.63 U	3.78 U	5.31 U	**10.5**	**9.37**
Chrysene	**18.1**	**14.7**	**16.5**	**38.7**	**36.6**
Dibenzo(a,h)anthracene	2.26 U	1.64 UJ	1.99 UJ	4.26 UJ	3.31 UJ
Fluoranthene	**33.1**	**18.6**	**25.4**	**33.8**	**30.2**
Fluorene	**11.5**	**1.55**	**1.77**	**4.86**	**3.71**
Indeno(1,2,3-c,d)pyrene	**8.92**	5.63 U	**7.74 J**	**17.2 J**	**12.3**
Naphthalene	**105**	**4.95**	**7.07**	**18**	**12.6**
Perylene	**19.3**	**9.28**	**11.7**	**30.8**	**15.3**
Phenanthrene	**58.9**	**10.6**	**12.5**	**31.7**	**24.1**
Pyrene	**83.3**	**23.7**	**34.4**	**67.1**	**57.3**
Total Benzofluoranthenes (b,j,k) (U = 0)	**14.1**	**9.35**	**12.9**	**37.4**	**30.87**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**16.493**	**9.792 J**	**13.559 J**	**30.557 J**	**24.483 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**16.8875**	**10.3445 J**	**13.924 J**	**30.77 J**	**24.6485 J**
Total HPAH (SMS) (U = 0)	**181.52**	**81.54 J**	**117.54 J**	**264.4 J**	**201.47 J**
Total LPAH (SMS) (U = 0)	**209.27 J**	**21.65 J**	**26.55 J**	**68.98 J**	**52.32 J**
Dioxin Furans (ng/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**0.86 J**	**0.974 J**	**0.825 J**	**1.99**	**2.56**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**3.2 J**	**3.2 J**	**3.66 J**	**7.44 J**	**8.43**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**5.26**	**6**	**6.68**	**14.9**	**21.8**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**26.6**	**18.4**	**21.6**	**51.6**	**55.3**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**10.7**	**14 J**	**14.2 J**	**27**	**24.7**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**596**	**411**	**434**	**1020**	**981**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**4560**	**3200**	**3220**	**7910**	**7110**

Table 1

Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020	SheltonRI_FS_2020
Location ID	RIFS-SMA5-SG-COMP-10	OMMP-SMA1-SG-COMP-07	OMMP-SMA1-SG-COMP-07	OMMP-SMA1-SG-COMP-07	OMMP-SMA2-SG-COMP-02
Sample ID	RIFS-SMA5-SG-COMP-110-062620	OMMP-SMA1-SG-COMP-07-062520	OMMP-SMA1-SG-COMP-107-062520	OMMP-SMA1-SG-DCOMP-06-062520	OMMP-SMA2-SG-COMP-02-062220
Sample Date	6/26/2020	6/25/2020	6/25/2020	6/25/2020	6/22/2020
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	FD	N	FD	N	N
Matrix	SE	SE	SE	DS	SE
X	998575.107154	996804.21437	996804.21437	996804.21437	997435.430299
Y	694914.120132	695878.200881	695878.200881	695878.200881	696175.103502
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**166**	**252 J**	**274 J**	**639**	**587 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**172 J**	**314 J**	**318 J**	**601 J**	**669 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**444**	**430**	**453**	**1070**	**1100**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**1540**	**978**	**977**	**2460**	**2170**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**2.26**	**1.43**	**1.52**	**3.1**	**3.15**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**2.21 J**	**1.62 J**	**1.85 J**	**3.74 J**	**3.73 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**3.25 J**	**2.16 J**	**2.3 J**	**5.01**	**5.37 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**15.9**	**10.3**	**10.9**	**25.2**	**24.3**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**5.56**	**3.88 J**	**4.41 J**	**10.2**	**12**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	4.81 U	4.72 U	4.72 U	**0.757 J**	**0.701 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**4.21 J**	**3.29 J**	**3.53 J**	**8.2**	**7.85**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**216**	**134**	**135**	**328**	**326**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**10.4**	**6.08**	**7.38**	**17**	**17.6**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**651**	**377**	**334**	**806**	**804**
Total Tetrachlorodibenzofuran (TCDF)	**59.3 J**	**36.1 J**	**38.5 J**	**85.1 J**	**88.8 J**
Total Pentachlorodibenzofuran (PeCDF)	**88.6**	**52.3 J**	**52.4**	**134**	**114**
Total Hexachlorodibenzofuran (HxCDF)	**290**	**171 J**	**177**	**452**	**377**
Total Heptachlorodibenzofuran (HpCDF)	**770**	**466**	**388**	**1130**	**1010**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**22.1781 J**	**17.4205 J**	**18.5805 J**	**41.4057 J**	**43.3132 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**21.9376 J**	**17.1845 J**	**18.3445 J**	**41.4057 J**	**43.3132 J**

Notes:

Bold: Detected result

µg/kg: microgram per kilogram

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HpCDD: Heptachlorodibenzo-p-dioxin

HpCDF: Heptachlorodibenzofuran

HxCDD: Hexachlorodibenzo-p-dioxin

HxCDF: Hexachlorodibenzofuran

J: Estimated value

mg/kg: miligrams per kilogram

ng/kg: nanogram per kilogram

PeCDD: Pentachlorodibenzo-p-dioxin

PeCDF: Pentachlorodibenzofuran

TCDD: Tetrachlorodibenzo-p-dioxin

TCDF: Tetrachlorodibenzofuran

TEQ: Toxic equavilency units

U: Compound analyzed for, but not detected above detection limit

UJ: Compound analyzed for, but not detected above estimated detection

Table 1
Simpson 2020 RI Chemical Data

Task	SheltonRI_FS_2020
Location ID	OMMP-SMA3-SG-COMP-05
Sample ID	OMMP-SMA3-SG-DCOMP-04-062520
Sample Date	6/25/2020
Depth	0 - 10 cm
Sample Type	N
Matrix	DS
X	996024.669013
Y	693974.192878
Conventional Parameters (pct)	
Total organic carbon	**3.42**
Loss on ignition	--
Moisture (water) content	--
Total solids	**36.44**
Metals (mg/kg)	
Copper	--
Organometallic Compounds (µg/kg)	
Butyltin (ion)	--
Dibutyltin (ion)	--
Tetrabutyltin	--
Tributyltin (ion)	--
Polycyclic Aromatic Hydrocarbons (µg/kg)	
2-Methylnaphthalene	**20.1**
Acenaphthene	**28.9**
Acenaphthylene	**11.6 J**
Anthracene	**32.4**
Benzo(a)anthracene	**51.3**
Benzo(a)pyrene	**49.4**
Benzo(b)fluoranthene	**61**
Benzo(e)pyrene	**49.8**
Benzo(g,h,i)perylene	**45.3**
Benzo(k)fluoranthene	**23**
Chrysene	**78.4**
Dibenzo(a,h)anthracene	7.56 UJ
Fluoranthene	**203**
Fluorene	**24.9**
Indeno(1,2,3-c,d)pyrene	**30.6**
Naphthalene	**121**
Perylene	**42.5**
Phenanthrene	**153**
Pyrene	**263**
Total Benzofluoranthenes (b,j,k) (U = 0)	**84**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**66.774 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**67.152 J**
Total HPAH (SMS) (U = 0)	**805 J**
Total LPAH (SMS) (U = 0)	**371.8 J**
Dioxin Furans (ng/kg)	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	**1.39 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	**5.95 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**11.6**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**43.6**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**21**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**950**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**7560**

Table 1
Simpson 2020 RI Chemical Data

Task	**SheltonRI_FS_2020**
Location ID	**OMMP-SMA3-SG-COMP-05**
Sample ID	**OMMP-SMA3-SG-DCOMP-04-062520**
Sample Date	**6/25/2020**
Depth	**0 - 10 cm**
Sample Type	**N**
Matrix	**DS**
X	**996024.669013**
Y	**693974.192878**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**382**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**430 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	**817**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**2470**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**4.59**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	**4.29 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	**5.68**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**25.2**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**9.65**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.842 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**7.44**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**315**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**15.2**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**868**
Total Tetrachlorodibenzofuran (TCDF)	**111 J**
Total Pentachlorodibenzofuran (PeCDF)	**132 J**
Total Hexachlorodibenzofuran (HxCDF)	**420**
Total Heptachlorodibenzofuran (HpCDF)	**1080**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**36.8953 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	**36.8953 J**

Notes:
Bold: Detected result
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
HpCDD: Heptachlorodibenzo-p-dioxin
HpCDF: Heptachlorodibenzofuran
HxCDD: Hexachlorodibenzo-p-dioxin
HxCDF: Hexachlorodibenzofuran
J: Estimated value
mg/kg: miligrams per kilogram
ng/kg: nanogram per kilogram
PeCDD: Pentachlorodibenzo-p-dioxin
PeCDF: Pentachlorodibenzofuran
TCDD: Tetrachlorodibenzo-p-dioxin
TCDF: Tetrachlorodibenzofuran
TEQ: Toxic equavilency units
U: Compound analyzed for, but not detected above detection limit
UJ: Compound analyzed for, but not detected above estimated detection

Appendix I

Bivalve Tissue Data from Puget Sound Reference Areas

Appendix I. Bivalve Dioxin/Furan and cPAH TEQ Tissue Data from Puget Sound Reference Areas

Dioxin/Furan TEQ Levels in Bivalve Tissues Collected from Puget Sound Reference Areas

Species	Tissue Type	Location	Year	Individuals Per Composite	Sample Detection Frequency	Dioxin/Furan TEQ (ng/kg wet weight)			Source
						Mean	Minimum	Maximum	
Butter clam	soft parts	Padilla/Fidalgo Bay	1999	50	1/1	0.91	0.91	0.91	Ecology (2000)
Littleneck clam	soft parts	Padilla/Fidalgo Bay	1999	50	1/1	1.63	1.63	1.63	Ecology (2000)
Geoduck	whole-body	Dungeness Bay	2002	1	3/3	0.26	0.22	0.30	Malcolm Pirnie (2007)
Geoduck	whole-body	Freshwater Bay	2002	1	3/3	0.23	0.21	0.24	Malcolm Pirnie (2007)
Horse clam	whole-body	Dungeness Bay	2002	1	3/3	0.26	0.21	0.32	Malcolm Pirnie (2007)
Horse clam	whole-body	Freshwater Bay	2002	1	3/3	0.25	0.25	0.26	Malcolm Pirnie (2007)
Littleneck clam	soft parts	Salsbury Point	2003	10-20	2/2	0.25	0.23	0.27	Parametrix (2003)
Geoduck	edible meat	Freshwater Bay	2006	1	8/8	0.03	0.02	0.04	Malcolm Pirnie (2007)
Geoduck	gut ball	Freshwater Bay	2006	1	5/5	0.07	0.06	0.10	Malcolm Pirnie (2007)
Horse clam	edible meat	Dungeness Bay	2006	1	8/8	0.04	0.01	0.16	Malcolm Pirnie (2007)
Horse clam	gut ball	Dungeness Bay	2006	1	5/5	0.05	0.03	0.06	Malcolm Pirnie (2007)
Horse clam	edible meat	Freshwater Bay	2006	1	8/8	0.03	0.02	0.06	Malcolm Pirnie (2007)
Horse clam	gut ball	Freshwater Bay	2006	1	5/5	0.06	0.05	0.08	Malcolm Pirnie (2007)
Geoduck	whole-body	Dungeness Bay	2008	1	1/1	1.42	1.42	1.42	Ecology and Environment (2012)
Horse clam	whole-body	Dungeness Bay	2008	4-5	2/2	1.50	1.42	1.57	Ecology and Environment (2012)
Bay mussel	soft parts	Penn Cove	2014	64	1/1	0.09	0.09	0.09	Wash. Dept. Fish & Wildlife (2015)
Blue mussel	soft parts	Penn Cove	2015	32	1/1	0.11	0.11	0.11	Anchor QEA (2017c)
Blue mussel	soft parts	Penn Cove	2016	32	2/2	0.12	0.11	0.12	Anchor QEA (2017c)

cPAH TEQ Levels in Bivalve Tissues Collected from Puget Sound Reference Areas

Species	Tissue Type	Location	Year	Individuals Per Composite	Sample Detection Frequency	cPAH TEQ (µg/kg wet weight)			Source
						Mean	Minimum	Maximum	
Butter clam	soft parts	Padilla/Fidalgo Bay	1999	50	0/1	*0.85 U*	*0.85 U*	*0.85 U*	Ecology (2000)
Littleneck clam	soft parts	Padilla/Fidalgo Bay	1999	50	0/1	*0.88 U*	*0.88 U*	*0.88 U*	Ecology (2000)
Bay mussel	soft parts	Padilla/Fidalgo Bay	1999	50	0/1	*0.86 U*	*0.86 U*	*0.86 U*	Ecology (2000)
Geoduck	soft parts	Dungeness Bay	2002	1	1/3	0.13	0.11 U	0.17	Malcolm Pirnie (2007)
Geoduck	soft parts	Freshwater Bay	2002	1	1/3	0.12	0.11 U	0.14	Malcolm Pirnie (2007)
Littleneck clam	soft parts	Salsbury Point	2003	10-20	0/2	0.11 U	0.11 U	0.11 U	Parametrix (2003)
Geoduck	soft parts	Dungeness Bay	2008	2	1/1	0.07	0.07	0.07	Ecology and Environment (2012)
Bay mussel	soft parts	Penn Cove	2014	96	1/1	0.41	0.41	0.41	Wash. Dept. Fish & Wildlife (2015)
Blue mussel	soft parts	Penn Cove	2015	32	1/1	0.47	0.47	0.47	Anchor QEA (2017c)
Blue mussel	soft parts	Penn Cove	2016	32	2/2	0.44	0.37	0.50	Anchor QEA (2017c)

Notes:

U denotes that cPAHs were not detected above the indicated method detection limit.

Italicized values denote elevated detection limits; these values were not used for Puget Sound reference area levels