Work Plan
Remedial Investigation/Feasibility Study and Interim Action
Cap Sante Marine Lease Area
Anacortes, Washington

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Prepared for

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1.0 INTRODUCTION

This document integrates a work plan for a Remedial Investigation/Feasibility Study (RI/FS) and a scope of work for an Interim Action within the Cap Sante Marine (CSM) Lease Area (Site), located at the Port of Anacortes (Port) Cap Sante Boat Haven on the east end of 13th Street in Anacortes, Washington (Figure 1). Recent environmental investigations of the Site, completed by the Port, have confirmed that contamination is present in the subsurface soil and groundwater in the vicinity of two former underground storage tanks (USTs; Floyd Snider and McCarthy 2004, Floyd|Snider 2005). In order to assess the nature and extent of the contamination, the Port is performing an RI/FS under an Agreed Order with the Washington State Department of Ecology (Ecology). Ecology is overseeing the Site as part of Fidalgo and Padilla Bay efforts under the Governor's Puget Sound Initiative. This work plan serves as the Scope of Work for the Agreed Order. The activities described in this work plan will be conducted to fulfill the requirements set forth in the Agreed Order by assessing the nature and extent of contamination at the Site and providing sufficient information to select a cleanup action. It is anticipated that an interim action will be implemented at the Site prior to completion of the RI/FS and selection of the final remedy. The interim action will be considered after the site-specific cleanup levels are established for the Site. The interim action will be implemented to reduce potential threats to human health or the environment by eliminating known contaminant pathways or to correct a problem that may become worse over time. Pursuant to the Agreed Order, this work plan also includes provisions for an interim action to address petroleum-contaminated soil prior to and during Site redevelopment activities. A scope of work for the interim action is set forth in Section 4.0 of this document.

This work plan was prepared for submittal to Ecology in accordance with the provisions of the Agreed Order, and was developed to meet the general requirements of an RI and FS as defined by the Washington Model Toxics Control Act Cleanup (MTCA) Regulation (WAC 173-340-350). This work plan describes the RI activities to be performed, the FS activities to be performed, and the planned schedule and reporting. Appendices to this work plan consist of a Sampling and Analysis Plan (Appendix A); a Quality Assurance Project Plan (Appendix B); a project Health and Safety Plan (Appendix C); the Port of Anacortes Petroleum Seepage Study (Appendix D); 2004 and 2005 Environmental Due Diligence Reports (Appendix E); a Dredge Material Characterization Report for Cap Sante Marina (Appendix F); Background Information for Terrestrial Evaluation (Appendix G); and a Public Participation Plan (Appendix H).

2.0 BACKGROUND INFORMATION

This section describes the CSM Site, including its known history, current uses, existing property features, and geology, and summarizes previous environmental investigations.

2.1 PROPERTY DESCRIPTION

As described in Section 1.0, the Site is located within the Cap Sante Boat Haven in Anacortes, Washington. The Site is currently used as a boatyard, marina support area, and a marine fueling facility by Cap Sante Marine, Ltd., tenant of the Port. The property is bounded by Fidalgo Bay on the east, Q Avenue on the west, 11th Avenue on the north, and 13th Street to the south. The ground surface at the Site is asphalt in the roadway and a combination of asphalt, concrete slab, and gravel within the boatyard.

2.2 SITE HISTORY

Prior to 1947, the Site consisted of tide flats. In the late 1940s to early 1950s, the area was filled with dredged material from the adjacent federal waterway. The Port has owned the Site since 1956 and has leased it to various operators over time. The Site has been operated as a boatyard and marina support area, including a marine fueling facility, since approximately 1959. Cap Sante Marine, Ltd, the current tenant, has occupied the Site since the late 1970s and provides small vessel storage, launch, and minor maintenance services. Vessel fueling was provided from a float located offshore from the CSM Site. Fuel was supplied to the float via a series of underground pipelines from USTs located within the CSM Site area (see Figure 2).

Fuel releases have been recorded at the Site since the 1980s. In the early 1980s, petroleum fuel was observed seeping into the marine waters at the boat basin at several locations near the fuel float. In 1983, under order from the U.S. Coast Guard, the Port installed a trench to control the seepage of fuel. The trench intercepted the fuel flowing through the soil. According to the available documentation, approximately 1,250 gallons of fuel were recovered from the trench and the seepage stopped. It was determined that the seepage was the result of leakage from the USTs and supply lines that serviced the fuel float.

The USTs contained gasoline, diesel, and two-stroke oil pre-mix. The approximate total storage capacity of the original tanks was 22,000 gallons. In 1985, the Port replaced these USTs with two new 12,000 gallon tanks. Recently, the fuel float was demolished by the Port as part of the boat haven redevelopment. To date, the USTs and supply lines have not been removed.

2.3 PREVIOUS INVESTIGATIONS

In 1982, the USTs and supply lines were repaired; however, petroleum leakage continued to be observed at the Site. Following the continued petroleum seepage, a Petroleum Seepage Study was conducted that included hydrogeologic explorations and analyses (Hart Crowser 1983). The results of the Petroleum Seepage Study are presented in the Petroleum Seepage Study report provided in Appendix D.

In 1983, eight observation wells were installed and several test pits were excavated. The data obtained from the investigation indicated that petroleum present in the subsurface soil was migrating toward the shoreline on top of the water table. In 1984, a petroleum recovery system was installed that was comprised of an interceptor trench system coupled with a recovery well. The interceptor trench was excavated to a depth of approximately 8 to 10 ft at the approximate location shown on Figure 2, and was backfilled with coarse gravel. A petroleum recovery well was installed in direct hydraulic connection to the trench. Petroleum pumped from the well was directed into a separate storage tank. The recovery system operated for approximately 28 weeks, recovering approximately 1,250 gallons of petroleum. Groundwater wells were monitored for 6 months following the recovery system shutdown. Petroleum seepage into the harbor was not observed following these remedial actions.

In 2004 and 2005, the Port conducted a series of Environmental Due Diligence Investigations into the extent of soil and groundwater contamination at the Site (Floyd|Snider 2005). As part of the 2004 investigation, soil and groundwater samples were collected from six locations near the former fuel recovery trench. A total of 13 soil and 6 groundwater samples were collected and analyzed for petroleum hydrocarbon contaminants. Soil concentrations of benzene and/or xylenes exceeded MTCA Method A cleanup levels at four of the sampling locations, and gasoline-range petroleum hydrocarbons were detected at concentrations exceeding MTCA Method A cleanup levels at two sampling locations. Cleanup levels for benzene, gasoline, and diesel in groundwater were exceeded at two of the sampling locations. In 2005, soil and groundwater samples were collected from nine locations in the general vicinity of the USTs. A total of 7 soil samples and 5 groundwater samples were collected and analyzed for petroleum hydrocarbon contaminants. Soil concentrations of benzene and/or diesel-range petroleum hydrocarbons exceeded MTCA Method A cleanup levels at five of the sampling locations. Gasoline-range and diesel-range petroleum hydrocarbons and benzene exceeded groundwater cleanup levels at five of the sampling locations. The Port's investigations revealed soil and groundwater contaminated with gasoline-range and diesel-range petroleum hydrocarbon, and benzene in a roughly fan-shaped area around the USTs that extended to Fidalgo Bay. Analytical results for the 2004 and 2005 soil and groundwater investigations are summarized in Tables 1 and 2 and on Figure 3. The 2004 and 2005 Due Diligence Reports are provided in Appendix E.

Sediments adjacent to the Site were tested in February 1999 and January 2000 in conjunction with maintenance dredging of the boat haven. Dredged materials were subject to the chemical quality evaluations required by the Dredged Material Management Program and were found to be suitable for unconfined open-water disposal (Appendix F). The maintenance dredging was performed in two phases of work. Phase 1 was completed during the 2004/2005 dredging window and included dredging from the federal channel and from the entrance of the Marina to the A- and B-Docks. Phase 2 included dredging the marina area between B-Dock and E-Dock and was completed during the 2006/2007 dredging window (Figure 2).

2.4 CURRENT PROPERTY CONDITIONS

2.4.1 GEOLOGY AND HYDROLOGY

Based on previous investigations (Hart Crowser 1983), the subsurface geology at the Site consists of dredged fill material overlying native marine sediment and glacial deposits. The fill consists of gray silty, fine to medium sand. The native layer underlying the dredged fill material consists of a sandy, clayey silt. The native silt layer is encountered at about 9 ft below ground surface (BGS) and ranges from 3 to 6 ft in thickness. A shallow unconfined aquifer is present within the dredged fill material. Groundwater in this shallow aquifer has been encountered at depths ranging from 4 to 5.5 ft BGS. The native silt layer encountered at approximately 9 ft BGS separates the shallow aquifer from a deeper confined aquifer present in the native sand layer. Due to the proximity of the Site to Fidalgo Bay, Site groundwater is assumed to be tidally influenced with a general flow direction to the east toward the bay.

2.4.2 CHEMICALS OF POTENTIAL CONCERN

At the CSM Site, the chemicals of potential concern (COPCs) for soil and groundwater include those associated with the historical petroleum fuel tanks and supply lines associated with the fuel seepage in the early 1980s. COPCs include petroleum hydrocarbons; polycyclic aromatic hydrocarbons (PAHs); volatile organic compounds (VOCs) associated with petroleum fuel; and lead. The specific COPCs are listed below:

- Gasoline-range petroleum hydrocarbons
- Diesel-range petroleum hydrocarbons
- Carcinogenic PAHs (cPAHs)
- Napthalene
- 1-Methylnaphthalene
- 2-Methylnaphthalene

- Benzene, toluene, ethylbenzene, xylenes (BTEX)
- Methyl tert-butyl ether (MTBE)
- Lead
- 1,2-Dibromoethane (EDB)
- 1,2-Dichlorethane (EDC)
- N-Hexane.

Previous investigations at the Site focused on identifying the nature and extent of these COPCs. Further investigation of the Site will include analysis of the chemical parameters listed in Table 830-1 of the MTCA (Chapter 173-340 WAC). Also, because heavy oil was detected in groundwater during the 2005 groundwater investigation, heavy oil will be analyzed for in some or all of the soil and groundwater samples. Chromium, copper, zinc, and polychlorinated biphenyls (PCBs) will also be analyzed for in some samples collected in the vicinity of the waste oil tank. Unless detected, these additional parameters will not be carried forward as COPCs.

2.5 FUTURE SITE LAND USE

Currently, the Port is redeveloping the Cap Sante Boat Haven including parts of the CSM Site. Redevelopment activities include the following:

- Dredging of moorage areas to -12 ft mean lower low water
- Installation of new moorage floats for C-, D-, and E-Docks
- Demolition of the existing boat launch and fuel float facility and construction of a new fuel facility near the terminus of A-Dock
- Installation of a boat launch facility between the B-Dock and C-Dock
- Installation of a pedestrian esplanade along the shoreline.

Future plans may include the reconfiguration of the current upland boatyard.

3.0 REMEDIAL INVESTIGATION

The RI will evaluate existing soil, groundwater, and sediment quality data from the Site. Additional information will be collected, as needed, to characterize the Site for the purpose of developing and evaluating cleanup action alternatives and selecting a cleanup action. The scope of the RI will include a soil investigation, groundwater investigation, and a sediment investigation. To expedite the RI, the sediment investigation and monitoring well installation associated with the groundwater investigation will be done concurrently and in advance of the soil investigation. The results of the RI, as well as previous investigation results, will be compared to preliminary cleanup levels to determine the nature and extent of contamination. Although cleanup levels will be developed for soil and groundwater as part of the FS (discussed further in Section 5.0), preliminary cleanup levels will be established during the RI to evaluate the nature and extent of contamination and to select analytical methods with reporting limits at or below the cleanup levels to the extent possible.

This section presents preliminary cleanup levels, the rationale for the preliminary cleanup levels, and the activities associated with each investigation.

3.1 PRELIMINARY CLEANUP LEVELS

In accordance with MTCA, the development of preliminary cleanup levels included identifying potential exposure pathways for human and environmental impacts based on the planned land use. The Site is currently zoned commercial and, as discussed in Section 2.1, the Site is currently used as a boatyard and for retail. As discussed in Section 2.5, the Port plans to redevelop portions of the Site as part of an overall upgrade of the Cap Sante Boat Haven facility. Redevelopment plans include installation of new moorage floats, relocation of the fuel dock, installation of a boat launch facility, and installation of a pedestrian esplanade along the shoreline. It is not anticipated that the zoning will change following redevelopment.

3.1.1 DERIVATION OF SOIL AND GROUNDWATER TPH CLEANUP LEVELS PROTECTIVE OF OFFSHORE SEDIMENTS

Sediment total petroleum hydrocarbon (TPH) toxicity will be evaluated through bioassay testing to provide a basis for determining TPH cleanup levels in Site soil and groundwater. Site soil and groundwater TPH cleanup levels must be protective of benthic organisms in sediment and will prevent re-contamination of sediment. Sediment samples will be collected from three locations along the shoreline of the Site at the approximate elevation of the groundwater table and at multiple locations offshore of the Site. These samples will be analyzed for the COPCs, and the shoreline sample containing

the highest TPH concentration will be subject to bioassay testing to evaluate the potential toxicity of the test sediments. If the sediment passes the bioassay tests, no further investigation of the sediment will be conducted because there are no demonstrated impacts to sediment resulting from historical releases at the Site. In this case, soil and groundwater cleanup levels will default to MTCA Method A cleanup levels for TPH. If the bioassay results show toxicity to benthic organisms related to TPH, then additional testing will be performed in consultation with Ecology. The additional testing will utilize the other sediment sample results to identify the range of sediment TPH concentration at the Site. Additional toxicity testing will focus on identification of TPH levels that do not pose adverse effects to benthic organisms. On identification of protective sediment TPH concentrations, groundwater and soil cleanup levels will be calculated using the U.S. Environmental Protection Agency (EPA) Equilibrium Partitioning Model for sediment.

3.1.2 GROUNDWATER

Groundwater at or potentially affected by the Site is not currently used for drinking water and is not a reasonable future source of drinking water due the availability of a municipal water supply and, in accordance with WAC 173-340-720(2)(d), due to its proximity to marine surface water. However, groundwater samples collected during the RI will be analyzed for additional parameters (total dissolved solids, salinity, etc.) that will support the conclusion that groundwater at the Site is not a reasonable source of drinking water. As a result, the potential exposure pathways for Site groundwater include:

- Human ingestion of marine organisms contaminated by releases of affected Site groundwater to adjacent marine surface water
- Acute or chronic effects to aquatic organisms resulting from exposure to constituents in groundwater discharging to adjacent marine surface water.

Groundwater cleanup criteria that are developed based on the exposure pathways identified in this subsection must be adequately protective of aquatic organisms and of humans that ingest these marine organisms. Except for TPH, MTCA Method B marine surface water cleanup levels will be developed in accordance with WAC 173-340-730(3) for the COPCs. TPH cleanup levels for groundwater will be based on the TPH concentration permissible in groundwater to prevent toxicity to benthic organisms and recontamination of sediment. The concentration value will be calculated using the EPA Equilibrium Partitioning Model for sediment, using the sediment TPH cleanup level. If a sediment TPH cleanup level is not calculated because bioassay tests pass, as discussed in Section 3.1.1, MTCA Method A cleanup levels will be used for TPH groundwater cleanup levels. Preliminary groundwater cleanup levels and the development of these cleanup levels, including the concentrations established under applicable state and federal laws, are presented in Table 3. However, in accordance with WAC 173-340-740(5)(c), further

adjustment to the preliminary groundwater cleanup levels presented in Table 3 may be necessary if practical quantitation limits are greater than cleanup levels.

3.1.3 SOIL

Except for TPH, MTCA Method B cleanup levels will be used as preliminary soil cleanup levels. Because access to the property by the general public is currently allowed and will continue to be allowed after redevelopment, preliminary soil cleanup levels will be based on unrestricted land use, as defined in MTCA. During the FS, cleanup levels and/or risk-based remediation levels for specific land uses and associated institutional controls may be considered as a component of cleanup alternative development and evaluation. Under MTCA Method B, soil cleanup levels must be as stringent as:

- Concentrations established under applicable state and federal laws
- Concentrations protective of terrestrial ecological receptors
- Concentrations protective of direct human contact with soil
- Concentrations protective of groundwater.

Consideration of the above criteria was made, as follows, during development of preliminary soil cleanup levels:

- Except for MTCA, there are no soil cleanup levels established under applicable state or federal laws for the COPCs at the Site.
- A terrestrial ecological evaluation is not required for the Site because it does not meet any of the criteria in WAC 173-340-7491(2). Copies of the forms documenting this decision for the Site are included in Appendix G. As a result, the Site meets the exclusion for a terrestrial ecological evaluation. Therefore, human contact and leaching to groundwater are the only applicable pathways for Site soil.
- Except for TPH, standard MTCA Method B soil cleanup levels protective of direct human contact will be developed for the COPCs. These cleanup levels will be developed in accordance with WAC 173-340-740(3) using Ecology's on-line CLARC database (Ecology 2001). Table 4 shows the preliminary soil cleanup levels for protection of human health. The preliminary cleanup level for benzo(a)pyrene will be used for the sum of cPAHs using total equivalency factors (TEFs) in accordance with WAC 173-340-708(8)(e) and Ecology guidance (Ecology 2001). MTCA Method A cleanup levels will be used as TPH cleanup levels protective of direct human contact, as shown in Table 4.
- Unless nonaqueous phase liquid (NAPL) is present at the Site, preliminary soil cleanup levels for the saturated and unsaturated soil zones that are protective of groundwater will be determined for the COPCs (except TPH) using the fixed parameter three-phase partitioning model in accordance with WAC 173-340-747(4). Based on the exposure pathways identified in Section 3.1.2 for Site groundwater, because groundwater is not a current or likely future source of drinking water and because it discharges to marine surface water, marine surface

water preliminary cleanup levels protective of human health and aquatic organisms developed in accordance with WAC 173-340-730 will be used in the calculation. Preliminary soil TPH cleanup levels protective of groundwater will be calculated using the TPH concentration permissible in groundwater to prevent sediment toxicity and recontamination (see Section 3.1.2). Table 4 shows the preliminary soil cleanup levels for protection of groundwater as marine surface water.

- If NAPL is present, preliminary soil cleanup levels protective of groundwater will be determined for the constituents present in the NAPL using the four-phase partitioning model in accordance with WAC 173-340-747(6). This methodology calculates a predicted groundwater concentration for each constituent present in the NAPL based on the concentrations of these constituents in soil. The predicted groundwater concentration is then compared to the applicable groundwater cleanup level. For each of the constituents present in the NAPL, except TPH, the predicted groundwater concentration will be compared to the groundwater cleanup level protective of marine surface water. For TPH, the predicted groundwater concentration will be compared to the TPH concentration permissible in groundwater to prevent sediment toxicity recontamination. If the predicted groundwater concentration for each constituent and for the TPH mixture is less than or equal to the applicable groundwater cleanup levels, then the soil concentrations measured at the Site will be considered protective. If the predicted groundwater concentrations for each constituent and for TPH is more than the applicable groundwater concentration, then the Site soil concentrations will not be considered protective and calculation of protective soil concentrations will be conducted iteratively using the four-phase partitioning model.

- If NAPL is present, the TPH preliminary cleanup levels protective of groundwater will be compared to residual saturation screening levels to ensure that the soil cleanup levels will not result in the accumulation of NAPL. Residual saturation screening levels for TPH will be established using the values specified in Table 747-5 of the MTCA (Chapter 173-340 WAC)

Preliminary soil cleanup levels may be adjusted to be no less than natural background in accordance with WAC 173-340-740(5)(c). Background concentrations for metals, based on statewide 90th percentile values (Ecology 1994), were compared to preliminary soil cleanup levels protective of human direct contact and groundwater. Preliminary cleanup levels for copper, mercury, and nickel were adjusted upward to the natural background level. Preliminary soil cleanup levels adjusted based on natural background are identified in Table 4. Also, in accordance with WAC 173-340-740(5)(c), further adjustment to the preliminary cleanup levels may be necessary if the practical quantitation limits are greater than the preliminary cleanup levels.

3.2 SEDIMENT INVESTIGATION

Initially, a sediment investigation will be performed to determine the sediment toxicity-based soil and groundwater cleanup criteria as described in 3.1.1 above. Twelve surface (0 to 10 cm) sediment samples (SED-1 through SED-12) will be collected from the locations shown on Figure 4. Initially, the sediment samples will be analyzed for petroleum hydrocarbon fractions using volatile petroleum

hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), and NWTPH-Dx methodologies. A bioassay test will be performed using shoreline samples (SED-1, SED-2, or SED-3) containing the highest concentrations of TPH. Other sediment samples with significant TPH concentrations that are considered to be associated with historical upland releases of petroleum hydrocarbons may also be submitted for toxicity testing. If the sediment sample passes the bioassay tests, the concentrations of TPH in sediment will be considered protective of benthic organisms and MTCA Method A cleanup levels will be used. If the sediment sample fails the bioassay tests, additional bioassay testing will be performed on samples representative of the range of TPH at the Site as determined from the 12 sediment samples that will be collected. Additional toxicity testing will be identified and completed in consultation with Ecology. Sediment sample collection procedures are discussed in more detail in the SAP (Appendix A).

3.3 SOIL INVESTIGATION

The soil investigation will be initiated following completion of the sediment investigation. This will allow TPH cleanup levels protective of sediment to be developed for the soil prior to collecting and analyzing soil samples. The soil investigation will consist of collecting soil samples from twelve borings (SB-1 through SB-12) at the approximate locations shown on Figure 5. Three of the borings (SB-02, SB-03, and SB-12) are located upgradient of the former USTs to better delineate the extent of petroleum-impacted soil in the vicinity of the former USTs. Six of the borings (SB-01, SB-04, SB-05, SB-06, SB-08, and SB-11) are located along the CSM shoreline to characterize the extent of impacted soil shoreward of the recovery trench. One soil boring, SB-07, will be located downgradient of the former waste oil tank and another soil boring, SB-09, will be located between previous boring locations CSM-04 and CSM-14. Soil sampling at these boring locations will be conducted to fill data gaps associated with MTCA testing requirements for petroleum releases. One soil boring, SB-10, will be located in an area located near the B-Dock that was recently identified as potentially impacted by petroleum. Soil samples will also be collected at the proposed monitoring well locations (shown on Figure 5 and described in Section 3.4) if a zone of contamination is encountered during drilling of the monitoring well borehole.

At each boring location, a sample of the surface soil (0 to 0.5 ft BGS) will be collected and submitted for laboratory analysis. Additionally, if soil conditions at any of the twelve borings indicate a zone of potential contamination (e.g., debris, presence of oil or sheen, odors, and/or discoloration), a sample will be collected from that zone and submitted for laboratory analysis. A sample will also be collected from a depth below the zone of potential contamination where no evidence of contamination is present. If no evidence of potential contamination is observed at a boring, a soil sample will be collected

from the 1- to 2-ft depth and from the capillary fringe, in addition to the surface soil sample, and submitted for laboratory analysis.

Boreholes for collecting soil samples will be drilled using a truck-mounted Geoprobe® direct-push drilling rig. Soil samples will be obtained from the soil borings using a closed-piston sampling device with a core sampler. Soil sample collection procedures are discussed in more detail in the SAP provided in Appendix A of this work plan.

Soil samples submitted for analysis will be analyzed for the COPCs identified in Section 2.4.2. Soil samples submitted for laboratory analysis from soil boring SB-07, located near the former waste oil tank, will be analyzed for the COPCs, as well as chromium, copper, zinc, and PCBs. If necessary for the development of TPH cleanup levels that are protective of sediment, 10 soil samples will be collected from the vadose zone at borings where petroleum hydrocarbon contamination is observed. The vadose zone samples will be analyzed for TPH fractions using EPH and VPH methodologies (Ecology 1997). Analytical methods and reporting limits goals for the analysis of each constituent are described further in the SAP provided in Appendix A of this work plan.

3.4 GROUNDWATER INVESTIGATION

Five groundwater monitoring wells will be installed at the Site to determine groundwater depth, flow direction, and other characteristics, and to determine if hazardous substances are present. Based on previous investigations (Hart Crowser 1983), it is expected that groundwater generally flows toward the shoreline (Cap Sante Waterway). As described in Section 3.1.2, the property groundwater is not a current or reasonable future drinking water source. The groundwater investigation will focus on characterization of groundwater quality migrating onto and off of the Site. The groundwater investigation will consist of installation of four shallow monitoring wells screened in the upper aquifer and one deep well screened in the lower aquifer, measurement of groundwater levels at each well location, collection of groundwater samples at each well, and collection of a groundwater sample at soil boring SB-01. Groundwater samples submitted for laboratory analysis will be analyzed for the COPCs identified in Section 2.4.2 and other parameters that will be used to evaluate the use of groundwater as drinking water and/or to evaluate natural attenuation as a potential cleanup option. Monitoring well locations and installation procedures, groundwater sampling and analysis, and measurement of groundwater levels are discussed below; more detailed procedures are provided in the SAP (Appendix A).

3.4.1 MONITORING WELL LOCATIONS

Four shallow monitoring wells (MW-01, MW-02, MW-03S, and MW-04) and one deep monitoring well (MW-03D) will be installed at the proposed locations shown on Figure 5. The proposed groundwater monitoring well locations were selected to provide additional information on the groundwater quality in the vicinity of the USTs and historical releases. Shallow monitoring well MW-01 is located upgradient from the former USTs to determine the chemical quality of groundwater entering the area. Shallow monitoring well MW-02 is located upgradient of one of the historical petroleum seepage areas and southeast of the former USTs. Monitoring wells MW-03S and MW-04 are located downgradient of the former USTs and historical petroleum recovery trench. The actual location of the monitoring wells may be modified slightly during installation activities, based on field conditions and to reduce possible conflict with current Site use or future Site development plans.

3.4.2 MONITORING WELL INSTALLATION

Boreholes for shallow and deep monitoring wells will be drilled using a hollow-stem auger drill rig. Step-down drilling procedures across the confining unit will be used for the deep well installed in the lower aquifer. Shallow monitoring well boreholes will be terminated at the top of the upper confining unit or will extend no more than 0.5 ft into the upper confining unit with total depths expected to be about 9 ft BGS. The deep monitoring well boreholes will be terminated approximately 10 to 15 ft below the base of the upper confining unit or at the top of the lower confining unit, if this unit is present at depths less than 10 ft below the upper confining unit. Monitoring well installation and construction will be performed in accordance with the *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 WAC).

3.4.3 GROUNDWATER MONITORING

Following well installation, each well will be developed and groundwater samples will be collected as described in the SAP. Groundwater sampling will occur within 1 hour before and 1 after a low tide so that samples collected will be of water discharging from the site that is minimally influenced by the tide. Two other groundwater monitoring events will be conducted in addition to this monitoring event. These monitoring events will be conducted during a dry season (typically August or September) and a wet season (typically April, May, or November). At least two quarters of groundwater monitoring may be completed prior to implementation of an interim action at the Site. Water levels will also be measured at each monitoring well and in Cap Sante Waterway during each sampling event. In addition to the groundwater samples collected at each monitoring well, a groundwater sample will be collected

directly from soil boring SB-01 during the soil investigation. Collection of a groundwater sample at soil boring SB-01 will also occur within 1 hour before and 1 hour after low tide. Groundwater samples will be analyzed for the COPCs identified in Section 2.4.2 and other parameters that will be used to evaluate the use of groundwater as drinking water and/or to evaluate natural attenuation as a potential cleanup option. Analysis of groundwater samples for metals will include both total and dissolved; however, which result will be used for characterization of Site groundwater will depend on sample turbidity. For turbid groundwater samples, the dissolved metals results will likely be used to characterize Site groundwater. For non-turbid groundwater samples, total metals results will likely be used to characterize Site groundwater. However, the use of total or dissolved metal results for characterizing Site groundwater will be determined in consultation with Ecology.

To further delineate groundwater flow characteristics across the Site, specifically groundwater tidal influence information, a 72-hour tidal study will be conducted. Data collection will include continuous (every 15 minutes) water level measurements from monitoring wells located at the Site, and in the marina using electronic dataloggers and well transducers. Manual water levels will also be collected by field staff to confirm results of the electronic data collection. Net groundwater flow directions determined from the tidal study will be used along with the groundwater monitoring analytical results to more accurately define the nature and extent of potential groundwater contamination beneath the Site. In addition, aquifer hydraulic conductivity will be determined by conducting aquifer well slug tests.

Procedures for well development, water level monitoring, groundwater sample collection, slug tests, and the tidal study are provided in the SAP (Appendix A).

4.0 INTERIM ACTION

The purpose of an interim action at the CSM Site is to remove contaminated soil from the known source area to reduce the potential for transport of contamination off Site. The interim action will be implemented as early as is practical in the Site RI/FS and cleanup process, after site-specific cleanup criteria are established. The interim action will achieve an immediate reduction in source material volume and will lower, if not eliminate, the potential environmental threats posed by leaving the source material in place. The interim action would also be completed prior to redevelopment of the Site because delaying such action will result in substantially greater cost. Removal of soil meets the criteria of an interim action as defined by WAC 173-340-430(1)(b); if removal of the soil is not conducted prior to or during construction activities associated with the Site redevelopment, the cost of removing this soil will substantially increase due to restraints posed by new buildings and structures.

As described in Section 2.2, the source of the petroleum seeping into the marine waters in the early 1980's was determined to be leaking USTs and supply lines that serviced the fuel float (Figure 2). Although the leaky USTs were replaced and the supply lines repaired, contaminated soil surrounding the USTs is still present. The interim action will be conducted to remove the contaminated soil. The extent of soil to be removed will be identified based on the sample results for the previous investigations and the soil investigation described in Section 3.3. Soil sample results from these investigations will be compared to the preliminary cleanup levels described in Section 3.1. Soil located within the vicinity of the former USTs that contains concentrations of constituents exceeding the preliminary cleanup levels will be removed during the interim action, to the extent practicable. Although it is the intent of the Port to have the interim action be as complete as possible, the interim action may not constitute the cleanup action for the site; therefore, the proposed interim action will be implemented in a manner that does not foreclose reasonable alternatives for a future site cleanup action, if necessary.

Soil removal during the interim action is expected to include proper decommissioning of the existing USTs and service lines and be coordinated with habitat restoration opportunities, where appropriate. In all of the remedial actions under this Order, the Port will integrate cleanup options and habitat restoration objectives as determined appropriate by Ecology. Excavated soil will be disposed offsite at a disposal facility determined appropriate based on soil analytical results collected during the RI soil investigation and previous soil investigations. If the extent of contaminated soil extends below the groundwater table, temporary dewatering may be required to depress the water table to below the base of the excavation. The type of excavation dewatering used will be a function of the excavation method used and the preferences of the contractor. Wastewater generated during dewatering will be contained and disposed of appropriately.

Because the interim action will involve removal, handling, and disposal of known contaminated materials, MTCA compliance monitoring requirements specified in WAC 173-340-410 will be considered appropriate for this interim action.

MTCA compliance monitoring activities will include the following:

- Protection monitoring to confirm that human health and the environment are adequately protected during implementation of the interim action, as described in a health and safety plan

- Performance monitoring to confirm that the interim action has attained the cleanup standards established for the interim action and other performance standards (such as construction quality control monitoring necessary to demonstrate compliance with project permits)

- Performance monitoring to assess the effectiveness of the interim action subsequent to the completion of the interim action but prior to selection of the final remedy for the Site.

A compliance monitoring program for the interim action will be submitted for approval to Ecology and documented in an addendum to this work plan prior to conducting the interim action. However, in general, compliance monitoring will consist of monitoring the health and safety of workers during implementation of the interim action and collecting soil confirmation samples at the base and sidewalls of the excavation to determine that the preliminary soil cleanup levels have been achieved.

In accordance with MTCA, all cleanup actions conducted under MTCA will comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as ARARs. A brief overview of potential ARARs for the interim action is provided in the bullets below; however, the primary ARAR is the MTCA cleanup regulation (Chapter 173-340 WAC), especially with respect to the development of cleanup levels and procedures for development and implementation of a cleanup under MTCA. The ARARs that may be applicable to the interim action include the following:

- Washington Water Pollution Control Act and the following implementing regulation: Water Quality Standards for Surface Waters (Chapter 173-201A WAC). These regulations establish water quality standards for surface waters of the State of Washington consistent with public health and the propagation and protection of fish, shellfish, and wildlife. These standards will be used to develop groundwater cleanup levels for the Site, as discussed in Section 3.1.

- Washington Hazardous Waste Management Act (Chapter 70.105 RCW) and the following implementing regulation: Dangerous Waste Regulations (Chapter 173-303 WAC). These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of dangerous waste. The regulation designates those solid wastes that are dangerous or extremely hazardous to the public health and environment. The management of excavated contaminated soil from the Site will be conducted in accordance with these regulations to the extent that any dangerous wastes are discovered or generated during the cleanup action.

- Washington Solid Waste Management Act (Chapter 70.95 RCW) and the following implementing regulations: Solid Waste Handling Standards (Chapter 173-350 WAC) and Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC). These regulations establish a comprehensive statewide program for solid waste management, including proper handling and disposal. The management of excavated contaminated soil from the Site will be conducted in accordance with these regulations to the extent that the soil can be managed as inert or solid waste instead of dangerous waste.

- Shoreline Management Act (SMA; Chapter 90.58 RCW). The SMA establishes permitting and other requirements for substantial development occurring within waters of the U.S. or within 200 ft of a shoreline, and requires that the activities in coastal zones be consistent with local regulations. MTCA exempts cleanup projects being conducted under an enforceable order or consent decree from the requirement of obtaining the shoreline permit; however, the cleanup must be conducted in accordance with the substantive requirements of the regulation.

- Hazardous Waste Operations (Chapter 296-843 WAC). This establishes safety requirements for workers providing investigation and cleanup operations at sites containing hazardous materials. These requirements would be applicable to onsite cleanup activities and would be addressed in a site health and safety plan prepared specifically for these activities.

- Washington Clean Air Act (WCAA, Chapter 70.94 RCW). The WCAA establishes permitting and other requirements for air emission controls.

- State Water Pollution Control Act (Chapter 90.48 RCW). This Act establishes permitting and other requirements for discharge to state surface waters. The procedural requirements of this chapter do not apply to any person conducting a remedial action at a facility pursuant to a consent decree, order, or agreed order issued pursuant to chapter 70.105D RCW. Ecology is required to ensure compliance with the substantive requirements of this chapter through the consent decree, order, or agreed order issued pursuant to chapter 70.105D RCW.

- Occupational Safety and Health Act (OSHA), 29 CFR Subpart 1910.120. OSHA establishes worker health and safety requirements for hazardous waste operations and emergency response.

- Washington State Industrial Safety and Health Act (WISHA). WISHA establishes standards governing workplace safety and health conditions in the State of Washington.

- National Toxics Rule (40 CFR Subpart 131.36). This Rule establishes federal water quality standards

- Clean Water Act (CWA, 33 U.S.C 1251 et seq). The CWA establishes wastewater standards for industry and water quality standards for contaminants in surface waters.

- City of Anacortes Engineering Standards. This establishes grading, filling, and other construction requirements.

- State Environmental Policy Act (SEPA). This policy requires consideration of likely environmental consequences of a proposed construction project.

- Sediment Management Standards (SMS, Chapter 173-204 WAC). The SMS establishes standards for the quality of surface sediments.

Prior to implementation of the interim action, an addendum to this work plan describing the specifics of the interim action will be prepared for Ecology review and approval. This addendum will identify the sustentative requirements of federal, state or local requirements as provided in RCW 70.105D.090. The addendum will also delineate the anticipated area and depth of the excavation based on data obtained during the RI and previous investigations, excavation methods, methods of disposal for the contaminated soil and other wastes generated during the interim action, and a compliance monitoring program.

5.0 FEASIBILITY STUDY

The RI/FS will develop cleanup levels for the Site and evaluate hazardous substances in soil and groundwater by comparing soil and groundwater data to these cleanup levels. If the RI data do not exceed cleanup levels, then an FS (other than establishment of cleanup levels and points of compliance) will not be necessary and will not be performed. If the RI data does exceed cleanup levels, then the FS will develop and evaluate cleanup action alternatives for contaminated media so that cleanup actions may be selected. The FS will:

- Develop cleanup levels and points of compliance and, as necessary, establish remediation levels.
- Delineate affected media where evaluation of remedial action is appropriate.
- Develop remedial action objectives.
- Screen and evaluate specific cleanup alternatives and recommend a preferred alternative.
- Identify opportunities for shoreline restoration.
- Be presented in a written report along with the results of the RI (the RI/FS report).

The following sections provide the details of the FS process that will be completed, if necessary, for the Site.

5.1 ESTABLISHMENT OF CLEANUP LEVELS, POINTS OF COMPLIANCE, AND REMEDIATION LEVELS

Cleanup standards, including cleanup levels and points of compliance, will be developed for soil and groundwater in accordance with MTCA requirements. Exposure pathways and receptors will be identified as part of cleanup level development. As needed, remediation levels may also be established for specific cleanup alternatives.

Cleanup levels for soil will be protective of human health, terrestrial ecological receptors, groundwater, and sediment based on current and likely future uses of the property. The point of compliance for soil will also be established.

Cleanup levels for groundwater will be based on protection of marine surface water and sediment. Groundwater at or potentially affected by the property is not a current or reasonable future source of drinking water. It is expected that information developed during the RI will be used to demonstrate that groundwater at the property meets the requirements of WAC 173-340-720 for non-potable groundwater.

A groundwater point of compliance will be developed. The point of compliance is likely to be conditional, located at or near the groundwater/surface water interface.

5.2 DELINEATION OF MEDIA REQUIRING REMEDIAL ACTION

The RI process will determine if soil and groundwater sample results exceed cleanup levels and, if so, identify the locations of the exceedances. Based on any exceedances and the established points of compliance, the FS will identify the extent or volume of soil or groundwater that requires remedial action.

5.3 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) that define the goals of the cleanup that must be achieved to adequately protect human health and the environment will be developed for each medium and area identified as requiring remedial action. These RAOs will be action-specific and/or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on developed cleanup levels. The RAOs will specify the COPCs, the potential exposure pathways and receptors, and acceptable contaminant levels or range of levels for each exposure pathway, as appropriate.

5.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In accordance with MTCA, all cleanup actions must comply with applicable state and federal laws (WAC 173-340-710(1)). MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as applicable or relevant and appropriate requirements (ARARs). The primary ARARs will likely be the MTCA cleanup levels and regulations that address implementation of a cleanup under MTCA. Other potential ARARs may include the following:

- Washington Pollution Control Act and the implementing regulations: Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC)
- Washington Hazardous Waste Management Act and the implementing regulations: Dangerous Waste Regulations (Chapter 173-303 WAC), to the extent that any dangerous wastes are discovered or generated during the cleanup action
- The federal Clean Water Act and the surface water quality criteria promulgated thereunder
- Washington's Shoreline Management Act with respect to construction activities conducted near the shoreline during the cleanup action.

The FS will identify ARARs for the Site cleanup.

5.5 SCREENING OF CLEANUP ALTERNATIVES

Cleanup alternatives will be developed for each medium of concern. Initially, general remediation technologies will be identified for the purpose of meeting RAOs for each medium. General remediation technologies consist of specific remedial action technologies and process options. General remediation technologies will be considered and evaluated based on the media type and the properties of any contaminant(s) and may include institutional controls, containment or other engineering controls, removal, *in situ* treatment, and natural attenuation.

Specific remedial action technologies are the engineering components of a general remediation technology. Examples include horizontal barriers, groundwater extraction, groundwater treatment, *in situ* oxidation, *in situ* bioremediation, and capping. Process options are those specific processes within each specific technology. For example, groundwater treatment technology could include process options such as air stripping, activated carbon, and UV/chemical oxidation. Several specific technologies may be identified for each general remediation technology and multiple process options may exist within each specific technology.

Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for the particular medium and COPCs. Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology expectations identified in WAC 173-340-370 using best professional judgment and guidance documents as appropriate [e.g., *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988)].

During the development of cleanup alternatives, both the current and planned future land use will be considered. For example, where property is already developed, containment alternatives may be given preferential consideration over soil cleanup alternatives that would be more disruptive to Site use.

If the RI identifies localized hot spots of contaminants in soil, active cleanup alternatives such as excavation or *in situ* treatment alternatives may be appropriate for those limited areas. If there are portions of the property with large volumes of materials with relatively low concentrations of hazardous substances, cleanup alternatives including engineering controls or natural attenuation will be developed. Current and planned future property uses will be considered during development of cleanup alternatives.

5.6 EVALUATION OF CLEANUP ALTERNATIVES

MTCA requires that cleanup alternatives be compared to a number of criteria as set forth in WAC 173-340-360 to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as

a basis for comparing the relative merits of the developed cleanup alternatives. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with threshold requirements, permanence, and restoration timeframe, and the results of the evaluation will be documented in the RI/FS reports.

5.7 HABITAT RESTORATION

The Site is being overseen by Ecology and work is being done in an expedited manner under the Governor's Puget Sound Initiative. The initiative focuses on cleaning up contamination as well as restoring Puget Sound. Ecology recognizes that site cleanups can be designed and implemented in a manner that improves habitat values and provides for shoreline restoration in conjunction with remedial actions. While planning the cleanup, and making cleanup decisions, Ecology and the Port of Anacortes will evaluate opportunities to perform remedial actions in a fashion that coincidentally enhances habitat. Elements of the remedial action will be evaluated for restoration opportunities in consultation with Ecology as plans for cleanup are developed.

6.0 PUBLIC PARTICIPATION

Under the terms of the Agreed Order, a Public Participation Plan (PPP; presented in Appendix H) was prepared for the project that summarizes the RI/FS activities and potential Interim Action to be conducted at the CSM Site and will be provided to the public to present the opportunity for the public to learn about and provide input on the potential Interim Action, remedial investigation, and remedial alternatives as required under MTCA (WAC) 173-340-600.

7.0 SCHEDULE AND REPORTING

The Agreed Order establishes the RI/FS schedule and reporting requirements, which are summarized in this section. In an effort to expedite the implementation of an interim action at the Site, the initial sediment and groundwater studies may be initiated prior to Ecology's approval of the work plan. Early implementation of these studies will allow adequate time for the development of site-specific TPH cleanup numbers and sufficient groundwater quality monitoring. Soil and additional groundwater investigation will be completed on approval of the Work Plan. Following completion of all field activities and receipt of the analytical data, a RI/FS report will be prepared and submitted to Ecology. All sampling data will be submitted to Ecology in both printed and electronic formats in accordance with Ecology's Toxics Cleanup Program Policy 840.

If an interim action is planned, a work plan for this action will be prepared in accordance with WAC 173-340-430(7) and submitted to Ecology for approval. Following completion of the interim action, a report will be prepared in accordance with WAC 173-340-515(4).

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This document has been prepared under the supervision and direction of the following key staff:

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