Swinomish Indian Tribal Community

Tribal Economic Zone Area 1
Phase II Environmental Site Assessment
SQAP – Revision 2

LaConner, WA

Prepared for:

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Acronym List

%R	percent recovery
AOC	area of concern
B	biota
BNSF	Burlington Northern Santa Fe
CCC	criterion continuous concentration
COC	Chain of Custody
COPC	contaminant of potential concern
CLP	Contract Laboratory Program
CS	complete sample
CSLs	Washington State marine sediment cleanup screening levels
CWA	Clean Water Act
DQO	data quality objective
Ecology	Washington Department of Ecology
EIGov	Environment International Government, Ltd.
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
ft	foot
HRS	Hazard Ranking System
HSP	Health and Safety Plan
HWA	Hong West Associates Geosciences, Inc.
IDW	investigation-derived waste
LAET	lowest apparent effects threshold
LOEC	low observed effects concentration
MS	matrix spike
MSD	matrix spike duplicate
NOEC	no observed effects concentration
NRWQC	National Recommended Water Quality Criteria
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
pet coke	petroleum coke
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RPD	relative percent difference
RSL	Regional Screening Level
SCHD	Skagit County Health Department
SD	sediment
SITC	Swinomish Indian Tribal Community

SOP	standard operating procedure
SQAP	Sampling and Quality Assurance Plan
SQS	Puget Sound Marine Sediment Quality Standards
SR	State Route
SVOCs	semi-volatile organic compounds
TAL	Target Analyte List
TBA	Targeted Brownfields Assessment
TEZ	Tribal Economic Zone
TPH	total petroleum hydrocarbons
TOC	total organic carbon
USACE	United States Army Corps of Engineers
VOCs	volatile organic compounds

1. APPROVAL PAGE

Document Title: Sampling and Quality Assurance Plan (SQAP) for the Swinomish Indian Tribal Community, Tribal Economic Zone Area 1, Phase II Environmental Site Assessment, La Conner, WA

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2. PROJECT ORGANIZATION

This section provides a brief description of how the project is organized, including identification of the key project personnel and their responsibilities and a flow chart showing the chain of command.

Figure 2-1 is a project organization chart depicting the agencies and companies involved with this project and lines of authority. **Table 2-1** describes each participant's role in this project.

Table 2-1
Project Personnel Responsibilities

Name	Title	Organizational Affiliation and Contact Info	Responsibilities
Joanne LaBaw*	Task Order Project Officer	US EPA *Phone*: 206.553.2594 *Email*: labaw.joanne@epa.gov	Oversees all project activities, approval of the SQAP and all project modifications.
Jon Boe*	Brownfields Project Coordinator	Swinomish Indian Tribal Community *Phone*: 360.466.7280 *Email*: jboe@swinomish.nsn.us	Sets project objectives and oversees project activities. Provides comment and oversight on the SQAP and all project modifications.
Ginna Grepo-Grove*	QA Officer	US EPA *Phone*: 206.553.1632 *Email*: Grepo-Grove.Gina@epa.gov	Performs or assigns a Quality Assurance review of the SQAP and project data.
Bethany Plewe*	Regional Sample Control Coordinator	US EPA *Phone*: 206.553.1603 *Email*: Plewe.Bethany@epa.gov	Lab coordinator for Contract Laboratory Program and EPA Manchester Environmental Laboratory (MEL).
Jennifer Crawford*	Backup Regional Sample Control Coordinator	US EPA *Phone:* 206.553.6261 *Email:* crawford.jennifer@epa.gov	SQAP Review
Craig Christian*	Brownfields Principal Manager	EIGov *Phone*: 206.525.3362 *Email*: Craig.Christian@eigov.us	Provides overall contract and client management, resource assignments, and technical and project management.
Peter Graziani	Task Manager/ Field Coordinator	EIGov *Phone*: 206.525.3362 *Email*: Peter.Graziani@eigov.us	Day-to-day technical lead in charge of field work. Coordinates and conducts data collection. Participates in data interpretation and preparation of deliverables. Communicates and

			coordinates with subcontractors.
Suzanne Dolberg	QA Officer	EIGov *Phone*: 206.525.3362 *Email*: Suzanne.Dolberg@eigov.us	Provides project quality assurance oversight.
Field Staff	Scientists/ Engineers	EIGov *Phone*: 206.525.3362	Conduct field activities with oversight from Project Manager/Task Manager. Oversee subcontractor field activities. Communicate and coordinate with the Project Manager.
Subcontractors	Laboratory Services	TBD	Analyzes samples for chemical constituents.
	Investigation Derived Waste (IDW) Services	TBD	Properly disposes of investigation-derived waste.

* Distribution List for Final SQAP.

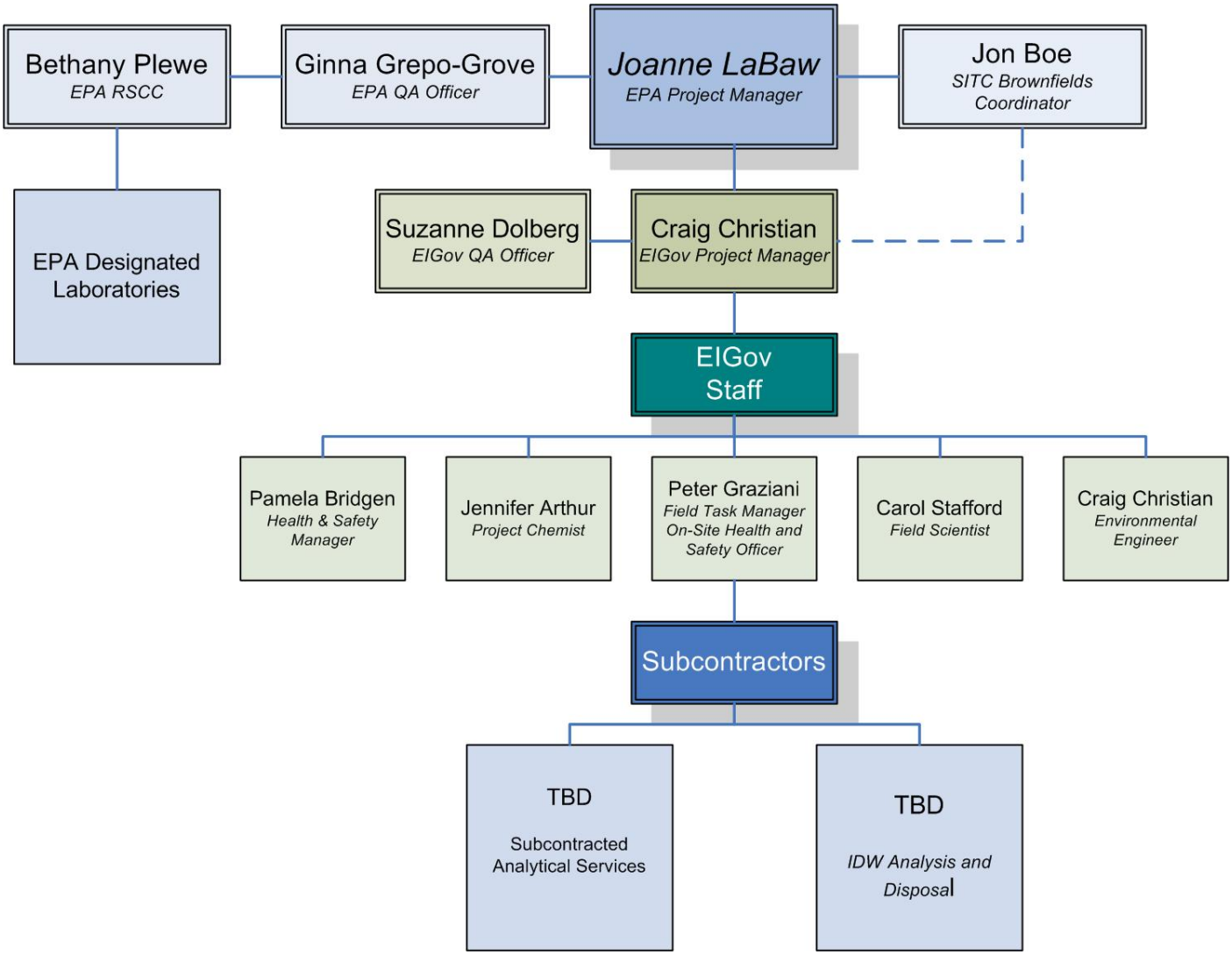

Figure 2-1: Project Organization Chart	EIGov	5505 34th Ave NE Seattle WA 98105

3. SCOPE OF WORK

This section introduces the project (Section 3.1) and describes the purpose and objectives of conducting a Phase II Environmental Site Assessment (ESA) at the Swinomish Indian Tribal Community (SITC or Tribe) Tribal Economic Zone (TEZ) Area 1 (Section 3.2). A brief description of the project tasks required for accomplishing the project objectives is provided (Section 3.3) as is a schedule for completing the tasks (Section 3.4).

3.1 Introduction

Through the Region 10 United States Environmental Protection Agency (EPA) Targeted Brownfields Assessment (TBA) Program, the EPA is performing a Phase II ESA at the SITC TEZ Area 1 near La Conner, Washington, for the SITC. Environment International Government, Ltd. (EIGov) has been contracted by the EPA to perform the tasks associated with this project.

The SITC Reservation encompasses approximately 7,400 acres of uplands, almost 2,900 acres of tidelands, and 420 acres of freshwater wetlands and has hosted a number of commercial and industrial activities in various areas around the Reservation (**Figure 3-1**). TEZ Area 1 is located on the northernmost point of the SITC Reservation, within the boundaries of Skagit County, Washington (**Figure 3-2**). The TEZ Area 1 is the focus of this Phase II ESA, and was identified during previous site investigations as one of four areas of concern on the Reservation. Potential for contamination in the area is suspected due to historical site operations taking place within TEZ Area 1 and its proximity to contaminated sites listed on Washington Department of Ecology's (Ecology's) Confirmed and Suspected Contaminated Sites List.

In spite of its current industrial setting, the landfill vicinity is an area of substantial ecological value. As an example, it is directly adjacent to what is believed to be the largest great blue heron rookery on the west coast. During low tides, dozens of herons are frequently seen feeding on the mudflats inside and outside of the lagoon. Tidelands in the immediate vicinity of the landfill are important winter habitat for black brant and other waterfowl, and the dredge spoil islands just offshore of the landfill area are an important nesting area for glaucous-winged gulls and Caspian terns. Various species of shorebirds make extensive use of the area for feeding and breeding, and bald eagles and other raptors, including peregrine falcons, are commonly observed in the area. The lagoon is productive habitat for otters and raccoons as well. While the area in the vicinity of the landfill does not contain a traditional tribal shellfish harvesting area, a substantial (harvestable) population of Pacific oysters can now be found along the seaward side of the railroad grade bordering the lagoon. (SITC 2008a).

The lagoon itself is a "pocket estuary" that the Skagit River Systems Cooperative (SRSC), as well as the Tribe, considers a key component of restoration plans for endangered wild Chinook habitat. The largest

numbers of the small fish in the deeper tidal channels of the high marsh area are a species of stickleback. Juvenile salmonids appear to also be attempting to use this area, according to test netting data held by SRSC. The tidal channels within the lower and upper salt marshes of the lagoon provide refuge for small fish, crustaceans and other marine life throughout the tidal prism. Several of the larger channels in the lagoon contain two species of eelgrass, *Zostera maritima* and *Zostera japonica*. The lagoon has a substantial infestation of invasive cordgrass (*Spartina anglica*) that is being controlled by the Tribe and the Skagit County Noxious Weed Board. (SITC 2008a).

The culture and economy of the Reservation residents has centered primarily on the use and cultivation of natural resources from marine and upland sources. Because the Reservation population consumes significantly higher amounts of marine organisms than the general population, contamination of fish and shellfish stocks by hazardous materials is of particular concern to the SITC. Additionally, the area, with its easy access to State Route (SR)-20 and existing businesses, it is in the most suitable location for future economic development by the SITC. Given the concern over the potential impacts to the Tribe's natural resources and the Tribe's desire to expand economic development on their land, a Phase II ESA will be conducted at a two sites within TEZ Area 1 to identify the nature and extent of contamination and determine if further action is required to reduce risk posed by site contamination.

EIGov has developed this Sampling and Quality Assurance Plan (SQAP) as part of the Comprehensive Field Task Work Plan required prior to conducting field work; The Comprehensive Field Task Work Plan will consist of this document and a site-specific Health and Safety Plan (HSP). The SQAP was developed in accordance with EPA guidance documents. EIGov primarily utilized the Phase I Environmental Site Assessment report for TEZ Area 1, prepared by the SITC Environmental Management Department in 2008, to obtain site-specific information. Additional documents covering previous investigations at and around TEZ Area 1 were also utilized to provide site-specific information.

3.2 Purpose and Objectives

The purpose of the SQAP is to describe the field sampling and data gathering methods to be used at the Site in detail. This document also includes information regarding the objectives of the Phase II ESA, Site background and conditions, sampling objectives, sampling locations and frequency, sampling procedures and equipment, task management responsibilities and a schedule for completion of the field investigations and reporting activities. Specifically, the SQAP describes detailed sampling and analytical standard operating procedures (SOPs); quality assurance/quality control (QA/QC) methods to ensure that the results of the work performed satisfy the data quality objectives (DQOs) dictated by the intended use of the data; project instructions; laboratory method detection limits; reporting limits; compound-specific risk-based assessment criteria; and data evaluation procedures.

The overall objectives of this project are as follows:

1. Make preliminary determinations of the type and general extent of contamination in sediment within TEZ Area 1.
2. Determine sediment and surface water toxicity within the part of the mudflat and lagoon area of TEZ Area 1 that is likely to be affected by leachate from the landfill.
3. Determine if marine biota have been impacted by contamination within TEZ Area 1.
4. Determine, using published state and federal risk-based regulatory standards, the risks posed by contamination.
5. Develop potential alternatives for addressing contamination identified during the investigation.
6. Estimate order of magnitude costs of implementing the alternatives to support future development of habitat for a salmon estuary at the Site.

3.3 Project Tasks

Based on the Scope of Work provided to EIGov by the EPA, the tasks associated with this project are as follows:

Task 1 – Site Visit and Scoping Meeting. This task involves visiting the Site to understand the scope of the project, gain familiarity with the Site, and determine project limitations and potential hindrances to field activities. The initial site visit and scoping meeting was completed on April 23, 2009. This task also involves the development of this SQAP and project management activities.

Task 2 – Phase II ESA. This task involves collecting sediment and biota samples from the tidelands at two sites within TEZ Area 1. The subtasks associated with this task are described in detail in Section 5.

Task 3 – Data Analysis and Validation. This task includes submitting the samples collected as part of Task 2 to analytical laboratories and reviewing the data for quality. This task also involves comparing the data to risk-based regulatory criteria to determine if additional actions are necessary.

Task 4 – Reporting. A final project report will be completed after the analytical results have been received and validated. The final project report will include the following:

- Description of Phase II ESA Activities;
- Tabulated analytical results of samples collected during the Phase II ESA[1];
- Deviations from the approved SQAP will be discussed;
- Recommendations for additional work, if any, and justifications based upon DQOs and the conceptual site model; and,
- Order-of-Magnitude Cost Estimate for any remedial action alternatives presented.

[1] Analytes detected above laboratory detection limits and exceeding regulatory standards will be highlighted.

3.4 Project Schedule

Table 3-1 presents the proposed schedule for completing the tasks involved with completing the SITC TEZ Area 1 Phase II ESA. The field sampling dates of June 22 to June 26 were chosen because of the exceptionally low tides expected during that week.

Table 3-1
SITC TEZ Area 1 Phase II ESA Schedule

Task	Proposed Start Date	Proposed Completion Date
Task 1 – Site Visit/Scoping Meeting	April 23, 2009	April 23, 2009
Task 2 –Phase II ESA		
Develop Draft SQAP	May 13, 2009	May 22, 2009
Review and Approval of SQAP	May 22, 2009	June 12, 2009
Finalize SQAP	June 12, 2009	June 19, 2009
Procure Subcontractors and Equipment	June 15, 2009	
Mobilize to Site	June 22, 2009	
All Field Work and Sampling[2]	June 22, 2009	June 26, 2009
Task 3 – Data Analysis and Validation[1]		
Submit All Samples to Laboratory[2]	June 23, 2009	June 26, 2009
Laboratory Analysis and Reporting	June 23, 2009	August 21, 2009
Data Validation	July 31, 2009	August 28, 2009
Comparison of Data to Regulatory Criteria	July 31, 2009	September 4, 2009
Task 4 – Reporting		
Develop Draft TBA Report	August 21, 2009	September 18, 2009
Review and Approval of Draft Report	September 18, 2009	October 2, 2009
Finalize Report	October 2, 2009	October 9, 2009

Table 3-1 Notes:

1. Schedule assumes that samples are accepted by Manchester Environmental Laboratory (MEL). The standard turnaround time for MEL is eight weeks, including data review.
2. Although two rounds of sampling are specified in Section 5.3, the rounds will be conducted concurrently, with the second round of sampling being driven by analytical results received 24 hours after sample submission.

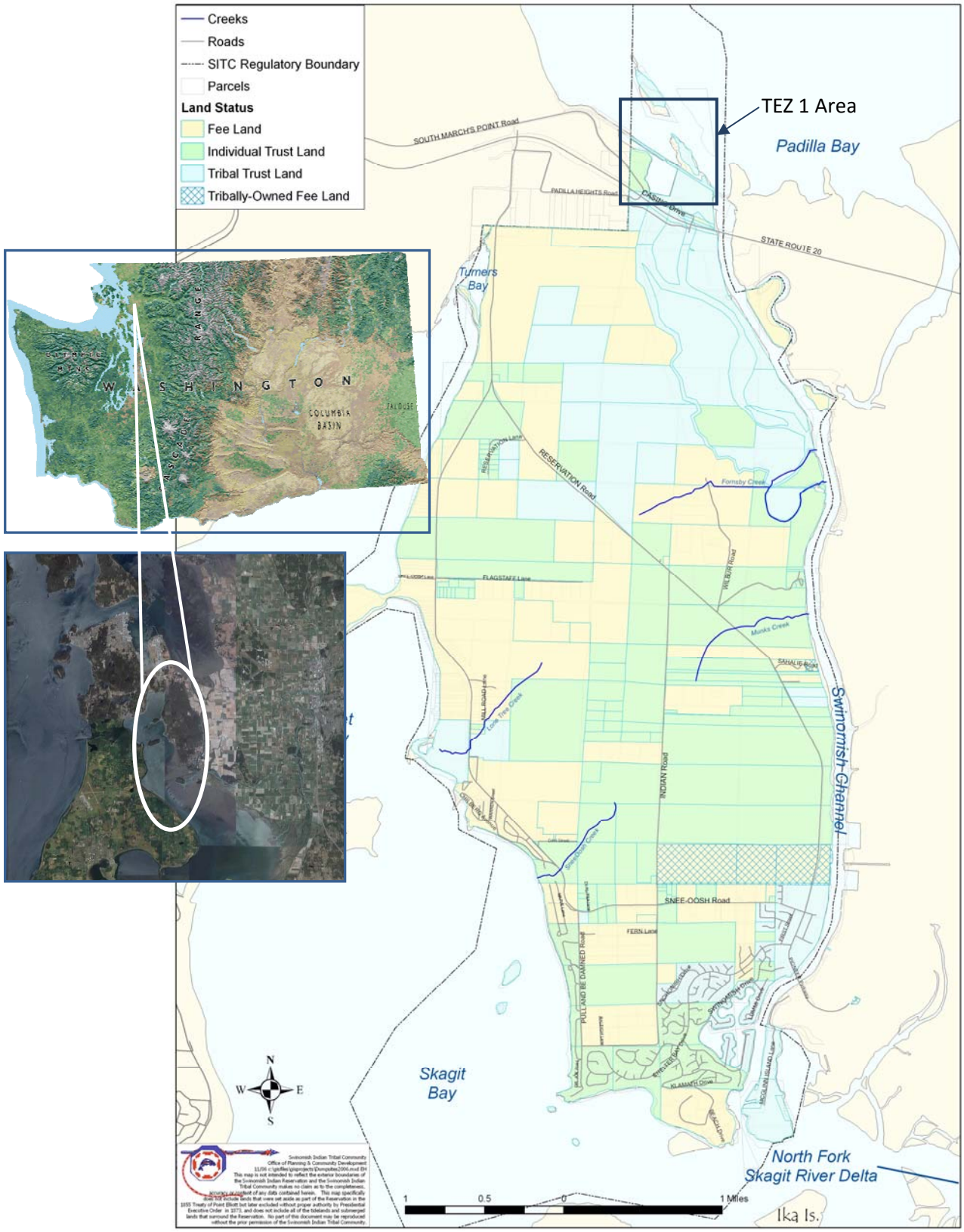

Figure 3-1: Swinomish Indian Reservation	EIGov	5505 34th Ave NE Seattle WA 98105

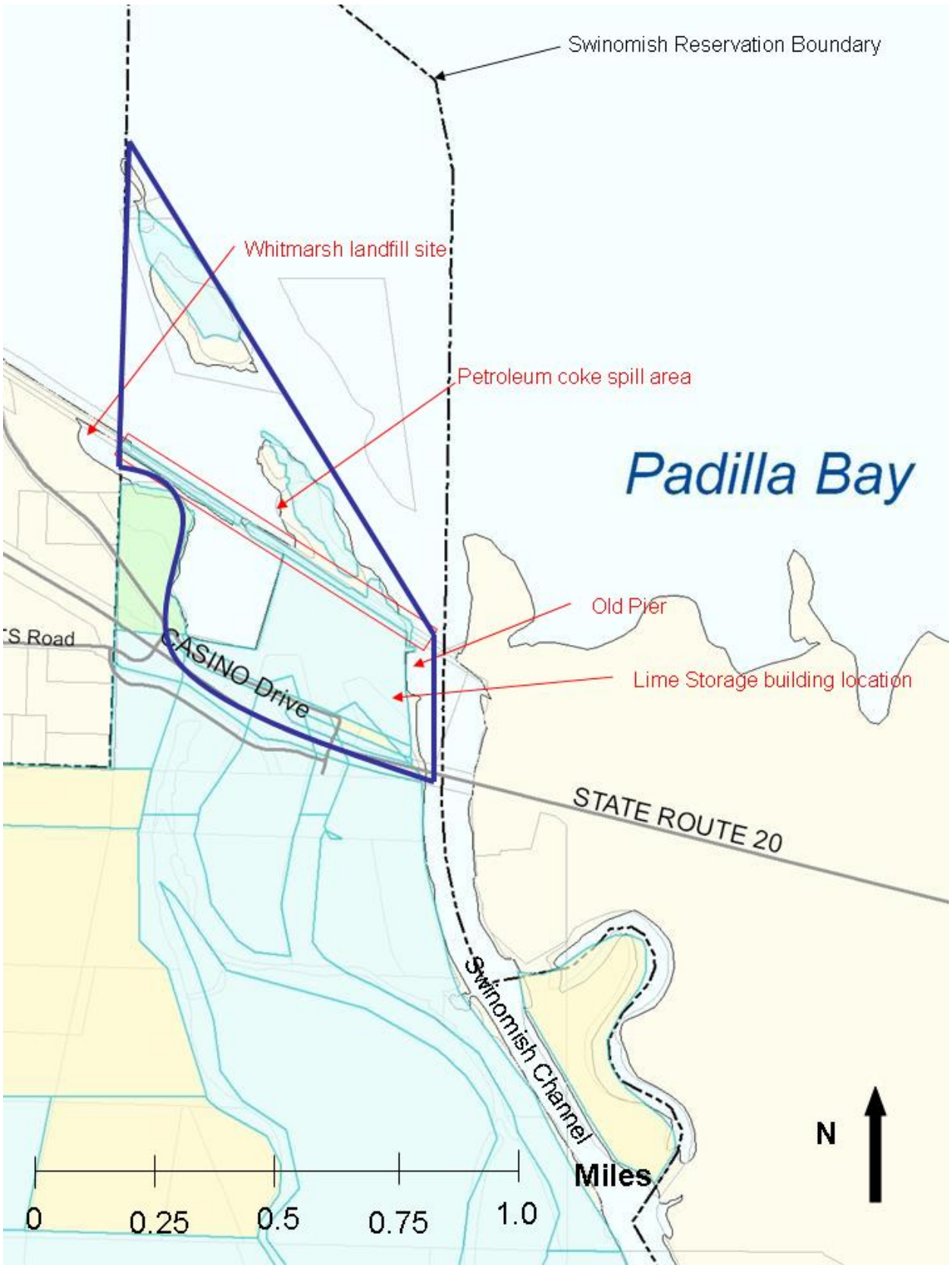

Figure 3-2: Tribal Economic Zone Area 1 Swinomish Indian Reservation	EIGov	5505 34th Ave NE Seattle WA 98105

4. SITE CONDITIONS

This section establishes general site conditions which helps direct the types and locations of samples expected to be collected as part of the Phase II ESA. Section 4.1 describes the location and conditions known to exist within TEZ Area 1. Site history is discussed in Section 4.2. Section 4.3 describes previous investigations that have been conducted on and near the areas of interest at TEZ Area 1. A conceptual site model is presented in Section 4.4.

4.1 Site Description

TEZ Area 1 encompasses approximately 58 acres of uplands and 145 acres of intertidal area on Padilla Bay, west of the Swinomish Channel on the northernmost point of the Swinomish Indian Reservation. The average elevation of the upland area of the site is approximately 20 feet (ft) above mean sea level. The City of La Conner, Washington, lies about seven miles south of TEZ Area 1, while the City of Anacortes, Washington lies seven miles to the west. **Figure 3-2** shows the location of TEZ Area 1, the sites of interest within the area, and the surrounding areas.

The Swinomish Channel, bordering TEZ Area 1 on the east, is a periodically dredged, navigable waterway that connects Padilla Bay in the north with Skagit Bay in the south and forms the eastern border of TEZ Area 1. The Swinomish Northern Lights Casino complex and a large gas station/convenience store are located on the filled tidelands between the lagoon and the Swinomish Channel. A small RV park lies north of the casino (SITC 2008b).

A Burlington Northern Santa Fe (BNSF) railroad spur runs east and west through the northern part of TEZ Area 1. This spur terminates at two petroleum refineries located just west of TEZ Area 1 on March Point. The BNSF railroad bed and the lands filled to construct the rail spur create a tidal mudflat lagoon out of tidelands bounded on the east by the Swinomish Channel and on the west by the Whitmarsh Landfill Site. This entire area between the BNSF rail spur, the casino, and former landfill is referred to in this SQAP as the intertidal area. The BNSF railroad spur separates the northern part of the intertidal mud flat area from Padilla Bay. The Swinomish Northern Lights Casino is located on land directly east of an intertidal lagoon which is covered with water during high tide and muddy during low tide. West of the intertidal lagoon and abutting the eastern border of the Whitmarsh Landfill are the intertidal mudflats which are mostly exposed during the tidal cycle and contain some degree of vegetation (SITC 2008b).

Adjacent to the northwest corner of TEZ Area I, but not on the Reservation, is the Whitmarsh Landfill Site, a former landfill about 15 acres in size. Tidal mudflats cut off by the BNSF railroad were used as a dump for domestic, commercial, and industrial waste from the 1950s until the landfill was closed and

capped with several feet of soil in 1973. An active sawmill is now located on the southern part of the Whitmarsh Landfill site (SITC 2008b).

The surficial dredge spoils in TEZ Area 1 are fine to medium sands that are excessively drained, have moderately high saturated hydraulic conductivity, and are apparently infertile as evidenced by the low prevalence of plant life in the area. The groundwater table in this area is tidally influenced and high, given the low elevation of the filled areas. Groundwater in this area is likely saline and unsuitable for use as drinking water. There are reportedly no active or abandoned wells in Area 1; all drinking water in the area is municipal water piped to the Reservation from Anacortes, Washington (SITC 2008b).

4.2 Site History

TEZ Area 1 has been part of the Swinomish Reservation and owned by the Tribe or under tribal trust ownership since the Treaty of Point Elliot was negotiated in 1855 (SITC 2008b).

In 1892, Congress approved a United States Army Corps of Engineers (USACE) dredging and diking project to make the Swinomish Channel an inland passage (Rodriguez 2007). The channel began to be dredged shortly thereafter. The spoils from dredging operations were deposited on the Reservation along the west side of the channel (SITC 2008b). The channel was completed in 1937 (Rodriguez 2007). An aerial photograph from 1966 indicates that the upland portions of the TEZ Area 1 were increasing in size westward from the channel as spoils continued to be deposited. An aerial photograph in 1975 shows a second highway bridge spanning the channel south of the original span. By 1978, a large section of previously intertidal area south of the BNSF railroad and east of the previous dredge spoil areas had been filled. This filling was done under an Economic Development Agency grant, and the fill material came from channel dredging permitted by the USACE. A sewage treatment pond and roads were constructed in the area. In addition, a pier was built near the channel railroad crossing on the west side of the channel, north of the lime storage building. By 1994, a second highway bridge was built over the channel, and the original road and draw bridge were removed (SITC 2008b).

Also during the 1960s, a building was constructed adjacent to the channel on filled land owned by the Knudsons, who owned and farmed lands south of SR-20. The building has been described as a lime storage building, and it was associated with a pier and a conveyor system. San Juan Island, at this time, was a major producer of lime, and this location would have been convenient for offloading and local storage of the material. North of the lime storage building there is a water pipeline carrying water from the Skagit River to Anacortes. By 1994, the lime storage building was still in place, but its pier was in disrepair and the conveyor system was removed. By 2003, the lime storage building had been removed, although its foundation slab and pier remnants still remain today (SITC 2008b).

The BNSF railroad spur that traverses the northern part of TEZ Area 1 has been in use since the late 1800s. In the past several decades, coarse green petroleum coke and fine coke dust (pet coke) have

blown out of or been spilled from railroad cars transiting the Reservation from the Shell Refinery at March Point. A significant coke spill occurred during the late 1990s on the Reservation on the north side of the tracks, just east of the bridge that crosses a channel in the lagoon. Material from this spill likely made its way into Padilla Bay sediments, as did much of the coke dust blowing from the open rail cars over many years. Since approximately 2003, after SITC environmental officials began to investigate the railroad petroleum coke (pet coke) issues, the refinery has been doing a better job cleaning the rail cars of coke dust after loading. More recently they have applied a binder to the pet coke to make it less likely to blow out during transit. The relatively high total organic carbon (TOC) measured in nearby mudflat sediments by Ecology in a 1998 study may suggest contamination from the railroad, since the high carbon content of the pet coke would show up as sediment TOC. Levels of sediment TOC in and near Whitmarsh Lagoon, west of the Whitmarsh Landfill site, were as much as 10 times higher than those of reference sediments in Samish Bay and similar appearing sediments in low energy areas of Fidalgo Bay, just west of March Point (SITC 2008b).

In the 1950s, tidal mudflats cut off by the BNSF railroad were used as a dump for domestic, commercial and industrial waste. The landfill was closed and covered with several feet of soil in 1973; however, the landfill is not believed to have been capped with clay or to have incorporated any other means to prevent or contain contaminant leaching. The land was purchased by a landowner who later constructed a sawmill on it that is still in operation. In the summer of 1998, the original sawmill burned down, but has since been rebuilt and expanded past its original footprint. A thick layer of wood waste from sawmill operations now covers the area (SITC 2008b).

The Swinomish Bingo Palace was constructed on the site in 1985. Between 1985 and 1994, this facility was expanded to its current footprint and in 1998 became the Swinomish Northern Lights Casino. In 2001, construction began on a gas station/convenience store adjacent to the casino. Between 2003 and 2004, an RV Park was built between the casino and the BNSF railroad tracks (SITC 2008b).

4.3 Previous Investigations

Numerous investigations have been conducted in TEZ Area 1 but consist primarily of Phase I ESAs, although a Phase II ESA was recently conducted and included sampling of TEZ Area 1 and other sites within the Reservation. Numerous studies have been conducted on the sediments and seepage at the Whitmarsh Landfill and sediments from the lagoon between the landfill and the Reservation. **Table 4-1** summarizes the previous investigations that have been completed within TEZ Area 1 and at areas surrounding TEZ Area 1 that may impact environmental conditions within the Reservation. Table 4-1 includes information regarding the type of investigation, investigation location, date, organization completing the investigation, completed field activities, and general observations.

Table 4-1
Previous Investigation Summary

Investigation Type	Location	Organization	Year	Work Completed	Observations
Phase II ESA	TEZ Area 1 – Lime Storage Area	SITC	2008	Soil sample collection & analysis from area east of casino on bank of Swinomish Channel	Arsenic, cadmium, lead, and dioxins, detected at concentrations exceeding benchmarks.
Phase I ESA	TEZ Area 1	SITC	2008	Site visit, Phase I Report	Areas of concern include lime storage area, tidal flats adjacent to Whitmarsh Landfill Site, Burlington Northern rail spur, industrial pier site and creosoted timber debris, and the Whitmarsh Siding
Phase I ESA	TEZ Area 1 & 2	Hong West Associates Geosciences, Inc. (HWA)	2006	Site visit, Phase I Report	Areas of concern include lime storage area, disposal of creosote-treated timbers and pesticides.
Hazard Ranking System (HRS) Scoring	Whitmarsh Landfill Site	Skagit County Health Department (SCHD)	2003	HRS Summary Score Sheet	Ecology Ranking Status = 2 Surface water/Environment HRS Score = 71.2
Phase I ESA	TEZ Area 1 & 2	HWA	2000	Updated the 1998 Phase I Report	No new findings.
Phase I ESA	TEZ Area 1 & 2	HWA	1998	Site visit, Phase I report	Areas of concern included on-site sewage treatment system, lime storage area, and pet coke spills on the railroad siding.
Sample Collection	Whitmarsh Landfill on Padilla Bay Lagoon	Ecology	1998	Seep and sediment sampling with	Seep and sediment samples contained contaminants exceeding levels of concern.

Table 4-1
Previous Investigation Summary

Investigation Type	Location	Organization	Year	Work Completed	Observations
				chemical & toxicity analysis	Sediment toxicity was observed in samples collected from inside and outside the lagoon.
Sample Collection	Whitmarsh Landfill	SCHD & Skagit Public Works	1996	Seep & sediment sampling & analysis	Organic and inorganic contaminants detected at low levels but below risk-based criteria.
Toxicity Study	Padilla Bay near Whitmarsh Landfill	Padilla Bay National Estuarine Reserve	1992	Sediment Toxicity Analysis	Epibenthic Harpacticoid Copepod abundance was normal in areas of landfill seeps, but sediments in seep area had high mortality in amphipod bioassays.
Sample Collection	Whitmarsh landfill tidal lagoon	Ecology	1989	Leachate and sediment sample collection & analysis	Leachate contained metals at levels exceeding state's acute toxicity criteria for marine systems. Sediment did not contain polychlorinated biphenyls (PCBs) or cresylic acid at levels of concern.
Preliminary Assessment/Site Inspection	Whitmarsh Landfill	Ecology	1985	Water and sediment sample collection & analysis	Elevated metals and volatile organics observed in water. No further action recommended under Superfund.
Potential Hazardous Waste Site Preliminary Assessment	Whitmarsh Landfill	JRB Associates	1984	Site Visit	Observed leachate surfacing on eastern boundary of landfill.

4.4 Conceptual Site Model

The EPA has tasked EIGov with assessing two potential areas of contamination within TEZ Area 1. The first area includes the intertidal mudflats and lagoon that is likely affected by the leachate from the Whitmarsh Landfill; the second area includes the pet coke spills along the BNSF railroad to the east of

the railroad bridge entering the tidal lagoon. Ecology is planning a sediment sampling event in the Padilla Bay Lagoon located directly adjacent to the northern boundary of the Whitmarsh Landfill and just south of the BNSF railroad tracks. Ecology's sampling event will include some sampling on the section of the lagoon within the SITC reservation. EIGov's sampling efforts will focus on the areas within the Reservation that will not be sampled by Ecology, specifically areas east and north of Ecology's proposed sampling area.

A conceptual site model summarizing potential contaminant source areas of concern, contaminants of concern, surface drainage patterns and subsurface conditions that define migration pathways, and the potential exposure routes and receptors of site contaminants has been prepared for the intertidal mudflat, lagoon, and pet coke spill areas to be investigated as part of this Phase II ESA.

Because the Whitmarsh Landfill cap was not constructed of clay or any other impermeable material, surface water infiltration is a concern as it can infiltrate the landfill and leach out into the intertidal mudflats and lagoon. Leachate was first observed surfacing on the eastern boundary of the landfill in 1984 and discharging to the Padilla Bay (SCHD 2003). Numerous other seeps have been identified around the landfill's boundary with Padilla Bay. Numerous studies have documented leachate and sediment toxicity within the Padilla Lagoon. Seeps originating from the landfill and discharging to Padilla Bay have been sampled and shown to exhibit concentrations of toxic chemicals exceeding water quality standards (SCHD 2003). Bioassays conducted on sediment samples collected from lagoon locations in the vicinity of the landfill exhibited significant toxicity (SCHD 2003). Contaminants at levels exceeding Washington State Sediment Management Standards have been observed in sediment samples collected from the lagoon, including a sample collected from the Reservation boundary (SCHD 2003). Analysis of leachate indicates that it is not saline, indicating that seawater was not infiltrating the landfill. Based on historic observations, it is clear that leachate from the Whitmarsh Landfill is a potential source of contamination within the intertidal areas of TEZ Area 1.

The annual average precipitation near the Reservation is 32.7 inches per year and occurs mostly in the winter and spring (La Conner, WA Weather 2009). Precipitation on the Reservation and Whitmarsh Landfill would be expected to infiltrate into the subsurface soil, but heavy rains could also result in overland flow towards the intertidal lagoon and ultimately Padilla Bay. Surface water from upland areas of the Reservation and Whitmarsh Landfill drain to Padilla Bay either directly or via the Swinomish Channel or other smaller tidal channels traversing the intertidal lagoon. The areas under investigation as part of this Phase II ESA are comprised primarily of sediment; however, because the sediments are exposed during periods of low tide, surface water runoff from upland areas during low tide can result in sediment contamination or spread existing contamination. Surface water runoff can also transport the petroleum coke spilled along the BNSF railroad spur out into the intertidal lagoon or Padilla Bay, depending on which side of the railroad the spills occurred. Tides in this area also can spread sediment contamination.

Petroleum coke material and dust blowing from the open rail cars over many years has likely made its way into Padilla Bay and the intertidal lagoon sediments.

Partitioning of contaminants from the sediment to surface water and pore water is another potential pathway that can make contaminant fractions more biologically available for uptake by aquatic biota.

Based on historical operations and physical information regarding the site, a conceptual site model was developed for the intertidal mudflats and lagoon area and the BNSF railroad spur based on the following considerations:

- Groundcover consists primarily of native soil and vegetation. However, along the BNSF rail spur, ground cover is elevated and consists of large rock, cobble and gravel on top of the native soil.
- The native mudflat sediments are mostly dredged spoil material from the channel and alluvial silts from river deposition. The mud is quite deep in the intertidal areas in the west part of the lagoon.
- Subsurface soil consists of silty mud that is excessively drained and has a moderately high hydraulic conductivity. Some areas on the east side of the lagoon are sandy from the spoils deposited when they were filled in the early 20th century. The high marsh area and the soils below the mud near the high marsh area appear to be gravel and small cobble.
- For over 20 years, the land west of the intertidal area was utilized as a landfill for unknown types of waste. The closed landfill was not covered with an impermeable surface.
- Seeps originating from the landfill have been observed at numerous locations along its boundary with Padilla Bay.
- Leachate from the landfill has been found to contain elevated levels of contaminants.
- Groundwater in the area is relatively shallow and tidally influenced.
- Topography of the area is flat with the exception of the steep slope south of the Whitmarsh Landfill site.
- Material disposed of at the former landfill is unknown, but is believed to consist mostly of mixed municipal and industrial waste.
- Channels are present throughout the intertidal area lagoon.
- A drainage ditch is located adjacent to SR-20 that flows into the intertidal area.
- For several decades, pet coke and coke dust have blown out of or been spilled from railroad cars transiting the Reservation from the March Point refineries.

4.4.1 Potential Source Areas of Concern

This project is focusing on two primary areas of concern (AOC) within TEZ Area 1 which are the tidelands adjacent to the Whitmarsh Landfill and the BNSF railroad spur.

The contaminant source areas potentially contributing contamination to the two AOCs are as follows:

- Leachate from the Whitmarsh Landfill site;
- The petroleum coke spill sites along the BNSF railroad spur; and,
- Stormwater runoff from SR-20 and adjacent areas.

Numerous petroleum coke spills have occurred over the years along the BNSF railroad spur and up until recently, it was common for petroleum coke dust to blow out of the railcars traversing this spur. The Whitmarsh Landfill was not capped with impermeable materials. Therefore, stormwater can infiltrate the landfill and generate leachate. Previous investigations have revealed that the landfill leaches potentially contaminated groundwater to the sediments abutting the landfill.

4.4.2 Contaminants of Potential Concern

The contaminants of potential concern (COPCs) in the AOCs are associated with contaminant source areas include the following:

- **Total Organic Carbon**. TOC is not toxic to human health, but high levels of TOC in sediments have been shown to be toxic to aquatic organisms. TOC is associated with pet coke from the BNSF railroad spur.

- **Target Analyte List (TAL) Metals**. TAL Metals are likely to originate from the landfill and are hazardous to human health and the environment.

- **Semi-volatile Organic Compounds (SVOCs)**. SVOCs, toxic to both human health and the environment, are likely associated with all contaminant source areas. SVOCs consist of a wide range of contaminants including a subset of contaminants referred to as Polycyclic Aromatic Hydrocarbons (PAHs). PAHs can be both carcinogenic and non-carcinogenic.

- **Volatile Organic Compounds (VOCs)**. VOCs, toxic to human health and the environment, are associated with the Whitmarsh Landfill site.

- **Polychlorinated Biphenyls (PCBs).** PCBs, toxic to human health and the environment, are pervasive and persistent contaminants found in numerous areas. Due to the lack of knowledge regarding what was dumped at the landfill, PCBs may be associated with this potential source.

- **Dioxins/Furans**. The landfill may be a source of dioxins/furans as much of the waste deposited there was burned until 1969 (SCHD 2003). Dioxins/furans are often the byproduct of combustion.

- **Total Petroleum Hydrocarbons (TPH)**. Total petroleum hydrocarbons are toxic to human health and the environment. Oil sheens have been observed in pooled water and the intertidal lagoon by the SITC and also by EIGov during a recent site visit. Potential sources of TPH contamination include the Whitmarsh Landfill, the BNSF rail spur and stormwater drainage ditches located just off of SR-20 which drain through the intertidal mudflats into Padilla Bay.

- **Pesticides**. Pesticides are toxic to human health and the environment. Due to the lack of knowledge regarding what was dumped at the landfills including the wood waste landfills, pesticides may be associated with these sources.

Very little data is available regarding the types of material disposed of at the Whitmarsh Landfill during its operation; however, reports indicate that the landfill accepted waste from the cities of Anacortes, Burlington, La Conner, and Mount Vernon. The landfill also accepted waste from rural Skagit County, Whidbey Island, and the Shell and Texaco Refineries on March Point. (SCHD 2003)

4.4.3 Potential Migration Pathways

The primary routes of contaminant migration include:

- Migration of groundwater to surface water and sediment;
- Surface water runoff;
- Transport as fugitive airborne particulate matter during railroad transport activities;
- Tidal transport of contaminated sediment; and
- Partitioning of sediment contaminants into pore water and surface water.

4.4.4 Potential Exposure Pathways

Potential exposure pathways for aquatic organisms include absorption and ingestion of contaminated surface water, pore water, and sediment. Plant life in the intertidal mudflats can also uptake contaminants found in the sediment and pore water. Potential exposure routes for human receptors include ingestion of and dermal contact with contaminated sediment and the ingestion of contaminated aquatic organisms.

4.5 Potential Receptors

Potential receptors include aquatic organism such as shellfish and fish exposed to contaminants in the sediment and surface water. If gross contamination is present at and or has migrated to areas near groundwater discharge to surface water, potential receptors include aquatic organisms. In turn, terrestrial animals that eat contaminated plant life, shellfish, and fish can also be exposed to contamination.

Other receptors include humans who ingest contaminated aquatic organisms. The degree of exposure depends on the amount of aquatic organisms consumed. Tribal residents will have higher exposure levels as they consume more fish and shellfish than the general population. Recreational consumers, like recreational fishermen, will have lower exposure rates as most of their diet does not consist of fish and shellfish from Padilla Bay.

5. Sampling and Analysis Plan

The SITC TEZ Area 1 Site Phase II ESA is focusing on assessing contamination within the intertidal area and near the BNSF rail spur. This section describes the sampling and analysis activities that will be conducted during this Phase II ESA, including the types of samples, rationale for sample locations, and the proposed chemical analyses. This section also describes the tasks associated with the Phase II ESA and the work that will be performed to complete the tasks.

Standard operating procedures that will be utilized for this project are listed in **Table 5-1**; all SOPs can be found in the Appendix A. **Table 5-2a** through **Table 5-2c** present a summary of the samples to be collected as part of this investigation, including sample locations, media to be sampled, and the analyses to be performed on the samples. Field quality control samples that will be collected as part of this project are also described in Tables 5-2a through 5-2c. **Tables 5-2a** through **Table 5-2c** also describe the sample analysis requirements, including analyses to be performed, required sample volumes, containers, preservation methods, and maximum holding times. **Table 5-3** describes analytical sensitivity requirement for project samples. **Table 5-4** presents data quality objectives and risk-based criteria proposed for evaluating analytical data associated with this project.

5.1 Mobilization/Demobilization

The field investigation will begin with mobilization activities. Mobilization of staff and equipment will be required to prepare for the field effort and will continue throughout its duration to support the various subcontractor services and field tasks. Mobilization activities include:

- Procuring subcontractors;
- Orienting field personnel on proposed activities and health and safety protocols;
- Leasing and purchasing expendable and non-expendable items;
- Communicating and coordinating with Site owners and/or the SITC for Site access;
- Establishing a temporary field office or work area;
- Constructing and decommissioning a decontamination area;
- Assembling and transporting field equipment to and from the Site; and
- Coordinating and scheduling subcontractors.

Subcontractor procurement will include final evaluation and selection of subcontractors for off-site analytical laboratory services and investigation-derived waste (IDW) management services. IDW is discussed further in Section 5.8. All subcontractors will be required to adhere to the procedures presented in this SQAP. Subcontractors will also be required to comply with all state and local

certification requirements. All employees and subcontractors[2] of EIGov who will participate in field activities at the Site are required to read the EIGov's *Site-Specific Health and Safety Plan (*HSP) and sign that they understand and will abide by its requirements. Field sampling will be conducted by EIGov employees; however, if necessary, utility locate subcontractors and IDW disposal contractors may be subcontracted for limited purpose.

A temporary field office will include using a room within an existing building at the Site or establishing an outdoor field station using a table. A mutually agreeable location at the Site will be designated by the SITC Brownfields Coordinator for decontamination activities and an accumulation area for all drums containing IDW. The equipment and disposable items necessary to perform the various field activities will be ordered and stocked at EIGov's offices until the time it is needed in the field. Demobilization activities will coincide with the completion of the field effort and will consist of conducting a final inspection of the work site and assembling and transporting field equipment back to EIGov's offices.

5.2 Utility Clearance

Utility clearance is not necessary for this field event as no drilling or subsurface soil sampling will be occurring in areas where utilities may be present.

5.3 Sediment and Surface Water Sampling

Two sediment sampling events are planned for the TEZ Area 1 intertidal area on the Swinomish Indian Reservation. One will be conducted by EIGov and another by Ecology. Ecology is planning a sediment and biota sampling event in the lagoon directly east of the Whitmarsh Landfill but may include some sampling on the section of the lagoon within the SITC Reservation near EIGov's study area. **Figure 5-1** shows the proposed locations for Ecology's sediment sampling effort[3]. It is unknown as of the authoring of this SQAP when Ecology's sampling event will occur.

EIGov will be collecting sediment samples co-located with surface water samples from the intertidal mudflat and lagoon east of the Whitmarsh Landfill. EIGov also will be collecting sediment samples from the BNSF rail spur area. EIGov plans to conduct sampling in the tidal channels within the intertidal mudflat area during low tide so that the samples include draw from the Whitmarsh Landfill. Co-located sediment/surface water samples are being collected in order to evaluate the toxicity and appraise the potential threat to the habitat of the lagoon. Sediment samples are being collected from the BNSF rail spur areas to evaluate the effects of pet coke spills in the area.

[2] Subcontractors that participate in field activities will be required to have their own health and safety plan and will be responsible for monitoring their own safety. However, if any of their activities will conflict with EIGov's HSP, then the activities will need to be re-evaluated.

[3] Ecology's *Sediment Investigation Work Plan* is still in draft format. As of the authoring of this SQAP, it is unknown when the draft plan will be finalized.

The co-located sediment/surface water samples will be referred to as Complete Samples (CS) and their station locations will be named accordingly. Up to 50 co-located sediment/surface water samples will be collected during this project, but analysis of the samples will be divided into two sampling events – Round 1 and Round 2. The two rounds of sampling will be performed concurrently. A total of 25 locations have been specified where samples are scheduled to be collected; these samples are referred to as the Round 1 samples. Up to an additional 25 locations may be sampled depending on analytical results of the Round 1 samples. The proposed locations of the first 25 co-located samples are shown on **Figures 5-2 through 5-5**. The locations of samples collected during Round 2 will be determined after receiving preliminary analytical results from the Microtox® bioassay testing. Samples will be collected from the intertidal mudflat and lagoon area to assess toxicity associated with landfill leachate.

Samples will be collected from the BNSF rail spur area to assess the toxicity of the petroleum coke spilled in the area. A total of seven sediment samples will be collected from this area during the Round 1 sampling event. Three samples will be collected 5 feet from the shoreline (SD01, SD03, and SD05). Three additional samples will be collected 10 feet from the shoreline (SD02, SD04, and SD-06). For use as a background comparison, sample SD07 will be collected at a location presumed to be unaffected by the coke spills. The locations of these sediment samples are depicted on **Figure 5-5**.

In general, sediment samples will be collected in accordance with the procedures outlined in SOP No. EIGov-1003 provided in Appendix A. More specifically, all sediment samples, co-located or not, will be collected from the top 10 centimeters of sediment with a clean mud auger or clean stainless steel spoon and be placed into the appropriate sample jars (discussed in **Table 5-2**) and submitted to pre-determined analytical laboratory for Microtox® bioassay testing and for chemical analyses. Microtox® bioassay testing evaluates sediment toxicity but does not reveal the type or concentration of contaminants within the sediment. Additional sample jars will be submitted to a fixed analytical laboratory to be analyzed for the presence of TOC, VOCs, SVOCs, PCB Aroclors/Pesticides, TAL Metals, and TPH. Two of the sediment samples will also be analyzed for dioxins/furans. Dioxins/furans sediment samples will be frozen on dry ice prior to shipment to the laboratory, along with the biota samples. Sediment samples collected from the BNSF rail spur area will be submitted to a fixed analytical laboratory for TOC, SVOC, TAL metals, and TPH analysis. Surface water samples co-located with the sediment samples also will be collected and submitted to a fixed laboratory to be analyzed for the same analytes with the exception of the Microtox® bioassay, TOC, and dioxin. The EPA Contract Laboratory Program (CLP) will be utilized when applicable and available to reduce analytical costs.

Surface water samples will be collected using the direct grab method described in SOP No. EIGov-1002. One surface water sample will be collected at each co-located sediment/surface water location, with the exception of two locations. Two surface water samples will be collected per co-located sample location for two sample locations near the landfill. One of the surface water samples will be submitted to an analytical laboratory for chemical analysis while the second sample will be submitted for Microtox®

bioassay testing. Because this area provides habitat to a salmon estuary, there is concern over water toxicity to salmonids. Microtox® bioassay testing will help assess this toxicity. If the surface water samples submitted for Microtox® bioassay show toxicity, additional surface water samples may be collected during the second round of sampling to assess the extent of toxicity.

For the Round 1 sampling event, a total of 25 co-located sediment/surface water samples, 2 surface water samples, and 7 sediment samples will be submitted to fixed laboratories for Microtox® bioassay and for chemical analysis. Round 1 samples are shown as samples CS1 through CS25 on Figures 5-2 through 5-5 and samples SD01 through SD07 on Figure 5-4. Microtox® bioassay results from the Round 1 samples will guide where to collect samples during the Round 2 sampling event. Up to 25 additional sediment samples may be added to the Round 2 samples depending on Round 1 analytical results. Round 2 samples will be collected from areas near the Round 1 samples showing toxicity. These samples will be collected using the same methods as Round 1 sampling and submitted for the same analyses. The purpose for selecting samples near the Round 1 samples showing toxicity is to further demarcate the extent, type, and concentration of contamination causing the toxicity.

The proposed sample identification numbers and chemical analyses to be performed on the sediment and surface water samples are presented in **Tables 5-2a** and **5-2b**, respectively.

5.4 Biota Sampling

EIGov plans to collect a total of three biota samples and test the tissue for SVOCs, TAL Metals, TPH, PCB Aroclors/Pesticides and dioxins/furans. Biota samples also will be analyzed for lipid content. Lipid content is used to normalize organic contaminants in tissues. One sample will be collected from three general locations within TEZ Area 1. The locations include the coke spill area adjacent to the BNSF rail spur, the area west of the railroad bridge, and a background location west of the Whitmarsh Landfill (See Figure 5-3 for proposed locations). The background location will likely be the area west of the landfill, along the shoreline which may be less influenced by landfill leachate or contamination. Only oysters, the predominant biota in the areas of interest, will be collected as part of the biota sampling.

Biota sampling will require a minimum of 200 edible grams of tissue to be analyzed for the appropriate contaminants. The effort to collect biota samples will likely require about 1 to 2 hours per sample. Pacific oysters, common in the Pacific Northwest, contain an average of 15 grams of edible tissue for a shell length of 7 to 9 centimeters (Sydney Fish Market 2009). Assuming that oysters near the BNSF railroad spur are similar to Pacific oysters, this will require collecting upwards of 15 individual oysters to constitute one sample, more if the oysters are small. Not all of the sample may be collected from the same location, but EIGov will aim to find areas where oysters are highly concentrated and collect biota samples from these areas. If sufficient sample volume cannot be obtained from within an area of 1,000 square yards, biota sampling may need to be conducted at a different location. However, if it is possible to collect the entire biota sample from one location, except in the case of the background biota sample,

a sediment sample will also be collected and submitted for the same analysis as the biota sample. The purpose of submitting a co-located sediment sample with the biota sample would be to assess sediment influence on the biota. There is no plan to collect a sediment sample in the same location as the background biota sample location, Oyster 3.

Composite biota samples will be collected in accordance with SOP No. EIGov-1001. In general, only live oysters of similar size will be collected. Each oyster will be removed from surfaces using a clean knife or trowel and wrapped in clean aluminum foil. Sets of whole organisms representing one sample location will be wrapped together, placed in one or more plastic bags labeled with the sample location the set represents, and placed immediately on dry ice to be frozen prior to shipment to the laboratory, along with the dioxins/furans sediment samples. Frozen biota samples will be submitted to the EPA-designated laboratory to be homogenized. Note, it is the edible flesh that will be homogenized and not the entire organism. The EPA-designated laboratory receiving the biota samples will then submit aliquots of the homogenized samples to other laboratories as necessary to ensure that the sample is analyzed for all of the desired analytes.

All three biota samples will be analyzed for the presence of SVOCs, TAL Metals, TPH, PCB Aroclors/Pesticides and dioxins/furans. More details on the biota samples such as proposed sample identification numbers and chemical analyses to be performed are presented in **Table 5-2c**.

Table 5-1
Field Standard Operating Procedures

Project Sampling SOP	SOP Number	Revised Date
Shellfish Sampling	EIGov-1001	Rev 0, 5/15/2009
Surface Water Sampling	EIGov-1002	Rev 0, 5/15/2009
Sediment Sampling	EIGov-1003	Rev 1, 1/22/2009
Chain-of-Custody and Sample Labeling	EIGov-1004	Rev 1, 1/12/2009
Quality Assurance/Quality Control Sample Collection	ICF-1021	Rev 1, 1/22/2009
Field Equipment Decontamination	ICF-1008	Rev 1, 1/12/2009
Environmental Sample Packaging and Shipping	ICF-4034	Rev 0, 1/14/2009
Field Documentation and Forms	ICF-4014	Rev 1, 1/12/2009
Investigation Derived Waste Handling	ICF-4033	Rev 0, 1/13/2009

TABLE 5-2a. Co-located Sediment (CS)/Sediment (SD) Sampling and Analysis Methods Requirements and SITC TEZ Area 1 Site Sampling Summary

Specific Analysis Requested				Microtox® bioassay	TOC	VOCs	SVOCs	Pesticides/PCB Aroclors	TAL metals	TPH-DRO	dioxins/furans
Analytical Method				Ecology Marine Microtox Sediment Porewater Toxicity Assessment 2003	Plumb (1981)[1]	SOM01.2 (med soil)/ EPA 8260	SOM01.2 (med soil)/ EPA 8270	SOM01.2 (soil)/ EPA 8081, 8082	ILM05.4 (soil)/EPA 6010, 7471A (Hg)	NWTPH-Dx	DLM02.0 (solids)/ EPA 1613B
Preservation Requirements				cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 6 °C immediately after collection	freeze immediately after collection
Sample Holding Time				14 days	14 days	48 hours	14 days	14 days	6 months; 28 days (Hg)	14 days	1 year
				Container/ Sample Volume, Notes							
Sample ID	**Depth**	**Rationale**	**Field Analyses/ Observations**	1x 32-oz wide-mouth glass jar (10-15 mL porewater required for analysis)	1x 4-oz wide-mouth glass jar	4x 40-mL amber glass vial[2]	1x 8-oz wide-mouth glass jar[3]	1x 8-oz wide-mouth glass jar[3]	1x 8-oz wide-mouth glass jar[3]	1x 8-oz wide-mouth glass jar	1x 8-oz wide-mouth glass jar[3]
CS01-CS50	0 to 10 cm bgs	Characterize toxicity of and contamination in sediment.	Visual Characterization								
Round 1 field sampling											
total field samples				25	25	25	25	25	25	25	2
total field duplicates				3	3	3	3	3	3	3	1
total field/rinsate blanks (1/day)				1	NA	NA	NA	NA	NA	NA	NA
total trip blanks (VOC only)				NA	NA	1	NA	NA	NA	NA	NA
total temperature blanks (not analysis-specific)				1	NA	NA	NA	NA	NA	NA	NA
total laboratory QC dup/MS/MSD[6]				4[9]	4	4	4[7]	4	4[8]	NA	2
Total Round 1 analyses				34	32	33	32	32	32	28	5
Round 2 field sampling											
total field samples				1-25	1-25	1-25	1-25	1-25	1-25	1-25	NA
total field duplicates				2-3	2-3	2-3	2-3	2-3	2-3	2-3	
total field/rinsate blanks (1/day)				1							
total trip blanks (VOC only)						1					
total temperature blanks (not analysis-specific)				1							

total laboratory QC dup/MS/MSD[6]				2-4[9]	2	2	2-4[7]	2	2[8]	NA	NA
Total Round 2 analyses				7 - 34	5 - 30	6 – 31	5 - 32	5 – 30	5 – 30	3 - 28	NA
total analyses (Rounds 1 and 2)				41-68	37-62	39-64	37-64	37-62	37-62	31-56	5
SD01-SD07	0 to 10 cm bgs	Characterize toxicity of and contamination in sediment.	Visual Characterization								
total field samples (Round 1)				7	7	NA	7	NA	7	7	NA
total field duplicates				1	1	NA	1	NA	1	1	NA
total field blanks				NA	NA	NA	NA	NA	NA	NA	NA
total trip blanks (VOC only)				NA	NA	NA	NA	NA	NA	NA	NA
total temperature blanks (not analysis-specific)				NA	NA	NA	NA	NA	NA	NA	NA
total laboratory QC dup/MS/MSD (designated)[6]				2[9]	2	NA	2	NA	2	NA	NA
total analyses				8	10	NA	10	NA	10	8	NA

TABLE 5-2b. Co-located Surface Water (SW) Sampling and Analysis Methods Requirements and SITC TEZ Area 1 Site Sampling Summary

Specific Analysis Requested				Microtox® bioassay	VOCs	SVOCs	Pesticides/ PCB Aroclors	TAL metals	TPH-DRO
Method				Ecology Marine Microtox Sediment Porewater Toxicity Assessment 2003	SOM01.2 (low water)/ EPA 8260	SOM01.2 (low water)/ EPA 8270	SOM01.2 (water)/ EPA 8081, 8082	ILM05.4 (ICP-AES water)/EPA 6010, 7471A (Hg)	NWTPH-Dx
Preservation Requirements				cool to 4 °C immediately after collection	pH <2 with HCl; cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	pH <2 with HNO_3; cool to 4 °C immediately after collection	cool to 6 °C immediately after collection
Sample Holding Time (Not Frozen)				14 days	14 days	7 days	7 days	6 months; 28 days (Hg)	7 days
				Container/ Sample Volume, Notes					
Sample ID	**Depth**	**Rationale**	**Field Analyses/ Observations**	1x 4-oz wide-mouth glass jar	3x 40-mL amber glass vial[2], zero headspace or air bubbles	2x 1-L amber round glass bottle [4]	2x 1-L amber round glass bottle [4]	1x 1-L HDPE	2x 500-mL amber glass
SW01-SW50	NA	Characterize surface water conditions	Visual Characterization						
Round 1 field sampling									
total field samples				2	25	25	25	25	25
total field duplicates				1	3	3	3	3	3
total field/rinsate blanks (1/day)				1	1	1	1	1	1
total trip blanks (VOC only)				NA	1	NA	NA	NA	NA
total temperature blanks (not analysis-specific)				1	NA	NA	NA	NA	NA
total laboratory QC dup/MS/MSD (designated)[6]				2[9]	4[7]	4	4	4[8]	NA
Total Round 1 analyses				7	34	33	33	33	29
Round 2 field sampling									
total field samples				NA	1-25	1-25	1-25	1-25	1-25

total field duplicates		2-3	2-3	2-3	2-3	2-3
total field/rinsate blanks (1/day)		1	1	1	1	1
total trip blanks (VOC only)		1				
total temperature blanks (not analysis-specific)		1				
total laboratory QC dup/MS/MSD (designated)[6]		2[7]	2	2	2[8]	NA
Total Round 2 analyses		8 – 33	6 - 31	6 – 31	6 – 31	4 – 29
Total Round 1 & Round 2 analyses	**7**	**42-67**	**39-64**	**39-64**	**39-64**	**33-58**

TABLE 5-2c. Biota (B) Sampling and Analysis Methods Requirements and SITC TEZ Area 1 Site Sampling Summary

Specific Analysis Requested				SVOCs	TAL metals	TPH-DRO	dioxins/furans	Pesticides/PCB Aroclors
Analytical Method				SOM01.2 (low soil, low soil by SIM)/EPA 8270	ILM05.4 (soil)/EPA 6010, 7471A	NWTPH-Dx	DLM02.0 (solids)/EPA 1613B	SOM01.2 (soil)/EPA 8081, 8082
Preservation Requirements				freeze immediately after collection	freeze immediately after collection	freeze immediately after collection	freeze immediately after collection	freeze immediately after collection
Sample Holding Time				14 days	6 months; 28 days (Hg)	14 days	1 year	14 days
				Container/ Sample Volume, Notes				
Sample ID	**Depth**	**Rationale**	**Field Analyses/ Observations**	No specific container requirements /5x 20g	1x 8-oz wide-mouth glass jar[3]	No specific container requirements /5x 10g	No specific container requirements/ 5x 25g	1x 8-oz wide-mouth glass jar[3]
B01-B02	NA	Characterize biota conditions	Visual Characterization					
total field samples (Round 1)				3	3	3	3	
total field duplicates				1	1	1	1	
total field/rinsate blanks				1	NA	NA	NA	
total trip blanks (VOC only)				NA	NA	NA	NA	
total temperature blanks (not analysis-specific)				NA	NA	NA	NA	
total laboratory QC dup/MS/MSD (designated)[6]				2	2[8]	2	2	
total analyses				7	6	6	6	

Tables 5-2a-c Notes:

[1]Plumb, R. H. Jr., Procedures for Handling and Chemical Analysis of Sediment & Water Samples, May 1981, USACE Publication AD/A103788

[2]40-mL amber glass vial, 24 mm neck finish; closure: polypropylene or phenolic, open-top screw-cap, 15-cm opening, 24-400 size; septum: 24 mm disc of 0.005 in. PTFE bonded to 0.120 in silicone for total thickness 0.125 in

[3]8-oz short, wide mouth, straight-sided glass jar, 70-mm neck finish; closure: polypropylene or phenolic cap, 70-400 size, 0.015-in. PTFE liner

[4]1-L amber round glass bottle 33-mm pour-out neck finish; closure: polypropylene or phenolic cap, 33-430 size, 0.015 in. PTFE liner

[5]1-L HDPE, cylinder-round bottle, 28-mm neck finish; closure: polypropylene or phenolic cap, 28-410 size, F217 polyethylene liner

[6]samples for laboratory QC will be designated in the field, one dup/MS/MSD per 20 samples

[7]CLP Method SOM01.2 does not require MS/MSD for trace VOA or BNA analysis

[8]CLP Method ILM05.4 requires a duplicate, does not require MSD for TAL metals analysis

[9]Precision of Microtox analysis will be assessed by running laboratory triplicates on designated samples

Tables 5-2a-c Key:

°C	Degree Celsius	HCl	Hydrochloric acid	TPH	Total petroleum hydrocarbons	mm	millimeter
DRO	Diesel-range organics	oz	Ounce	mL	milliliter	g	gram
HDPE	high-density polyethylene	QC	Quality control sample	PTFE	polytetrafluoroethylene	L	liter
HNO_3	Nitric acid	TOC	Total organic carbon	SVOC	Semivolatile organic compounds	VOC	Volatile organic compounds
bgs	below ground surface	cm	centimeter	ARI	Analytical Resources, Inc.	NA	Not applicabe
CAS	Columbia Analytical Services, Inc.						

Table 5-3. Analytical Sensitivity and Project Criteria

Parameter	Method	Reporting Limit (RL)			MS Recovery Limits (%)			MS/MSD or Laboratory Duplicate RPD Limits (%)			Field Duplicate RPD Limits (%)		
		sediment	water	biota	sediment	water	biota	sediment	water	biota	sediment	water	biota
Microtox® bioassay	Microtox® bioassay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOC	Plumb (1981)[1]	0.02%	NA	NA	75-125	NA	NA	≤ 20	NA	NA	30	NA	NA
VOCs	SOM01.2	per CLP contract CRQLs (med soil)	per CLP contract CRQLs (low water)	NA	80-120	80-120	NA	≤ 30	≤ 30	NA	≤ 50	≤ 30	NA
SVOCs	SOM01.2	per CLP contract CRQLs (med soil)	per CLP contract CRQLs (low water)	per CLP contract CRQLs (low soil, low soil by SIM)	60-78	67-79	10-218[2]	≤ 30	≤ 30	≤ 40	≤ 50	≤ 30	≤ 40
PCB Aroclors/ Pesticides	SOM01.2	per CLP contract CRQLs	per CLP contract CRQLs	per CLP contract CRQLs (soil)	40-106	45-110	NA	≤ 30	≤ 30	NA	≤ 50	≤ 30	NA
TAL metals	ILM05.4	per CLP contract CRQLs	per CLP contract CRQLs (ICP-AES water)	per CLP contract CRQLs (soil)	75-125	75-125	70-130	≤ 20	≤ 20	≤ 30	≤ 50	≤ 30	≤ 30
TPH	NWTPH-Dx	10.0 mg/kg	0.50 mg/L	10.0 mg/kg[3]	NA	NA	NA	≤ 30	≤ 30	≤ 30[3]	≤ 50	≤ 30	≤ 50[3]
dioxins/ furans	DLM02.0	per CLP contract CRQLs (solids)	NA	per CLP contract CRQLs (solids)	63-170[2]	NA	63-170[2]	≤ 50	NA	≤ 50	≤ 50	NA	≤ 50

Table 5-3 Notes:

ww = wet weight

[1]Plumb, R. H. Jr., Procedures for Handling and Chemical Analysis of Sediment & Water Samples, May 1981, USACE Publication AD/A103788

[2]% recovery limits are analyte, dioxin/furan congener-specific; range given is lowest/highest value for all congeners

[3]Values are soil method values

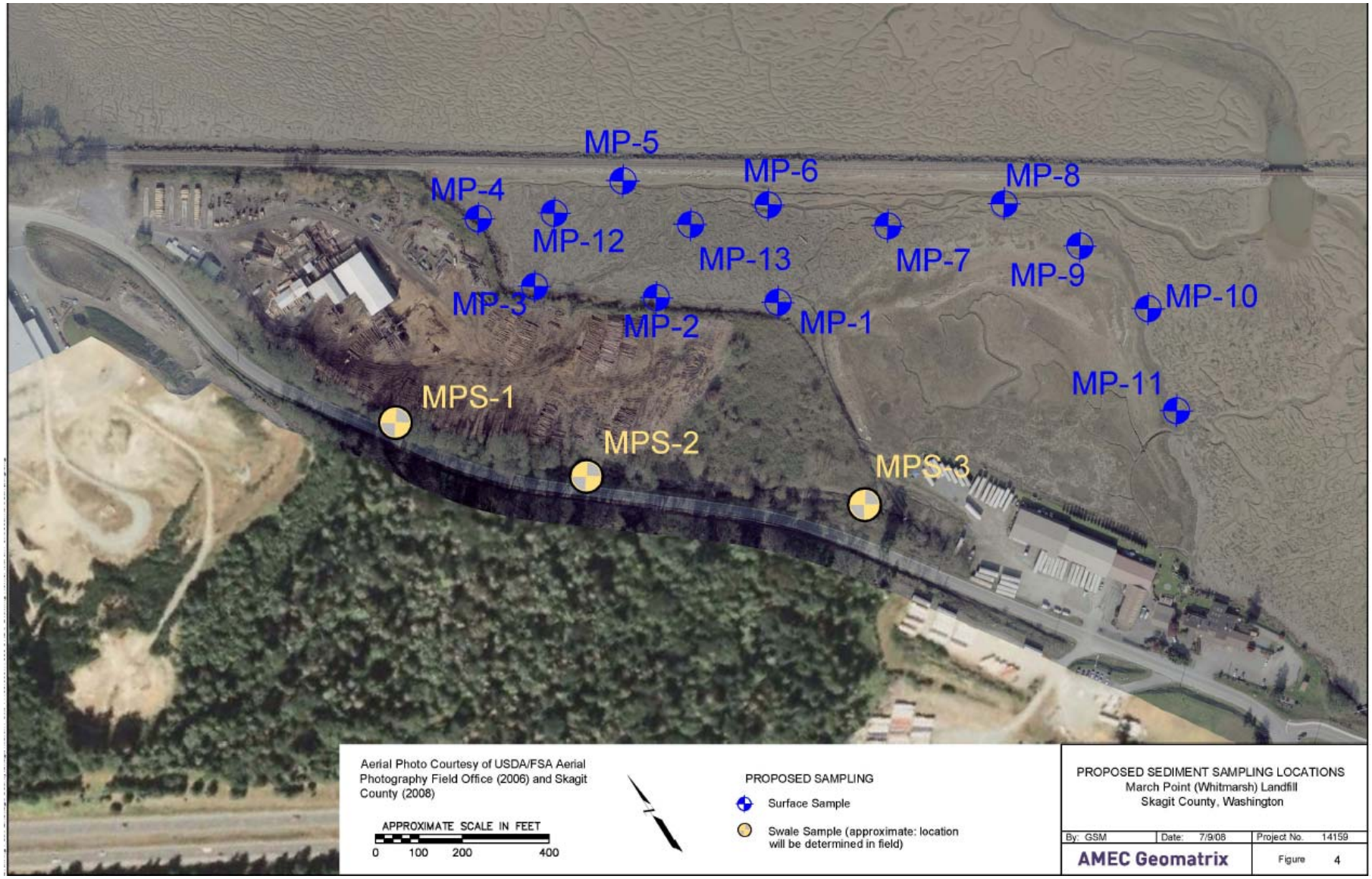

Figure 5-1: Project Organization-Proposed Sampling Locations for Washington Department of Ecology Investigation *From – Sediment investigation work plan march point (Whitmarsh)Landfill Skagit County, WA* *By AMEC Geomatrix Inc., Lynwood, WA*	EIGov	5505 34th Ave NE Seattle WA 98105

Figure 5-2- EIGov Proposed Sampling Locations for Phase II ESA in TEZ Area 1: Overview of Padilla Bay Lagoon, the Whitmarsh Landfill, and the Swinomish Indian Tribal Community	EIGov	5505 34th Ave NESeattle, WA 98105

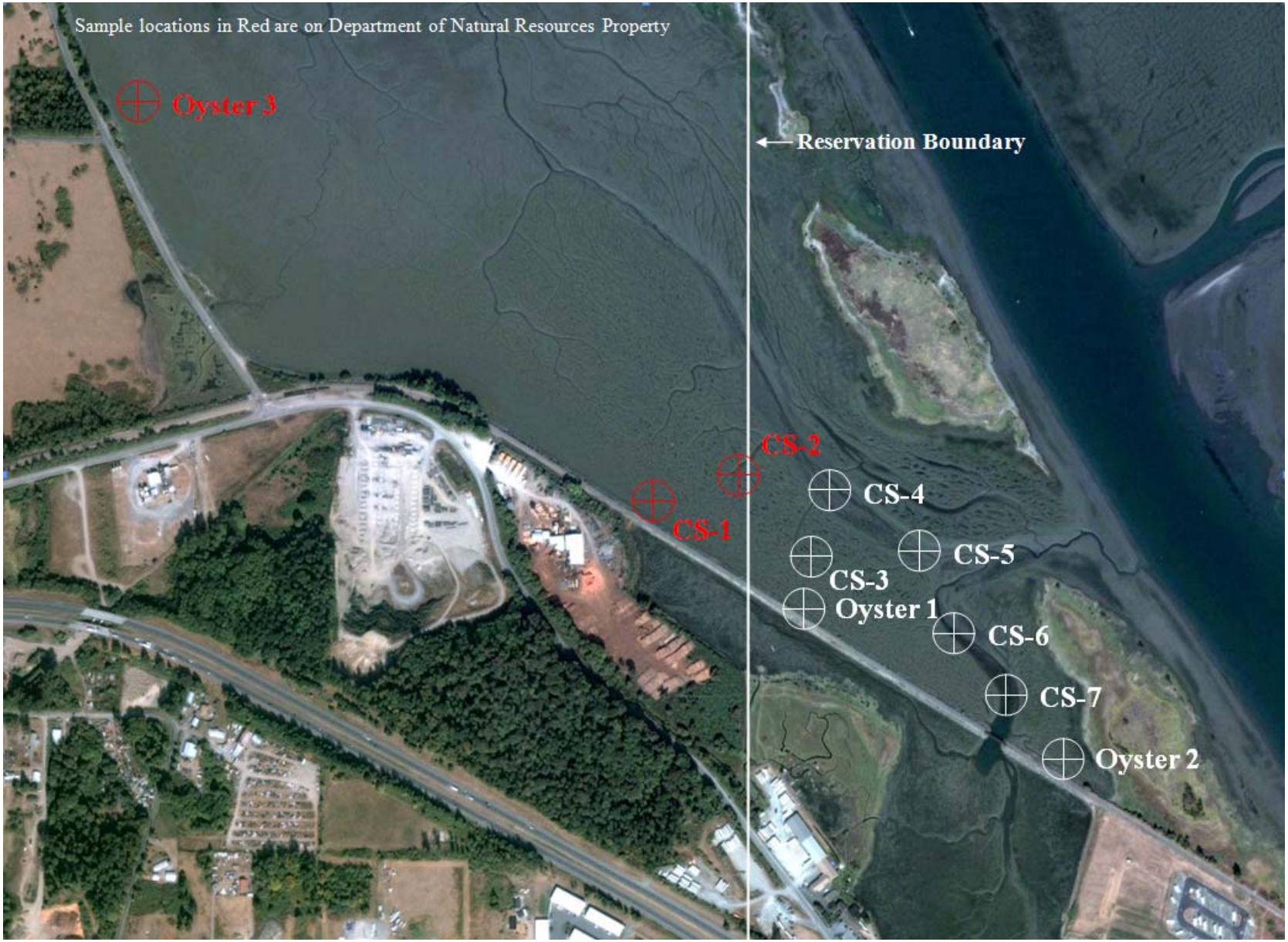

Figure 5-3 – EIGov Proposed Sampling Locations for Phase II ESA in TEZ Area 1: Complete Sample (CS) Sample Locations Adjacent to the Whitmarsh Landfill	EIGov	5505 34th Ave NE Seattle WA 98105

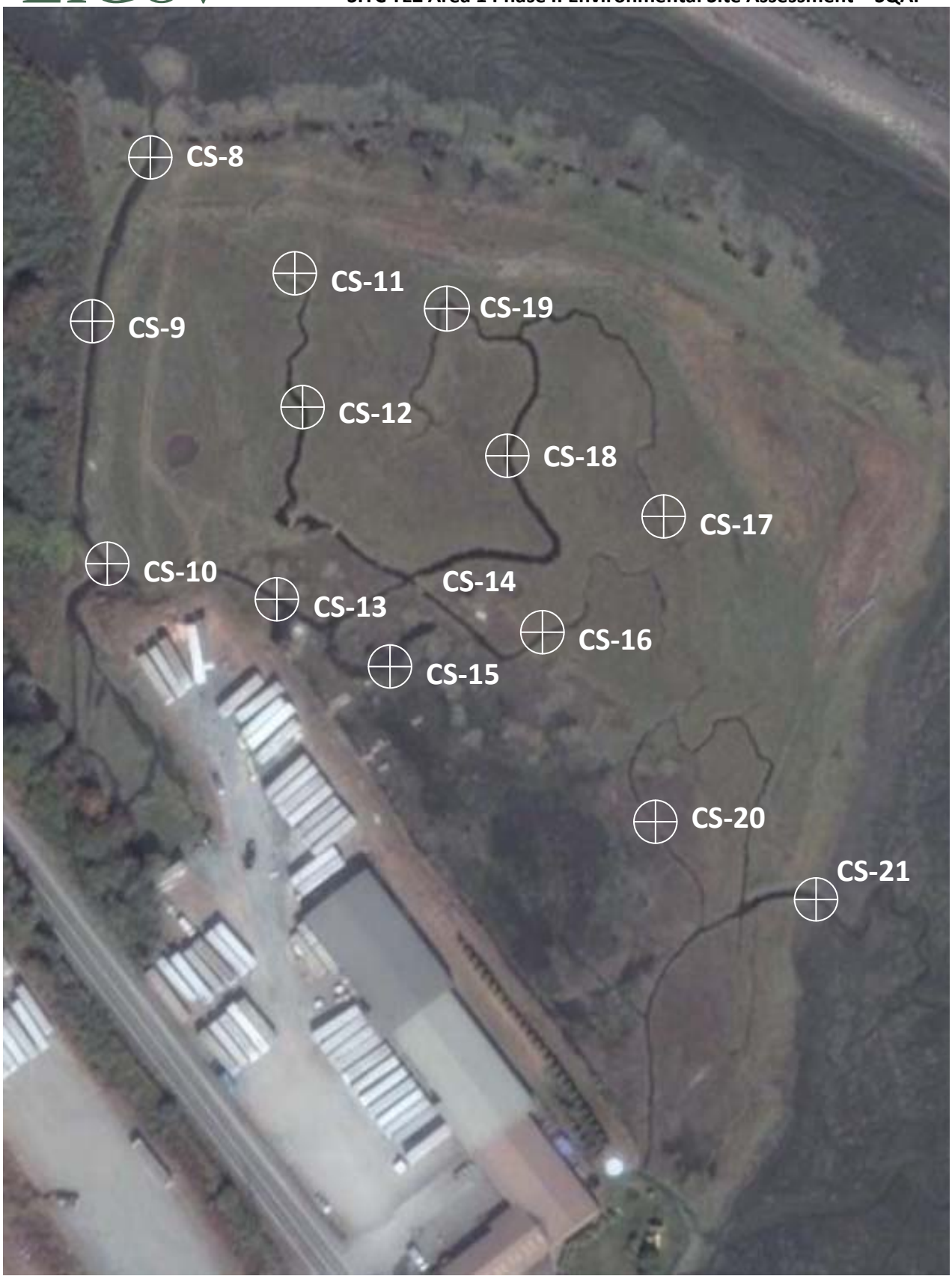

Figure 5-4 - EIGov Proposed Sampling Locations for Phase II ESA in TEZ Area 1: Sample Locations in the Tidal Channels within the SITC Reservation	EIGov	5505 34th Ave NE Seattle WA 98105

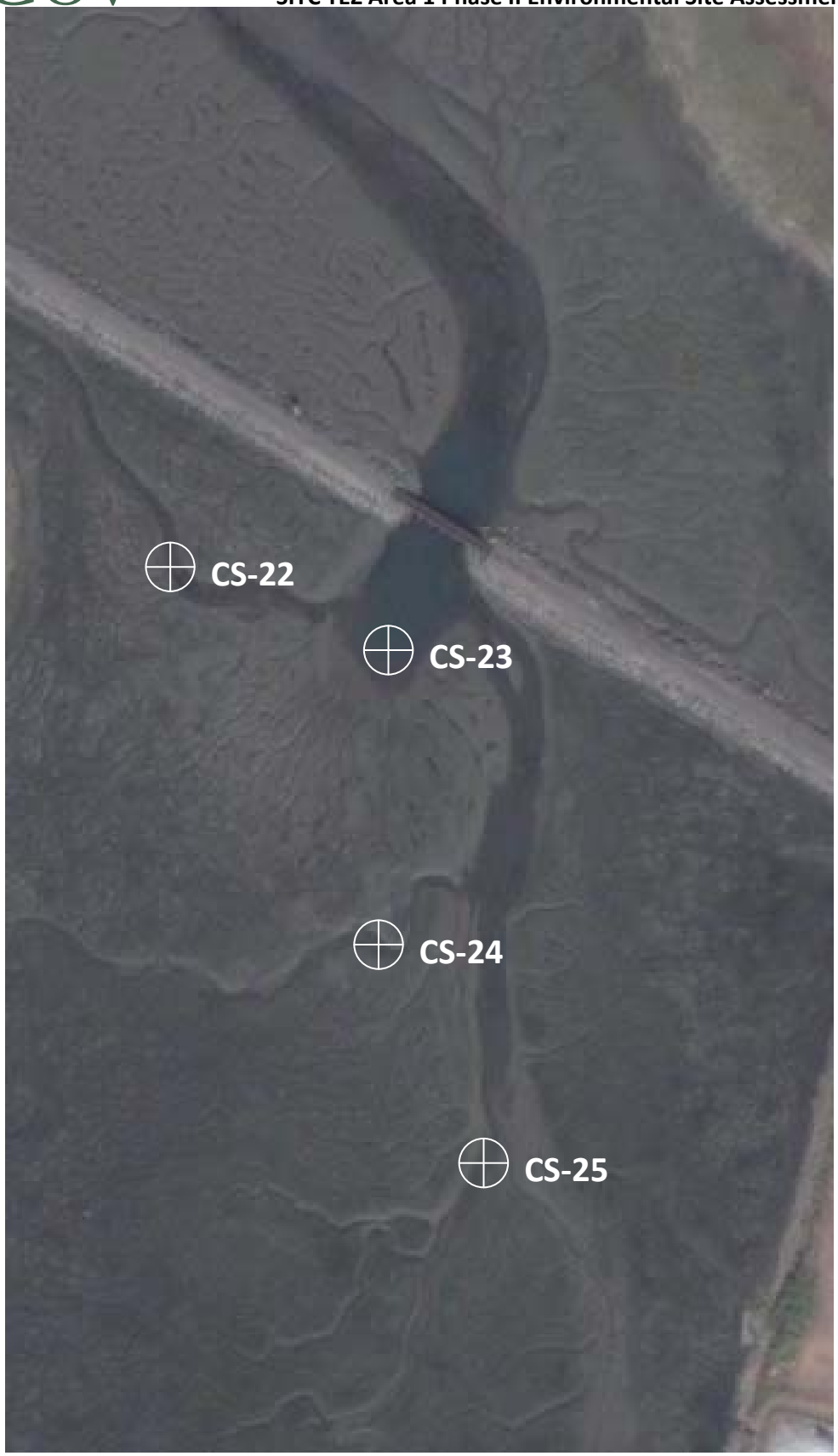

Figure 5-5 - EIGov Proposed Sampling Locations for Phase II ESA in TEZ Area 1: Samples Locations at the Mouth of the Lagoon, and Padilla Bay	EIGov	5505 34th Ave NE Seattle WA 98105

5.5 Data Assessment

5.5.1 Data Quality Objectives and Criteria for Data Measurement

DQOs are the quantitative and qualitative terms used by EPA to describe the quality and quantity of the data needed to meet the objectives of the project. DQOs are developed by considering the purpose of collecting the data and its intended use.

The objective of this site investigation is to collect sufficient data to determine if contamination identified in the study areas are of concern and to determine if further action is required to address contamination identified in site samples.

DQOs for measurement data (referred to here as data quality indicators) are precision, accuracy, representativeness, completeness, comparability, and measurement range. The overall QA objective for analytical data is to ensure that data of known, acceptable and legally defensible quality are generated. To achieve this goal, data must be reviewed for 1) precision, 2) accuracy or bias, 3) representativeness, 4) comparability, and 5) completeness.

A summary of DQOs developed to meet the goals of the SITC TEZ Area 1 Phase II ESA project are presented in **Table 5-3**. Data validation to ensure QA/QC measures have been met is discussed in further detail in Section 5.5.1.6.

5.5.1.1 Precision

Precision measures the scatter in the data due to random error. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the MS/MSD or duplicates.

Field and analytical precision will be evaluated by the relative percent difference (RPD) between field duplicate samples and laboratory duplicate samples; laboratory accuracy and precision will be determined by the spike recoveries and the RPDs of the MS/MSD samples, respectively.

$$RPD = \frac{(R1 - R2)}{((R1 + R2)/2)} \times 100$$

R1 = Recovery for MS or initial analyte concentration
R2 = Recovery for MSD or duplicate sample concentration

Precision criteria for this study are analytical parameter-dependent, and are listed for sediment, surface water and biota in Table 5-3.

5.5.1.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. Analytical accuracy is assessed by "spiking" samples with known standards (surrogates or matrix spikes) and establishing the percent recovery. When a known amount of surrogate is added to a sample and its percent recovery is within laboratory established control limits, then the analyte values in the sample are considered accurate.

Accuracy will be evaluated by the use of percent recovery (%R) of the target analyte in spiked samples and surrogates in all samples and QC samples.

$$\% \text{ Recovery} = \frac{SQ - NQ}{S} \times 100$$

SQ = quantity of spike or surrogate found in sample
NQ = quantity found in native (unspiked) sample
S = quantity of spike or surrogate added to native sample

5.5.1.3 Representativeness

Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix, which is being tested. Representativeness of samples is ensured by adherence to standard field sampling protocols and standard laboratory protocols.

The design of the sampling scheme and number of samples should provide a representativeness of each matrix or product of the chemical processes being sampled.

5.5.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard techniques for both sample collection and laboratory analysis should make data collected comparable to both internal and other data generated. Sample collection methods and other field methods are described in Section 5.0.

Comparability is the measurement of the confidence in comparing the results of this study/project with the results of a different study/project using the same matrix, sample location, sampling techniques and analytical methodologies.

5.5.1.5 Completeness

Completeness is defined as the ratio of acceptable (non-rejected) measurements obtained to the total number of measurements for an activity. The completeness objective for this project is 100 percent.

Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Since sampling is by grabs and limited in number of samples, the number of valid results obtained from the analyses are expected to be equal or better than 90%. Percent completeness may be calculated using the following formula:

$$\% \text{ Completeness} = \frac{\text{\# of valid results}}{\text{\# of samples taken}} \times 100$$

The QA objectives outlined, above, will be evaluated in conjunction with the data validation process.

5.5.1.6 Data Review, Verification, and Validation

All of the data received from the laboratory will be subject to validation at a Level 2 review. The Level 2 review includes verifying the following:

- The laboratory utilized the specified extract, analysis, and cleanup methods.
- The sample holding time was not exceeded.
- Sample numbers and analyses match those requested on the chain-of-custody.
- Required reporting limits have been achieved.
- Surrogate compound analyses have been performed and have met QC criteria.
- Initial and continuing calibrations were run at the proper frequency and have met acceptance criteria.
- Laboratory blanks are free of contaminants.

Data found to have significant deficiencies will be validated in accordance with EPA's functional guidelines for data validation (EPA 1999, EPA 2004). Following this review, data qualifiers assigned by the laboratory may be amended.

5.5.1.7 Corrective Action

If procedures in the field or the lab are not performed to the project specifications and data quality objectives are not met, specific corrective actions will be determined that may include but are not limited to the following:

- Identifying the source of the violation
- Re-analyzing samples if holding time criteria permit

- Re-sampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data and flagging it to indicate the level of uncertainty.

5.5.2 Data Comparison

In order to assess potential risk posed by contamination detected in Site sediment, surface water, and biota samples, analytical data will be compared to published state and federal risk-based regulatory standards.

Sediment Data. Sediment data will be compared to Puget Sound Marine Sediment Quality Standards (SQSs; WAC 173-204-320), where available, which in all cases are equal to or more conservative than the Washington State marine sediment cleanup screening levels (CSLs; WAC 173-204-520). In the cases where SQSs are not available, sediment data will be compared to Ecology's freshwater lowest apparent effects threshold (LAET) values (Ecology 2003). In the cases where Washington State sediment screening criteria are not available, sediment data will be compared to the most conservative of values available from the following sources: Oregon Department of Environmental Quality guidance for ecological risk assessment (ODEQ 2001) and toxicological benchmarks for effects on sediment-associated biota (Jones et al. 1997).

Because several of the SQSs for organic chemicals are organic-carbon normalized, it is important that analytical data for these parameters are normalized using the respective TOC data for accurate comparison. If sediment TOC is low, less than 0.5%, comparison of the organic carbon-normalized values with the CSL values may not be appropriate. Upon receipt of the data, the PM will review the TOC data and determine the appropriate values to compare with the SQSs.

Sediment Microtox® data will be evaluated pursuant to WAC 173-204-320(3)(e). Based on this statute, sediments will be determined to have adverse effects on biological resources when the following results are demonstrated:

> The mean light output of the highest concentration of the test sediment is less than eighty percent of the mean light output of the reference sediment, and the two means are statistically different from each other (t test, $p \leq 0.05$).

Surface Water Data. Surface water data will be compared to Washington State toxic substances criteria for marine water chronic exposure (WAC 173-201A-240). In the cases where Washington State criteria are not available, surface water data will be compared to the Clean Water Act (CWA) National Recommended Water Quality Criteria (NRWQC) saltwater criterion continuous concentration (CCC) values. In the cases where these criteria are not available, surface water data will be compared to freshwater toxicological benchmarks from Suter and Tsao (1996) to assess potential risk to ecological

receptors or EPA Regional Screening Level (RSL) values (EPA 2009) to assess potential human health risk. In the case of VOCs, data will be compared to NOAA Screening Quick Reference Table (SQuiRT) marine chronic values where available.

Shellfish Data. Oyster tissue data will be evaluated using whole-body bivalve tissue effects concentrations available from the literature. Tissue effects concentrations were selected based on whole-body bivalve tissue no observed effects concentrations (NOECs) and low observed effects concentrations (LOECs) available from the following sources: Environmental Residue Effects Database (USACE 2003) and Jarvinen and Ankley (1999), a compilation of tissue residue NOECs and LOECs. Tissue effects levels are not available for all contaminants of interest, and in some cases the selected effects level was based on a surrogate analyte (Aroclor 1016 for total PCB Aroclors; fluoranthene for total and individual PAHs). For the contaminants for which whole-body bivalve tissue effects concentrations are not available, overall Site surface water quality will be evaluated using the CWA NRWQC for human health consumption of organism only. This screen provides an indirect indicator of potential human health risk from oyster consumption; however, it should be noted that NRWQC values are based on assumptions about bioconcentration in the organism and are not site-specific. NRWQC values also are based on assumptions about consumption, which may be less than Tribal consumption. Surface water data exceedances of the human health NRWQC criteria indicate probable, rather than potential risk to ecological receptors, and should not be interpreted as a conservative screen for oysters.

Table 5-4 presents the state or federal risk-based regulatory standards that will be used to compare analytical data collected during the Phase II ESA.

Table 5-4. Summary of Data Quality Objectives

Parameters	State or Federal Standard or Benchmark			Analytical Level[1]	Intended Data Use[2]
	sediment	surface water	biota tissue effects level (mg/kg ww)		
Microtox® bioassay	WAC 173-204-320 (narrative criterion)	WAC 173-204-320 (narrative criterion)	NA	Level 2	CC, FA. ID, IR
TOC	LAET[3]	NA	NA	Level 2	CC, FA. ID, IR
VOCs	ODEQ (2001) or Jones et al. (1997)	NOAA SQuiRT chronic marine	NA	Level 2	CC, FA. ID, IR
SVOCs	SQS[4]	Suter and Tsao (1996) or EPA RSL (2009)	LOEC	Level 2	CC, FA. ID, IR
PCBs	SQS	WAC 173-201A-240	LOEC	Level 2	CC, FA. ID, IR
TAL metals	SQS	WAC 173-201A-240	NOEC, LOEC	Level 2	CC, FA. ID, IR
TPH	NA	NA	NA	Level 2	CC, FA. ID, IR
Dioxins/furans	NOAA SQuiRT	NA	NA	Level 2	CC, FA. ID, IR

	marine sediment TEL				

Notes:

1. Analytical levels (EPA 1998): Level 2 = analyses using standard laboratory QA/QC, including duplicate analyses, suitable calibration standards, sample preparation equipment, and operator training.
2. Data Intended End Use is project-specific and can include: CC = determine quantity and levels of contamination; FA = determine the need for further action or no further action; FS = field screening; HS = Health & Safety; ID = identify waste material/contaminants; IR = identify impacted targets/receptors.
3. Lowest Apparent Effects Threshold (LAET); Ecology, 2003
4. Marine Sediment Quality Standards (SQS); WAC 173-204-320

5.6 Decontamination

Non-dedicated sampling equipment such as the scoops and shovels that will be utilized to collect sediment samples will require decontamination between sample locations. Decontamination procedures will be performed in accordance with SOP No. ICF-1008 found in Appendix A.

5.7 Location & Elevation Survey

All sediment sample locations will be surveyed for vertical (elevation[4]) and horizontal location using a handheld Global Positioning System (GPS) Unit. Field survey data presented by the GPS unit will clearly list the coordinates (and system) and relative elevation, as appropriate for all surveyed locations. The location and elevation survey will be used to develop maps and graphics of the Site.

5.8 Investigation-Derived Waste Handling

IDW generated during the field activities performed during this investigation include personal protective equipment (PPE) and decontamination fluids. All IDW will be handled and disposed of in accordance with SOP No. ICF-4033 in Appendix A.

PPE will be treated as non-hazardous waste unless field screening indicates they are contaminated. Hazardous PPE will be segregated from non-hazardous. EIGov will then arrange for the disposal of hazardous PPE after receiving analytical results from field sampling efforts.

5.9 Sample Handling and Custody

Samples collected during the Phase II ESA will be stored in coolers and kept under custody at all times. An EPA Region 10 FORMS II Lite™ Chain of Custody (COC) form will be completed in indelible ink for each shipping container (e.g., ice chest) used. Each sample will be included in the field data sheets and

[4] GPS is designed for horizontal, not vertical accuracy. The vertical error is likely to be 1.5 times that of the horizontal estimated positional error. (Pepper 2009)

given individual numbers to match the bottles and the field data sheets. Prior to sealing the ice chest, one copy of the COC form and a copy of the field record sheet will be sealed in a re-sealable waterproof plastic bag. This plastic bag will be taped to the inside cover of the ice chest so that it is maintained with the samples being tracked. Ice chests will be sealed with reinforced tape for shipment. Until the field samples are relinquished to the laboratory, the samples will be kept in coolers with ice and cooled to approximately 4 °C. Each cooler will have an accompanying temperature blank.

5.10 Data Management & Documentation Procedures

Data management will be maintained in an organized manner in the field, at the analytical laboratory, and during reporting to minimize data interpretation errors and omissions.

5.10.1 Field Data Management and Documentation

Field data management and documentation including field log books and sample collection forms will be performed in accordance to SOP No. ICF-4014. Chain-of-custody and sample labeling documentation procedures are detailed in SOP No. EIGov-1004. Both SOPs are included in Appendix A. The SOPs also include the relevant field forms. All field data management and documentation are subject to possible QA audit assessment.

5.10.2 Laboratory Data Management and Documentation

The laboratory will provide a “Level B” data package deliverable, which will include:

- Project narrative;
- Sample results sheets;
- Chain-of-custody and sample receipt documentation;
- Initial and continuing calibration summary sheets, if available and when appropriate to meet project-specific requirements;
- Instrument performance verification (Gas Chromatograph/Mass Spectrometer tunes, interference check samples, retention time shift checks), as appropriate for the specific method;
- Surrogate and internal standard data, as appropriate for the specific method; and
- Field and laboratory QC samples results including blank, matrix spike, laboratory control sample, and duplicate results.

Data packages will be provided for all samples analyzed and these will be maintained as a permanent record in the project file.

5.10.3 Reporting Data Management and Documentation

All laboratory data will be tabulated in an electronic format (typically Microsoft Excel or Microsoft Access) and any data qualifiers needed as a result of the data evaluation (Form R) will be included. To minimize potential for transcription errors, sample results will be electronically downloaded directly and verified against the hardcopy data packages. The data will be verified by comparing the electronic data printouts to the hardcopy laboratory data package results and the qualifications made in the data evaluation reports. This verification is performed to detect and correct errors, and to prevent the loss of data during data reduction, data reporting, and data entry into forms/reports/databases.

Electronic and database files will be maintained as a permanent record in the project file. Summary data tables and graphics generated from the electronic laboratory data will be included in the final assessment or investigation report.

The project file will be maintained for the life of the contract and provided upon request to US EPA. The project file will be archived in accordance with contract requirements.

6. REFERENCES

Jarvinen AW, Ankley GT, 1999, *Linkage of effects to tissue residues: Development of a comprehensive database for aquatic organisms exposed to inorganic and organic chemicals*, SEATAC Press, Pensacola, FL.

Jones, D.S., G.W. Suter II, and R.N. Hull. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision*. ES/ER/TM-95/R4, Prepared for the United States Department of Energy. Oak Ridge National Laboratory, Oak Ridge, Tennessee. <http://www.hsrd.ornl.gov/ecorisk/tm95r4.pdf>

"La Conner, WA Weather." www.idcide.com. April 24, 2009. <http://www.idcide.com/weather/wa/la-conner.htm >

Oregon Department of Environmental Quality (ODEQ). 2001. *Guidance for Ecological Risk Assessment Level II – Screening Level Values.* Waste Management & Cleanup Division, Cleanup Policy & Program Development Section, Portland, Oregon. <http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceEcologicalRisk.pdf>

Rodriguez, Richard J., August 24, 2007, "Swinomish Chanel dredging work stalls." [Weblog Entry]. BitterEnd: Assistance Towing & Rambling Maritime Information. (http://captrichardrodriguez.blogspot.com/2007/08/swinomish-channel-dredging-work-stalls.html). April 23, 2009.

Pepper, Robert, 2009, *GPS Vehicle Navigation in Australia* Support Website, GPS Nav Frequently Asked Questions. Website Accessed April 22, 2009. http://www.gpsvehiclenavigation.com/GPS/FAQ.php.

Skagit County Health Department (SCHD), February 25, 2003, Worksheet 1: Summary Score Sheet for March Point Landfill. Prepared by Polly Dubbel for the February 25, 2003 Ecology Site Register.

SITC, November 2008a, *Swinomish Tribe Comments to Washington Department of Ecology on Whitmarsh Landfill Site Investigation Documents*, prepared by the Swinomish Indian Tribal Community Environmental Management Program, Office of Planning and Community Development.

SITC, July 2008b, *Swinomish Indian Tribal Community, Brownfields Phase I Environmental Assessment, North Tribal Economic Zone Area 1 (TEZ Area 1)*, prepared by the Swinomish Indian Tribal Community Environmental Management Program, Office of Planning and Community Development, and reviewed by Environment International, Ltd.

Suter, G.W., II, and C.L. Tsao. 1996, *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*. ES/ER/TM-96/R2. Prepared for the United States Department of Energy. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

"Sydney Fish Market, Fishline, Species Information: Pacific Oyster." *Sydney Fish Market*. n.d. Web. May 8, 2009. <http://www.sydneyfishmarket.com.au/?TabId=91&xmmid=620&xmid=719>.

United States Army Corps of Engineers (USACE), 2003, Environmental Residue-Effects Database (ERED) [online]. US Army Corps of Engineers and US Environmental Protection Agency. Updated October 2008. Available from: <http://el.erdc.usace.army.mil/ered/ >.

United States Environmental Protection Agency (EPA), 2009, *Regional Screening Level (RSL) Table Master April 2009*, U.S. Environmental Protection Agency. <http://www.epa.gov/region09/superfund/prg/pdf/composite_sl_table_run_APRIL2009.pdf >

_____, 2006, *National Recommended Water Quality Criteria (NRWQC)*, U.S. Environmental Protection Agency, Office of Water/Office of Science and Technology, Washington, D.C. 4 Nov. 2008. <http://www.epa.gov/waterscience/criteria/wqctable/>

_____, 2004, *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA, Office of Solid Waste and Emergency Response, Document No. EPA 540/R-04-004, Washington D.C.

_____, 1999, *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA, Office of Solid Waste and Emergency Response, Document No. EPA 540/R-99-008, Washington D.C.

Washington State Department of Ecology (Ecology). 2003. *Development of Freshwater Sediment Quality Values for use in Washington State.* Phase II Report: Development and Recommendation of SQVs for Freshwater Sediments in Washington State. Publication Number 03-09-088. Washington State Department of Ecology, Olympia, Washington.

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