SEPA Environmental Checklist

A. Background

1. Name of proposed project, if applicable:

Former Occidental Chemical Corporation (OCC) Port of Tacoma Facility Remediation.

Current operator of the Site: Glenn Springs Holdings (GSH).

2. Name of applicant:

GSH

3. Address and phone number of applicant and contact person:

Glenn Springs Holdings, Inc.
7601 Old Channel Trail
Montague, MI 49437
Contact Person: Clint Babcock
972-687-7506
Clint_Babcock@oxy.com

4. Date checklist prepared:

November 24, 2023

5. Agency requesting checklist:

Washington State Department of Ecology (Ecology)

6. Proposed timing or schedule (including phasing, if applicable):

May 2024 to December 2028, subject to change based on timing of AO, permits and EDR submittals.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

GSH/OCC has no plans to add to, expand, or to conduct further activity on the upland, shoreline, or in-water portion at the Site.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

GSH/OCC is working with Ecology and USEPA to address environmental issues at the former OCC Site. This on-going remediation work is being performed under an Agreed Order DE 16943 (AO) (December 31, 2019) between Ecology and OCC. Ecology's oversight role is recognized under Washington State's cleanup law, the Model Toxics Control Act, Chapter 70.105D RCW (MTCA). The proposed work is compiled in a draft Cleanup Action Plan (dCAP) developed by Ecology.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

GSH will be submitting a JARPA application for the Section 404/Section 401 Clean Water Act and Section 10 Rivers and Harbors Act approvals. No other applications of other proposals directly affecting the property are currently pending governmental approval.

10. List any government approvals or permits that will be needed for your proposal, if known.

List provided below is from the draft Cleanup Action Plan and includes government approvals and permits that may be needed

Table 3.1 Potential Applicable State and Federal Laws and Relevant and Appropriate Requirements

Topic	Standard or Requirement	Regulatory Citation		Project-Specific Comments
		Federal	State	
Hazardous Substance Cleanup	Washington State Cleanup Standards; Cleanup Screening Levels (CSL)		Model Toxics Control Act (MTCA) (RCW 70A.305; WAC 173-340), especially WAC 173-340-710 through 173-340-760	Applicable to determining cleanup of hazardous waste sites to protect human health and the environment.
Surface Water Quality	Surface water quality standards. National Recommended Water Quality Criteria (WQC); National Toxics Rule (NTR); State Water Quality Standards (WQS); Clean Water Act and NPDES Requirements Model Toxics Control Act (MTCA)	WQC per Clean Water Act Section 304(a) (33 USC § 1314) NTR at 40 CFR 131.36(b)(1) as applied to Washington. 40 CFR 131.36(d)(14) 40 CFR 122-125	Water Pollution Control Act (RCW 90.46); WQS (WAC 173-201A); Aquatic Life Criteria (ALC) numerical criteria (WAC 173-201A-240)	Relevant to remedial actions impacting contaminant migration to surface water and groundwater. Applicable to remedial actions involving discharge to a Port of Tacoma. Substantive requirements will be applicable to any alternative that discharges effluent to surface water.
	State Waste Discharge Program; Clean Water Act Pretreatment Requirements	40 CFR Part 403 and 405-471	WAC-173-216	Applicable if the option of discharge to the sanitary sewer (Port of Tacoma) is part of a remedy. Substantive requirements must be met.
Solid Waste Disposal	Requirements for solid waste handling management and disposal	Solid Waste Disposal Act (42 U.S.C 6901-6992K; 40 CFR 257-258)	Solid Waste Management (RCW 70.95; WAC 173-350)	Substantive requirements for non-dangerous or non-hazardous waste generated during remedial activities unless wastes meet recycling or other exemptions will be complied with.
Waste Treatment, Storage, and Disposal	Dangerous or Hazardous Waste Management Ecology Dangerous Waste Regulations	Resource Conservation and Recovery Act, Hazardous Waste (42 U.S.C §§ 6901-6992K, 40 CFR 260-279)	Dangerous Waste Management (RCW 70A.300; WAC 173-303)	Applicable if remedial activities include land disposal of RCRA hazardous waste, such as that generated from excavation of waste that is characterized as hazardous
	Transportation of Hazardous Waste	49 CFR 170-189		Applicable to remedial activities that involve the off-Site transportation of hazardous waste
Land Disposal of Waste	Management and disposal of materials containing polychlorinated biphenyls (PCBs)	Toxic Substances Control Act (15 U S C § 2605; 40 CFR 761.61(c))	Dangerous Waste Management (RCW 70A.300; WAC 173-303-140, 141)	Any dangerous or hazardous waste land disposal shall meet substantive land disposal requirements.
	Hazardous Waste Land Disposal Restrictions	Resource Conservation and Recovery Act Land Disposal Restrictions (42 U.S.C §§ 6901-6992K; 40 CFR 268)		

Topic	Standard or Requirement	Regulatory Citation		Project-Specific Comments
		Federal	State	
Dredge/Fill and Other In-Water Construction Work	Discharge of dredged/fill material into navigable waters or wetlands	Clean Water Act Sections 401, 404 (33 U.S.C. §§ 1341, 1344, 40 CFR 121.2 (content of 401 certifications), 230 (disposal sites/mitigation), 232 (definitions/exemptions); 33 CFR 320, 322-3, 328-30 (Army Corps of Engineers 404 Permitting))	Hydraulic Code Rules (RCW 77.65; WAC 220-110) Dredged Materials Management Program (DMMP) (RCW 79.105.500; WAC 332-30-166 (3))	Applicable to construction of barrier wall east.
	Navigation and Commerce	Rivers and Harbor Act Section 10 (33 U.S.C. § 403)		Unauthorized obstruction or alteration of navigable waterways is prohibited. In-water dredging and disposal are not anticipated.
Endangered Species and Critical Habitat	Taking or jeopardy to endangered or threatened species; adverse modification of critical habitat	Endangered Species Act (16 U.S.C §§ 1531-1544; 50 CFR 17 (listings, prohibitions), 402 (interagency consultations), 222-224 (endangered and threatened marine species), 226.212 (critical habitat for Northwest salmon and steelhead))		It is unlawful to take (or possess, deliver, carry, transport or ship) any endangered species, or violate any regulation re-endangered or threatened species. EPA in consultation with the Services shall insure any authorized action is not likely to jeopardize endangered or threatened species or adversely modify critical habitat, absent an exemption.
Migratory Birds	Taking or adversely affecting migratory birds	Migratory Bird Treaty Act, (16 U.S.C §§ 703-712; 50 CFR 10 and 21)		Applicable to avoid adversely affecting migratory bird species as defined in federal regulations, including individual birds and their nests.
Eagles	Taking or harming eagles	Bald and Golden Eagle Protection Act (16 U.S.C. § 668, 50 CFR 22)	Bald Eagle Protection Rules (RCW 77.12.655; WAC 232-12-292)	Taking or harming of eagles, their eggs, nests or young is prohibited; substantive requirements for the protection of bald eagle habitat including nesting, perching and roosting at the site will be met.
Floodplain Protection	Adverse impacts, potential harm	Floodplain Management Procedures (40 CFR 6, Appendix A, Section 6, see also Executive Order 11988)		Applicable to avoid potential adverse impacts and to minimize impacts for which no practical alternative exists.
Shoreline Management	Construction and development		Shoreline Management Act RCW 90.58; WAC 173-26, City of Tacoma Shoreline Master Program, Pierce County Shoreline Master Program (18S.10.010 Title 21)	Master plans within their jurisdiction apply within 200 feet of the shoreline to the extent they impose or establish more stringent requirements.
Air Emissions	Ambient air quality standards; fugitive emission/fugitive dust	Clean Air Act (42 U.S.C. §§ 7401-7671q; 40 CFR 50)	Washington Clean Air Act (RCW 70.94, WAC 173-400)	Some treatment alternatives may impact ambient air quality. Substantive requirements will be applicable if alternative results in emission from treatment processes.
	National Ambient Air Quality Standards (NAAQS)	40 CFR Part 50		Applicable to treatment alternatives that may emit pollutants to the air, establishes standards to protect health and welfare.
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR Part 261		Applicable to treatment alternatives that may emit toxic pollutants to the air.
	State Environmental Policy Act (SEPA)		WAC 197-11	SEPA checklist may be required prior to construction of the remediation system.
Native American Graves and Sacred Sites	Protections	Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001 et seq.); American Indian Religious Freedom Act (42 U.S.C. §§ 1196 et seq.)		Requirements for the protection of Native American remains, funerary objects and associated cultural artifacts when burial sites are encountered; and protection of tribal exercise of traditional tribal religions, including traditional cultural properties, sites and archeological resources. See also Executive Order 13007 which requires federal agencies to avoid

Topic	Standard or Requirement	Regulatory Citation		Project-Specific Comments
		Federal	State	
				physical damage to tribal sacred sites, and interfering with access of tribes thereto.

Noise	Permissible noise levels		Noise Control Act (RCW 70.107, WAC 173-60-040-050)	Maximum levels at specified times for specified durations are WAC 173-60-040, subject to exemptions in WAC 173-60-050, including 050(3)(a) (sounds originating from temporary construction sites as a result of construction activity) and (3)(f) (sounds created by emergency equipment and work necessary in the interests of law enforcement or for health, safety or welfare of the community).
Historic Preservation		National Historic Preservation Act Section 106 (16 U.S.C. § 470; 36 CFR 800)		Potentially applicable if potential remedial activity on the site, building, structure, or object included or eligible for inclusion in the National Register of Historic Places.
Groundwater Quality	EPA Underground Injection Control (UIC) Program Regulations	40 CFR 144 and 146		To be considered for any in situ remediation technologies that involve injection into an aquifer.

Construction	City of Tacoma requirements			Establishes criteria for review and analysis of all development, including grading, erosion control, and property development. Requires permits for excavation of soil in excess of 50 cubic yards and construction and demolition activities. SEPA checklist required if soil excavation is greater than 500 cubic yards. Permit required for connection of effluent water from the treatment system to the storm drain system. Even though it is necessary to meet the substantive provisions of these permits, appropriate permits should be obtained from the City for future site work in the spirit of cooperation.
	Tacoma Power			Permits required for power connections and wiring for remediation systems.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

GSH/OCC proposes the following four elements used in combination for containing and treating contaminants of concern:

- A cover over the Site;
- A sheet pile vertical barrier wall adjacent to the Hylebos Waterway; and
- Groundwater extraction and treatment
- Soil vapor extraction and treatment

The proposed work will also include institutional controls, groundwater use restrictions, and groundwater and soil vapor monitoring.

The cover over the Site will be on an area of approximately 40 acres.

The sheet pile vertical barrier wall will be approximately 2,200 feet long and 75-feet deep in the intertidal area of the Hylebos Waterway. This work will include filling the approximately 1.6-

acre embankment behind the wall.

Volatile organic compounds mass removal and reduction elements include
- Extracting and treating groundwater; and
- Extracting and treating soil vapor

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The Site is located at 605 and 709 E Alexander Ave, Tacoma, Washington, 98421. The project area is on the eastern-most peninsula of the area of ownership and operations of the Port of Tacoma (POT) that extends into Commencement Bay at the mouth of the Puyallup River Valley. Portions of USEPA-designated Segment 5 of the Hylebos Waterway Cleanup Project are contained within the Site. The City of Tacoma conducts land use planning under the Growth Management Act. The City of Tacoma has zoned the Site as industrial under the zoning designations of Port Maritime & Industrial District (PMI District) and Port Industrial Area-High Intensity (S 10). The S 10 zoning designation applies to the shoreline areas of the Site and the PMI zoning designation applies to the uplands of the peninsula.

The properties formerly owned and/or operated on by OCC or its predecessors include:
- 605 E Alexander Avenue property (former OCC Facility currently owned by Mariana Properties, Inc. [Mariana])
- 709 E Alexander Avenue property (currently owned by Mariana)

The properties are bounded on the west, north, and south by former Todd Shipyards and/or United States Navy (US Navy) properties (now owned by the POT), and on the east by the Hylebos Waterway. The Site is within the roughly 12-square-mile area Commencement Bay Nearshore/Tideflats Superfund site (CB/NT site).

B. Environmental Elements

1. *Earth*

a. General description of the site:

(circle one): **Flat,** rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)?

The steepest slope on the Site is on the eastern portion of the property where the shoreline begins. The slope from the top of the shoreline to the Hylebos Waterway varies across the property running north to south. The top of the shoreline elevation is approximately 14 to 15 ft (NAVD 88). The percent slope along the shoreline ranges from 35 percent to 50 percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

From ground surface,

- Fill: 10-15 feet, mixture of sand, silt, and gravel material placed through dredging of the Hylebos and Blair Waterways to develop the peninsula
- Deltaic deposits: 30-200 feet (eastern and northeastern portion of Site) and 300 feet (southwestern portion of Site), heterogeneous mixture of interbedded sands, silts, and clays
- Glacial deposits: estimated to more than 1,000 feet, heterogeneous mixture of interbedded gravel, sands, silts, and clays

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

The DNR ShoreZone Inventory identifies the Site shoreline as 100 percent modified/man-made. The shoreline in the project area and the surrounding area is developed with industrial land use facilities. Riparian habitat is also severely limited throughout the Site. The artificial shoreline is armored with cobble behind wooden retention walls, crushed concrete and rock riprap, angular rock, and wooden docks. The Site's shoreline has generally steep slopes with minimal horizontal intertidal gravel-cobble surface area.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

An area of approximately 1.6 acres on the embankment will be backfilled behind the barrier wall. The source of the fill material will be from on-Site grading material. If materials sourced from the Site are not sufficient to complete the backfilling activities, additional materials will be imported from a local clean borrow source.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

The construction of the vertical barrier wall is intended to eliminate erosion at the Site. The selected contractor will install booms around the in-water work area to contain any soil that erodes during construction activities. The area behind the new wall construction will be backfilled and covered.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

100 percent. The open surface area between the existing shoreline and the new vertical barrier wall associated with 605 and 709 E Alexander Avenue properties will be backfilled and topped with an asphalt or concrete pavement apron to provide approximately 1.6 acres of new upland at

the Site. The upland portion of the Site will be covered with an asphalt cover and a new treatment building and associated equipment will be constructed.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

The construction of the vertical barrier wall will reduce erosion at the Site. The area behind the new wall construction will be backfilled and covered. The wall along the Site includes a steel "combination wall" system that will consist of sheet piles between large wide-flange piles (king piles). The sheet and king-piling of the wall system will provide resistance to the applied earth loading through flexural resistance.

During construction of the king pile bulkhead wall approximately 30,150 square feet of existing timber pier structures are to be removed. The existing supporting timber piles inboard of the new wall will remain. The existing supporting timber piles outboard of the new wall are to be cutoff approximately 2 feet below the existing mudline.

The selected contractor will install booms around the in-water work area to contain any soil that erodes during construction activities.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

During construction, measures will be put in place to minimize potential air emissions from grading and filling operations.

One of the goals of this work is to remove or reduce volatile organic compounds in soils and groundwater at the Site. This work will reduce air emission and vapor intrusion of hazardous vapor and particulates.

The new treatment plant will be operated under a new PSCAA air permit that will prescribe the quantity of allowable emissions.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No off-Site sources of emissions or odor have been identified.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Best management practices (e.g., wetting) will be used to minimize potential air emissions from grading and filling operations.

Proposed methods to reduce and control emissions and vapor intrusions include

- A cover over the Site;

- A sheet pile vertical barrier wall adjacent to the Hylebos Waterway; and
- Variable amounts of groundwater extraction and treatment

The new treatment plant will include equipment to treat/destroy contaminants and to control emissions under a new air permit.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The Site is on the peninsula between Hylebos and Blair Waterways in Commencement Bay and includes the shoreline of Segment 5 of the Hylebos Waterway.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Work on the Hylebos Waterway shoreline will include removal of existing timber pier structures, driving sheet pile and king pile wall sections using an impact or vibratory hammer, installing bulkhead using a floating marine-based construction barge, and backfilling behind wall.

A cover will be placed over the Site, including within 200 feet of the Hylebos Waterway.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No dredging is proposed as part of the project. During construction of the vertical barrier wall approximately 30,150 square feet of existing timber pier structures are to be removed above the surface water. The existing supporting timber piles inboard of the new wall will remain in the area to be backfilled. The existing supporting timber piles outboard of the new wall are to be cutoff approximately 2 feet below the mudline.

Localized resuspension of sediment will occur during vibratory hammering and piling cutting. Washington Administrative Code 173-201A-210 provides guidance for a temporary zone of mixing during and immediately after necessary in-water construction activities that result in disturbance of in place sediments. For marine waters, the point of compliance for this temporary mixing zone is 150 feet from the activity. Based on this point of compliance, a conservative project footprint can be based on a potential worst-case dispersion of turbidity during limited in-water work and during tidal cycles when disturbed soils in work areas below MHHW are inundated, although it is expected that turbidity increases would rapidly dissipate. Thus, a conservative boundary of potential turbidity effect will be defined as twice the mixing zone, at 300 feet. The project footprint will therefore include the 300-foot radius around the location of work below MHHW as well as the footprint of other upland Site development work. The marine contractor will install oil booms and silt curtains as a best management practice to reduce turbidity or in the event of a spill.

Approximately 1.6 acres of fill material will be backfilled behind the barrier wall. The source of the fill material will be from on-Site grading material. If materials sourced from the Site are not sufficient to complete the backfilling activities, additional materials will be imported from a local clean borrow source.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No surface water withdraws or diversions are proposed.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

The Hylebos Waterway shoreline is within a 100-year floodplain—see attached Figure 1.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No discharge of waste materials is anticipated during the construction project.

b. Ground:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Groundwater will be extracted from remedial extraction wells, treated on Site, and discharged to the Hylebos Waterway under an NPDES permit. Based on Ecology's Washington State Well Report database, no drinking water wells occur near the Site, and the municipal water source is not impacted by the Site. Ecology's letter dated March 30, 2015, determined that the peninsula groundwater meets the MTCA Section 720 non-potable classification. The underlying and surrounding groundwater has salinity levels that exceed USEPA drinking water standards (e.g., total dissolved solids [TDS] >500 milligrams per liter [mg/L], secondary maximum contaminant level [SMCL]).

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

No waste material will be discharged into the ground from septic tanks or other sources as part of this construction project. Treated effluent from the on-Site treatment system is discharged through a single outfall along the shoreline under a NPDES permit.

c. Water Runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Runoff includes stormwater during heavy rain events. Currently, the Site is flat and predominantly unpaved; therefore, stormwater infiltrates into the ground. The portion of the Site that is paved contains catch basins where stormwater is routed. The catch basins contain filters where solids are removed. Treated effluent from the on-Site treatment system is discharged through a single outfall along the shoreline. A combination of stormwater and treated effluent is discharged to the Hylebos Waterway from a single outfall. The site will be covered as part of the proposed work and stormwater will be directed to the Hylebos Waterway via designed swales.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Hazardous substances are currently in the groundwater, soil, and sediment throughout the Site. There is an on-Site treatment system that removes hazardous substances from the groundwater. The proposed work is intended to contain and remove these substances.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Currently, the Site is flat and predominantly unpaved. Stormwater infiltrates into the ground or is routed into catch basins and is discharged to the Hylebos Waterway. The site will be covered as part of the proposed work and stormwater will be directed to the Hylebos Waterway via designed swales and a single outfall.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

The proposed cover will include swales to control surface water and direct it the Hylebos Waterway. The proposed vertical barrier wall will reduce groundwater flow into Hylebos Waterway. Groundwater will continue to be extracted and treated by the on-Site treatment system.

4. Plants

a. Check the types of vegetation found on the site:

_X__deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
_X__shrubs
_X__grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.

_X__ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Disturbances during construction of the vertical barrier wall will be within the Hylebos Waterway where no aquatic vegetation was identified during the 22 September 2020 Site visit. Construction of the cover will include removal of the vegetation on the Site. Terrestrial vegetation at the Site is consistent with early succession, pioneer species that include both native and non-native species typically found in formerly developed/disturbed areas. Only vegetation located within the construction footprint will be affected by this project. A Biological Resource Report (BRR) has been developed and provides additional details and photographs from the Site visit. The BRR is provided as Appendix A to the JARPA.

c. List threatened and endangered species known to be on or near the site.

No federally-listed species are known to occur within or near the Site. The bull trout (*Salvelinus confluentus*) has critical habitat that overlaps with the Site; however, preferred habitat requirements for bull trout do not exist at the Site. A BRR has been developed and provides additional details. The BRR is provided as Appendix A to the JARPA.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

The Site meets the definition of an industrial property under WAC 173-340-200. There are no residential properties currently existing or planned to be located on or near the Site, and access control fencing ensures access to the property is limited. Since the Site was formerly in industrial use and the surrounding facilities are industrial, it is anticipated the land will return to light industrial use following construction. A BRR has been developed and provides additional details. The BRR is provided as Appendix A to the JARPA.

e. List all noxious weeds and invasive species known to be on or near the site.

The following plant species were observed at the Site during the 22 September 2020 Site visit and listed on the Washington State Noxious Weed List: Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*), Scotch Broom (*Cytisus scoparius*), Broadleaved Pepperweed (*Lepidium latifolium*), Japanese Knotweed (*Polygonum cuspidatum*), Stinking Willie (*Senecio jacobaea*), English Ivy (*Hedera helix*), Himalayan Blackberry (*Rubus bifrons*), and Orange Eye Butterflybush (*Buddleja davidii*). A BRR has been developed and provides additional details. The BRR is provided as Appendix A to the JARPA.

5. Animals

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

- Birds: hawk, heron, eagle, songbirds, other:
- Mammals: deer, bear, elk, beaver, other:
- Fish: bass, salmon, trout, herring, shellfish, other:

birds: Double-crested Cormorant (*Phalacrocorax auritus*), Herring Gull (*Larus argentatus*), Common Tern (*Sterna hirundo*), Western Gull (*Larus occidentalis*), Rock Pigeon (*Columbalivia*)

mammals: N/A

fish: The project area is outside WDFW designated Priority Habitats and USFWS designated Critical Habitat for the identified state and federally listed species, except where it overlaps bull trout critical habitat. Potential critical habitats in the project areas were not identified during the field visit conducted on 22 September 2020. Marine mammals have historically utilized the waters in or near Commencement Bay include Gray and Minke whales, Orcas, False killer whales, California sea lions, and Harbor porpoises. The potential impacts to marine mammals will be evaluated with NOAA. A Marine Mammal Incidental Harassment Authorization (IHA) and Marine Mammal Mitigation and Monitoring Plan (4MP) will be developed prior to construction.

b. List any threatened and endangered species known to be on or near the site.

The bull trout has critical habitat that overlaps with the Site. However, bull trout prefer clean gravel for spawning and rearing, unblocked migratory corridors, and complex and diverse cover. The habitat located along the bank consists of broken pieces of concrete and asphalt with little to no vegetative cover. No aquatic vegetation was observed. It is highly unlikely that bull trout would find this area to be suitable habitat; therefore, it is unlikely bull trout will be impacted.

c. Is the site part of a migration route? If so, explain.

Hylebos Waterway is critical habitat for the bull trout which overlaps the proposed project area and this waterbody may serve as a migratory corridor for numerous transient migratory fish and bird species. Impacts from this project to this waterbody will be minimum and temporary and not anticipated to reduce its ability to serve as a migratory route.

d. Proposed measures to preserve or enhance wildlife, if any:

The vertical barrier wall construction project will enhance wildlife usage by reducing exposure to contaminated surface water.

e. List any invasive animal species known to be on or near the site.

No invasive animal species were observed at the Site during the 22 September 2020 Site visit.

6. *Energy and Natural Resources*

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

A combination of electric, natural gas, and motor oils will be used to perform the construction project. Various pieces of equipment require these fuels to operate.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No impacts to potential use of solar energy by adjacent properties are anticipated.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

No energy impacts are anticipated.

7. *Environmental Health*

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Hazardous substances are currently in the groundwater and soil throughout the Site. The proposed work is intended to contain these substances from reaching the Hylebos Waterway and will enhance removal of these substances from soil and groundwater by extraction and treatment by an on-Site treatment system.

1) Describe any known or possible contamination at the site from present or past uses.

Approximately 57 contaminants of concern (COC) are present on Site, including 21 VOCs, 21 SVOCs, 4 pesticides/PCBs, 11 metals, and high pH. Environmental investigations at the Site began in the 1980s and have shown that the following parameters are the principal COCs:

- Chlorinated volatile organic compounds (CVOC)
- Fuel-related volatile organic compounds (fuel-related VOC)
- Caustic (sodium hydroxide)
- Salt (sodium chloride or NaCl)
- Metals (arsenic, chromium, copper, lead, mercury, nickel, thallium, zinc)
- Semi-volatile organic compounds (SVOC) (hexachlorobenzene [HCB] and hexachlorobutadiene [HCBD], which are by-products of solvent production)
- polychlorinated biphenyls (PCBs)
- Dioxins/furans

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

There are hazardous substances in the groundwater and soil throughout the Site. Contamination is from historical operations and waste disposal practices. OCC no longer operates at the Site and is in the process of completing a long-term remediation action. The final remedy for the Site will include containment of impacted soil and groundwater comprising of several components as described above.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

No storage, use, or production of toxic or hazardous chemicals will occur during construction activities. Disposal of creosote treated timber from the existing docks and pilings will be taken off Site and disposed of at a regulated facility.

4) Describe special emergency services that might be required.

No special emergency services are proposed for this project. However, the marine contractor installing the vertical barrier wall and the contractors constructing the upland portion of the remedy will be prepared to call for spill response services in the event of an emergency. The contractors will be required to maintain health and safety plans and spill response plans on Site and provide training to their workers.

5) Proposed measures to reduce or control environmental health hazards, if any:

GSH/OCC, their environmental consultants, and subcontracted contractors will develop health and safety plans, spill response plans, and other plans associated with development of best management practices (BMPs) that will assist in reducing exposure to health hazards. Daily safety "tailgate" meetings will be performed throughout construction activities to reinforce Site health and safety hazards.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

The area in which the proposed construction project will occur is in a highly active industrial area of the Hylebos Waterway and Commencement Bay. As a result, noise disturbance is typical and expected, including elevated in-air and in-water noise from vessel, truck, and train traffic and other marine industrial activity.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Construction equipment will primarily be in operation during weekday daytime hours; however, work during nighttime hours or weekends may be required depending on schedule constraints. Construction equipment is not anticipated to be elevated above ambient noise levels from surrounding industrial activities. If work needs to occur outside normal weekday daytime hours, appropriate noise variance permits will be obtained prior to the work being conducted.

3) Proposed measures to reduce or control noise impacts, if any:

No measures are proposed to reduce or control noise impacts. Construction equipment is not anticipated to be elevated above ambient noise levels from surrounding industrial activities. If work needs to occur outside normal weekday daytime hours, appropriate noise variance permits will be obtained prior to the work being conducted.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

OCC no longer operates at the Site and is in the process of completing a long-term remediation action. The final remedy for the Site will include containment of impacted soil and groundwater comprising of several components as described above. No affects to the current and adjacent land use is anticipated due to the construction.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

The Site is within an area zoned for heavy industry and commercial purposes and has not been used as working farmlands or working forest lands.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

The Site meets the definition of an industrial property under WAC 173-340-200. The Site is within an area zoned for heavy industry and commercial purposes and will not affect or be affected by surrounding working farm or forest land normal business operations.

c. Describe any structures on the site.

Five buildings are located in the Site area. Only the buildings and structures related to the existing groundwater treatment system remain.

d. Will any structures be demolished? If so, what?

The existing treatment plant will be demolished after a new treatment plant is constructed and is operating. During construction of the bulkhead wall approximately 30,150 square feet of existing timber pier structures are to be removed above the surface water. The existing supporting timber piles inboard of the new wall will remain in the area to be backfilled. The existing supporting timber piles outboard of the new wall are to be cutoff approximately 2 feet below the mudline.

e. What is the current zoning classification of the site?

The Site is within an area zoned for heavy industry and commercial purposes.

f. What is the current comprehensive plan designation of the site?

Unknown.

g. If applicable, what is the current shoreline master program designation of the site?

S-10 (Port/Industrial Area) and S-13.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

No part of the Site has been classified as a critical area by the city or county.

i. Approximately how many people would reside or work in the completed project?

No people will reside in the completed project area. There is ongoing environmental work expected after the completed project which will require people to work in the area. The current workforce visiting the Site is <5 people per day.

j. Approximately how many people would the completed project displace?

Zero people would be displaced as part of the completed project.

k. Proposed measures to avoid or reduce displacement impacts, if any:

No measures required.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The City of Tacoma conducts land use planning under the Growth Management Act. The City of Tacoma has zoned the Site as industrial under the zoning designations of Port Maritime & Industrial District (PMI District) and Port Industrial Area-High Intensity (S-10). The S-10 zoning designation applies to the shoreline areas of the Site and the PMI zoning designation applies to the uplands of the peninsula. The Site is within the roughly 12-square-mile area Commencement Bay Nearshore/Tideflats Superfund site (CB/NT site), and the proposed measures align with this broader remediation effort.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

No impacts to agricultural or forest lands are anticipated from the proposed project.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No units will be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No units will be eliminated as Ecology did not find homes near the Site.

c. Proposed measures to reduce or control housing impacts, if any:

No housing impacts are anticipated.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

See design plans (Appendix B). Currently an expected tip elevation of the retaining sheets of approximately -68.5 ft (MLLW). The sheets will extend to approximately 20 ft (MLLW). The new treatment plant height is expected to be similar to the existing treatment plant height

b. What views in the immediate vicinity would be altered or obstructed?

No impacts are anticipated to views in the immediate vicinity.

b. Proposed measures to reduce or control aesthetic impacts, if any:

No impacts are anticipated to aesthetics.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

No impacts are anticipated to light or glare. Work is planned to occur during daylight hours.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No impacts are anticipated to light or glare.

c. What existing off-site sources of light or glare may affect your proposal?

No impacts are anticipated to light or glare.

d. Proposed measures to reduce or control light and glare impacts, if any:

No impacts are anticipated to light or glare.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Sports/recreational fishing occurs in Hylebos Waterway.

b. Would the proposed project displace any existing recreational uses? If so, describe.

The project improves recreational uses by reducing potential exposure to potentially contaminated sediment/surface water. Potential accumulation of hazardous substances in fish would be reduced.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Government catch limits on sports/recreational fishing may be imposed.

13. Historic and cultural preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

A Cultural Resource Report has been developed (Appendix C).

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

A Cultural Resource Report has been developed.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

A Cultural Resource Report has been developed.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

A Cultural Resource Report has been developed.

14. Transportation

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

See Figure 4.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

The Site is not currently served by public transit.

c. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

No improvements are required to existing roads, streets, pedestrian, bicycle or state transportation facilities.

d. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The project will occur adjacent to and within the Hylebos Waterway. No impacts are anticipated to water, rail, or air transportation.

e. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Vehicular traffic is planned to occur during business days during standard business hours. The proposed project area is within an industrial area where no residential traffic occurs. Traffic to and from the Site will vary depending on equipment and material deliver needs.

f. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No impacts are anticipated to the movement of agricultural and forest products on roads or streets in the area.

g. Proposed measures to reduce or control transportation impacts, if any:

Vehicular traffic is planned to occur during business days during standard business hours.

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

No increased need for public services is anticipated. The completed project replaces existing dock structures with a vertical barrier wall. New land, 1.6 acres, will be created behind the vertical barrier wall.

b. Proposed measures to reduce or control direct impacts on public services, if any.

No increased need for public services is anticipated. The completed project replaces existing dock structures with a vertical barrier wall. New land, 1.6 acres, will be created behind the barrier wall.

16. Utilities

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

No new utilities are proposed for the project. Construction activities will be powered by gas, diesel, and generators.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Clinton J Babcock

Name of signee CLINTON J. BABCOCK

Position and Agency/Organization DIRECTOR OPERATIONS / GLENN SPRINGS HOLDINGS (GSH)

Date Submitted: 12/12/2023

D. Supplemental sheet for nonproject actions

(IT IS NOT NECESSARY to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

   - Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

   - Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

   - Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

   - Proposed measures to protect such resources or to avoid or reduce impacts are:

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

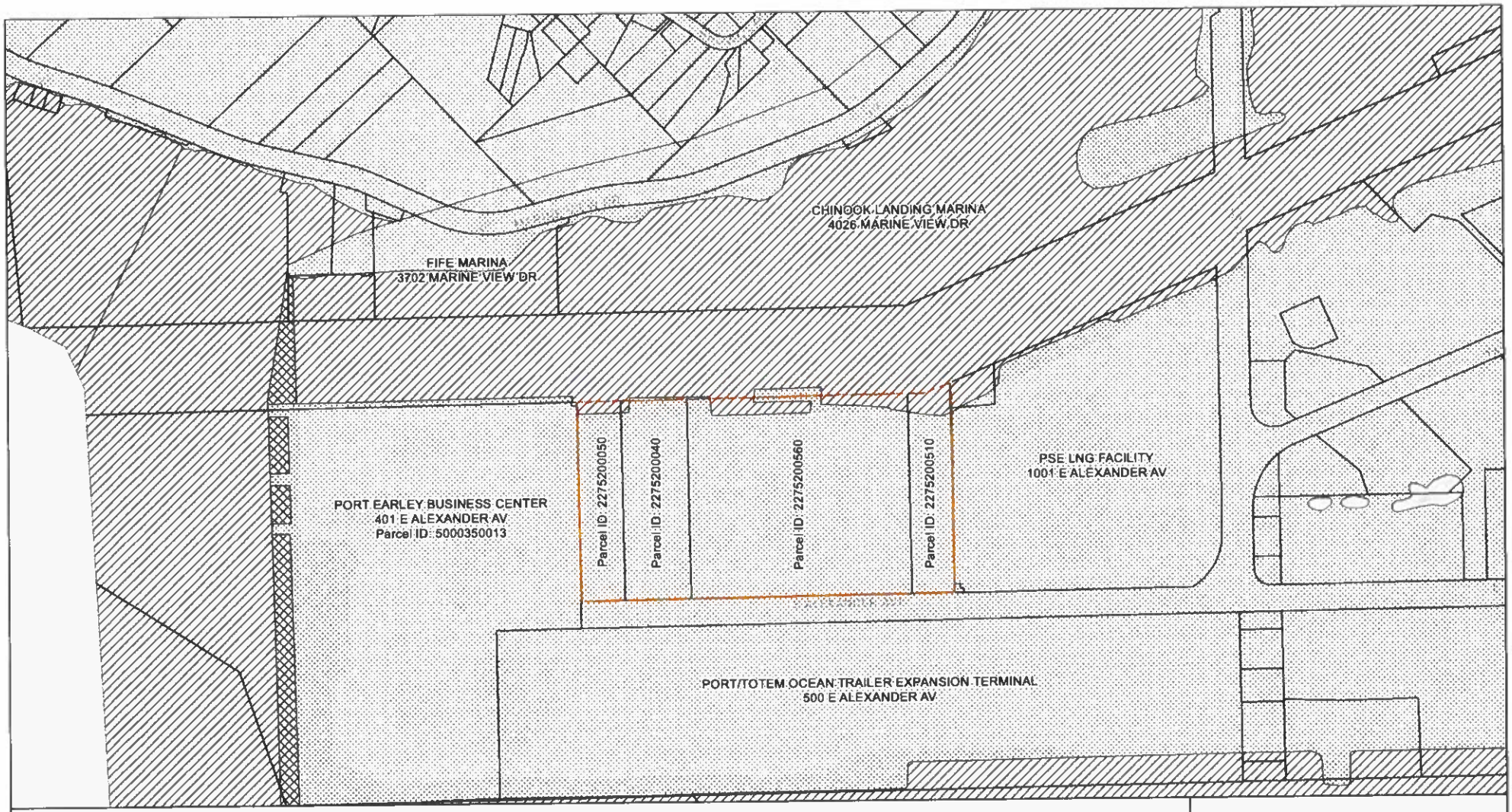
   - Proposed measures to avoid or reduce shoreline and land use impacts are:

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

   - Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Figure



Legend

- Site Boundary
- Taxlot Boundary

FEMA Floodzone

- Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods.
- Open Water
- Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves.
- Area of Minimal Flood Hazard

Notes:
Imagery Source:
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

True North

Plant North

0 100 200 400 Feet

FEMA Floodzone Map
Occidental Chemical Corporation,
Tacoma, Washington

Geosyntec consultants

TR0837 | December 2022

Figure 1

P:\Projects\Oxychem TR0837\600 GIS and CAD\620 GIS\MXDs\Revisions112922\Figure 5 FEMA Floodzone Map.mxd 1/18/2023 5:43:38 AM

Appendix A
Biological Resource Report

Prepared for:

Occidental Chemical Corporation
Tacoma, Washington

Biological Resource Report

Occidental Cleanup Site
Tacoma, Washington

Prepared By:

Geosyntec consultants

engineers | scientists | innovators

8217 Shoal Creek Boulevard
Suite 200
Austin, Texas 78757

Project Number TR0837

25 January 2023

TABLE OF CONTENTS

1. SUMMARY 1

2. INTRODUCTION 1

3. METHODS AND SURVEY LIMITATIONS 2

4. EXISTING CONDITIONS 3

4.1 ..... Botany 4

4.1.1 ..... Artificial Shoreline 4

4.1.2 ..... Revegetated Developed/Disturbed Land 5

4.2 ..... Zoology 5

5. SENSITIVE BIOLOGICAL RESOURCES 5

5.1 ..... Regulatory Setting 5

5.2 ..... Sensitive Vegetation Communities and Plant Species 6

5.3 ..... Sensitive Wildlife Species 6

5.4 ..... Wildlife Movement Corridor 9

5.5 ..... Jurisdictional Waters 9

6. PROJECT IMPACTS 9

6.1 ..... Vegetation Communities 9

6.2 ..... Sensitive Plant Species 10

6.3 ..... Sensitive Wildlife Species 10

6.4 ..... Jurisdictional Waters 10

6.5 ..... Indirect Impacts 11

7. MITIGATION 11

7.1 ..... Sensitive Vegetation Communities 11

7.2 ..... Migratory Birds 11

7.3 ..... Jurisdictional Waters 11

8. REFERENCES 12

LIST OF TABLES

Table 1 Botanical Species Observed on Site

Table 2 USFWS/WDFW Threatened and Endangered Species List for the Site

LIST OF FIGURES

Figure 1 Vicinity Map

Figure 2 Site Map

APPENDICES

Appendix A Ecological and Biological Site Assessment Photographic Log

1. SUMMARY

On behalf of Glenn Springs Holdings (GSH), Geosyntec Consultants, Inc. (Geosyntec) conducted a biological assessment for the former Occidental Chemical Corporation (OCC) properties located on a man-made peninsula at 605 and 709 Alexander Avenue, Tacoma, Washington (both owned by Mariana Properties) (Site) (Figure 1). The final remedy for the Site will include containment of impacted soil and groundwater comprising of several components. One of these components is a sheet pile vertical barrier wall. The longterm purpose of the barrier wall will be to eliminate horizontal discharge of potentially contaminated groundwater from the properties into the Hylebos Waterway and enhance containment of contaminated groundwater.

The Site is predominately developed and covered with impervious surfaces and some sparse vegetation. Portions of U.S. Environmental Protection Agency (EPA)-designated Segment 5 of the Hylebos Waterway Cleanup Project are part of the Site; however, no other watercourses or wetlands were identified. Impacts from barrier wall construction will occur to the Hylebos Waterway. The area between the barrier wall and the upland will be filled as part of the project, resulting in approximately 1.6 acres of impact. GSH will work with the state and federal agencies and the Puyallup Tribe on a Compensatory Mitigation approach to offset the 1.6-acre loss.

No sensitive vegetation or fauna were identified during an ecological and biological site assessment conducted in support for this report. There will be minimal impact to on-Site vegetation during construction. Additionally, there may be minimal impact to ground-nesting bird species within Site boundaries. The purpose of the wall is to eliminate horizontal high-pH discharge from seeps and shallow groundwater into the waterway; limit transient tidal effects on shallow groundwater, thereby resulting in less contaminant flushing and more consistent performance of groundwater extraction; and contain contaminated embankments. It is therefore anticipated to have an overall positive effect on the Hylebos Waterway, a Water of the U.S.

2. INTRODUCTION

GSH is working with the Washington State Department of Ecology (Ecology) and the United States Environmental Protection Agency (USEPA) to address environmental issues at the Site located on the eastern-most peninsula of the area of ownership and operations of the Port of Tacoma (POT) that extends into Commencement Bay at the mouth of the Puyallup River Valley. A portion of Segment 5 of the Hylebos Waterway is contained within the Site. Approximately 57 contaminants of concern (COCs) are present on Site, including 21 volatile organic compound (VOCs), 21 Semi-VOC (SVOCs), four pesticides, polychlorinated biphenyl (PCBs), 11 metals, and high pH. There are hazardous substances in the groundwater and soil throughout the Site. Contamination is from historical operations and waste disposal practices.

This on-going remediation work is being performed under an Administrative Order of Consent

(AOC) with USEPA, Ecology, and GSH. A 2002 amendment to the AOC recognizes Ecology's oversight role under Washington State's cleanup law, the Model Toxics Control Act (MTCA), Chapter 70.105D Revised Code of Washington (RCW).

The properties formerly owned and/or operated on by OCC or its predecessors include:

- 605 Alexander Avenue property (former OCC Facility currently owned by Mariana Properties, Inc. [Mariana])
- 709 Alexander Avenue property (currently owned by Mariana)

The properties are bounded on the west, north, and south by former Todd Shipyards and/or United States Navy (U.S. Navy) properties (now owned by the POT), and on the east by the Hylebos Waterway. The Site is within the roughly 12-square-mile area Commencement Bay Nearshore/Tideflats Superfund site (CB/NT Site).

GSH proposes three alternatives used in combination for containing and treating contaminants of concern:

- An asphalt cover over the Site,
- A sheet pile vertical barrier wall adjacent to the Hylebos Waterway, and
- Variable amounts of continued groundwater extraction and treatment.

All the proposed alternatives will include institutional controls, groundwater use restrictions, and groundwater and soil vapor monitoring.

This report will describe all biological resources within and around the Site and provide project information required for the analysis of potential environmental Washington State Department of Natural Resources (DNR) and the United States Army Corps of Engineers (USACE) requirements.

3. METHODS AND SURVEY LIMITATIONS

An experienced biologist with Geosyntec conducted an ecological and biological site assessment at the Site on 22 September 2020. At the time of the assessment, the weather was mostly sunny with a high of 75 degrees Fahrenheit (°F) and five mile-per-hour (mph) winds from the east. A handheld Global Positioning System (GPS) unit capable of recording with sub-meter accuracy (Trimble® R1 Data Collector) was utilized to obtain map the locations of ecological and biological resources of interest, as well as Site boundaries. Multiple wandering transects were traversed across the Site to gather data on flora/fauna observations and characterize the current conditions at the Site. Appendix A presents a photographic log of the site walk.

Plant species observed within the survey area were also noted in Table 1. Floral nomenclature for common and native plants is in accordance with the Washington Flora Checklist, hosted by the University of Washington Herbarium (Burke Museum Herbarium, 2020). The Washington Natural Heritage Program was used to classify native vegetation communities at the Site, following the 2017 U.S. National Vegetation Classification List (2017; minor revisions provided in 2020). Zoological nomenclature for birds follows the American Ornithological Society Checklist (Chesser et al. 2019); for herptiles and mammals, the Burke Museum online collections for the respective classes were referenced (Burke Museum Collections and Research, 2020a and 2020b).

Determination of the potential occurrence for Federally listed, sensitive, or noteworthy species is based upon the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool (USFWS, 2020); for State listed or sensitive species, determinations were based on species and habitats identified in the Commencement Bay Stewardship Collaborative: Ecosystem Management Plan (2015).

4. EXISTING CONDITIONS

The Site consists of a former OCC facility located on the eastern-most peninsula in Commencement Bay, along the Hylebos Waterway at the mouth of the Puyallup River Valley. A portion of Segment 5 of the Hylebos Waterway is contained within the Site. A Cultural Resource Report (CRR) was prepared for the Site and is Appendix C to the Joint Aquatic Resources Permit Application (JARPA). The CRR contains a detailed description of the existing conditions at the Site.

The soil in the City of Tacoma has not been surveyed by the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS 2020; Status of Soil Surveys, 2018). The Final Conceptual Site Model Report describes the geologic conditions of the Puyallup River Valley in the Site vicinity (CRA, 2014).

Starting from the ground surface, the Final Conceptual Site Model Report lists the following conditions:

- Fill: 10-15 feet, mixture of sand, silt, and gravel material placed through dredging of the Hylebos and Blair Waterways to develop the site peninsula.
- Deltaic deposits: 30-200 feet (eastern and northeastern portion of site) and 300 feet (southwestern portion of site), heterogeneous mixture of interbedded sands, silts, and clays
- Glacial deposits: estimated to more than 1,000 feet, heterogeneous mixture of interbedded gravel, sands, silts, and clays

4.1 Botany

Two vegetation/land cover types were identified at the Site: artificial shoreline and revegetated developed/disturbed land (Figure 2). Vegetation species identified during the Site assessment are included in Table 1.

Table 1: Botanical Species Observed on Site

Common Name	Species Name	Functional Group	Origin
Saltgrass	*Distichlis spicata*	Grass	Native
Red Fescue	*Festuca rubra*	Grass	Both
Meadow Barley	*Hordeum brachyantherum*	Grass	Native
Tall Fescue	*Schedonorus arundinaceus*	Grass	Native
Pacific Silverweed	*Argentina egedii* ssp. *egedii*	Forb	Native
Spotted Knapweed	*Centaurea stoebe* ssp. *micranthos*	Forb	Introduced
Scotch Broom	*Cytisus scoparius*	Forb	Introduced
Broadleaved Pepperweed	*Lepidium latifolium*	Forb	Introduced
Japanese Knotweed	*Polygonum cuspidatum*	Forb	Introduced
Curly Dock	*Rumex crispus*	Forb	Introduced
Stinking Willie	*Senecio jacobaea*	Forb	Introduced
English Ivy	*Hedera helix*	Vine	Introduced
Himalayan Blackberry	*Rubus bifrons*	Vine	Introduced
Orange Eye Butterflybush	*Buddleja davidii*	Shrub	Introduced
Oregon Crab Apple	*Pyrus fusca*	Shrub	Native
Western Dogwood	*Cornus sericea* ssp. *occidentalis*	Shrub	Native
Red Alder	*Alnus rubra*	Tree	Native
Black Cottonwood	*Populus balsamifera* ssp. *trichocarpa*	Tree	Native
Notes: Information from USDA Plants Database.			

As observed during the site visit, *Lepidium latifolium* (perennial pepperweed) has become established along the Hylebos Waterway. This plant can invade the upper intertidal, form monotypic stands, and exclude native vegetation.

4.1.1 Artificial Shoreline

The DNR ShoreZone Inventory identifies the Site shoreline as 100 percent modified/man-made. The shoreline in the Project area and the surrounding area is developed with industrial land use facilities. The artificial shoreline is armored with cobble behind wooden retention walls, crushed concrete and rock rip-rap, angular rock, and wooden docks (Appendix A). The Site's shoreline has generally steep slopes with minimal horizontal intertidal gravel-cobble surface area. Vegetation is limited to areas above MHHW, typically at the top of the armored shoreline and includes non-native invasive species commonly found in industrial shoreline

environments including Himalayan blackberry, butterfly bush (*Buddleja davidii*), and other upland weedy species. No vegetation grows in the intertidal zone of the shoreline. Ground above the intertidal zone is sparsely vegetated, with saltgrass and meadow barley growing in the soil above rip-rap. Curly dock, broadleaved pepperweed, and mosses grow on the wooden docks.

4.1.2 Revegetated Developed/Disturbed Land

The DNR Ecological Systems of Washington dataset identifies the inland areas of the Site as Nonnatural, High Intensity, Domestic and Commercial Development Land. At the Site, this land cover mainly consists of concrete, asphalt, and gravel with sparse vegetation. Western dogwood and black cottonwood saplings, as well as Oregon crab apple, red alder, orange eye butterfly bush shrubs grow along seams and cracks in the concrete and asphalt, as well as in gravel areas. Broadleaved pepperweed, Himalayan blackberry, and spotted knapweed are the dominant herbaceous species.

4.2 Zoology

Migratory birds, including waterfowl, marine birds, and shorebirds, utilize Commencement Bay during different parts of their life cycle (Earth Corps 2015). Migratory birds utilize open water, intertidal wetlands, and upland habitat as feeding, rearing, and resting areas. Common shorebirds were the only wildlife species observed on-Site during the assessment. Species included double-crested cormorant (*Phalacrocorax auritus*), herring gull (*Larus argentatus*), western gull (*L. occidentalis*), common tern (*Sterna hirundo*), and rock pigeon (*Columba livia*). Barnacles were observed during the site visit growing on all surfaces of the shoreline and docks within the intertidal zone.

5. SENSITIVE BIOLOGICAL RESOURCES

Applicable federal, state, and local regulations for protecting sensitive biological resources are summarized below, followed by a detailed discussion of sensitive resources with potential to occur on-Site. The assessments of potential species occurrence are based on on-Site conditions, known species ranges and habitat preferences, recorded species occurrences from the DNR Natural Heritage Program (NHP) database; USFWS IPaC tool; and species occurrence records from the Commencement Bay Stewardship Collaborative: Ecosystem Management Plan (EarthCorps 2015).

5.1 Regulatory Setting

For the purposes of this report, species and vegetation communities are considered sensitive if they are designated Threatened or Endangered by the WDFW or NOAA/USFWS or identified in the DNR NHP database. GSH is completing a Formal Section 7 Consultation, Under the

Endangered Species Act. The Puyallup Tribe, the Muckleshoot Tribe, NOAA and the State of Washington have trusteeship over natural resources in the Commencement Bay environment.

Federal Regulations: NOAA/USFWS - Endangered Species Act (ESA) Section 7; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act; Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 – Dredge Disposal, Magnuson-Stevens Fishery Conservation and Management Act, Tribal Rights Coordination.

State Regulations: State Environmental Policy Act (SEPA), State Historic Preservation Office - Section 106 Consultation, Coastal Zone Management Act (CZMA), Washington Department of Fish and Wildlife (WDFW) - Hydraulic Project Approval

City of Tacoma Regulations: Issue SEPA permit, Tacoma Municipal Code, Chapter 13.12

5.2 Sensitive Vegetation Communities and Plant Species

The DNR NHP and USFWS do not indicate sensitive vegetation communities or plant species within the Site or immediate Site vicinity. No sensitive vegetation communities, sensitive plant species, or submerged aquatic vegetation were identified during the Site survey.

5.3 Sensitive Wildlife Species

Prior to industrial development, the entire head of Commencement Bay was part of the Puyallup River delta, a large, ecologically complex area made up of productive salt water marshes and tideflats. During this century, dredge and fill activities physically eliminated most of the Puyallup River delta and associated wetlands. A number of important anadromous fish. including four salmon species (chinook, coho, chum, and pink) and steelhead trout, subsist in the Commencement Bay environment during part of their life cycles. Major adverse impacts on salmonid populations in the Commencement Bay environment are attributable to the loss of estuarine habitat and degradation of water quality in Commencement Bay and the lower Puyallup River. Mollusks, crabs, and shrimp are present throughout the Bay. The intertidal and subtidal sediments of the Bay also support numerous benthic macroinvertebrates that provide forage for many of the fish. In turn, these fish as well as shellfish and benthic macroinvertebrates, are preyed upon by mammals, waterfowl, and other marine birds. Currently, there are no commercial shrimp fisheries and very limited recreational fishing in this area.

The USFWS IPaC identifies five federally threatened or endangered species as having potential to be impacted by project-related activities. State status of the five identified species was determined from the WDFW website (**Table 2**).

The project area is outside WDFW designated Priority Habitats and USFWS designated Critical Habitat for the identified state and federally listed species, except where it overlaps bull trout critical habitat. Geosyntec did not identify potential critical habitats in the project areas during the field visit conducted on 22 September 2020.

Marine mammals have historically utilized the waters in or near Commencement Bay include Gray and Minke whales, Orcas, False killer whales, California sea lions, and harbor porpoises. The potential impacts to marine mammals will be evaluated with NOAA. A Marine Mammal Incidental Harassment Authorization (IHA) and Marine Mammal Mitigation and Monitoring Plan (4MP) will be developed.

Table 2. USFWS IPaC and WDFW Threatened and Endangered Species List for the Site

Common Name	Scientific Name	Type	Status		Habitat Requirements[3]	Habitat or Individuals Identified on Site
			Federal[1]	State[2]		
Gray wolf	*Canis lupus*	Mammal	PE	SE		No
Marbled murrelet	*Brachyramphus marmoratus*	Bird	LT	SE	Found in coastal areas, particularly salt water within 2 km of shores, such as bays and sounds. Usually nests in old growth coniferous forests near coast	Outside designated critical habitat, potential foraging habitat, no nesting habitat, no individuals identified
Streaked horned lark	*Eremophila alpestris strigata*	Bird	LT	SE	Found in prairie and open coastal habitat. Nests in natural or built ground depressions. Eats seeds and insects, usually from ground or occasionally perched on plants.	Outside designated critical habitat, potential nesting and forage habitat, no individuals identified
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	LT	SE	Found in dense wooded habitat with water nearby. In West, often nests in willow near streams and forages on nearby cottonwood	Outside designated critical habitat, no potential nesting and forage habitat, no individuals identified
Bull trout	*Salvelinus confluentus*	Fish	LT	C	Require cold water to survive (rarely found in temperatures exceeding 59-64° F), stable stream channels with clean gravel for spawning and rearing, unblocked migratory corridors, and complex and diverse cover.	Overlaps designated critical habitat

Note: (1) Federal Status (USFWS): LE = Listed Endangered, LT = Listed Threatened, PE = Proposed Endangered;
(2) State Status (WDFW): C = Candidate, SE = State Endangered, ST = State Threatened
Information acquired from USFWS Threatened and Endangered Species list (www.fws.gov) and WDFW At-Risk Species list (https://wdfw.wa.gov/species-habitats/at-risk/listed).
(3) Habitat Requirements determined from USFWS ECOS Environmental Conservation Online System and NatureServe Database

5.4 Wildlife Movement Corridor

Hylebos Waterway acts as a migratory corridor for anadromous fishes, such as salmonoids. Commencement Bay provides resting, foraging, and nesting areas for migratory birds and waterfowl (Earth Corps 2015).

5.5 Jurisdictional Waters

The proposed barrier wall will be installed in the Hylebos Waterway, an inlet of Commencement Bay and artificial channel of the Port of Tacoma, adjacent to OCC properties on the artificial Blair-Hylebos peninsula. The waterway measures 3 miles long and 200 feet wide. It extends southeast from Commencement Bay to the mouths of Hylebos and Wapato Creek. The main channel of Hylebos Creek originates near North Lake 5 miles to the northeast, flows south to meet West Hylebos Creek in Milton, and continues south and west to the Hylebos Waterway. Wapato Creek originates near State Route (SR) 161 6.5 miles to the southeast and flows north and west to the Hylebos Waterway. Most of the stream is channelized. The Blair Waterway is located 0.4 mile southwest of the project, the mouth of the Puyallup River 1.3 miles to the southwest, downtown Tacoma 2.5 miles to the southwest, and Surprise Lake 5.2 miles to the southeast.

A formal jurisdictional waters delineation was not conducted as part of this report. The jurisdictional status of features located within the Site were assessed based upon the Site visit conducted on 22 September 2020.

No wetlands were documented within the Site. A portion of Segment 5 of the Hylebos Waterway is located within the Site (Appendix A). The Hylebos Waterway is connected to Commencement Bay, which is located at the mouth of the Puyallup River Valley.

6. PROJECT IMPACTS

Project impacts to vegetation communities, sensitive plant and wildlife species, jurisdictional waters, and any indirect impacts are discussed below.

6.1 Vegetation Communities

A majority of the disturbance during construction of the barrier wall will be conducted within the Hylebos Waterway. A marine contractor will perform construction of the vertical barrier wall from floating barges. Some staging of equipment and supplies will occur onshore at the Site. After the wall is constructed, the area behind the wall will be backfilled with clean fill to grade and a concrete apron will be installed. No aquatic vegetation was identified in the area where the barrier wall is to be constructed during the 22 September 2020 site visit. As anticipated with an artificially filled peninsula for industrial use, the area is predominantly rip rap as noted in the Photograph Log (Appendix A); therefore, no aquatic vegetation communities will be impacted during construction activities.

The only other vegetation community within the Site consisted of a disturbed/revegetated community comprised primarily of early-succession, pioneer species of both native and non-native status. The Site is sparsely vegetated. Some impact to this vegetation community may occur during construction due to heavy equipment use. There will be some light industrial use of the area following construction; therefore, impact to vegetation following construction should be minimal.

6.2 Sensitive Plant Species

No sensitive plant species were identified on Site; therefore, sensitive plant species are unlikely to be impacted. Most species observed during the site visit are early-succession pioneer species that include both native and non-native species.

6.3 Sensitive Wildlife Species

The grey wolf, marbled murrelet, streaked horned lark, and yellow-bellied cuckoo were determined to not have habitat within the Site; therefore, these species are unlikely to be impacted.

Marbled murrelets are not expected in the narrow area of Blair or Hylebos Waterways near the Project footprint at any time of the year based on rare observations in the larger area of Commencement Bay and no known or confirmed breeding locations are nearby. The WDFW Priority Habitats and Species (PHS) database records no species occurrence for marbled murrelets in or near the project area (WDFW 2017a). The nearest marbled murrelet critical habitat areas to Commencement Bay are located approximately 40 miles northwest on the Olympic Peninsula, 40 miles southwest in the Capitol State Forest, and 30 miles southeast near Mount Rainier National Park (61 FR 26257).

The bull trout has critical habitat that overlaps with the Site. However, bull trout prefer clean gravel for spawning and rearing, unblocked migratory corridors, and complex and diverse cover. The habitat located along the bank consists of broken pieces of concrete and asphalt with little to no vegetative cover. No aquatic vegetation was observed. The groundwater beneath the Hylebos Waterway contains a chlorinated volatile organic compound (CVOC) plume and a high pH plume. This groundwater has been found to discharge to surrounding surface water boundaries, including the Hylebos Waterway. As a result, it is highly unlikely that bull trout would find this area to be suitable habitat; therefore, it is unlikely bull trout will be impacted.

6.4 Jurisdictional Waters

Project impacts to jurisdictional waters include the dredge and fill activities associated with the Cleanup Action Plan and groundwater barrier wall installation within the Hylebos Waterway. The barrier wall is proposed to be 2,200 feet long and 75 feet deep. Approximately 1.6 acres behind the barrier wall will be filled and a concrete apron will be constructed. This will create a loss of intertidal riprap habitat.

6.5 Indirect Impacts

According to the Cleanup Action Plan, the purpose of the barrier wall is to:

- Prevent migration of high pH into the Hylebos Waterway;
- Stabilize the bank and contain embankment materials; and
- Reduce transient tidal "flushing" of contaminants and more consistent performance of groundwater extraction system.

The project will have a positive indirect effect on the Hylebos Waterway by reducing pollution.

7. MITIGATION

Mitigation to sensitive resources is described below.

7.1 Sensitive Vegetation Communities

No sensitive vegetation communities were observed; therefore, mitigation for impacts to these communities will not be required.

7.2 Migratory Birds

Common shorebirds were observed during the Site visit. If any ground nests are present, there is potential for impact. The trees within Site boundaries are too small to hold raptor nests; therefore, it is unlikely raptor nests will be impacted. The NOAA/USFWS is not likely to require any mitigation for impacts to migratory birds at this Site.

7.3 Jurisdictional Waters

The approximate 1.6-acre fill behind the barrier wall will create a loss of intertidal riprap habitat. This will be offset with compensatory mitigation that meets Superfund and Clean Water Act requirements. The USEPA, NOAA and USACE will determine the amount of mitigation required.

8. REFERENCES

Burke Museum Collections and Research, University of Washington. 2020a. Amphibians and Reptiles of Washington (online). https://www.burkemuseum.org/collections-and-research/biology/herpetology/amphibians-reptiles-washington

Burke Museum Collections and Research, University of Washington. 2020b. Mammals of Washington (online). https://www.burkemuseum.org/collections-and-research/biology/mammalogy/mamwash/

Burke Museum Herbarium, University of Washington. 2020. Washington Flora Checklist (online). https://biology.burke.washington.edu/herbarium/waflora/checklist.php

Constoga-Rovers & Associates. April 2014. Final Conceptual Site Model Report, Groundwater and Sediment Remediation, Occidental Chemical Corporation. Tacoma, Washington.

Chesser, R. T., K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P.C. Rasmussen, J. V. Remsen, Jr., D. F. Stotz, B. M. Winger, and K. Winker. 2019. Check-list of North American Birds (online). American Ornithological Society. http://checklist.aou.org/taxa

EarthCorps. May 12, 2015. Commencement Bay Stewardship Collaborative: Ecosystem Management Plan. NRDA Trust Resources, Stewardship Framework and General Management Approach. NOAA.

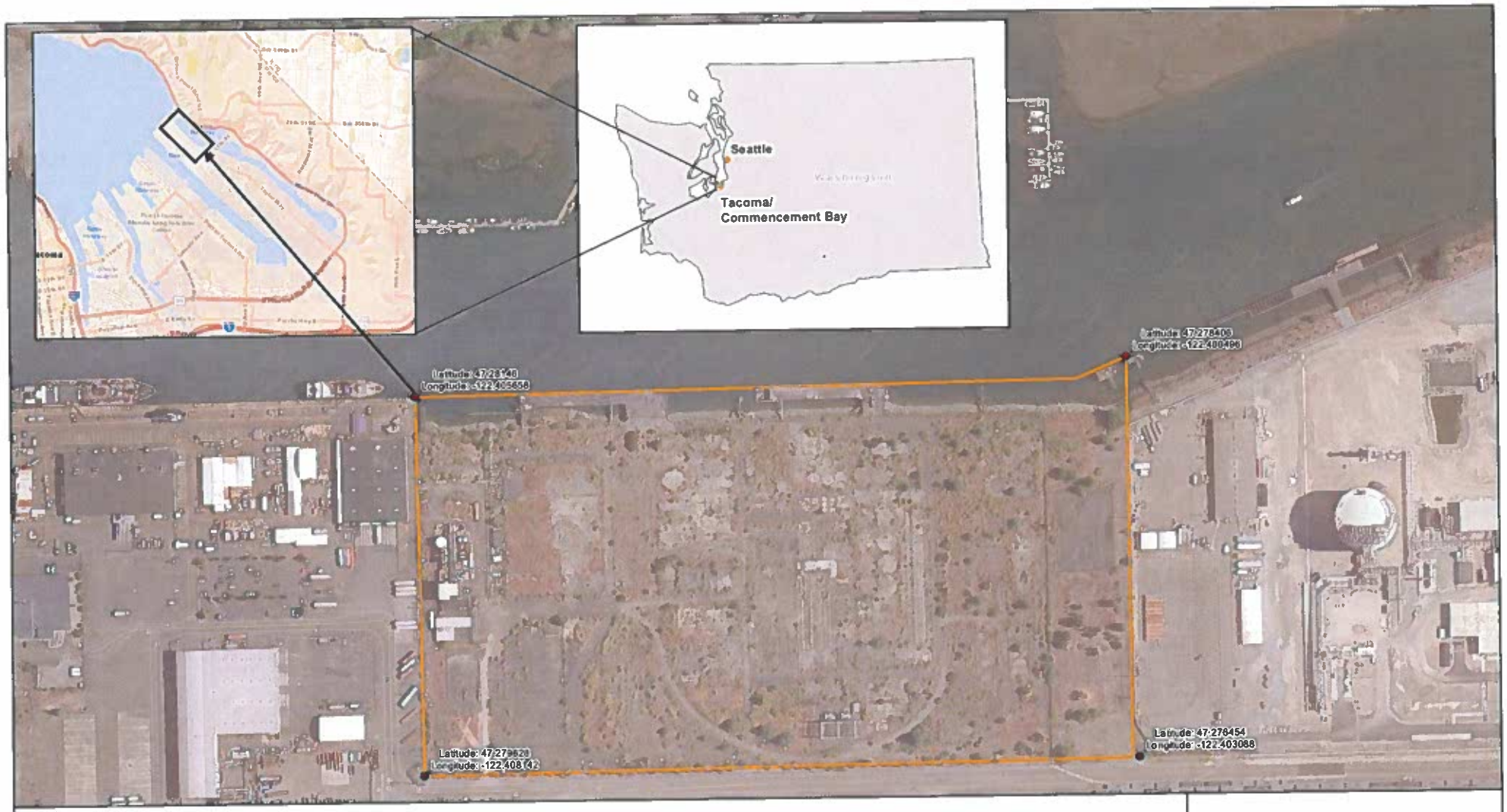
Washington Natural Heritage Program (WNHP). 2020. U.S National Vegetation Classification Plant Associations Known to Occur in Washington State (online). https://www.dnr.wa.gov/publications/amp_nh_assoc_list.pdf?cunimz

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2020 Web Soil Survey, Washington. Electronic document,

http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, December 30, 2020.

USDA NRCS. October 2018. Status of Soil Surveys Washington. Washington State Office.

FIGURES



Legend

- Site Boundary
- Corner Location

Notes:
Imagery Source
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

True North

Plant North

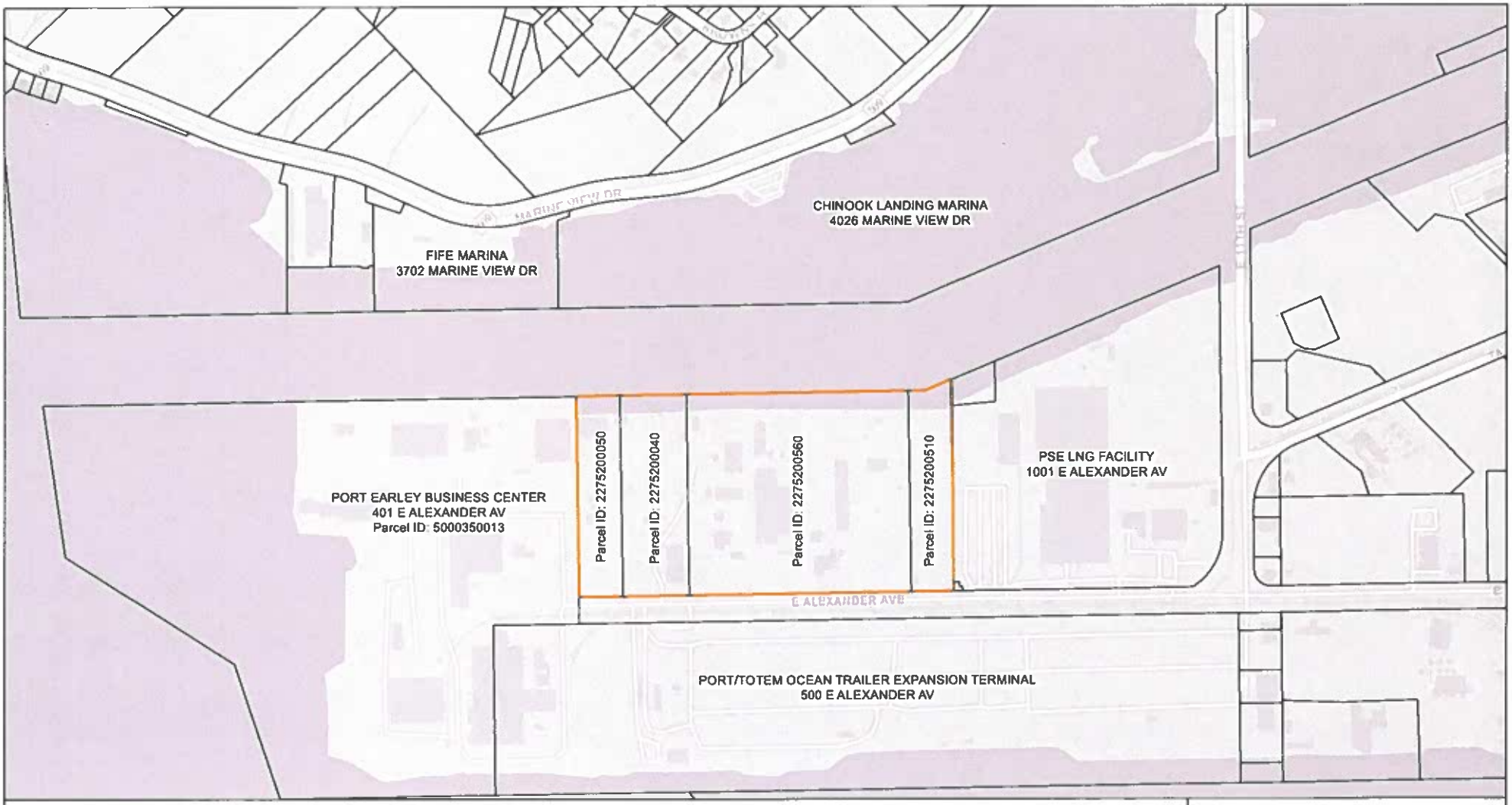
0 100 200 400 Feet

Site Location Map
Occidental Chemical Corporation
Tacoma, Washington

Geosyntec consultants

TR0837	December 2022	Figure 1

P:\Projects\Occhem TR0837\900 GIS and CAD\920 GIS\MXDs\Revisions112922\Figure 1 Site Location Map.mxd 11/30/2022 4:42:52 AM



Legend

- Site Boundary
- Taxlot Boundary

Notes:
Imagery Source:
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

True North

Plant North

0 100 200 400 Feet

Taxlot Map
Occidental Chemical Corporation,
Tacoma, Washington

Geosyntec consultants

TR0837 | December 2022

Figure 2

P:\Projects\Oxychem TR0837\900 GIS and CAD\920 GIS\MXDs\Revisions112922\Figure 2 Taxlot Map.mxd 11/30/2022 4:40:41 AM

APPENDIX A

Ecological and Biological Site Assessment Photographic Log

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
1	9/22/2020

Direction Photo Taken:

North

Description:

Upland site looking north.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
2	9/22/2020

Direction Photo Taken:

West

Description:

Upland view of the site looking west with Pier 7 cranes in the background.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

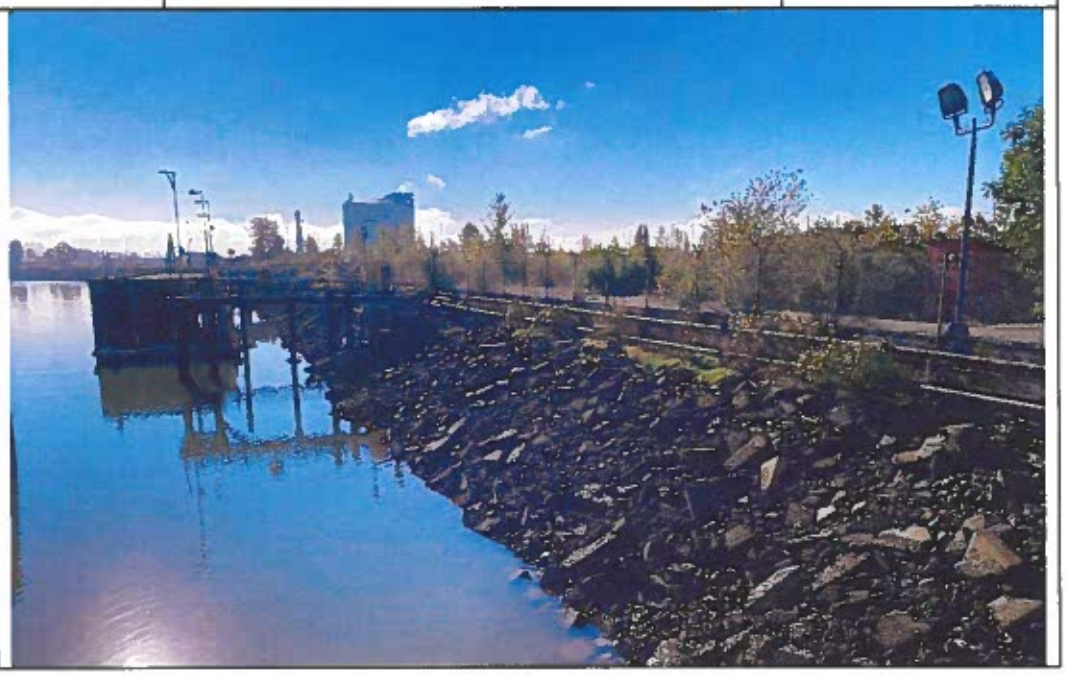
Photo No.	Date:
3	9/22/2020

Direction Photo Taken:

Southeast

Description:

The eastern edge of the site is an artificial shoreline at the Hylebos Waterway. The proposed barrier wall will run the length of the site, approximately 2,200 feet.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
4	9/22/2020

Direction Photo Taken:

Northwest

Description:

Structures within the waterway include intermittent pipe supports and a wooden dock.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

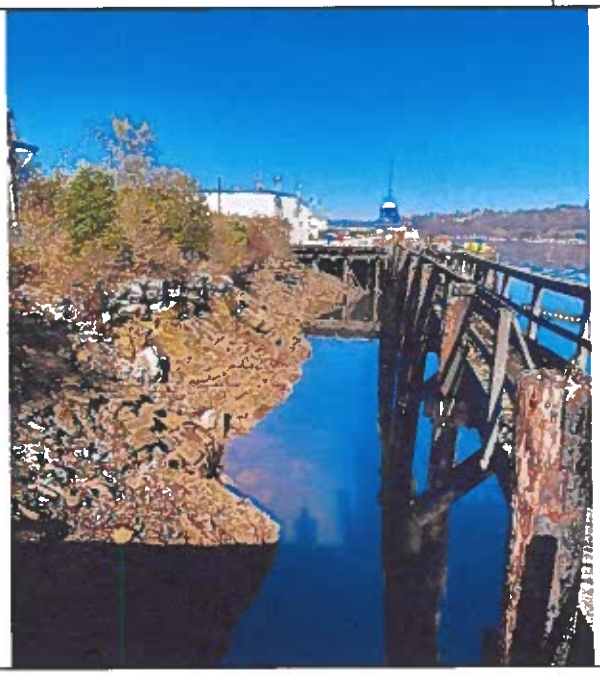
Photo No.	Date:
5	9/22/2020

Direction Photo Taken:

Northwest

Description:

Approximately 3.8 acres of the Waterway will be enclosed behind the proposed barrier wall and filled to prevent further contaminant leaching.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

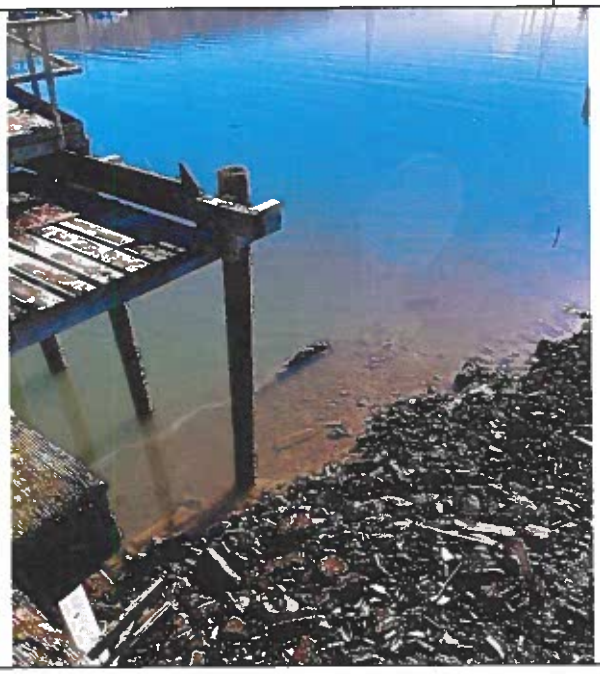
Photo No.	Date:
6	9/22/2020

Direction Photo Taken:

Northeast

Description:

Intertidal and subtidal riprap is unlikely to act as suitable spawning or rearing habitat for federally threatened bull trout. No aquatic fauna were observed during the site assessment.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
7	9/22/2020

Direction Photo Taken:

South

Description:

Riprap acting as shore protection. No aquatic fauna observed.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
8	9/22/2020

Direction Photo Taken:

South

Description:

Erosion of shoreline near fenced area. Piping and piling support along dock face.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

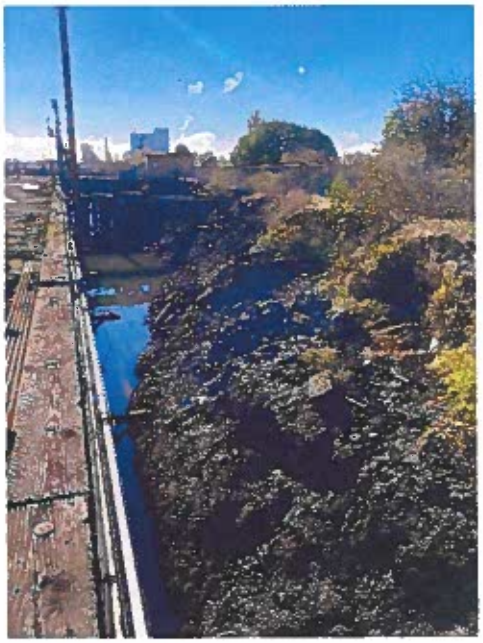
Photo No.	Date:
9	9/22/2020

Direction Photo Taken:

Southeast

Description:

Vegetation above the shoreline along with piping along the the dock. Dock 1 in the foreground and Dock 2 in the background.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
10	9/22/2020

Direction Photo Taken:

Northwest

Description:

Treatment system effluent pipe from shoreline entering the waterway.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

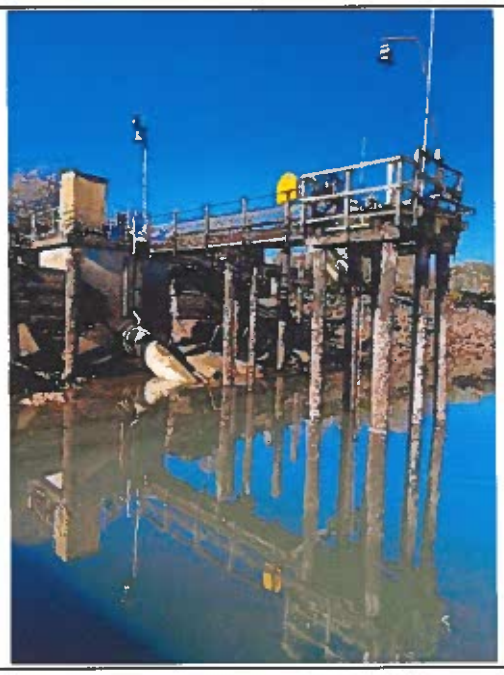
Photo No.	Date:
11	9/22/2020

Direction Photo Taken:

Northwest

Description:

Treatment system effluent pipe from shoreline entering the Waterway.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
12	9/22/2020

Direction Photo Taken:

Southeast

Description:

Looking under Dock 2 and the ramp up to the dock on the shoreward side of the dock.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

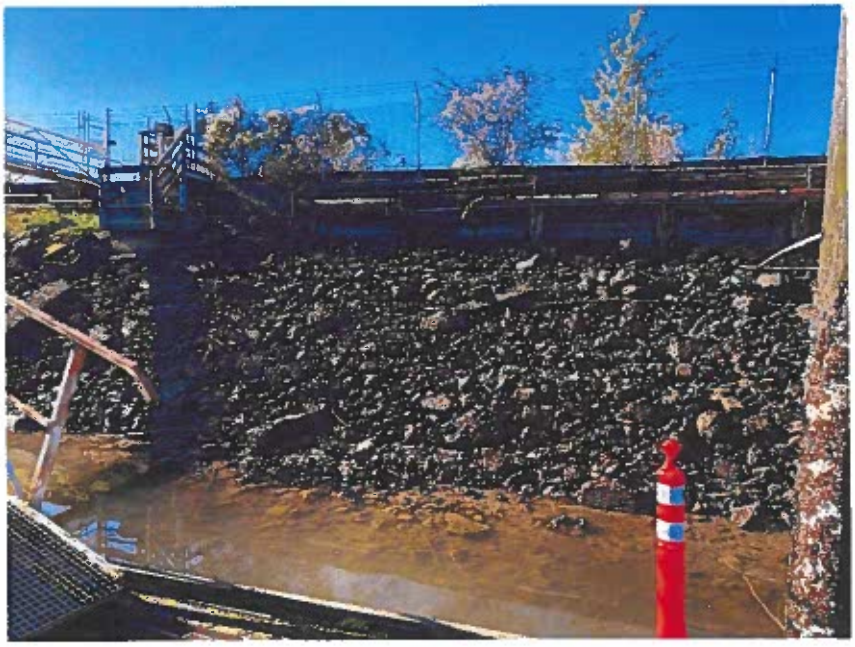
Photo No.	Date:
13	9/22/2020

Direction Photo Taken:

Northwest

Description:

Ramps to and from Dock 2 along with shoreline riprap providing protection.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
14	9/22/2020

Direction Photo Taken:

Southwest

Description:

Riprap along the riverbank providing shore protection; however, limited available habitat.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

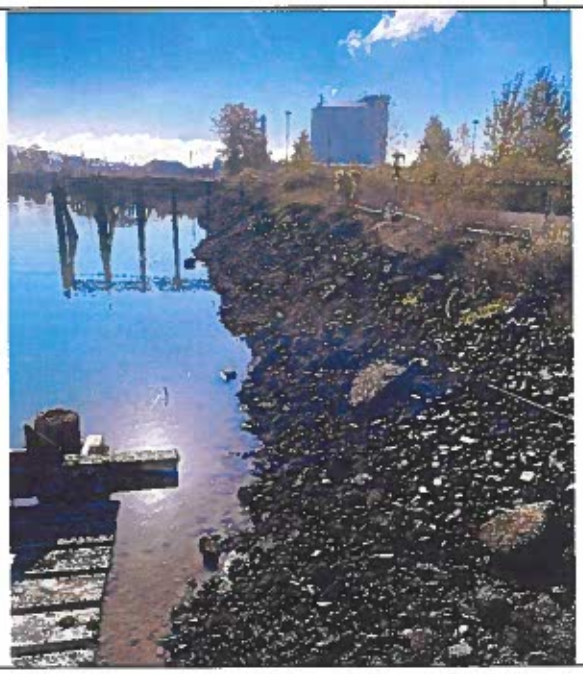
Photo No.	Date:
15	9/22/2020

Direction Photo Taken:

Southeast

Description:

Riverbank view from the dock looking in the southeasterly direction.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

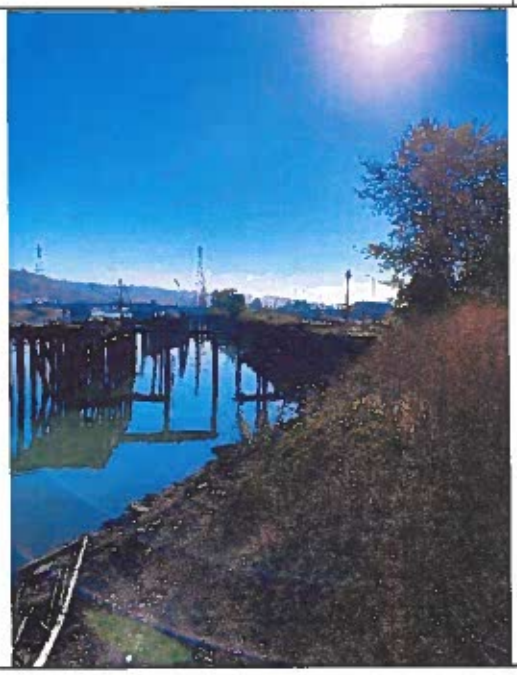
Photo No.	Date:
16	9/22/2020

Direction Photo Taken:

East

Description:

Edge of the property looking towards abandoned dock structure.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

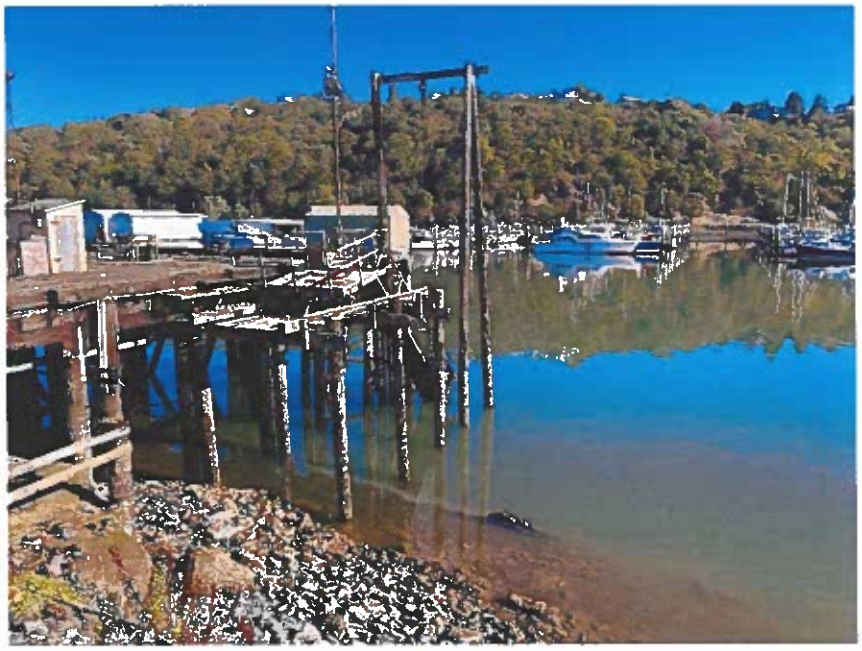
Photo No.	Date:
17	9/22/2020

Direction Photo Taken:

North

Description:

Looking from Dock 2 towards Chinook Landing Marina.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

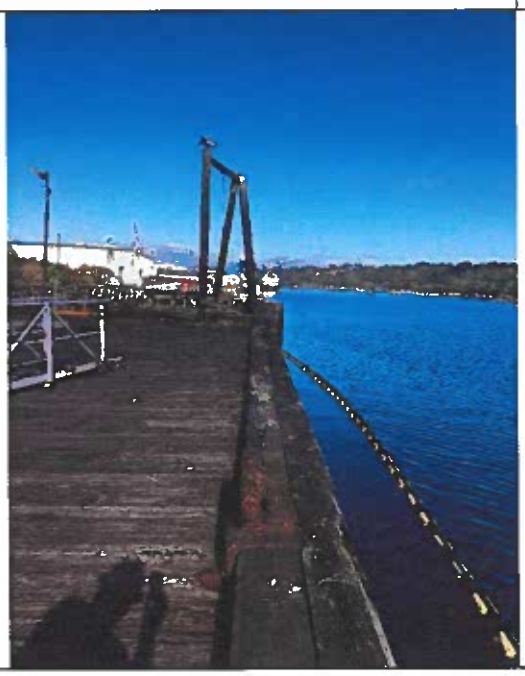
Photo No.	Date:
18	9/22/2020

Direction Photo Taken:

Northwest

Description:

Dock 1 looking towards Trident Seafood dock.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

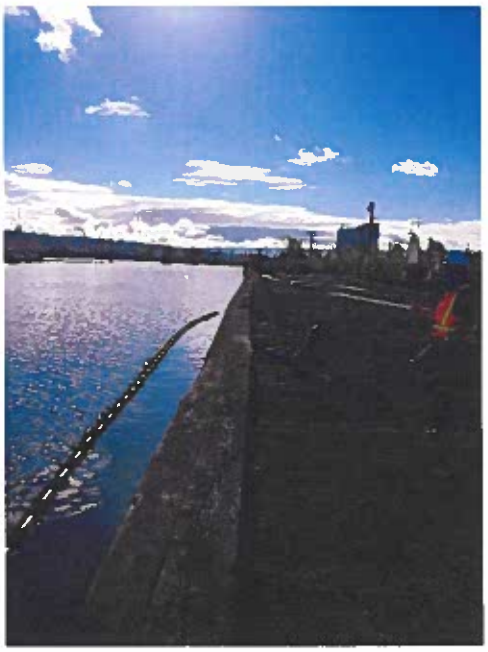
Photo No.	Date:
19	9/22/2020

Direction Photo Taken:

Southeast

Description:

Project site area with a boom in the water from the waterway side of the dock.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
20	9/22/2020

Direction Photo Taken:

Southeast

Description:

Piping running along the shoreline towards the dock.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
21	9/22/2020

Direction Photo Taken:

North

Description:

Photo taken while on Dock 1 looking towards the Chinook Landing Marina.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

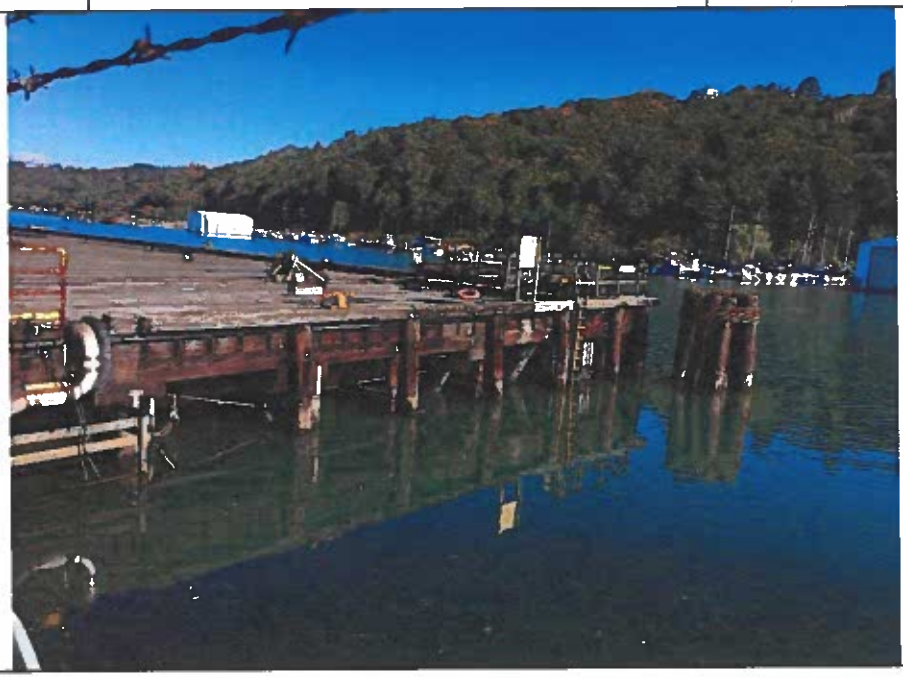
Photo No.	Date:
22	9/22/2020

Direction Photo Taken:

North

Description:

Photo taken of the southern part of Dock 1 during a high tide.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

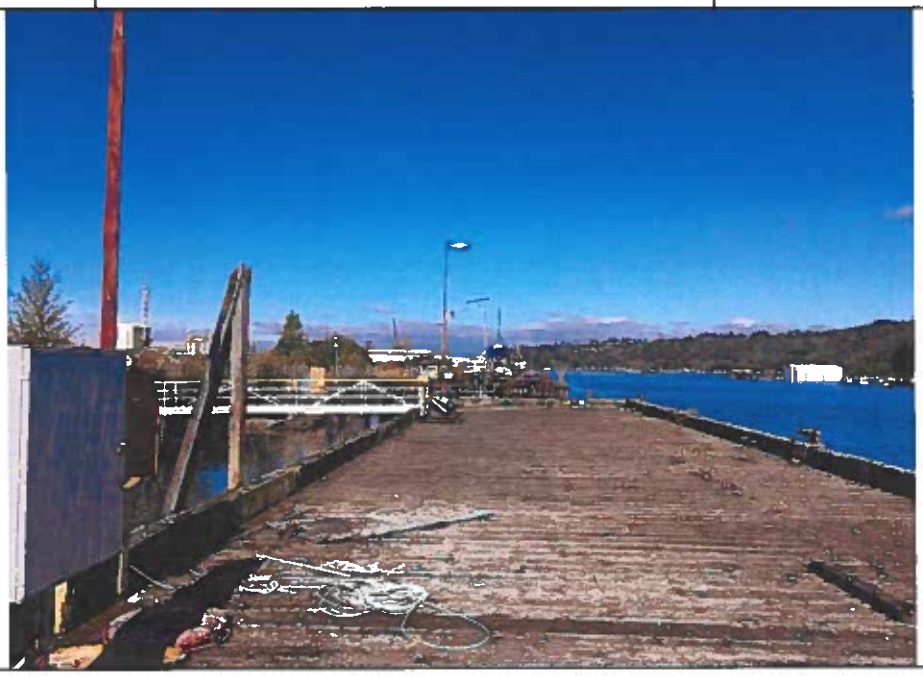
Photo No.	Date:
23	9/22/2020

Direction Photo Taken:

Northwest

Description:

Dock 1 looking towards the mouth of Hylebos Waterway.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
24	9/22/2020

Direction Photo Taken:

Northwest

Description:

Dock 1 looking shoreward during high tide.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

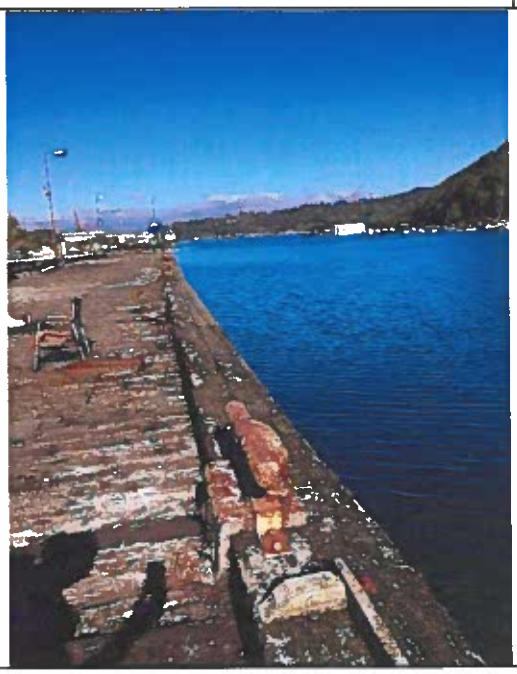
Photo No.	Date:
25	9/22/2020

Direction Photo Taken:

North

Description:

Dock 1 looking towards the mouth of Hylebos Waterway.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
26	9/22/2020

Direction Photo Taken:

Southeast

Description:

Hylebos Waterway with the Chinook Landing Marina in the background.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
27	9/22/2020

Direction Photo Taken:

Southeast

Description:

Photo taken from Dock 2 during high tide.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
28	9/22/2020

Direction Photo Taken:

Southeast

Description:

Riverbank with remnant piping and limited aquatic habitat.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
29	9/22/2020

Direction Photo Taken:

Southeast

Description:

Field crew inspecting waterfront habitat.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
30	9/22/2020

Direction Photo Taken:

Northeast

Description:

Submerged riprap during high tide.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

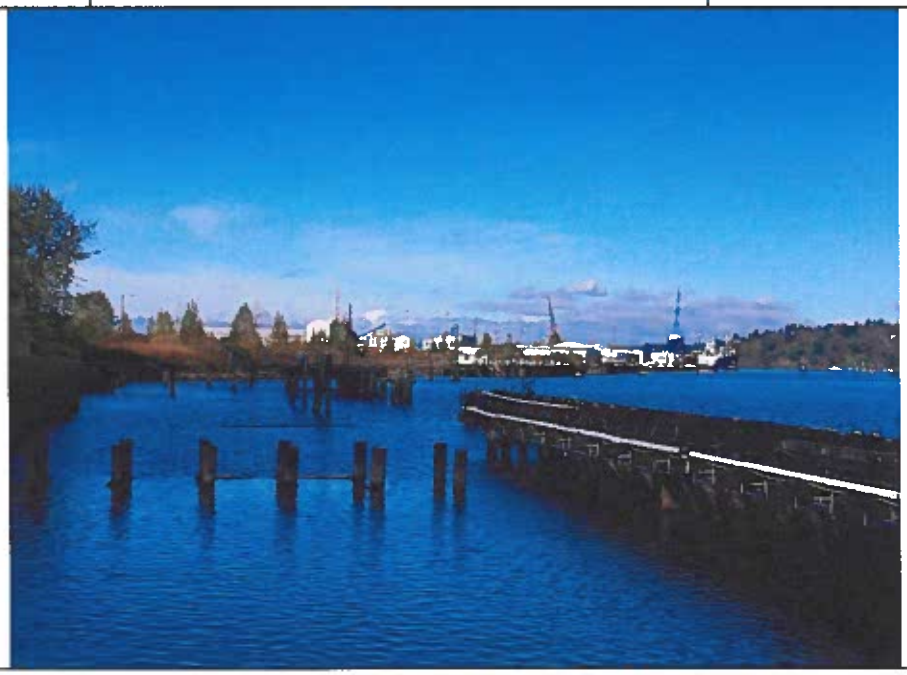
Photo No.	Date:
31	9/22/2020

Direction Photo Taken:

North

Description:

Southern edge of the property looking north towards the mouth of the Hylebos Waterway.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
32	9/22/2020

Direction Photo Taken:

East

Description:

Neighboring property to the east of former OCC Site

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

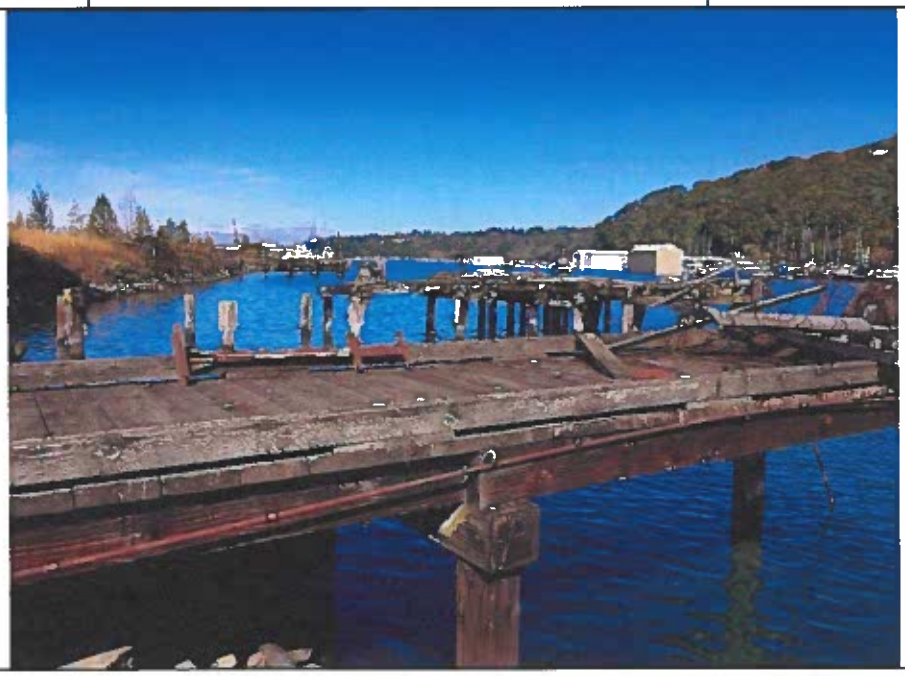
Photo No.	Date:
33	9/22/2020

Direction Photo Taken:

North

Description:

Derelict dock near the southern edge of the property.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
34	9/22/2020

Direction Photo Taken:

Southeast

Description:

Seagulls along the dock.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
35	9/22/2020

Direction Photo Taken:

Northwest

Description:

Street signs and property fencing from the shoreline

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
36	9/22/2020

Direction Photo Taken:

North

Description:

Dock 2 from the water.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
37	9/22/2020

Direction Photo Taken:

Northwest

Description:

Remnant piping along the shoreline and Dock 2 during high tide.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
38	9/22/2020

Direction Photo Taken:

Northwest

Description:

Remnant piping running under Dock 2.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
39	9/22/2020

Direction Photo Taken:

Northwest

Description:

Remnant piping running under Dock 2.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
40	9/22/2020

Direction Photo Taken:

Northwest

Description:

Shoreline along the fence during high tide.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

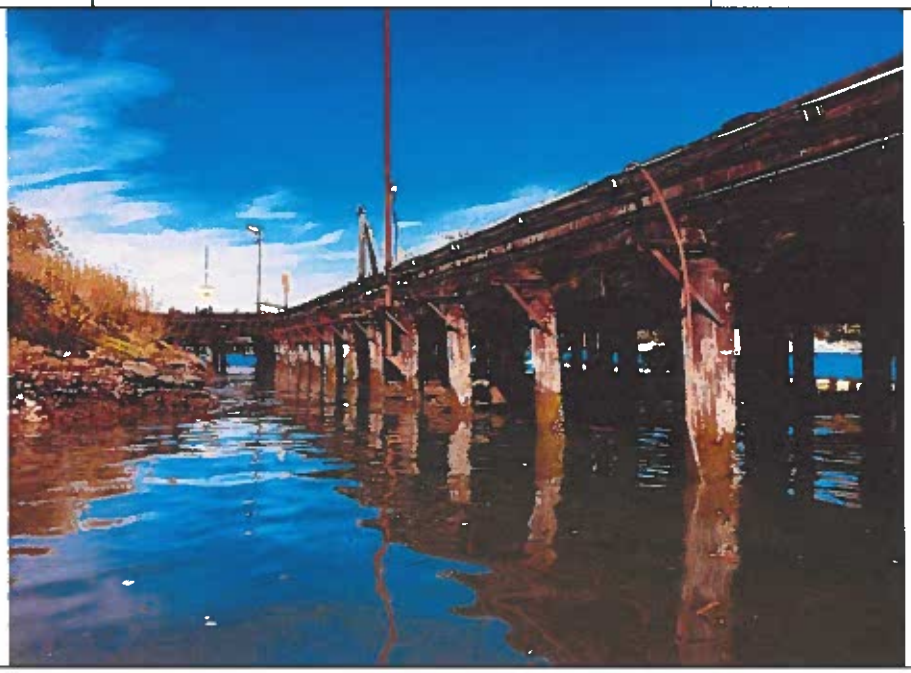
Photo No.	Date:
41	9/22/2020

Direction Photo Taken:

Northwest

Description:

Shoreward side of Dock 1.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

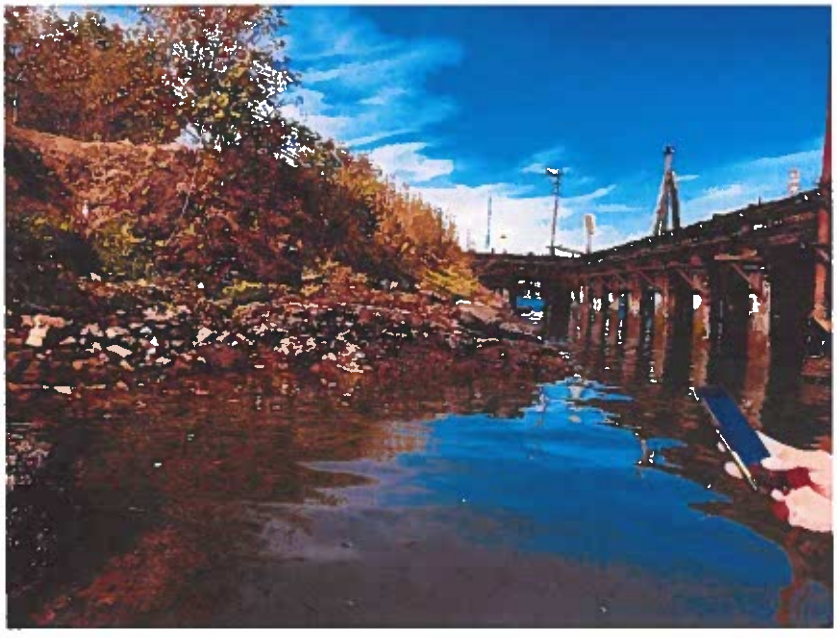
Photo No.	Date:
42	9/22/2020

Direction Photo Taken:

Northeast

Description:

Riprap near Dock 1.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
43	9/22/2020

Direction Photo Taken:

Northwest

Description:

Bricks acting as riprap located near Dock 1.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
44	9/22/2020

Direction Photo Taken:

southwest

Description:

Remnant pipes along riverbank.

Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

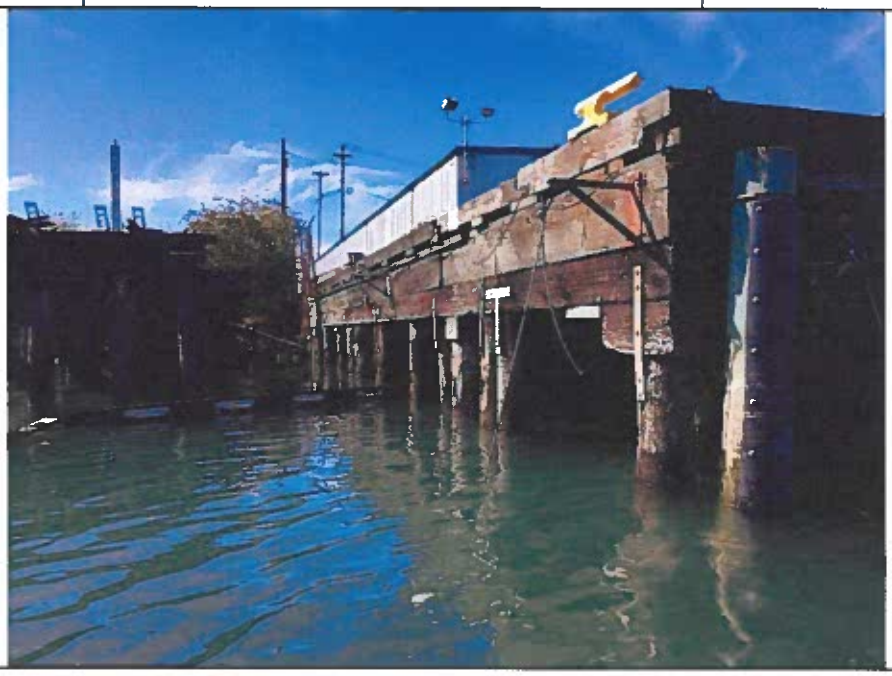
Photo No.	Date:
45	9/22/2020

Direction Photo Taken:

southwest

Description:

Trident Seafood dock.



Geosyntec consultants

PHOTOGRAPHIC LOG

Property Name:	Location:	Project No.
Occidental Chemical Corporation	Tacoma, Washington	TR0837

Photo No.	Date:
46	9/22/2020

Direction Photo Taken:

Southeast

Description:

Photo of field crew evaluating the shoreline from a boat under the dock.

Appendix B
Basis of Design and Drawings
Vertical Barrier Wall

1.0 General Requirements

1.1 Introduction

This document serves as the Basis of Design (BOD) for the preliminary design of a sheet pile barrier containment wall for the Occidental Chemical Corporation (OCC) in Tacoma, WA (605 and 709 Alexander Avenue). The site is located on the east side of the Blair-Hylebos Peninsula, along approximately 2,100 feet of shoreline of the Hylebos Waterway. KPFF understands that several containment alternatives have been evaluated to address contamination and environmental issues at the site, all of which (except for the No Action Alternative) include installation of a steel sheet pile vertical barrier wall adjacent to the Hylebos Waterway. According to the "Feasibility Study Report" by GHD (GHD, 2017), the primary purpose of the wall is to, "eliminate the horizontal discharge from seeps and shallow groundwater with high pH to the Waterway." In addition, the tip elevation of the sheet pile wall has been selected to allow for drawback of contamination from the Hylebos Waterway beneath the toe wall utilizing upland extraction wells. The wall will be just one component to the overall approach to address site contamination.

The barrier wall, including cut-off wall, king pile wall, and return walls, is anticipated to be approximately 2,235 feet long, with the sheet piles extending down to approximately elevation -68.5 ft (MLLW) (-66 ft NGVD) and the king piles extending down to approximately elevation -83.5 ft (MLLW) (-81 NGVD). The wall is anticipated to extend north onto the Port of Tacoma property leased by Trident Marine approximately 400 feet and will remain within the OCC property line to the south. See the attached preliminary JARPA drawings in Appendix A for details. The proposed alignment of the barrier wall system includes a cut-off toe-wall located offshore of the existing top of bank, installed between the face of Trident Marine's face of dock and their fender system. A king pile wall system runs parallel to the cut-off wall approximately 32 feet upland from the cut-off toe-wall, with return walls at the north and south extents.

This will require that at least the superstructure members (deck, deck framing, and pile caps) of the existing dock structures on the OCC site be demolished prior to wall installation. The existing open surface area between the existing shoreline and the wall will be backfilled and topped with an asphalt or concrete pavement apron to provide approximately 1.6 acres of new upland on the site, though the loading design criteria for this additional land has not yet been finalized. At this stage, the intent will be to leave the existing creosote treated timber piles from the wharf/pier structures upland from the new wall in-place and contain them within the backfill. The piling offshore of the new wall will be cut-off two feet below and mudline and the above water portion disposed of at an upland facility. Leaving the existing treated piles in-place will eliminate the need to remove them through the water column and dispose of them at a landfill. This strategy also retains the slope strengthening and stabilization characteristics of the piles themselves.

The structural concept for the wall along the OCC and PSE sites includes a steel "combination wall" system that consists of sheet piles between large wide-flange piles (king piles), functioning as a cantilever system. Geotechnical information has been extrapolated from a March 21, 2016 report by

GeoEngineers (GeoEngineers, 2016) associated with the PSE liquified natural gas (LNG) property adjacent to the south, but is not being relied upon for as-built purposes.

The structural concept for the wall along the Trident Marine dock includes installation of a cantilever sheet pile toe-wall installed beneath the water between the face of the dock and the fender system. This will likely require either partial or total removal of the fender system along the footprint of the wall, and reinstallation of the fender system after the toe-wall has been installed. The need to pull and reinstall fender piling will be evaluated, but for permitting purposes, it may be necessary to include this action in permit applications. This wall will be designed only as an environmental cut-off wall with only incidental scour being considered when evaluating the free height of the wall. The future long-term use of the site is not to accommodate any berth deepening.

Glenn Springs Holdings, Inc. (GSH) has performed a conceptual design and permitting review of the proposed containment wall. KPFF's initial effort is to validate the work performed in this conceptual design, propose engineering modifications to the existing concept if necessary, and to provide civil and structural engineering consultation to Geosyntec to assist with initiating discussions with the various permitting agencies.

2.0 Criteria Reference Documents

2.1.1 Reference Design Standards

- International Building Code (IBC), 2015 Edition
- American Society of Civil Engineers (ASCE), 2016, Minimum Design Loads for Buildings and Other Structures, ASCE Standard No. 7-16
- ASCE, 2014, Seismic Design of Pile-Supported Piers and Wharves, ASCE Standard No. 61-14.
- American Concrete Institute (ACI) Building Code Requirements for Structural Concrete, ACI 318-14
- American Institute of Steel Construction (AISC) Steel Construction Manual, 14th Edition
- American Association of State Highway & Transportation Officials (AASHTO) – Standard Specifications for Highway Bridges 2015
- American Society for Testing and Materials (ASTM) – Standards in Building Codes current editions
- American Welding Society – Structural Welding Code (AWS D1.1)

2.1.2 Reference Documents

- Naval Facilities Engineering Systems Command (NAVFAC) DM-7.02, Foundations and Earth Structures, 1982
- Permanent International Association of Navigation Congresses (PIANC), Seismic Design Guidelines for Port Structures, 2001
- U.S. Army Corps of Engineers (USACE) Engineer Manual (EM) 110-2-2503, Design of Sheet Pile Cellular Structures Cofferdams and Retaining Structures, 1989
- USACE EM 110-2-2504, Design of Sheet Pile Walls, 1994

- USACE Information Technical Laboratory (ITL) 92-11, Seismic Design of Waterfront Retaining Structures, 1992
- United Facilities Criteria (UFC) 4-152-01 Design: Piers and Wharves, 2005
- Geotechnical Report "Geotechnical Engineering Services Rev 3-Final Tacoma LNG Project", dated March 21, 2016

2.2 Generalized Survey and Tidal Datum Information

For the purposes of this project the following survey and bathymetric data will be utilized:

- Horizontal Project Datum: NAD 84/07
- Epoch Vertical Project Datum: MLLW
- Units: US Survey Feet
- Control Summary: Washington State Plane Coordinate System, NAD83/07, South Zone 4602, per WSRN Network.
- Upland Survey File: "KPFF UPLAND SURVEY.dwg", dated January 2021
- Bathymetric Survey File: "600550-X-SV 5ft Contours.dwg", performed by Sitts & Hill Engineers, Inc., dated May 2015

The following tidal elevation information is available for this project:

- National Oceanic and Atmospheric Administration (NOAA) Tidal Station 9446484: This is theclosest tidal data station to the project site and contains data from two epochs, 1960-1978 and 1983-2001, the latter being the most currently adopted epoch. The tidal station is located near the Port of Tacoma Administration Building at 1 Sitcum Way, Tacoma, WA. https://tidesandcurrents.noaa.gov/stationhome.html?id=9446484

The table below contains the most current tidal data based on Tidal Station 9446484, 1983-2001 epoch:

Tidal Data	Mean Lower Low Water Datum
Mean Higher High Water (MHHW)	11.78 ft
Mean High Water (MHW)	10.90 ft
Mean Low Water (MLW)	2.84 ft
Mean Lower Low Water (MLLW)	0.00 ft

3.0 General Project Information

3.1 Design Team

The design team leads for this project are shown in the following table:

Client/Consultant	Contact(s) & Phone Nos.	Discipline(s)
John Buyers/Geosyntec	(519) 514-2644	PM/Environmental

Ian Richardson, P.E./Geosyntec	(519) 514-2643	PM/Environmental
Keith Kroeger/Geosyntec	(503) 222-9518	Senior Project Scientist
Richard Bieber, LG/Geosyntec	(206) 496-1450	Geologist/Site Contact
Scott Kuebler, P.E., S.E./KPFF	(253) 396-0150	Civil/Structural
Adam Bergman, P.E./KPFF	(253) 396-0150	Civil/Structural

4.0 Structural Criteria

4.1 Introduction

The focus of the preliminary structural design will be the evaluation of the approximately 2,235 feet long vertical barrier wall, with an expected tip elevation of the retaining sheets of approximately -68.5 ft (MLLW). The significant exposed height of soil being retained by the wall and the relatively shallow pile tip elevation will require a combination-wall system which includes sheet pile lagging between king H-piles. The sheet and king-piling of the wall system will provide resistance to the applied earth loading through flexural resistance as a cantilever system.

The wall will be evaluated in a static condition for both vertical surcharge and lateral soil loading, as well as for its performance under seismic loading at multiple event levels assuming soil liquefaction does not result in lateral slope movement. A geotechnical consultant has not been included on the project team at this stage of the design. Preliminary structural analyses will be based on KPFF's evaluation of recommendations provided in both the conceptual design as well as the March 21, 2016 geotechnical report (GeoEngineers, 2016) associated with the PSE LNG property adjacent to the south. Final design will require a site-specific geotechnical study to be performed at the project location, particularly with respect to global slope stability and the potential for lateral spreading of the slope due to liquefaction. No independent evaluation of these potentials has been undertaken by KPFF.

KPFF understands that current preliminary plans do not include protection of the wall face from incidental contact from vessels. If desired, energy absorbing elements could be provided along the face of the wall either attached to the wall, or independently supported on fender piling. The latter would have permitting implications related to pile installation.

4.2 Loading Conditions

4.2.1 Permanent (Dead) Loading

Permanent loads will include the cumulative weight of the entire structure, including the weight of all structural components, pavement, utilities, and other permanent attachments.

4.2.2 Transient (Live) Loading

The vertical barrier wall will be designed for a vertical surcharge consisting of a uniform live load of 250 pounds per square foot (psf), which is appropriate for light industrial use. AASHTO HS25

truck axle surcharge loads, including dynamic load effects, will also be considered as both a surcharge to the wall system and in the design of the approach apron.

Upland surcharge loading consistent with a typical container terminal would be in the 1000psf range and is not being considered at this stage of the design. Components of the preliminary wall design articulated in Appendix A would need to be increased to accommodate this increase in the live load surcharge.

4.2.3 Earth Pressure Loading

A generalized soil profile has been determined based on the geotechnical report for the adjacent PSE LNG facility (GeoEngineers, 2016) for preliminary analysis, though this will need to be revised based on the conclusions of a future geotechnical study for the site used for the final design of the structure. Soil pressure active loading (static and seismic) and passive resistance to be applied to the wall system will be based on the soil layer parameters identified following in Table 1. The tabulated soil layer parameters assume static soil conditions and an active seismic increment, but do not account for potential loss of soil strength or slope failure due to liquefaction during a seismic event. Furthermore, utilization of these values provides a check for stability of the wall under these pressures but does not account for deeper global slope stability that could occur beneath the wall itself. See Sections 4.5 and 5.0 for a further discussion on the implications of slope stability and kinematic soil loading due to liquefaction.

Elevation (ft NGVD)	Material	N_{60}	ϕ	f	γ_t (pcf)	K_a	K_p	ΔK_{ae}
+12 to -30	Native Slope: Silty Sand and Poorly-Graded Sand	6	28	0.3	115	0.36	NA	0.19
	Engineered Fill		34	0.37	130	0.28	NA	0.16
	Lean Concrete Slurry (100psi)		45	0.45	150	0.17	NA	0.13
-30 to -50	Silty Sand, Poorly-Graded Sand, Lean Silt	8	30	0.33	120	0.33	3.0	0.18
-50 to -80	Silty Sand, Poorly-Graded Sand	12	32	0.35	125	0.31	3.3	0.18

Table 1: Soil Layer Parameters

4.2.4 Seismic Performance Criteria

Seismic demands on the wall will be based on an equivalent seismic surcharge applied in accordance with the load combinations of Section 4.3 under various seismic event levels, including an Operational Level Event (OLE), a Contingency Level Event (CLE), and a Design Level Event (DE). Wall performance under seismic demands will be characterized based on an allowable deformation in addition to those seen under static conditions. Stability will be based

on an appropriate factor of safety for both short and long-term loading static loading. See Table 2 for the deformation and stability criteria under the loading configurations considered:

Loading Condition	Deformation Based Criteria Description	Allowable Bulkhead Deformation (inches)	Global Stability Factor of Safety (FS) Based Criteria
Short-term static	Moderate bulkhead movement without overstressing of structural components	Less than 18	1.3
Long-term static	Moderate bulkhead movement of structural components	Less than 18	1.5
Seismic: OLE	Very little additional bulkhead movement beyond static loading condition – damage repairable in a short time period and no interruption to wharf operations	Less than 3 (permanent)	N/A
Seismic: CLE	Small additional bulkhead movement beyond static loading condition – damage repairable with minimal interruption to wharf operations	Less than 12 (permanent)	N/A
Seismic: MCE	Moderate additional bulkhead movement beyond static loading condition – moderate damage but economically repairable with some significant interruption to damaged portions of wharf operation	Less than 30 (permanent)	N/A

Table 2: Seismic Performance and Global Stability Criteria

4.3 Load Combinations

The following load combinations will be utilized for the design of the vertical barrier wall and apron. The load cases are based on ASCE 7-16, as applicable.

4.3.1 Load Definitions

- D = Dead Load
- L = Live Loads
- I = Impact Factor (applied to L as appropriate)
- E = Earth Pressure Loads
- R = Creep Loads
- S = Shrinkage Loads

- T = Temperature Loads

4.3.2 Service Load Cases

- 1.0(D + L + E + R + S + T)
- 1.0D + 0.75L + 1.0E
- 1.0D + 1.0L + 1.0E

4.3.3 Factored Load Cases

- 1.2D + 1.6L + 1.6E + 1.2(R + S + T)
- 0.9D + 1.6E + 1.2(R + S + T)
- 1.2D + 1.0L + 1.6E
- 1.2D + 1.6L + 1.6E

4.4 Existing Conditions

4.4.1 Existing Structures

Multiple wharf/pier structures consisting of timber piling, timber decks, and miscellaneous steel fabrications exist within the proposed barrier wall alignment and imported fill footprint. These structures will be demolished, and materials will be removed from the Site and disposed of according to local and state regulations. Existing piling between the bank and new wall alignment will remain in-place and be simply buried beneath the proposed apron, and piling offshore of the barrier wall will be cut two feet below the mudline. Leaving the bulk of the piling in the slope will have a beneficial effect on the overall slope stability and will prevent the need for extracting creosote treated piling through the water column. A conservative estimate on the number of piling required to be cut-off can be developed, if required for permitting. Furthermore, an estimate of the amount of deck demolition could be made, though it would require either record drawings of the wharf/pier structures (which are currently not available), or would require taking as-built measurements from a boat (which has not been performed to date).

4.5 Seismic Analysis

4.5.1 Approach

The wall system will be evaluated for three separate seismic event levels, including the OLE, CLE, and DE. Per ASCE 61-14, the OLE is a seismic event that experiences ground movement with a 50% probability of exceedance in 50 years. The CLE is a seismic event that experiences ground movement with a 10% probability of exceedance in 50 years, and the DE is a seismic event that experiences ground movement with a 2% probability of exceedance in 50 years. The earth loading associated with each event is typically evaluated as a rectangular lateral surcharge load, proportional to the height of the wall. The GeoEngineers, 2016 geotechnical report (GeoEngineers, 2016) for the adjacent LNG facility considers two event levels – an Operation Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE), analogous to the CLE and DE. In

these cases, the seismic surcharge to be applied are defined as 4*(Exposed Wall Height) and 8*(Exposed Wall Height), respectively. When combined with other loading, as appropriate, wall performance will be characterized by its additional movement from static conditions

The GeoEngineers, 2016 report (GeoEngineers, 2016) for the adjacent PSE Liquid Natural Gas (LNG) facility indicates liquefiable soils may be present at the OCC site. During a seismic event, liquefiable soil layers may exhibit a substantial loss in lateral resistance, in addition to generating an additional kinematic soil loading on the wall. This loading may be included as an equivalent soil pressure in a de-coupled analysis and evaluated in a static condition, though still requires a geotechnical evaluation of the resistance required to prevent soil failure. Alternatively, a geotechnical deformation-based analysis may be performed, where soil liquefaction is explicitly modeled in a time-history analysis, considering the interaction between the wall structure and the failing slope. In-lieu of designing the wall to resist loading due to kinematic effects, ground improvement may be provided to stabilize the slope and prevent liquefaction.

4.6 Materials

The following weights and strengths of structural components, pavement, utilities, and other permanent attachments will be used in lieu of specific material test data:

4.6.1 Concrete

The following concrete strengths will be used unless otherwise noted:

- Class A: f'_c = 4,000 psi; miscellaneous cast-in-place concrete. 150 pounds per cubic foot (pcf)

4.6.2 Reinforcement

All reinforcement shall conform to ASTM A615 or A706 Grade 60, f_y = 60 ksi except where noted otherwise.

4.6.3 Sheet Piling and King Piling

- Steel Sheet Piling: ASTM A572, Gr. 50
- Steel King Piling: ASTM A572, Gr. 50
- Rolled shapes: ASTM A992, f_y = 50 ksi unless otherwise noted
- Plate: ASTM A36, f_y = 36 ksi

5.0 Geotechnical Criteria

The geotechnical properties used have been extrapolated to the OCC project site from the information provided in the GeoEngineers, 2016 geotechnical memorandum for the PSE LNG Facility Project. Though this report does include a statement that it is only applicable to the LNG project site, the LNG facility is adjacent to the Occidental project site and it has been agreed with GSH that this is likely sufficient for permit level concept development. However, in order to accurately determine cost for the wall, KPFF recommends engaging a geotechnical engineer to provide data specific to the Occidental site. We are

assuming that the subsurface conditions at the LNG tank site are representative of the conditions at the former OCC properties and shoreline, but the two sites are relatively far apart when considering some geotechnical properties. Furthermore, recent site history such as fills and specific historic use of the property may have an impact on earth pressures particularly in the upper soil stratigraphy.
A site-specific geotechnical investigation and engineering study will be required in the area where the vertical barrier wall is proposed prior to detailed design to characterize the soil physical properties below the former OCC properties and shoreline. The data used may be sufficient for preliminary engineering for permitting, but there is still risk that site specific data may introduce additional project elements or cost that is not anticipated by this data. As mentioned previously, the greatest risk associated with this is the potential need to mitigate slope stability and lateral spreading issues which cannot be predicted by reviewing the data that has been provided.

6.0 Installation and Constructability Considerations

When considering permit implications, the following construction activities will likely need to be addressed.

- Installation of king piles and sheet piles
- Toe-wall installation
- Backfill and compaction

Installation of King Piles and Sheet Piles

The installation of the king piles and the sheet piles will likely be by vibratory installation from a crane mounted on a barge. A drivability analysis will be conducted by a geotechnical engineer to confirm this assumption. Typically, the king piles are installed utilizing a template that is first set into the ground using temporary piling which are extracted after the king piles have been installed. The sheets are interstitially placed between the king piles thereafter.

Toe-Wall Installation

Installation of the toe-wall along the face of the Trident dock will require temporary removal and replacement of their existing fender system in the footprint of the wall. Though the wall will not extend far above the mudline it is necessary to place it behind the existing fender system to avoid damaging vessel hulls if berth clearance is compromised. It is recommended that the existing fender piles (likely relatively shallow) be removed and replaced with either ammoniacal copper zinc arsenate (ACZA)-treated timber piling, or smaller diameter steel pipe piling. After the piling has been removed, the sheet piles can be placed as close to the face of the dock as possible and the fender piles reinstalled.

Backfill and Compaction

Backfill and compaction will may require dewatering and work schedules built around tidal fluctuations to achieve compaction. This aspect of construction will require coordination with a geotechnical engineer to determine the most appropriate backfill material type and gradation to achieve this goal and eliminate the need for dewatering. The project team is currently considering the possibility of adding soil amendments into the fill behind the wall to deal with future migration of High pH into the fill

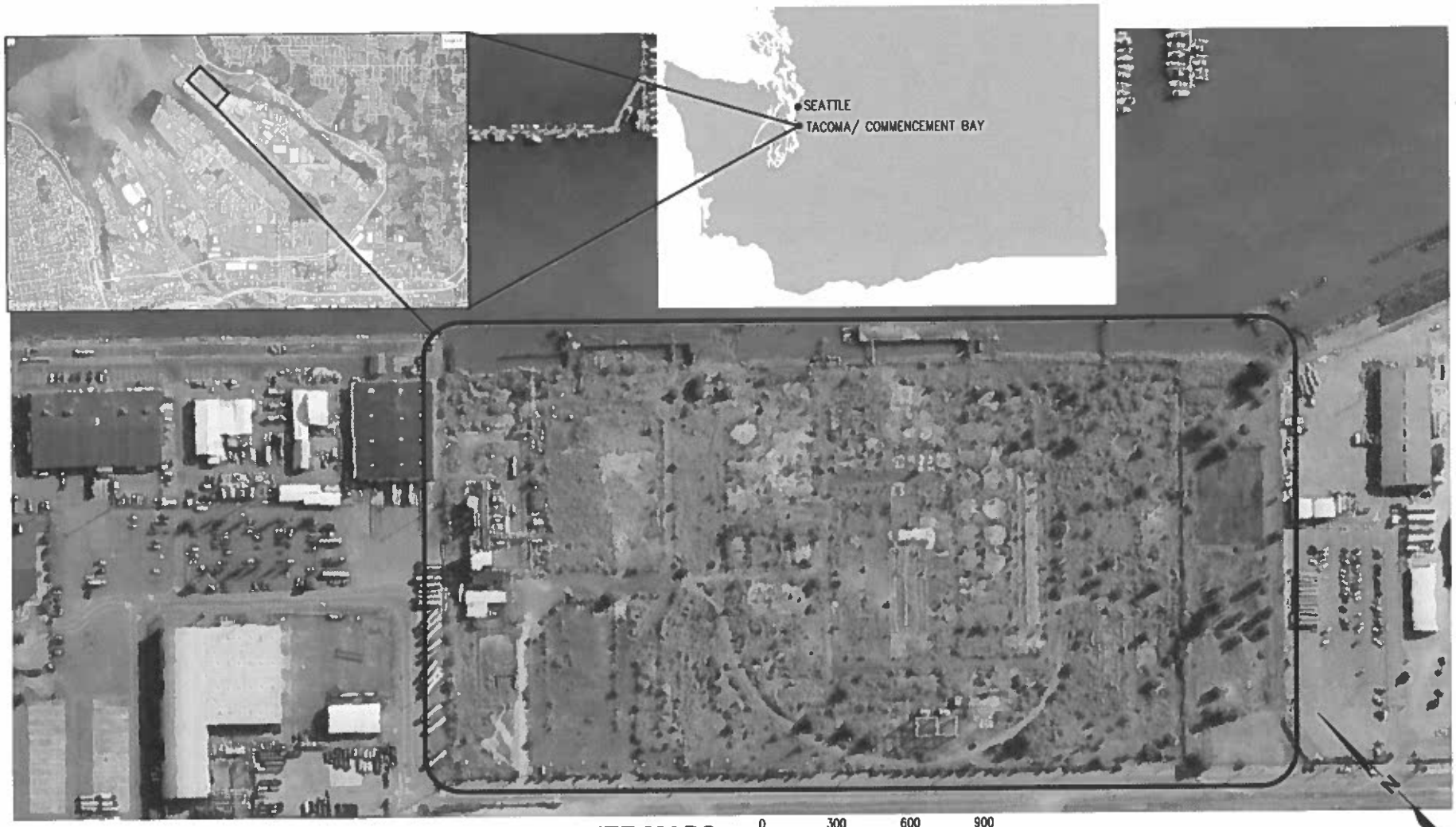
material. It is unlikely that this will have a significant effect on the structural design of the wall, but this will also be confirmed with the project geotechnical engineer when available.

7.0 References

GeoEngineers, 2016. Geotechnical Engineering Services Rev 3-Final, Tacoma LNG Project, Tacoma, Washington, March.

GHD, 2017. Feasibility Study Report, Occidental Chemical Corporation, Tacoma, Washington, January.

Appendix A – JAPRA Drawings



SITE MAPS
SCALE: 1:300

0 300 600 900
SCALE IN FEET

IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE
PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION: 27
TOWNSHIP: 21N
RANGE: 3E
LAT: 47.27898
LONG: -122.40443
DATUM: MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

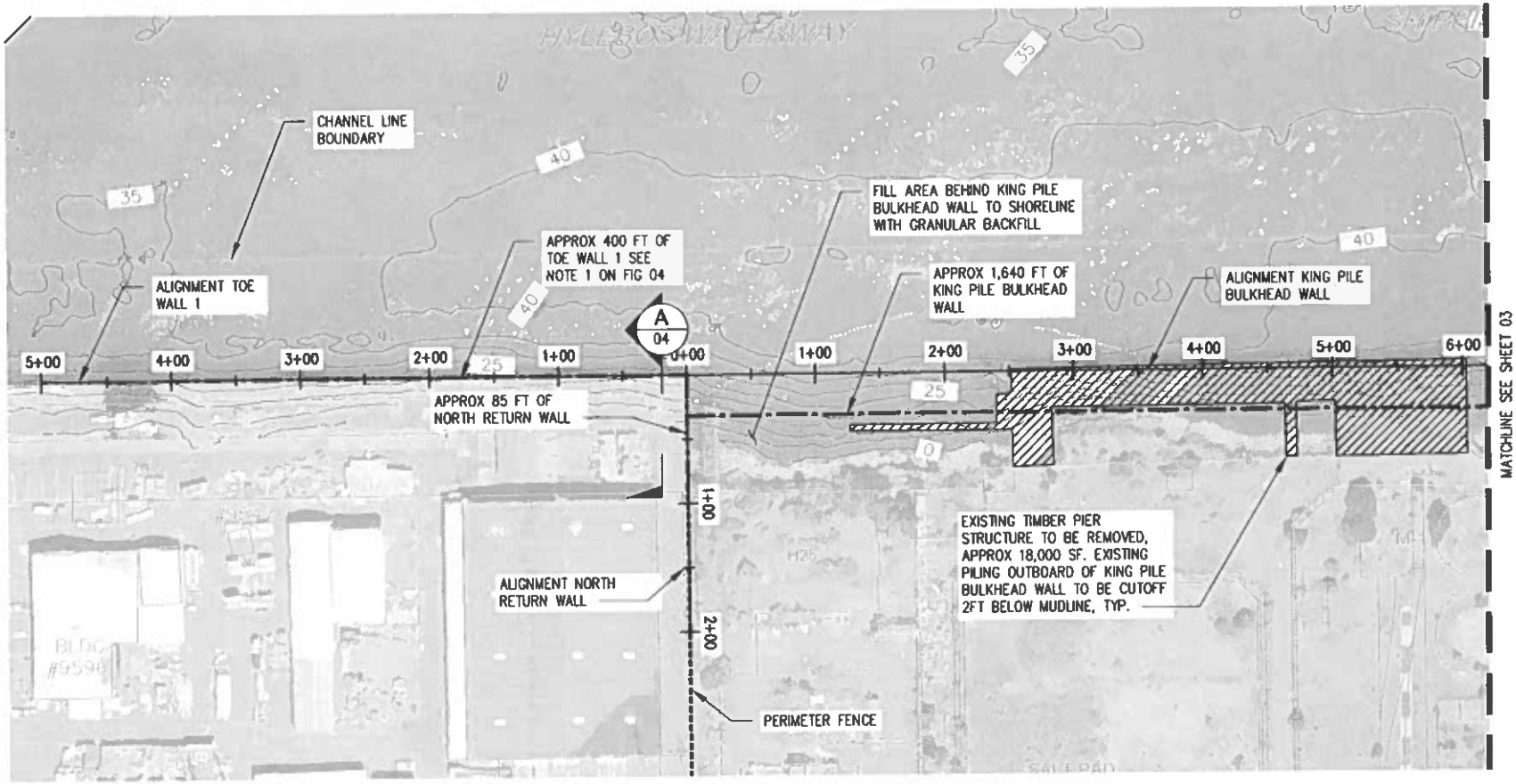
VERTICAL BARRIER WALL

FIGURE 1

SITE LOCATION PLAN

DATE: 12/16/2021

SHEET: 01 OF 06



LEGEND

- EXISTING DOCK STRUCTURE TO BE REMOVED. EXISTING PILES TO REMAIN UNLESS NOTED OTHERWISE
- SHEET PILE WALL
- PROPERTY LINE

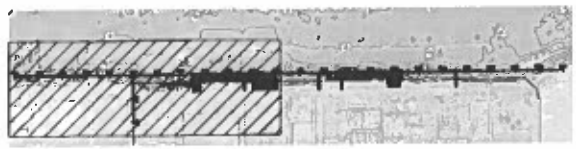
SURVEY SOURCE

UPLAND SURVEY INFORMATION BASED ON SURVEY PERFORMED BY KPFF "KPFF UPLAND SURVEY.dwg" DATED JANUARY 2021

BATHEYMETRIC SURVEY BASED ON CAD FILE PROVIDED BY THE PORT OF TACOMA " 600550-X-SV 5Ft Contours.dwg". SURVEY PERFORMED BY SITTS & HILL ENGINEERS, INC., DATED MAY 2015

PLAN

SCALE: 1/128" = 1'-0"



KEY PLAN

IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE
PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION: 27
TOWNSHIP: 21N
RANGE: 3E
LAT: 47.27898
LONG: -122.40443
DATUM: MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

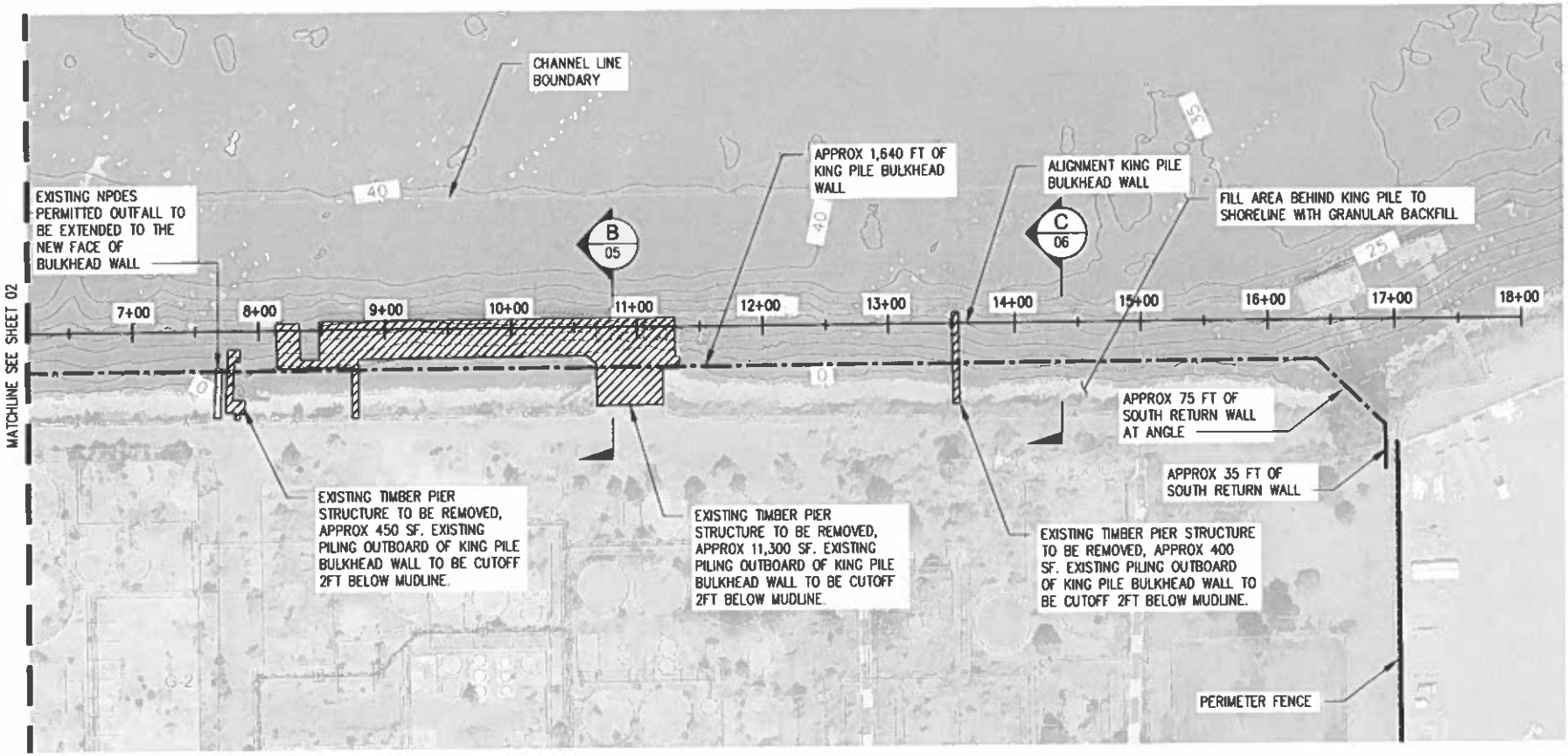
VERTICAL BARRIER WALL

FIGURE 2

CUT-OFF WALL SITE PLAN (1 OF 2)

DATE: 12/16/2021

SHEET: 02 OF 06



LEGEND

- EXISTING DOCK STRUCTURE TO BE REMOVED. EXISTING PILES TO REMAIN UNLESS NOTED OTHERWISE
- SHEET PILE WALL
- PROPERTY LINE

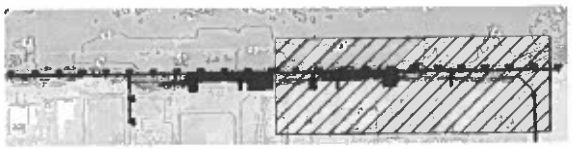
SURVEY SOURCE

UPLAND SURVEY INFORMATION BASED ON SURVEY PERFORMED BY KPFF "KPFF UPLAND SURVEY.dwg" DATED JANUARY 2021

BATHEYMETRIC SURVEY BASED ON CAD FILE PROVIDED BY THE PORT OF TACOMA " 600550-X-SV 5Ft Contours.dwg". SURVEY PERFORMED BY SITTS & HILL ENGINEERS, INC., DATED MAY 2015

PLAN

SCALE: 1/128" = 1'-0"



KEY PLAN

IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION: 27
TOWNSHIP: 21N
RANGE: 3E
LAT: 47.27898
LONG: -122.40443
DATUM: MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

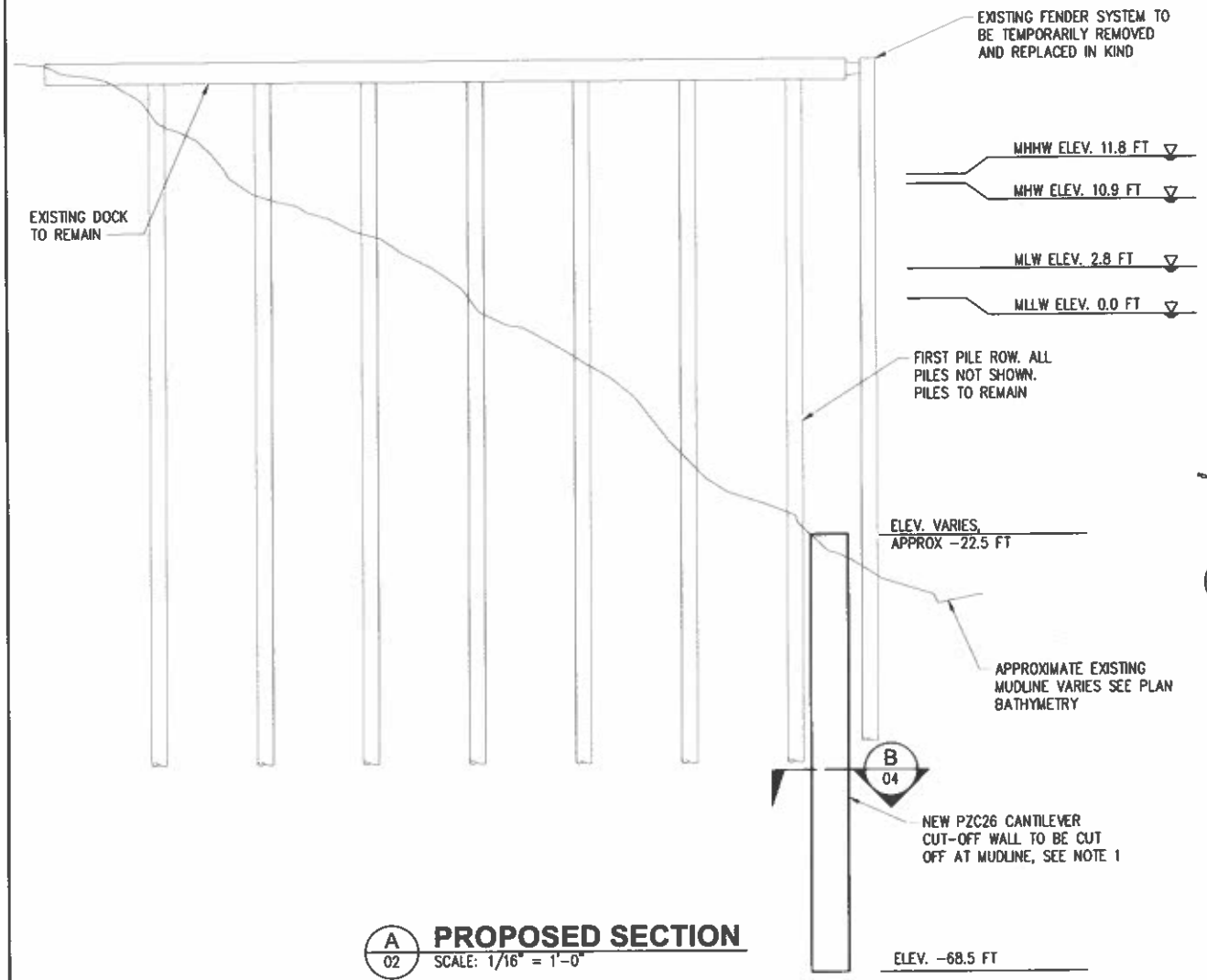
VERTICAL BARRIER WALL

FIGURE 3

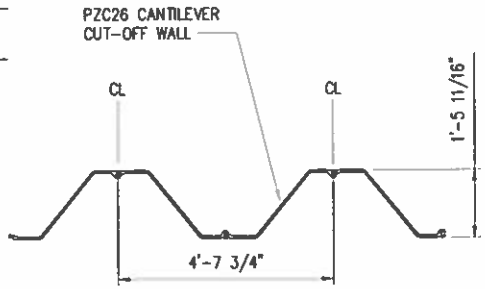
CUT-OFF WALL SITE PLAN (2 OF 2)

DATE: 12/16/2021

SHEET: 03 OF 06



A 02 **PROPOSED SECTION**
SCALE: 1/16" = 1'-0"



B 04 **PROPOSED SECTION**
SCALE: 1/4" = 1'-0"

SURFACE AREA OF FACE PER FT OF SYSTEM WIDTH = 46SF (APPROX.)

NOTES:
1. THIS PORTION OF THE WALL WILL BE REQUIRED IF MODELING DETERMINES THE WALL IS NEEDED TO ASSIST WITH HYDRAULIC CONTAINMENT. THE WALL EXTENSION WILL NOT BE NEEDED IF GROUNDWATER PUMPING IS ADEQUATE FOR HYDRAULIC CONTAINMENT.

IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE
PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION: 27
TOWNSHIP: 21N
RANGE: 3E
LAT: 47.27898
LONG: -122.40443
DATUM: MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

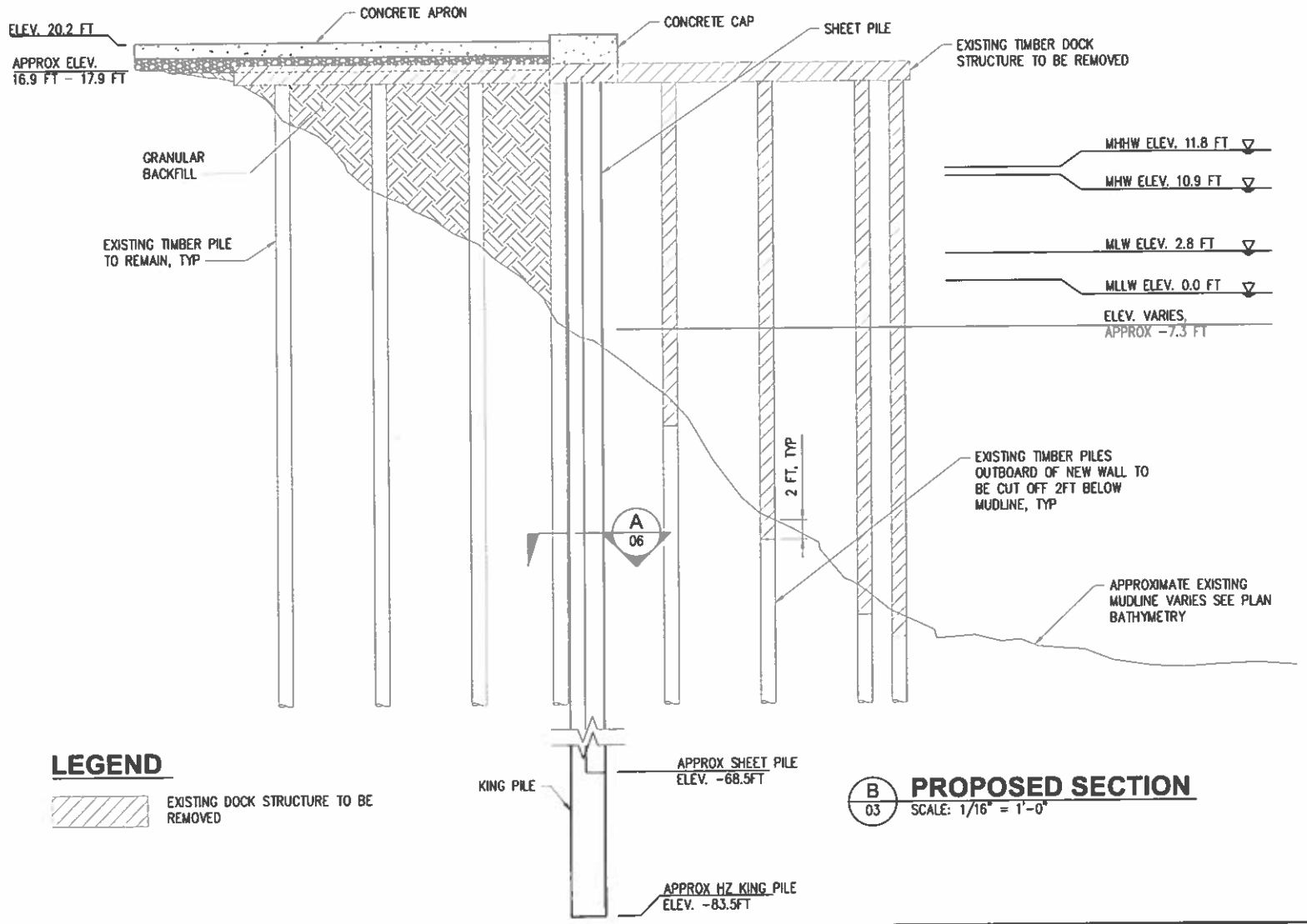
VERTICAL BARRIER WALL

FIGURE 4

PROPOSED SECTION AT TRIDENT DOCK

DATE: 12/16/2021

SHEET: 04 OF 06



IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION:	27	**LAT:**	47.27898
TOWNSHIP:	21N	**LONG:**	–122.40443
RANGE:	3E	**DATUM:**	MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

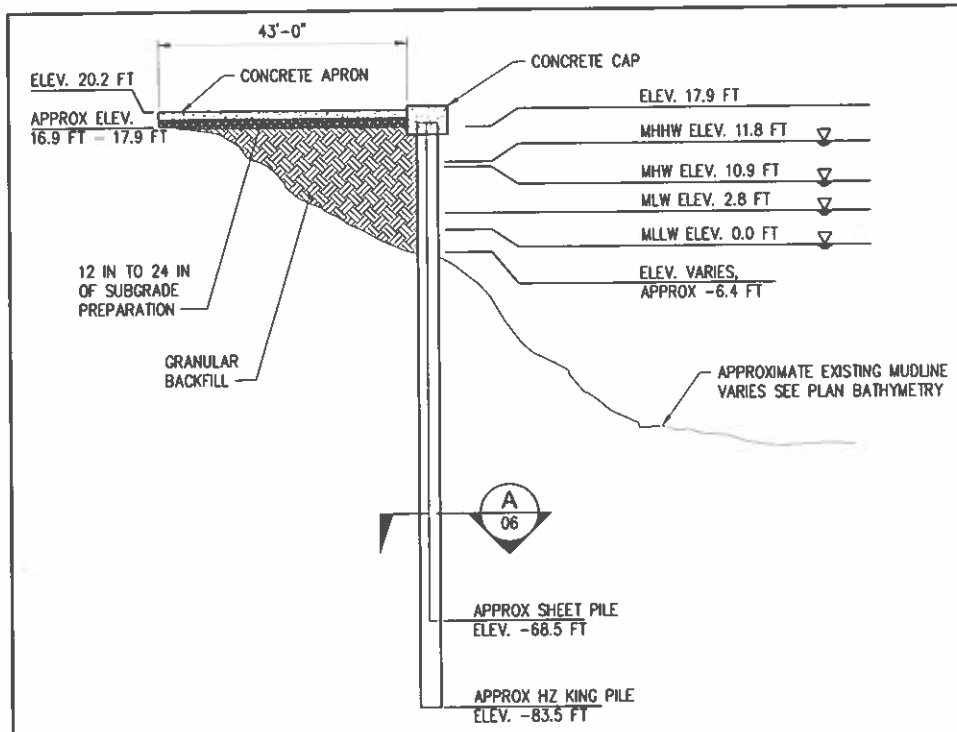
VERTICAL BARRIER WALL

FIGURE 5

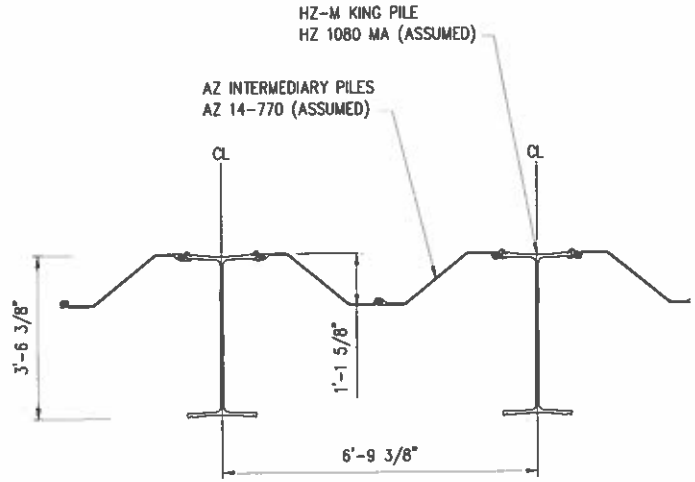
PROPOSED SECTION AT EXISTING WHARF TO BE REMOVED

DATE: 12/16/2021

SHEET: 05 OF 06



C/03 **PROPOSED SECTION**
SCALE: 1/32" = 1'-0"



A/06 **PROPOSED SECTION**
SCALE: 1/4" = 1'-0"

SURFACE AREA OF FACE PER FT OF
SYSTEM WIDTH = 85SF (APPROX.)

IN: HYLEBOS WATERWAY
AT: 605 AND 709 ALEXANDER AVENUE
CITY: TACOMA **COUNTY:** PIERCE **STATE:** WA
PARCEL #: 2275200050, 2275200040, 2275200560, 2275200510
ADJACENT PROPERTY OWNERS:
PORT OF TACOMA (TRIDENT)
DEPARTMENT OF NATURAL RESOURCES/ WASHINGTON STATE
PORT OF TACOMA (PSE/LNG)
APPLICATION BY: GLENN SPRINGS HOLDINGS, INC.
USACE REF NO: TBD

PURPOSE: SHEET PILE VERTICAL BARRIER WALL FOR CONTAINMENT OF CONTAMINATED GROUNDWATER

SECTION: 27
TOWNSHIP: 21N
RANGE: 3E
LAT: 47.27898
LONG: -122.40443
DATUM: MEAN LOWER LOW WATER

US ARMY CORPS OF ENGINEERS PERMIT

VERTICAL BARRIER WALL

FIGURE 6

PROPOSED SECTION AT TYPICAL SLOPE

DATE: 12/16/2021

SHEET: 06 OF 06

Appendix C
Cultural Resource Report

Cultural Resource Consultants

Technical Memo 2011C-1

DATE: January 7, 2020

TO: Keith Kroeger
Geosyntec Consultants

FROM: Margaret Berger, Principal Investigator

RE: Cultural Resources Assessment for the Occidental Chemical Corporation Barrier Wall Project, Tacoma, Pierce County, Washington

The attached report contains our final cultural resources assessment for the Occidental Chemical Corporation Barrier Wall Project, Tacoma, Pierce County, Washington. Background research conducted by Cultural Resource Consultants, LLC did not result in the identification of historic structures or archaeological sites at the project location. Proposed project activities are unlikely to encounter archaeological materials. No additional cultural resources investigation is recommended at this time. Please contact our office if you have any questions about our findings and/or recommendations.

P.O. Box 4159, Seattle, WA 98194
Phone 206 855-9020 Email info@crcwa.com

CULTURAL RESOURCES REPORT COVER SHEET

DAHP Project Number: 2021-01-00101

Author: Ian Kretzler

Title of Report: Cultural Resources Assessment for the Occidental Chemical Corporation Barrier Wall Project, Tacoma, Pierce County, Washington

Date of Report: January 7, 2020

County(ies): Pierce Sections: 27 Township: 21 N Range: 03 E

Quad: Tacoma North, WA Acres: ~1

PDF of report submitted (REQUIRED) ☒ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☒ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes ☒ No

TCP(s) found? ☐ Yes ☒ No

Replace a draft? ☐ Yes ☒ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ☒ No

Were Human Remains Found? ☐ Yes DAHP Case # ☒ No

DAHP Archaeological Site #:

_____
_____
_____
_____
_____
_____
_____
_____

- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.

Cultural Resources Assessment for the
Occidental Chemical Corporation Barrier Wall Project,
Tacoma, Pierce County, Washington

Table of Contents

Executive Summary **1**
1.0 Administrative Data **1**
1.2 Research Design 3
1.3 Project Description 3
2.0 Background Research **5**
2.1 Overview 5
2.2 Environmental Context 6
2.3 Paleoclimate and Vegetation 8
2.4 Archaeological Context 9
2.5 Native Peoples 10
2.5 Nineteenth and Twentieth Century History 11
2.6 Historical Records Search 14
2.7 Cultural Resources Database Review 30
3.0 Archaeological Expectations **35**
3.1 Archaeological Predictive Models 35
3.2 Archaeological Expectations 35
4.0 Conclusions, Findings, and Recommendations **36**
5.0 Limitations of this Assessment **36**
6.0 References **37**
Appendix A. Assessment Correspondence **48**
Appendix B. Inadvertent Discovery Protocol **50**

Executive Summary

This report contains a cultural resources assessment for the Occidental Chemical Corporation Barrier Wall Project, Tacoma, Pierce County, Washington. Geosyntec Consultants requested that a cultural resources assessment be completed ahead of proposed construction of a barrier wall adjacent to Occidental Chemical Corporation (OCC) property at the Port of Tacoma. Background research conducted by Cultural Resource Consultants, LLC (CRC) did not result in the identification of historic structures or archaeological sites at the project location. The project will take place offshore of the historical Tacoma tidelands in an area that has been impacted by port construction and dredging of the Hylebos Waterway. Archaeological materials are therefore unlikely to be encountered during project activities. No additional cultural resources investigation is recommended at this time. If project activities result in the discovery of archaeological materials, project staff should follow the inadvertent discovery protocol described below (Appendix B).

1.0 Administrative Data

Report Title: Cultural Resources Assessment for the Occidental Chemical Corporation Barrier Wall, Tacoma, Pierce County, Washington.

Author: Ian Kretzler.

Report Date: January 7, 2020.

Location: The project is located in the Hylebos Waterway adjacent to OCC property at 605 and 709 Alexander Avenue (Pierce County Tax Parcels 2275200050, 2275200040, 2275200560, 2275200510, and 2275200520).

Legal Description: The legal description for the project is the NE¼ and SE¼ of Section 27 in Township 21 North, Range 3 East, Willamette Meridian.

USGS 7.5' Topographic Map: Tacoma North, WA (2020) (Figure 1).

Total Area Involved: The project location encompasses approximately 1 acre.

Regulatory Nexus: Section 106 of the National Historic Preservation Act (NHPA).

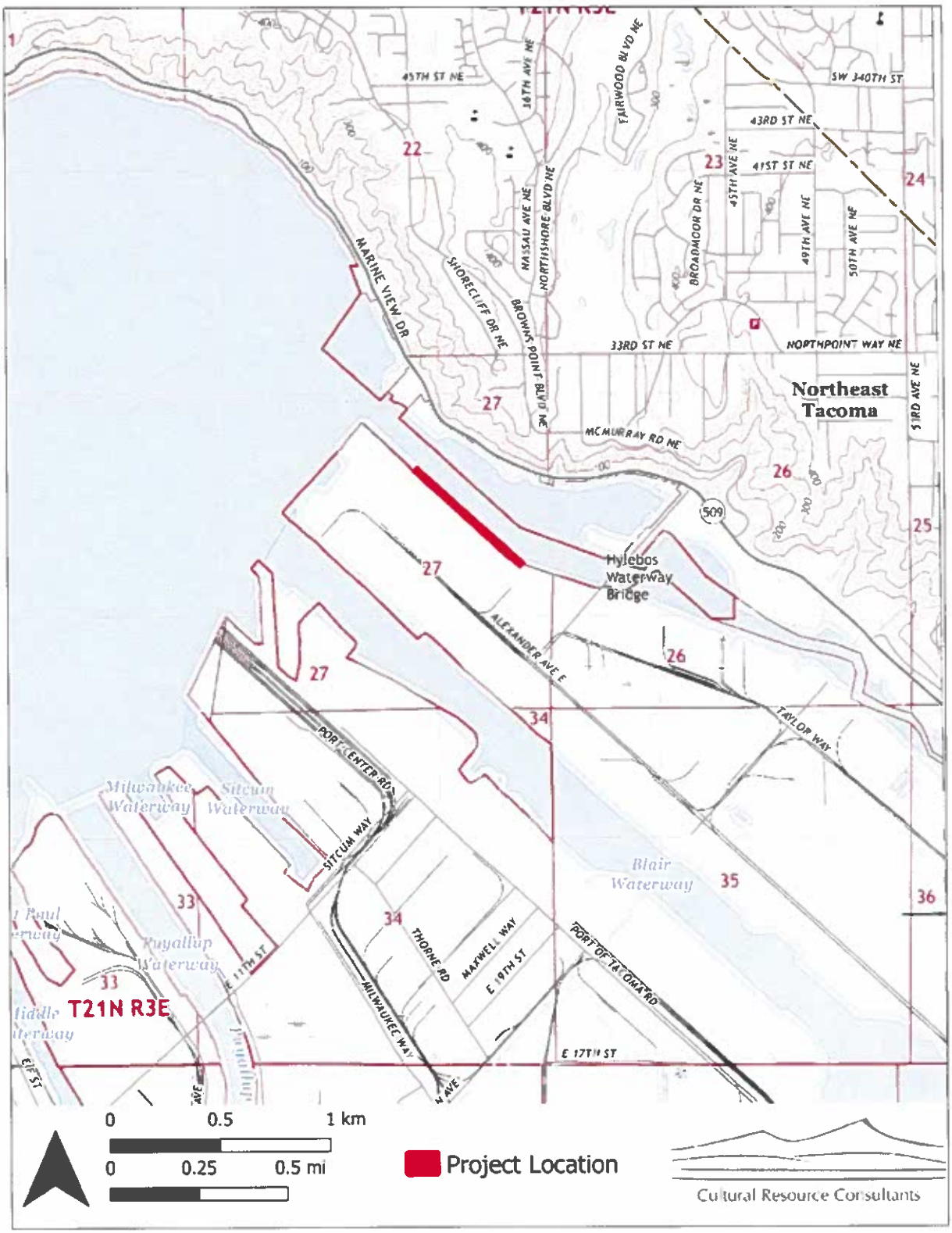


Figure 1. Project location on the 7.5' North Tacoma, Washington, topographic quadrangle (USGS 2020).

1.2 Research Design

This cultural resources assessment was completed as a component of environmental review for the Occidental Chemical Corporation Barrier Wall Project. It sought to prevent adverse impacts to cultural resources during ground disturbing activities by evaluating whether archaeological sites or historic structures exist within the boundaries of the project. CRC's work was intended, in part, to assist in addressing state regulations pertaining to the identification and protection of cultural resources. The Archaeological Sites and Resources Act (RCW 27.53) prohibits knowingly disturbing archaeological sites without a permit from DAHP; the Indian Graves and Records Act (RCW 27.44) prohibits knowingly disturbing Native American or historic graves; and the Abandoned and Historic Cemeteries and Historic Graves Act (RCW 68.60) calls for the protection and preservation of historic era cemeteries and graves.

The project is completing a Joint Aquatic Resources Permit Application (JARPA) to be submitted to the U.S. Army Corps of Engineers (USACE). The project is therefore considered a federal undertaking and must comply with Section 106 of the NHPA. Under Section 106, agencies involved in a federal undertaking must consider the undertaking's potential effects to historic properties within a defined area of potential effects (APE) (36 CFR 800.16(l)(1)). Historic properties are defined as buildings, districts, sites, structures, or objects, typically more than 50 years old, that are deemed eligible for listing on the National Register of Historic Places (NRHP). The Section 106 process involves identifying and inventorying historic properties within the APE and evaluating whether those properties satisfy NRHP eligibility criteria and integrity considerations. If NRHP-eligible historic properties are identified within the APE, potential adverse effects to historic properties must be assessed and a resolution of adverse effects recommended.

CRC's investigation consisted of (1) review of project information and correspondence provided by the project proponent and (2) examination of local archival, environmental, and archaeological datasets. On December 7, 2020, CRC contacted cultural resources staff at the Puyallup Tribe of Indians on a technical staff to technical staff basis to inquire about project-related information or concerns (Appendix A). Tribal correspondence was not intended to be or replace formal government-to-government consultation. This assessment considered comments provided by Tribes, results of previous cultural resources studies completed at the Port of Tacoma, the magnitude and nature of the undertaking, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties at the project location, as well as other applicable laws, standards, and guidelines (per 36CFR800.4 (b)(1)) (DAHP 2020b).

1.3 Project Description

The Occidental Chemical Corporation Barrier Wall Project aims to install a barrier wall structure within the Hylebos Waterway adjacent to OCC properties in the Port of Tacoma (Figure 2). The

barrier wall will measure approximately 2,200 linear feet and extend 78 feet deep in the marine channel of the Hylebos Waterway. The purpose of the wall is to eliminate horizontal high-pH discharge from seeps and shallow groundwater into the waterway; limit transient tidal effects on shallow groundwater, thereby resulting in less contaminant flushing and more consistent performance of groundwater extraction; and contain contaminated embankments. For the purposes of this report, the area of interest for cultural resources (hereafter, "the project location") is understood to be the area described above and depicted in Figures 1 – 3.

Figure 2. Aerial imagery of the project location and proposed barrier wall. Image courtesy of Geosyntec Consultants.

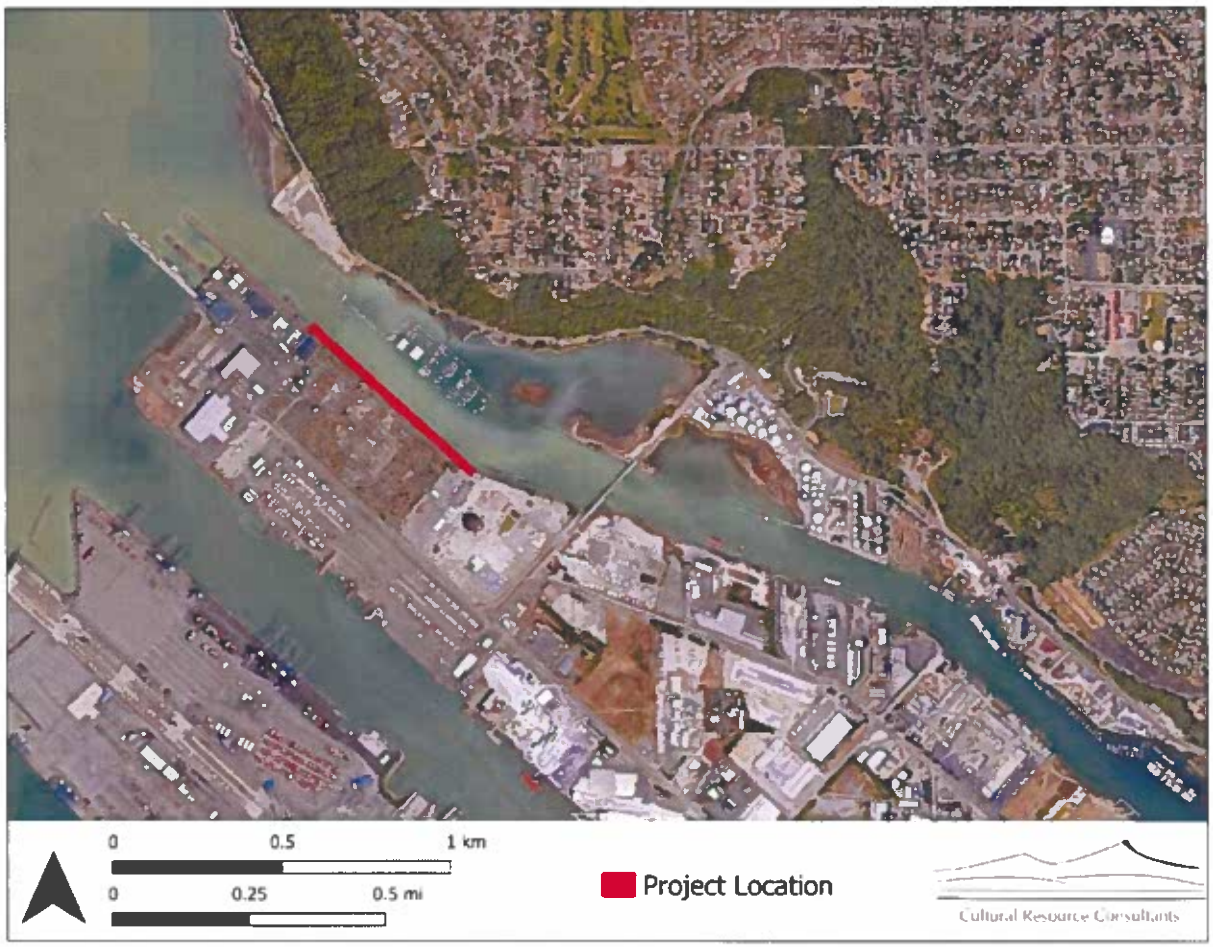


Figure 3. Aerial imagery of the project location.

2.0 Background Research

2.1 Overview

Background research was conducted in December 2020 and January 2021.

Recorded Cultural Resources Present: Yes [ ] No [x]
According to the Washington Information System for Architectural and Archaeological Records Data (WISAARD), no archaeological sites or historic structures (i.e. more than 50 years old) have been recorded at the project location (DAHP 2020a).

Context Overview: The following context overview summarizes environmental, historical, and archaeological information contained in local cultural resource reports; archaeological and historical data from DAHP and WISAARD; ethnographic resources; geological and soils surveys; historical maps and documents from the Bureau of Land Management (BLM) United States Surveyor General Land Status & Cadastral Survey Records database; HistoryLink; Historic Map Works; HistoricAerials; University of Washington's Digital Collection;

Washington State University's Early Washington Maps Collection; and CRC's library. This report's discussion of geology, archaeology, and history incorporates context information from CRC's previous work at the Port of Tacoma (e.g. Berger 2010; Berger et al. 2008, 2015; Chambers 2007).

In this and subsequent sections, radiocarbon dates and age ranges based on those dates are presented in calibrated calendrical years ago (cal BP). This notation indicates that the radiocarbon date has been corrected using current methodologies. Other age estimates are given as years BP (before present).

2.2 Environmental Context

Overview: The proposed barrier wall will be installed in the Hylebos Waterway, an inlet of Commencement Bay and artificial channel of the Port of Tacoma, adjacent to OCC properties on the artificial Blair-Hylebos peninsula. The waterway measures 3 miles long and 200 feet wide. It extends southeast from Commencement Bay to the mouths of Hylebos and Wapato Creek. The main channel of Hylebos Creek originates near North Lake 5 miles to the northeast, flows south to meet West Hylebos Creek in Milton, and continues south and west to the Hylebos Waterway. Wapato Creek originates near State Route (SR) 161 6.5 miles to the southeast and flows north and west to the Hylebos Waterway. Most of the stream is channelized. The Blair Waterway is located 0.4 mile southwest of the project, the mouth of the Puyallup River 1.3 miles to the southwest, downtown Tacoma 2.5 miles to the southwest, and Surprise Lake 5.2 miles to the southeast. The project is situated in the Eastern Puget Riverine Lowlands ecoregion. This area is composed of floodplains and terraces that, historically, were dominated by western red cedar and western hemlock forest and wetlands. Since the arrival of Euro-American settlers in the mid-nineteenth century, many of these habitats have been replaced by pastures, cropland, and urban centers (Pater et al. 1998).

Geomorphology: The landscape of northwestern Washington is a product of crustal deformation initiated by the Cascadia subduction zone; repeated glacial scouring and deposition, most recently during the Pleistocene; landslides, erosion, and deposition; and Holocene human activity. The project is situated within the Puget Trough physiographic province, which extends from the Canadian border to the Willamette Valley in Oregon (Franklin and Dyrness 1973). The northern half of this province encompasses the Puget Lowlands. During the late Pleistocene (110,000 to 12,000 years BP), much of the Pacific Northwest was scoured by repeated advances and retreats of the Cordilleran Ice Sheet (Kruckeberg 1991; Thorson 1980; Troost and Booth 2008). The Puget Lowlands were formed by these glacial events, as moving ice up to thousands of feet thick sculpted a series of north-south trending valleys within a wide basin between the Coast and Cascade Ranges (McKee 1972).

The ice sheet's Puget Lobe most recently advanced during the Vashon Stade of the Fraser glaciation, approximately 17,000 years BP. It reached Seattle 14,500 years BP and achieved its maximum extent near Olympia 14,000 years BP. The onset of climatic warming, an event that signaled the transition to the Holocene, caused the ice sheet retreat north (Booth et al. 2003). As the glacier receded, meltwater became impounded behind the ice, forming a series of south-draining proglacial lakes (Booth et al. 2012; Thorson 1981). These lakes eventually merged into Lake Bretz, which at its maximum extended from the southern margin of Whidbey Island to Olympia. As the ice sheet retreated north, new spillways emerged, carrying meltwater into the Strait of Juan de Fuca and reintroducing marine waters into what is now Puget Sound (Bretz 1913; Thorson 1981, 1989; Waitt and Thorson 1983). Till, outwash, and ice-contact sediments were deposited throughout the region during glacial retreat and meltwater recession (Booth 1994). The Puyallup Valley is relict meltwater channel that formed in outwash deposits as the glacier retreated from the area between Orting and Puyallup (Dragovich et al. 1994:9).

Isostatic rebound, global sea level change, and tectonic activity shaped the Puget Lowlands during the Holocene. The retreat of the glaciers caused land formerly covered by ice to uplift. The rate of uplift exceeded global sea level rise, leading to lower sea levels. Rebound was largely complete 1000 years after glacial retreat (James et al. 2000; Thorson 1989; Troost and Booth 2008). Global sea levels continued to rise, however, and sea levels in southern and central Puget Sound rose rapidly between 8000 and 5000 years BP. The rate of rise slowed after this point, and present-day sea levels were reached between 5000 and 1000 years BP (Eronen et al. 1987). Stratigraphic markers of subduction-thrust earthquakes and associated uplift, subsidence, and deformation have been observed at multiple locations on the Washington coast and around Puget Sound. Approximately 1100 years BP, an earthquake originating at the Seattle fault zone dramatically reshaped the local landscape. Areas north of the fault zone subsided up to 3 feet; areas south of the fault were uplifted up to 20 feet (Atwater and Moore 1992; Bucknam et al. 1992; Thorson 1989). Accounts of this and other seismic events are preserved in Tribes' oral histories (Ludwin et al. 2005).

Approximately 5600 years BP, a massive lahar known as the Osceola Mudflow deposited 3.8 cubic kilometers of sediment from the summit of Mount Rainier throughout the drainages of the White, Green, and Puyallup Rivers. The mudflow spread across more than 200 square kilometers (77 square miles) north and northeast of the mountain and buried land under up to 100 meters (330 feet) of sediment. Mudflow debris filled the Green, Auburn, and Puyallup deltas, which at the time entered the Duwamish and Puyallup Embayments, which together formed an arm of Puget Sound extending from Elliott Bay to Puyallup. Commencement Bay is a relic of this former embayment (Dragovich et al. 1994; Scott and Vallance 1995; Vallance and Scott 1997). The tidelands at the mouth of the Puyallup River on which the Port of Tacoma sits developed in the centuries that followed. Weaver (2003:6) estimates the tidelands emerged over the last 1,200 years BP and possibly more recently.

Over the last 150 years, industrial development, logging, and agricultural practices dramatically altered the estuarine and wetlands environments of the Puyallup delta and surrounding uplands. Large piers were constructed across the tidelands at Commencement Bay (Downing 1983:28). Natural delta progradation processes were interrupted by extensive dredging and filling (Bortelson et al. 1980). Former tide flats, marshes, and islands were capped with imported fill to create additional land suitable for development. Hylebos Creek was straightened, widened, and dredged for construction of the Hylebos Waterway. Dredged materials removed from the rivers and adjoining wetlands were used as fill to elevate adjacent areas above stream channels, marshes, and waterways (Berger 2010).

Mapped Surface Geologic Units: One surface geologic unit has been mapped at the project location: artificial fill (Holocene). This geologic unit consists of modified land and engineered and unengineered fill that has overlaid or disturbed native sediments (Schuster et al. 2015; WA DNR 2020).

Mapped Soil Units: No soil units have been mapped at the project location (USCA NRCS 2020).

2.3 Paleoclimate and Vegetation

The paleoclimate of the Pacific Northwest during the late Pleistocene and Holocene is defined by four periods, which exhibit general trends based on variations in temperature and moisture (Kopperl et al. 2016:37-38).

- 17,000 to 13,000 cal BP: the region was much cooler and drier compared to the present.
- 13,000 to 7000 cal BP: the retreat of glacial ice and increased solar radiation led to higher temperatures, less precipitation, colder winters, and more severe summer droughts compared to the present.
- 7000 to 5000 cal BP: cooler, moister conditions returned to the region, with temperature ranges similar to the present. The current maritime climate regime of the Puget Sound region was fully established by the end of this period.
- 5000 cal BP to present: climatic conditions have undergone short-term fluctuations such as the Little Ice Age (500 to 100 cal BP) and the Medieval Climatic Anomaly (1100 to 700 cal BP).

Regional fluctuations in temperature and moisture have supported different plant communities through time. Following glacial recession and meltwater subsidence, landforms stabilized and vegetation began to return. Newly exposed soils were first colonized by lodgepole pine (*Pinus contorta*), Sitka spruce (*Picea sitchensis*), and western hemlock (*Tsuga heterophylla*). As temperatures rose between 12,000 and 10,000 cal BP, trees advanced to higher elevations while

lowland forests became dominated by Douglas fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), and bracken fern (*Pteridium aquilinum*). These patterns continued into the early and middle Holocene. Present-day vegetation communities emerged after 6000 cal BP. Western red cedar (*Thuja plicata*) and western hemlock became important components of mid-low elevation forests while Alaska cedar (*Cupressus nootkatensis*), mountain hemlock (*Tsuga mertensiana*), and silver fir (*Abies amabilis*) emerged at cooler, moister higher elevations.

Today, the project location is situated within western Washington's western hemlock vegetation zone, which extends south from British Columbia through the Olympic Peninsula, Coast Ranges, Puget Trough, and Cascade physiographic provinces. The zone's wet, mild, maritime climate supports diverse plant taxa. In the Puget Lowlands, vegetation communities commonly consist of western hemlock, western red cedar, Douglas fir, vine maple (*Acer circinatum*), salal (*Gaultheria shallon*), Oregon grape (*Mahonia aquifolium*), ocean spray (*Holodiscus discolor*), ferns (especially *Pteridium aquilinum*), blackberry (*Rubus* sp.), and huckleberry (*Vaccinium* sp.) (Franklin and Dyrness 1973:72-74).

2.4 Archaeological Context

Thousands of years of human occupation in the Puget Sound region have been summarized in a number of archaeological, ethnographic, and historical investigations over the past several decades. These studies provide regional context for evaluating the potential of archaeological deposits at the project location (e.g. Ames and Maschner 1999; Carlson 1990; Greengo 1983; Kopperl et al. 2016; Larson and Lewarch 1995; Nelson 1990).

Human history in western Washington extends to at least 14,000 cal BP, a period corresponding with the most recent retreat of glacial ice in the region. Over the next six millennia, Native peoples lived in small, mobile groups that moved seasonally between productive hunting, fishing, and gathering locations. Archaeological evidence dating to the early part of this period is limited primarily to isolated projectile point finds. Native peoples' presence on the landscape 11,000 cal BP is evidenced by site 45KI839 in Redmond, which contained stone artifacts situated at the interface of glacial and peat deposits and buried under thick alluvium. It is western Washington's only well-stratified, excavated site from the late Pleistocene-Holocene transition (Kopperl et al. 2015).

Middle and late Holocene sites are better represented in Washington's archaeological record due to the stabilization of sea levels and, in recent millennia, regional population increases. During the middle Holocene, roughly 8000 to 3000 cal BP, Native peoples established a broader range of residential and resource procurement site types and sizes. Harvest of and occupation near littoral resources—activities that often produced sizable shell middens—emerged approximately 4500 cal BP. The expansion in site type and size during this period coincided with decreased mobility as groups developed specialized adaptations to local environments. Early components

of the West Point Site in Seattle (Larson and Lewarch 1995) date to this period. The site contained large quantities of faunal remains, stone projectile points, and shell and stone beads. The presence of fish, shellfish, bird, and mammal remains points to year-round utilization as Native peoples took advantage of the site's sheltered bluff and abundant nearby resources.

Middle Holocene patterns intensified during the late Holocene. Beginning around 3000 cal BP, the archaeological record is characterized by diverse site and artifact types located in a range of environments. Settlement patterns revolved around semi-permanent winter villages containing one or more families living in large, shed- and gable-roofed cedar plank houses. Resource harvest relied on landscape management practices such as prescribed burning, management of shellfish beds, and tending of important plants; fish weirs and other mass capture technologies; and food drying and storage. Notable late Holocene archaeological sites include Ozette near Neah Bay (Samuels 1994), Cathlapotle along the Columbia River near Ridgefield (Ames et al. 1999), late components of the West Point Site (Larson and Lewarch 1995), and Old Man House near Suquamish (Schalk and Rhode 1985).

The arrival of Euro-Americans in the Pacific Northwest in the late eighteenth century marked the beginning of the colonial period. The establishment of the Pacific fur trade and later the transformation of Washington and Oregon into U.S. settler colonies upended regional demography and ecology. Native peoples grappled with the impacts of foreign diseases, the introduction of new plants and animals, and land seizure and removal policies. Amid these changes, Native peoples acquired new materials and adapted settlement and subsistence practices to emerging economic opportunities and settler incursion (e.g. Wilson 2018).

2.5 Native Peoples

The project is located within the ancestral homelands of Southern Lushootseed-speaking Puyallup peoples, whose territory stretched from the Gig Harbor Peninsula and Vashon Island up the Puyallup and Carbon Rivers to Mount Rainier (Haeberlin and Gunther 1930; Smith 1940; Spier 1936:42). During the nineteenth century, and for centuries prior, Puyallup peoples and their neighbors followed a seasonal round structured by shifting resource availability. During the spring and summer, families travelled across the landscape, primarily via canoe, between seasonal camps situated in a variety of environmental zones. From these camps, they harvested salmon, shellfish, and other aquatic resources, hunted terrestrial mammals such as elk and deer, and collected berries, roots, and other plants. Many of these resources would have been present near the project along Hylebos and Wapato Creeks and the tidelands at Commencement Bay. Resources were dried and stored for consumption during the leaner winter months or processed for manufacture of clothing, medicines, baskets, and tools. As summer turned to winter, families relocated to large cedar planks houses in villages situated along waterways. Winter was a time for ceremonial activities and creating and strengthening social relations with members of other villages via trade, marriage, and cultural exchange. Knowledge of these and other lifeways

continues to be passed down among contemporary Native peoples. Today, descendants of the original inhabitants of Commencement Bay are members of the Puyallup Tribe of Indians (Puyallup Tribe of Indians 2020; Ruby et al. 2010; Suttles and Lane 1990).

The Commencement Bay tidelands area part of a storied landscape. The names given to rivers, mountains, food gathering areas, and other geographic markers encapsulate the creation and ordering of the world, stories for proper behavior toward human and non-human relations, and Native peoples' millennia-old and ongoing histories. The small sample of place names documented by ethnographers since the middle decades of the nineteenth century speaks to these connections and the nature of archaeological materials that may be encountered during this assessment.

Smith (1940:8-10) recorded the locations of 34 historical Puyallup and Nisqually villages across southern Puget Sound. The villages of Puyallup groups were distributed along the Puyallup River and its tributaries. Four villages, whose residents maintained close connections, were located at the mouth of the Puyallup in and around present-day downtown Tacoma. These villages—known as spwiyä'lαphαbc, twádɛbcαb, cátcqαd, and kalkálαqᵘ—were located approximately 2.5 miles southeast of the project. The name spwiyä'lαphαbc is derived from pwiyä'lαp, the name for the stretch of the Puyallup River from its mouth to the point where it meets the Carbon River. This name came to be used to refer to all Native groups living within the Puyallup watershed. Another village, known as sháxtl'αbc, was located near the project along the present-day Hylebos Waterway and near the historical mouth of Hylebos Creek. This location boasted ample salmon runs.

Waterman (2001:247-250) recorded several named places around Commencement Bay. Asxwop, or "where seals haul out," refers to a shallow inlet between the mouth of the Puyallup River and Wapato Creek. The portion of the tidelands between Hylebos and Wapato Creeks is Kalka'laqᵘ, or "place around which the water passes." Another portion of the tidelands is LtcElEb. All three areas have been covered or modified by the Port of Tacoma. Wapato Creek is known as Qa'1qalEqʷ, or "making many turns." Wapato also refers to a wetland plant with small starchy tubers that is an important first food for Native peoples. The name for Hylebos Creek is XaxtL!, or "brushy." Browns Point on the northern edge of Commencement Bay is known as Tcaia'lqo, or "hidden water." The name is derived from stcats, meaning "hidden," and referred to a spring concealed in a stand of alders along the shoreline.

2.5 Nineteenth and Twentieth Century History

During the early nineteenth century, the Pacific Northwest emerged as a center of British and U.S. exploration, mapping, and trade. In 1833, the Hudson's Bay Company (HBC) established Puget Sound's first Euro-American trading post, Fort Nisqually, near Sequalitchew Creek in present-day DuPont. The fort was situated halfway between HBC's Fort Vancouver to the south

Wilma and Crowley 2003). The port's global reach and trade volume expanded in subsequent decades, though by century's end new concerns about the environmental impact of port development emerged (Tate 2010). The port has worked with the Puyallup Tribe of Indians and other partners on environmental cleanup and habitat restoration in and around the historic tidelands (Port of Tacoma 2018; WAECY 2020a). The proposed barrier wall would further protect local waters from previous industrial contamination.

Figure 4. View of early port facilities from downtown Tacoma (Barnes 1919).

2.6 Historical Records Search

Information about nineteenth and twentieth century land use and property ownership at the project location is available in historical county atlases, topographic maps, census records, and aerial imagery. The extent of the tidelands along Commencement Bay before settler modification is preserved early surveys. In 1841, the United States Exploring Expedition, led by Charles Wilkes, mapped Commencement Bay and the adjacent Tacoma narrows (Figure 5). In 1874, the General Land Office (GLO) completed a cadastral survey of the Puyallup Reservation (Figure 6). Three years later, the United States Coast Survey produced a map of Commencement Bay

(Figure 7). On all three images, the project location is situated within the bay northwest of the extensive tidelands that stretched from the mouth of the Puyallup River to that of Hylebos Creek.

Subsequent maps capture the development of the Port of Tacoma. An 1890 map of Tacoma and 1897 topographic map show the present-day Thea Foss Waterway and early industrial activity at the western terminus of the Northern Pacific Railroad (Figures 8 – 9). The 1890 map describes the project vicinity as "Tide Flats, bare at low water." As part of its 1892 report, the Puyallup Indian Commission created a map of allotments on the Puyallup Reservation (Figure 10). The project is located 0.2 mile northwest of a 79-acre allotment owned by Old Tocanum. The allotment is bounded by the mouth of Hylebos Creek to the north and encompasses the mouth of Wapato Creek. It likely supported fishing, hunting, shellfish gathering, and other resource procurement activities. The project location was likely a productive fishing area given its proximity to the shoreline and the mouths of two creeks.

As reservation land was wrested from Puyallup control, port development accelerated. In 1910, a map of Commencement Bay shows the then-edge of the tidelands and proposed extensions to the port northeast of the Puyallup River (Figure 11). The map does not include the Blair and Hylebos Waterways but otherwise proved prescient in predicting the port's future expansion. Modifications to the tidelands are apparent on Pierce County atlases from 1915 and 1928 (Figures 12 – 13). The Hylebos Waterway was in place by 1915, the Blair-Hylebos peninsula by 1928. On the latter atlas, land adjacent to the northern half of the proposed barrier wall was owned by the Todd Dry Dock and Construction Company. The shipyard was built in 1917 to meet the U.S. Navy's World War I demand for vessels. At its peak, the yard employed 10,000 workers. The company produced 74 ships by the of the war. It closed soon after, and its buildings were razed in the early 1930s. The Seattle-Tacoma Shipbuilding Corporation took over much of the yard in 1939 to support World War II mobilization. The federal government acquired part of the facility in 1943, transforming it into a Naval Industrial Shipyard. Following the war, the shipyard was converted into the Naval & Marine Corps Reserve Center (N&MCRC) (Moore et al. 2008).

The N&MCRC persisted into the 1950s and 1960s, and federal ownership over part of the Blair-Hylebos peninsula is visible on a 1951 Pierce County atlas (Figure 14). Elsewhere along the proposed barrier, properties were owned by the Fletcher Oil Company and Hooker Electrochemical (also known as Hooker Chemical Corporation). Built in 1929, the Hooker plant produced chlorine for pulp mills, perchlorethylene for dry cleaners, and other chemicals. The 30-acre campus was acquired by Occidental Chemical in 1968. The facility closed in 2002. Historical operations and waste disposal led to an estimated 1 million pounds of toxic chemicals in groundwater, soil, and sediment across the former plant (Nunnally 2017; WAECY 2020b).

A 1960 Pierce County atlas does not list property owners along the Blair-Hylebos peninsula but offers a detailed look at the expansion of port waterways, extent of the Hooker campus, and the distribution of remaining tidelands (Figure 15).

Aerial imagery of the project vicinity is intermittently available throughout the twentieth century (NETR 2020; Puget Sound River History Project 2003; WAECY 2020c). In imagery from 1940, port facilities stretch across Commencement Bay (Figure 16). Tidelands extend from southeast of E 11th Street beyond present-day Lincoln Avenue. The Hooker Chemical plant is visible adjacent to the proposed barrier wall, as are log booms, ships, and other industrial plants. By 1968, the Blair and Hylebos Waterways had been extended to the southeast (Figure 17). Additional development had also occurred to the southeast, including construction of SR 509 and Interstate 5. The tidelands visible in imagery from 1940 had disappeared by this point. Development at and around the port continued over subsequent decades, though the port's major features remained largely unchanged. The Chinook Landing Marina in the Hylebos Waterway first appears in imagery from 1998. The Hooker Chemical campus appears mostly demolished by 2009 (Figure 18).

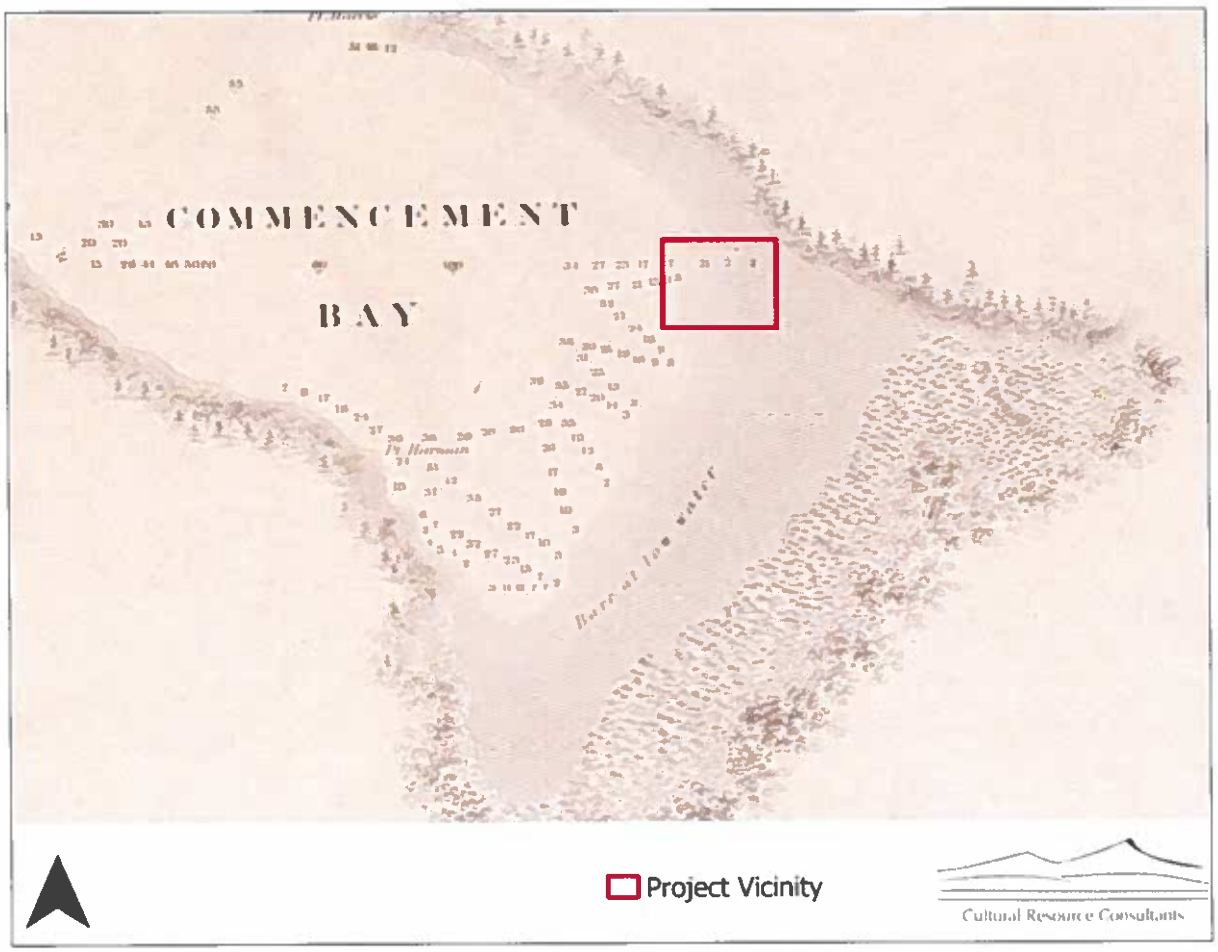


Figure 5. Wilkes (1841) survey of Commencement Bay.

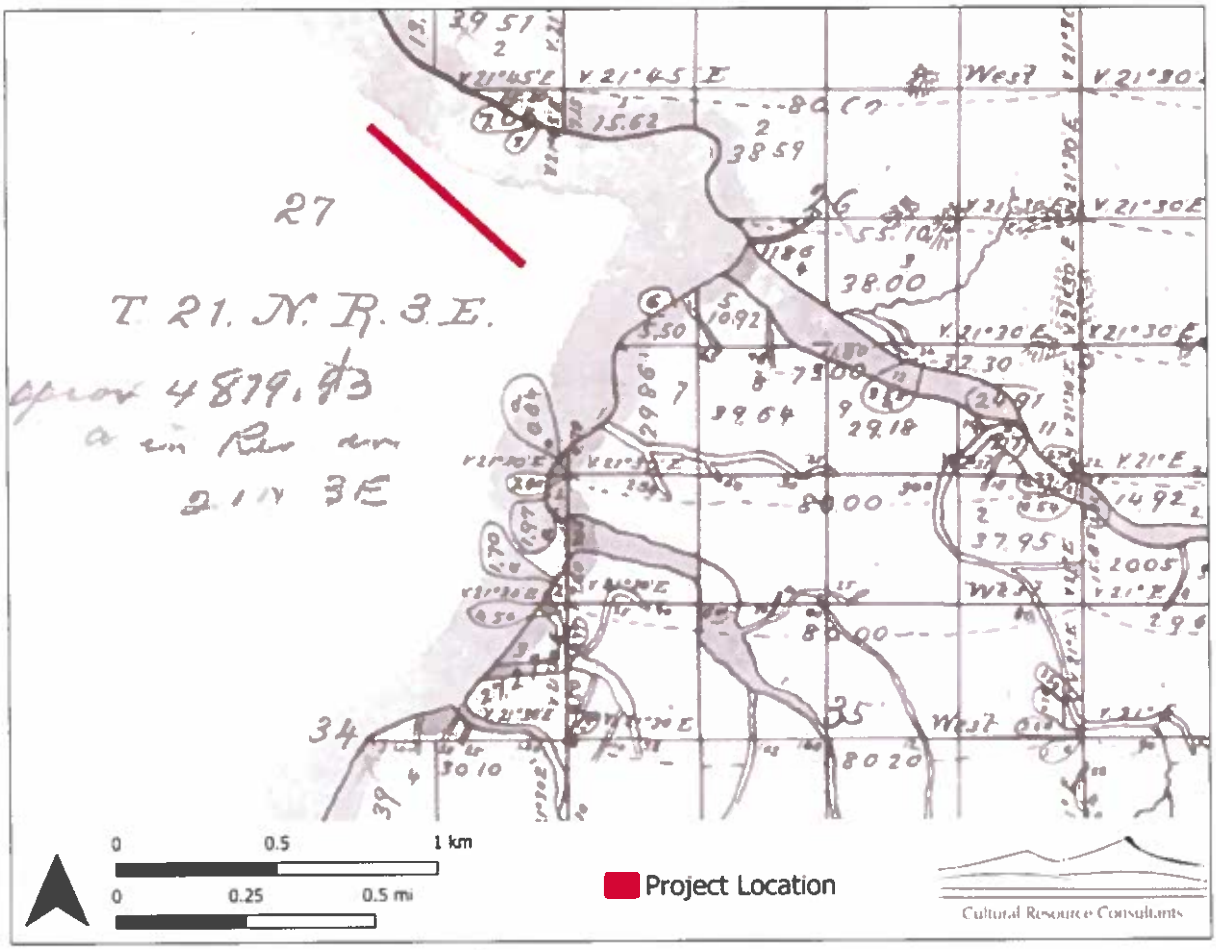


Figure 6. Cadastral survey of the project vicinity (GLO 1874).

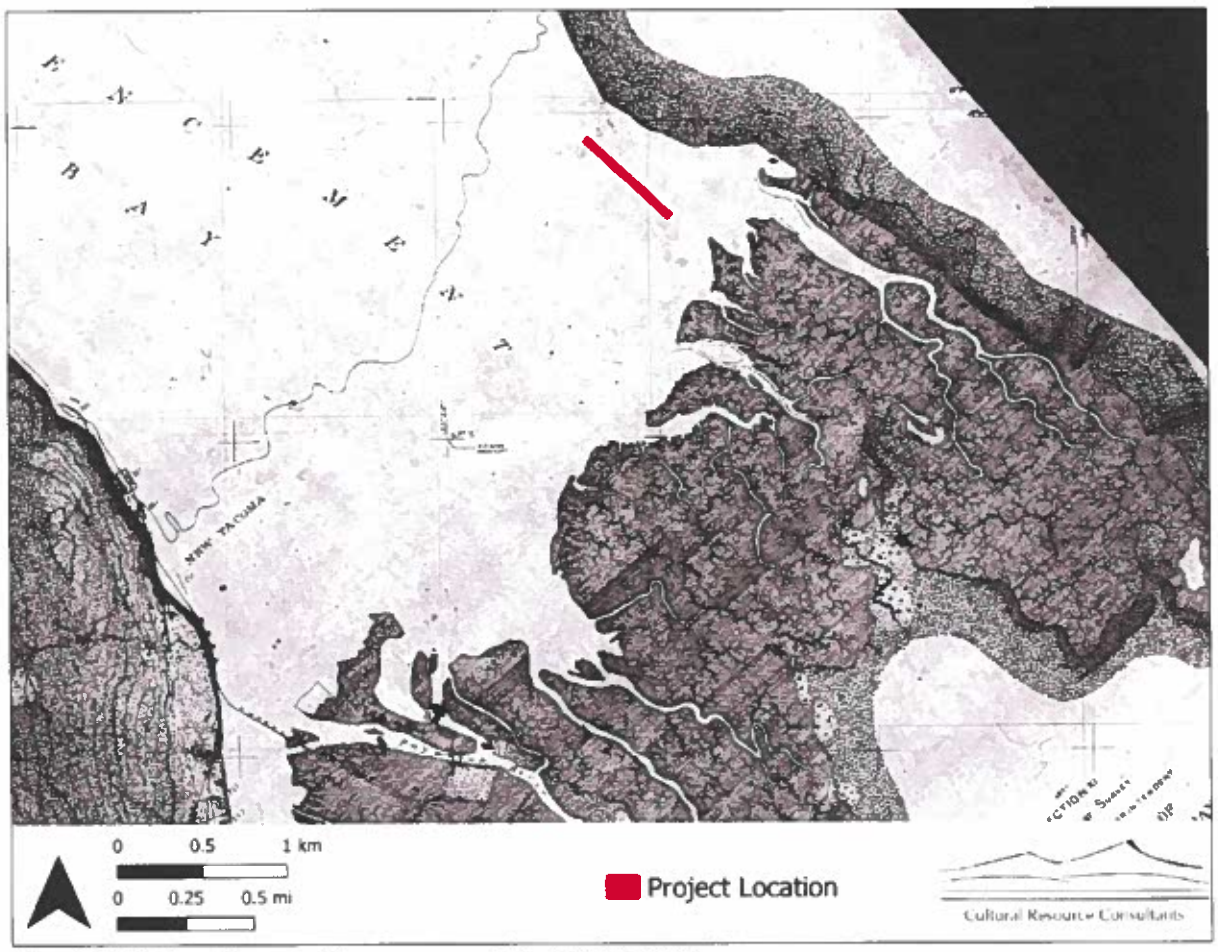


Figure 7. U.S. Coast Survey of Commencement Bay (USCS 1877).

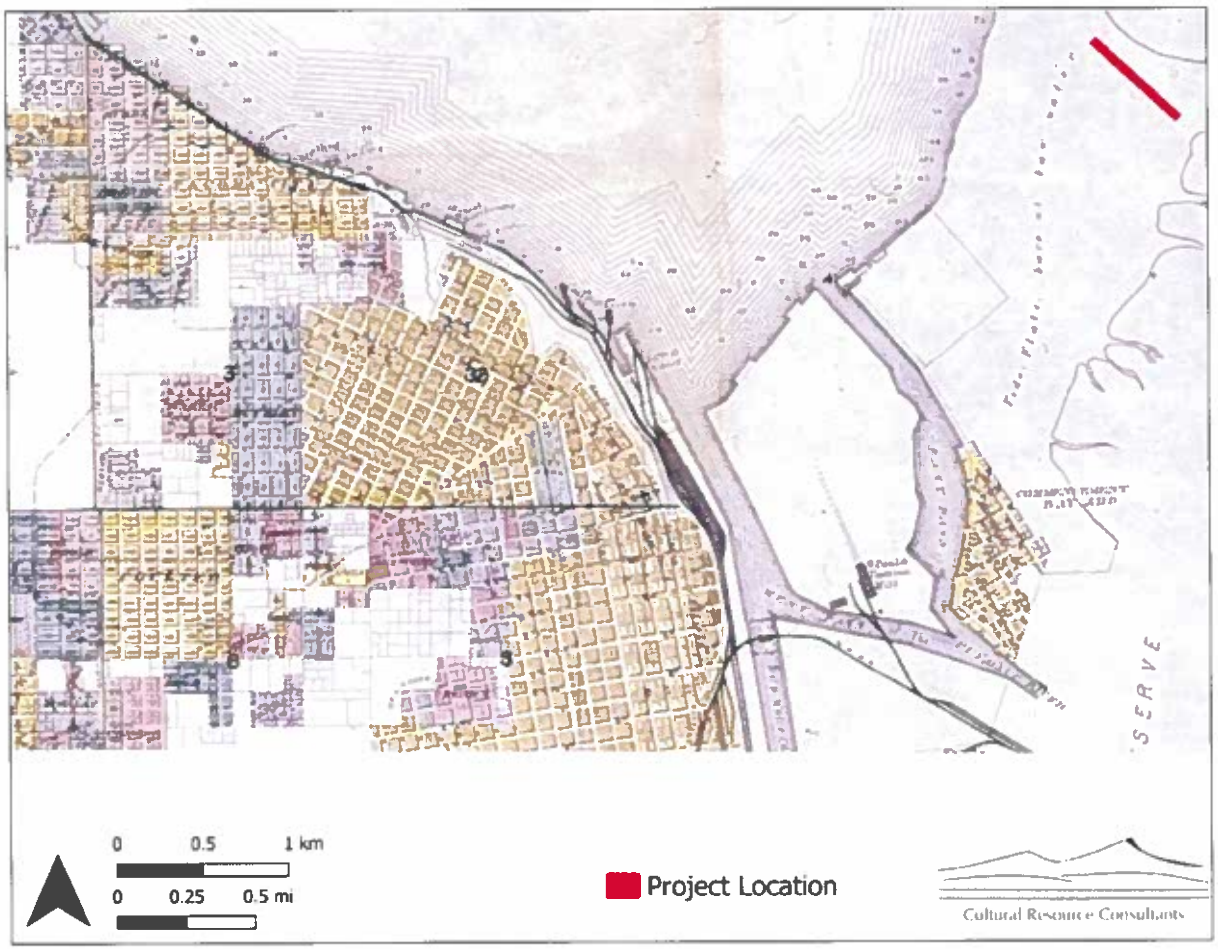


Figure 8. Map of Tacoma and surrounding land (Plummer 1890).

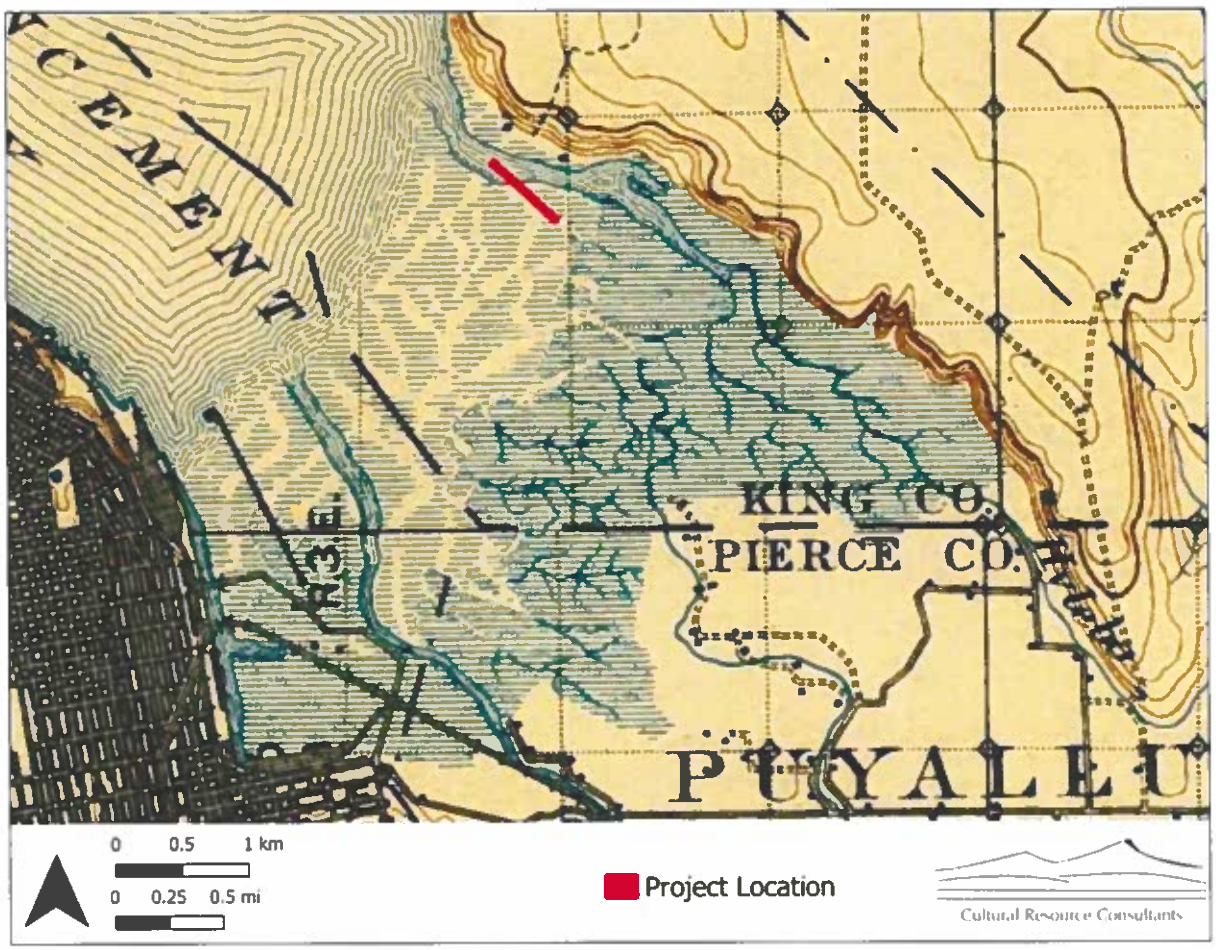


Figure 9. Map of the Tacoma, Washington, topographic quadrangle (USGS 1897).

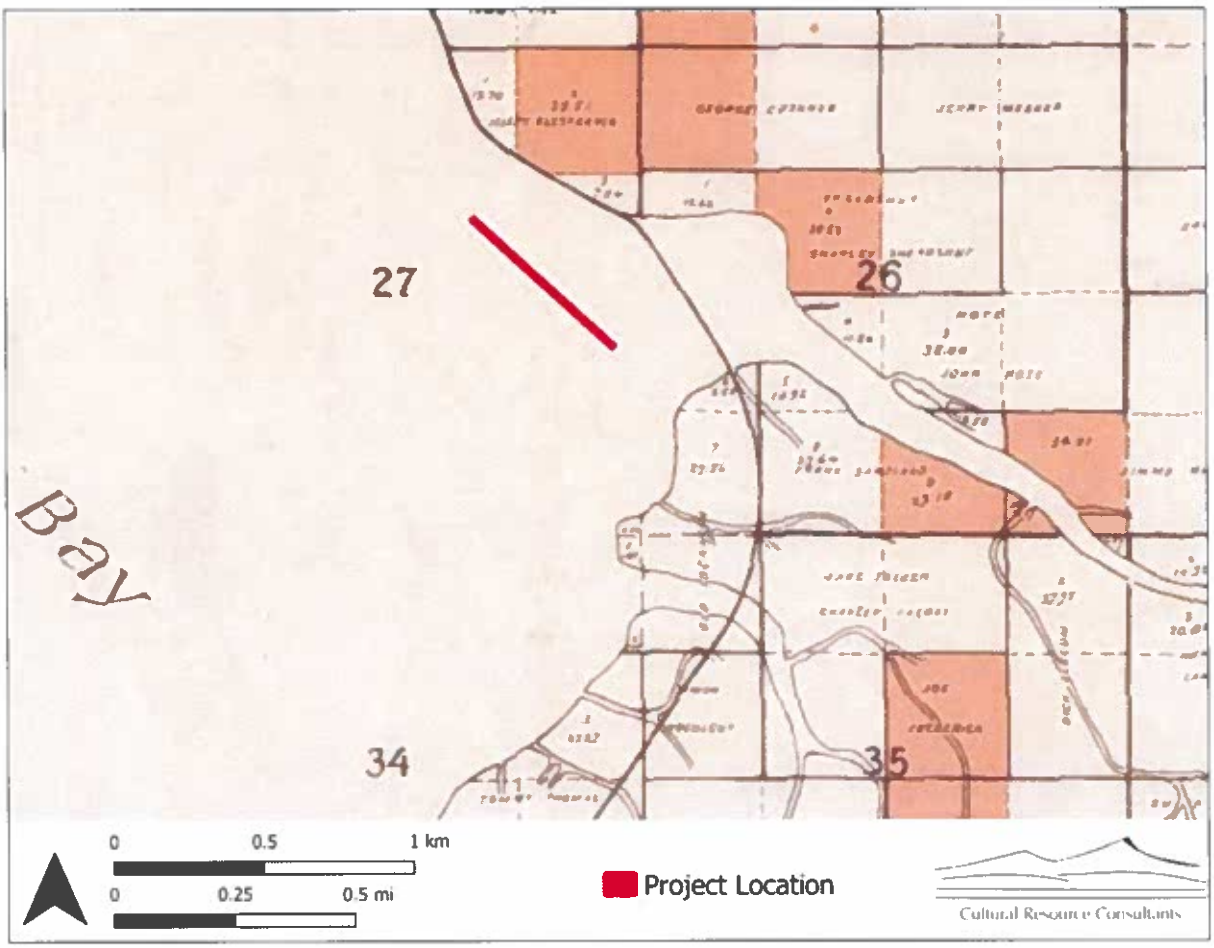


Figure 10. Map of allotments on the Puyallup Reservation (Puyallup Indian Commission 1892b).

Figure 11. Tacoma atlas of the project vicinity (Nicholson 1910).

Figure 12. Pierce County atlas of the project vicinity (Kroll Map Company 1915).

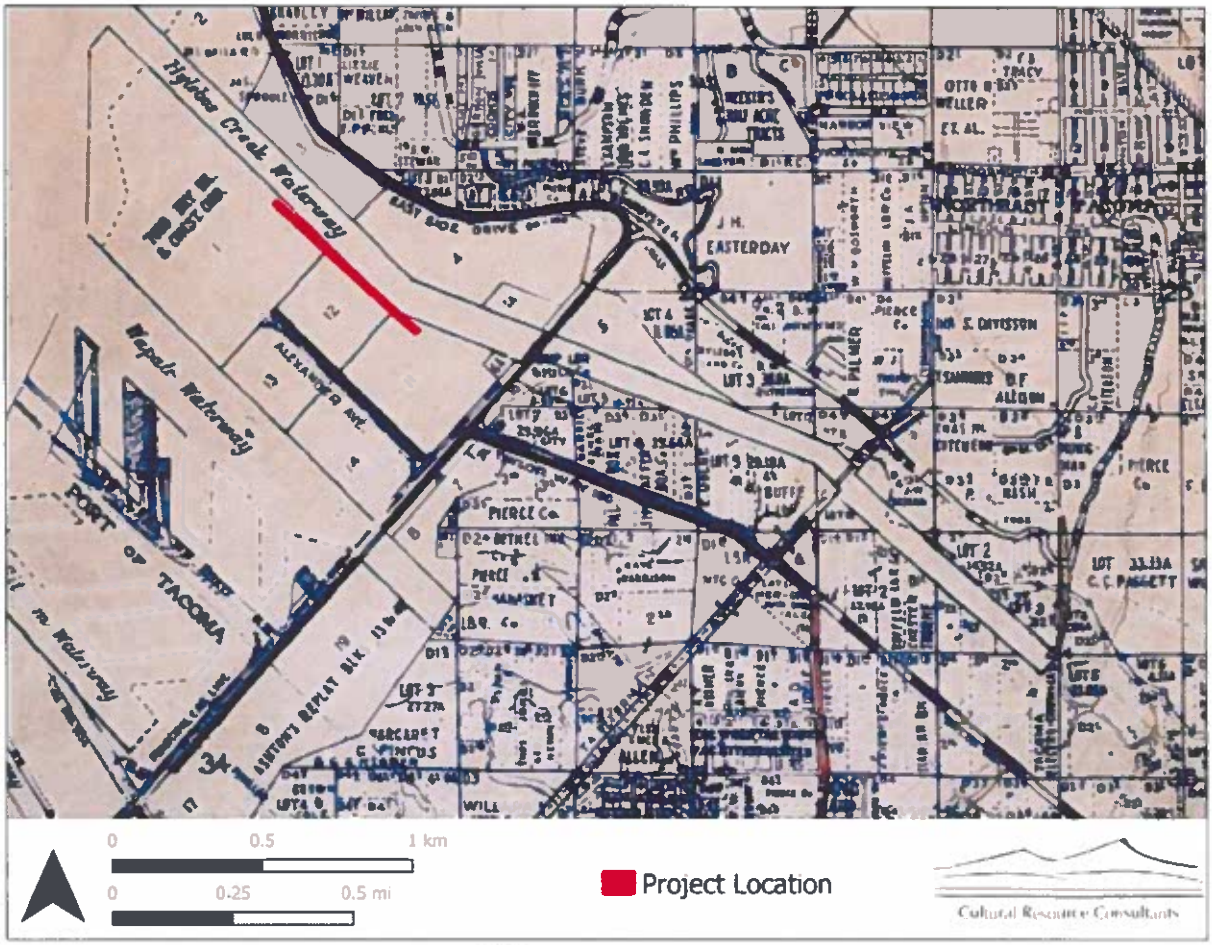


Figure 13. Pierce County atlas of the project vicinity (White 1928).

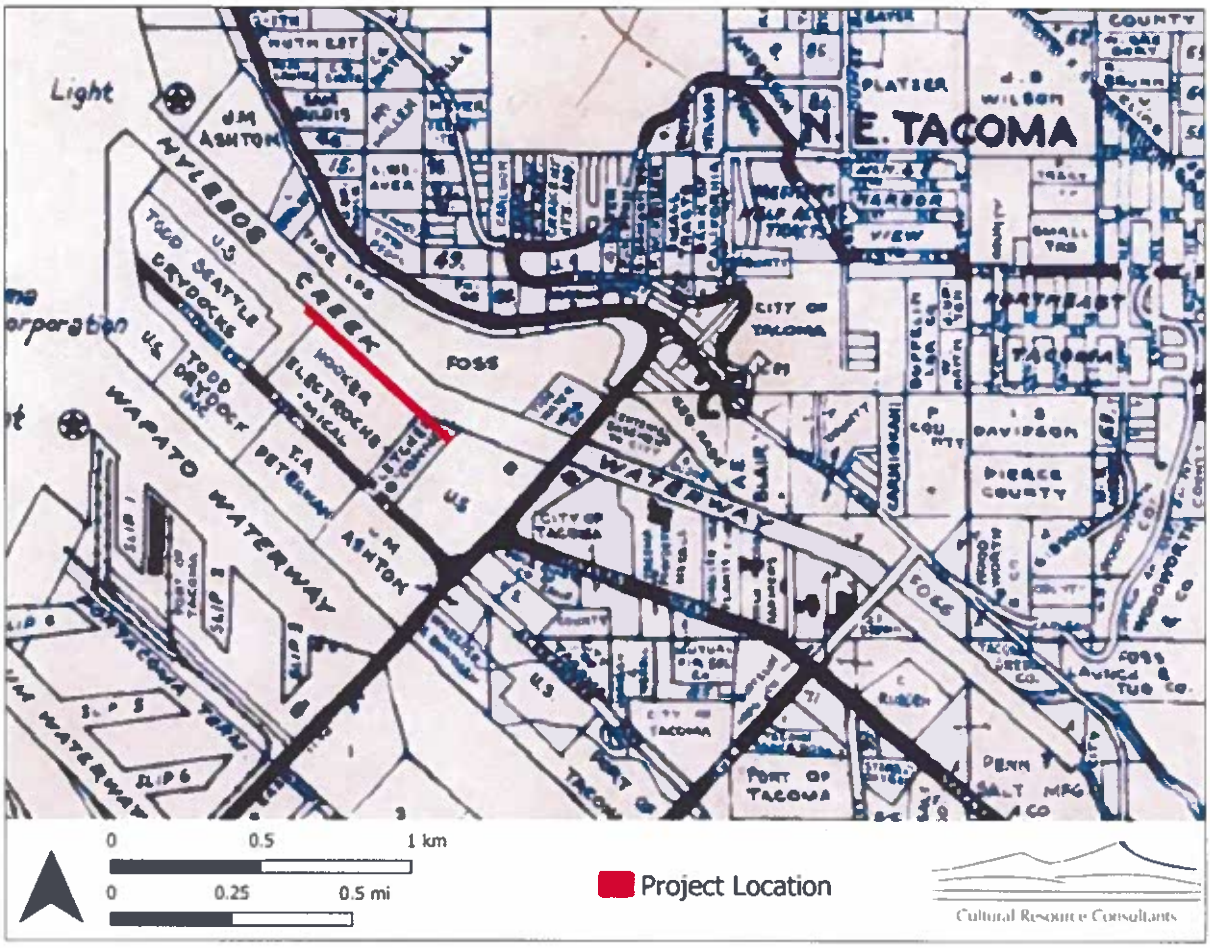


Figure 14. Pierce County atlas of the project vicinity (Metsker 1951).

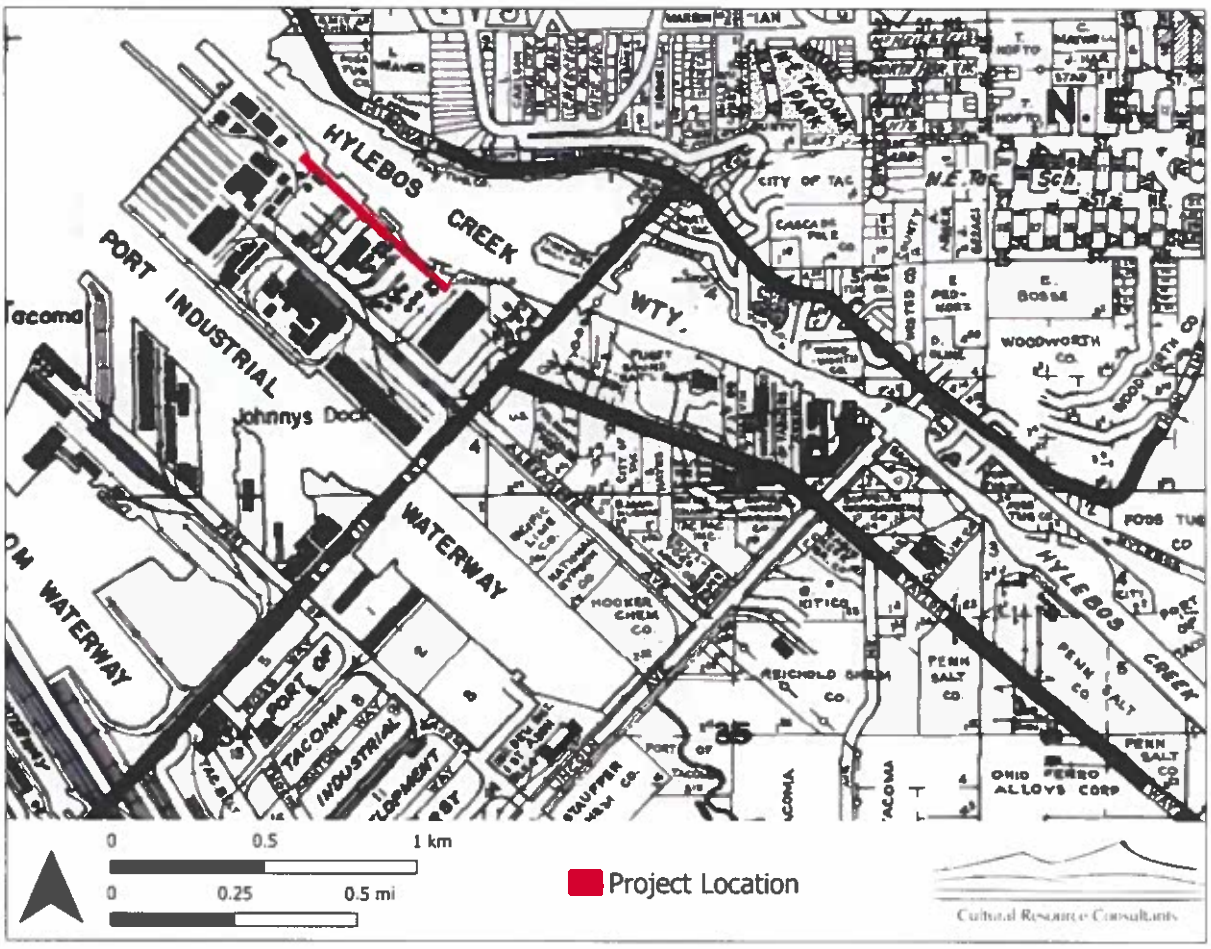


Figure 15. Pierce County atlas of the project vicinity (Metsker 1960).

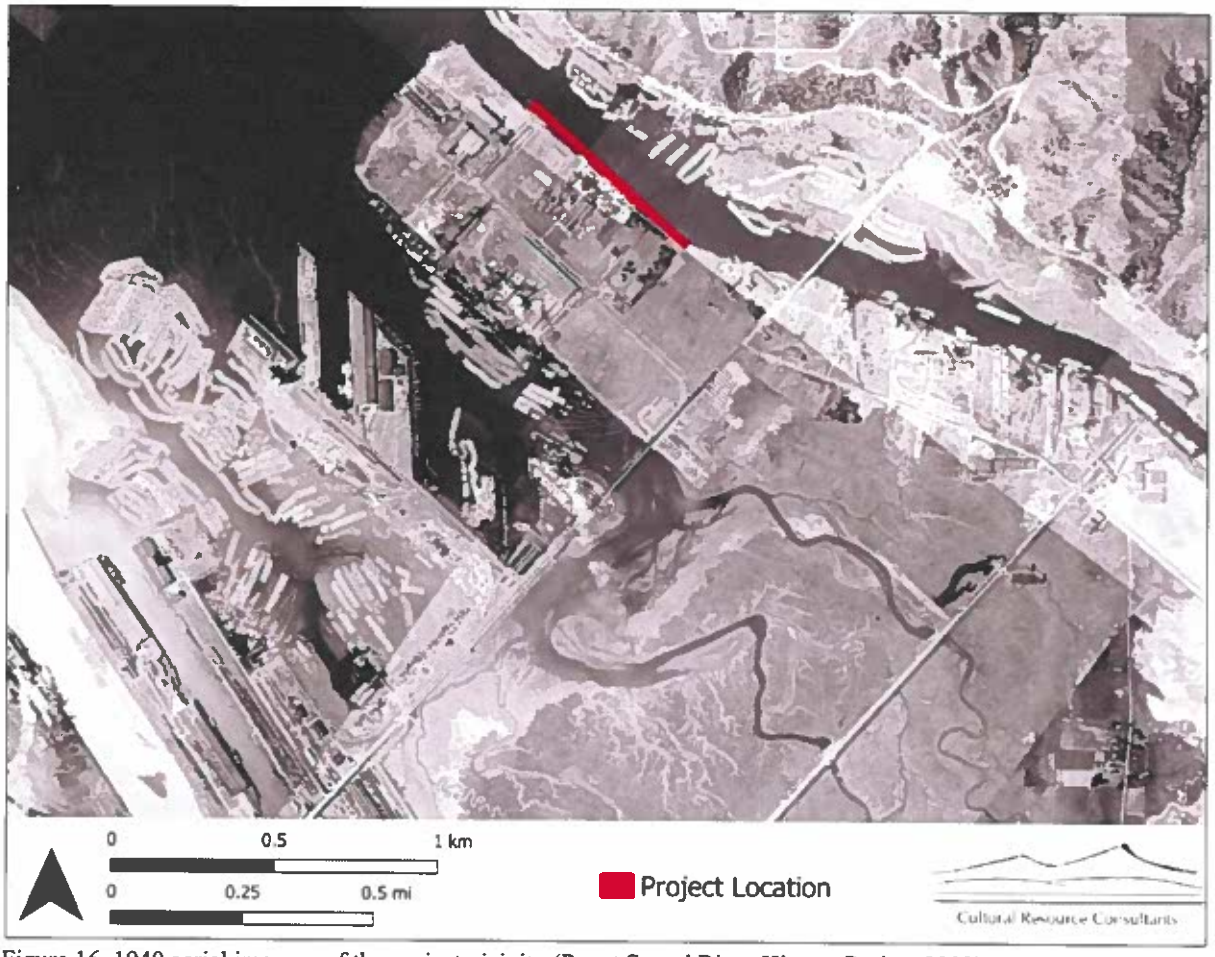


Figure 16. 1940 aerial imagery of the project vicinity (Puget Sound River History Project 2003).

Figure 17. 1977 aerial imagery of the Blair-Hylebos peninsula annotated with the location of the proposed barrier wall (red line) (WAECY 2020c).

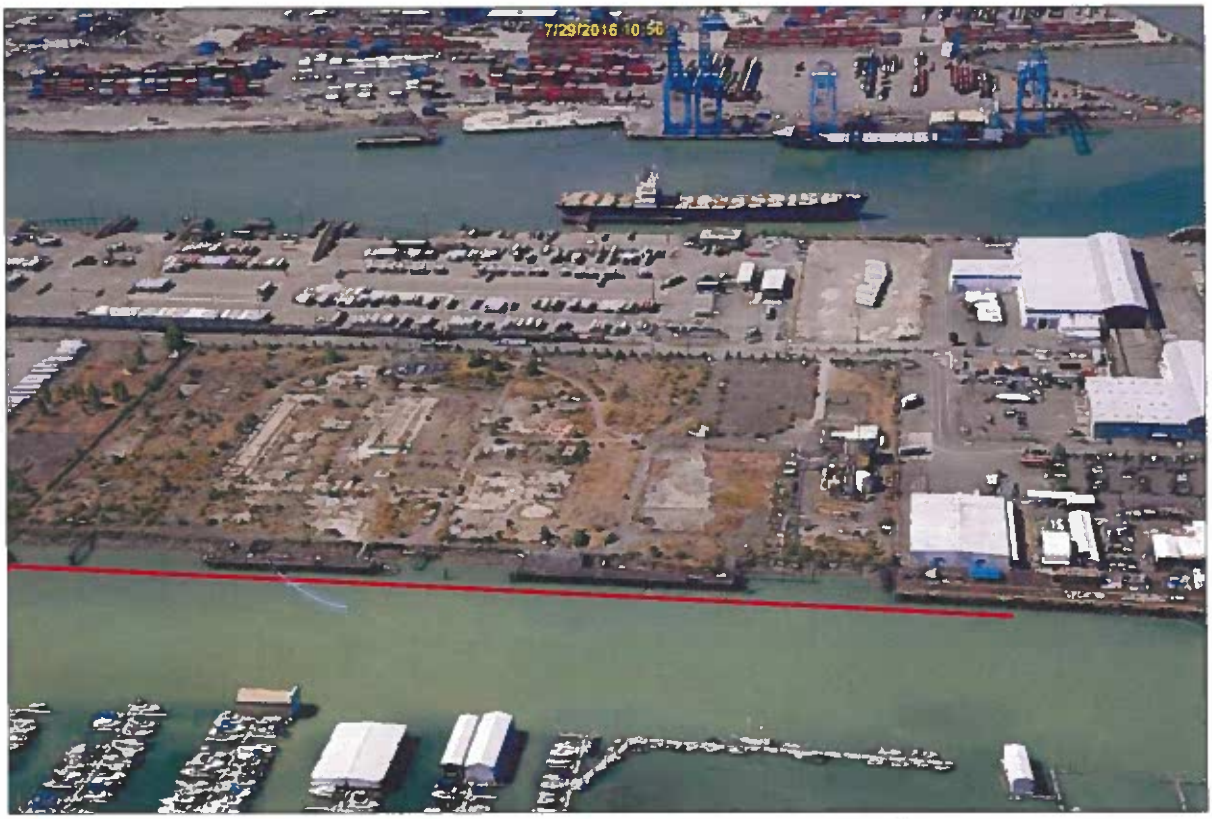


Figure 18. 2016 aerial imagery of the Blair-Hylebos peninsula annotated with the location of the proposed barrier wall (red line) (WAECY 2020c).

2.7 Cultural Resources Database Review

A review of the WISAARD database identified cultural resource studies, precontact and postcontact archaeological sites, and historic properties in the vicinity of the project. This information provides details about the nature and likelihood of cultural resources at the project location (DAHP 2020a). Since 1995, 27 cultural resources assessments have been completed within one mile of the project. Most of these assessments were conducted as part of development activities at the port. Six were conducted entirely or in part on the Blair-Hylebos peninsula northwest of E 11th Street.

Kent (2004) reviewed the impacts to cultural resources of proposed pier repair and associated environmental cleanup at the northern corner of the Blair-Hylebos peninsula. During background research and surface survey at low tide along the peninsula shoreline, no archaeological materials were identified. Kent (2004) concluded that the proposed work would not affect historic properties.

Miller and Bowden (2006) completed a cultural resources assessment as part of proposed rehabilitation of the Hylebos Bridge, which carries E 11th Street over the waterway. Originally

constructed in 1939, the bridge experienced mechanical failure in 2001, prompting the proposed repairs. Miller and Bowden (2006) recorded the structure and reevaluated its eligibility for listing on the NRHP (it had been previously classified not eligible). They recommended the bridge as not eligible for listing on the NRHP due to its lack of historical significance. However, they concluded that the bridge is eligible for listing on the Washington Heritage Register (WHR) due to the list's less stringent significance and integrity criteria. Lastly, Miller and Bowden (2006) reviewed logs of geophysical bores conducted beyond the main channel, which has been dredged up to 35 feet below surface. These bores contained fill extending to between 20 and 25 feet below surface. They concluded that archaeological materials were unlikely to be encountered during construction activities.

Shong and Miss (2010) completed archaeological monitoring during rehabilitation of the Hylebos Bridge. Monitoring focused on excavation of 10 bridge pier shafts, which measured 5 to 8 feet in diameter and were extended to between 60 and 80 feet below surface. An enclosed bucket auger retrieved samples from the drill shafts at 2- to 3-foot increments. The shafts excavated at the margins of the Hylebos Waterway contained fill consisting of mottled, loamy sand and gravel up to 15 feet below surface. In the center of the waterway, shafts contained silty sand, which transitioned to coarse sand approximately 65 to 75 feet below the mudline. These latter probes contained some modern material (brick and rebar) as well as woody debris and black, organic-rich sediment between 5 and 20 feet below surface. These materials were interpreted as recent accumulations since the last dredging of the Hylebos Waterway. Small shell fragments were present up to 40 feet below the mudline. The presence of shell indicated native sediments. No archaeological materials were identified.

Moore et al. (2008) completed a historic resources survey at the N&MCRC adjacent to the southern terminus of the proposed barrier wall. They reviewed the history of the parcel and recorded existing historic resources, including buildings, industrial plants, and shoreline infrastructure. They recommended all 16 historic resources at the N&MCRC not eligible for inclusion on the NRHP due to lack of integrity and/or significance.

Berger et al. (2008) completed a cultural resources assessment ahead of the Port of Tacoma's proposed redevelopment of the Blair-Hylebos peninsula. The port sought to convert industrial properties into container cargo and trailer support facilities, which required improvements to roads, railways, and infrastructure; dredging and filling activities; and creation of aquatic and wetland habitat. During background research and field investigation, Berger et al. (2008) examined 85 structures within the project area, inventorying six previously undocumented historic structures. All were recommended not eligible for listing on the NRHP. They also reviewed soil samples collected during geotechnical investigations. Fill was present in soil bores to depths ranging from 3 to 20 feet below surface. Fill was underlain by tideland, peat, and alluvial material. No archaeological materials or anthropogenic surfaces were identified.

Berger et al. (2015) conducted background research and surface survey ahead of proposed construction of a liquefied natural gas facility at the former N&MCRC. During surface survey, which proceeded via meandering transects throughout the project location, one historic warehouse was identified. The structure was originally constructed as part of the Naval Industrial Shipyard but was later separated from the complex and incorporated into the Port of Tacoma. The structure was recommended not eligible for listing on the NRHP due to lack of integrity.

Viloudaki and Amell (2019) provided archaeological monitoring and review during a dredged material characterization within Blair Waterway. Vibracore sediment cores were advanced up to 5 meters (15 feet) feet below the mudline at 25 locations. Recovered sediments were passed through 1/8-inch mesh to screen for artifacts. Observed subsurface deposits consisted of dark gray sand and silt with occasional pebbles and shell fragments. No archaeological materials were identified.

One archaeological site has been documented within one mile of the project location. Site 45PI975 is located on the eastern shoreline of the Hylebos Waterway immediately north of E 11th Street and approximately 0.4 mile northeast of the proposed barrier wall. The site contains abandoned pilings and several surface concentrations of postcontact glass, ceramic, and other debris. Identified artifacts are associated with late nineteenth to early twentieth century occupation along the edge of the tidelands. The site was recommended not eligible for listing on the NRHP (Cooper 2009a, 2009b).

Site 45PI47 is located 1.5 miles southeast of the proposed barrier wall. However, it is representative of the types of sites that may be encountered during proposed project activities. The site contains a fish weir that, before the construction of the Blair Waterway, was situated within Wapato Creek approximately half a mile upstream from its mouth. The site was identified in 1970 during dredging operations. The weir likely spanned the creek, but approximately half of the structure had been destroyed by the time dredging was halted. The weir consists of vertical stakes approximately 3 centimeters (cm) (1.2 inches) in diameter inserted into the creek bed at 6-cm (2.4-inch) intervals. The stakes canted downstream and were visible only at low tide. Before dredging, the site had been covered by 2 meters (6.6 feet) of alluvial sediment and 2.3 meters (7.5 feet) of fill. The site form also notes that basketry, netting, and rope were identified in association with the weir (Munsell 1981).

Six historic structures (i.e. more than 50 years old) have been recorded within a quarter mile of the proposed barrier wall (Table 1). The Hooker Chemical Corporation complex was documented in 1981. The complex's main building was constructed in 1929 and modified over subsequent decades. It has not received a formal register eligibility determination. The remainder of the chemical plant has been demolished. The Marine View Drive Community on the eastern

shoreline of the Hylebos Waterway consists of 24 cabins built on pilings over the tidelands during the early twentieth century. The community has not received a formal register eligibility determination. The remaining four structures—a warehouse (see Berger et al. 2015), wood pier, mooring dolphins, and berthing wharf—were constructed between 1942 and 1953 as part of the N&MCRC. All have been determined not eligible for listing on the NRHP. These six structures will not be impacted by proposed project activities.

Name, Address (Property ID)	Date of Construction	Historical Use	Historic Register Status	Potential Impacts
Hooker Chemical Corporation, 605 Alexander Avenue (30798)	1929	Industrial manufacturing	No determination	None
Marine View Drive Community 3620-5328 Marine View Drive (31035)	ca. 1900	Single-family residences	No determination	None
Building 50, N&MCRC, 901 Alexander Avenue (677655)	1942	Warehouse	Determined not eligible	None
Building 60, N&MCRC 1100 Alexander Avenue (90830)	1942	Naval facility	Determined not eligible	None
Building 61, N&MCRC 1100 Alexander Avenue (90828)	1953	Naval facility	Determined not eligible	None
Building 40, N&MCRC 1100 Alexander Avenue (90824)	1942	Naval facility	Determined not eligible	None

Table 1. Surveyed historic structures within a quarter mile of the project.

Five unsurveyed historic structures are located within a quarter mile of the project (Table 2). Information about these structures was added to WISAARD as part of DAHP's 2011 Historic Property Inventory (HPI) Upload Project, which incorporated county assessors' building records into the database. The uploaded data were not field verified, nor were eligibility assessments conducted. To date, these structures have not received formal surveys or historic register eligibility determinations. Three are located on the Blair-Hylebos Peninsula, two on the eastern shoreline of the Hylebos Waterway. These structures will not be impacted by proposed project activities.

Address (Property ID)	Date(s) of Construction	Historical Use	Historic Register Status	Potential Impacts
401 Alexander Avenue (534619)	1962	Manufacturing facility	No determination	None
901 Alexander Avenue (534620)	1953	Industrial storage	No determination	None
500 Alexander Avenue (534618)	1919, 1985	Commercial business	No determination	None
3622 Marine View Drive (532187)	1930	Manufacturing facility	No determination	None
Marine View Drive (532185)	1967	Domestic camp	No determination	None

Table 2. Unsurveyed historic structures within a quarter mile of the project.

Two register-listed historic properties are or were located within one mile of the project (Table 3). Fire Station No. 15 is located at 3510 E 11th Street. Constructed between 1928 and 1929, the station operated alongside fireboats to protect port properties. The station incorporates Spanish Revival details and is the only station in Tacoma with this architectural design. It exemplifies the growth of the city and the port and is listed on the NRHP and WHR (Brack 1985). The MV Kalakala was a double-ended car ferry. The ferry was built in 1935 on the hull of the 1926 ferry Peralta, which had been damaged in a fire. Its design emphasized sleek, smooth lines characteristic of the Streamlined Moderne style. It was unveiled to positive reviews in Seattle and further afield. The vessel could hold up to 2,000 passengers and 110 cars and operated as part of the Puget Sound Navigation Company until the ferry was sold to the state in 1951. It operated as part of the state ferry fleet until 1967. It was later used as a crab-processing vessel and cannery in Alaska before returning to Seattle in 1998, where it was moored in the Hylebos Waterway southeast of the project. The vessel was listed on the NRHP and WHR in 2006 (Rodrigues and Petershagen 2005). After falling into disrepair, it was scrapped in 2015 (Roberts 2015).

Name, Address	Dates of Significance	Historical Use	Historic Register Status	Potential Impacts
MV Kalakala, 1801 Taylor Way, Hylebos Waterway	1935-1951	Ferry	Listed on the NRHP and WHR; now scrapped	None
Fire Station No. 15, 3510 E 11th Street	1928-1935	Fire station	Listed on the NRHP and WHR	None

Table 3. Register-listed historic properties within one mile of the project

Four historic shipwrecks, all listed on WISAARD as "unknown wreck," are located within one mile of the project location. All are in the Hylebos Waterway. Nearest to the proposed barrier wall are three wrecks immediately southeast of the Hylebos Bridge. No recorded cemeteries are located within one mile of the project. No historic properties listed on the Pierce County Register of Historic Places are located within one mile of the project. No traditional cultural properties (TCPs) listed on WISAARD are located within one mile of the project (DAHP 2020a).

3.0 Archaeological Expectations

3.1 Archaeological Predictive Models

The DAHP statewide predictive model uses environmental data associated with documented archaeological sites to identify areas at which undocumented sites may be found (Kauhi and Markert 2009). Environmental categories included in the model are elevation, slope, aspect, distance to water, geology, soils, and landforms. The model contains five probability ranks: (1) low risk, (2) moderately low risk, (3) moderate risk, (4) high risk, and (5) very high risk. The model ranks the project location as very high risk.

3.2 Archaeological Expectations

This assessment combines the above cultural resources database review and predictive modeling results with information about local geomorphology, settlement patterns, and post-depositional processes to evaluate the possibility that archaeological deposits will be encountered at the project location. The proposed barrier wall is located in the Hylebos Waterway, an artificial channel created during the early twentieth century as part of the Port of Tacoma's extensive modification of the Commencement Bay tidelands. The tidelands supported settlement and resource harvest by Puyallup peoples for centuries, if not longer, and the project location's proximity to the mouths of Hylebos and Wapato Creeks likely made it a productive fishing location for residents of the village sháxtl'ɑbc and their neighbors. Historical maps indicate the project location was located beyond the tidelands during the late nineteenth century and is therefore unlikely to contain archaeological materials. Subsequent modification of the tidelands, construction of the Hylebos Waterway, deposition of fill and industrial waste, and dredging to a depth of at least 35 feet further reduce the possibility that archaeological materials exist at the project location. The depth of the proposed barrier wall is anticipated to extend to 78 feet deep. Construction will likely encounter native sediments below several feet of fill. Native sediments are unlikely to contain archaeological materials.

Archaeological materials, if present at the project location, will stem from Native peoples' historical use of the tidelands before the development of the port. These materials may include but are not limited to fish weirs, fire-modified rock (FMR), lithic artifacts, anthropogenic sediments, thermal features, and faunal remains. These artifacts, if present, will be encountered within alluvial sediments below recent fill deposits. Materials stemming from port-related activities, including industrial equipment, structural debris, and mass-produced glass, ceramic,

and metal objects, may be encountered in fill deposits. Generally, isolated finds of definitive post-1850 manufacture and concentrations of temporally non-diagnostic materials do not satisfy eligibility criteria for the NRHP, though exceptions may include intact floors or structural elements or remains associated with particular individuals or events.

4.0 Conclusions, Findings, and Recommendations

Based on review of historical, archaeological, and environmental datasets, proposed activities for the Occidental Chemical Corporation Barrier Wall Project are characterized by a low probability for adverse impacts to cultural resources. Although the DAHP statewide predictive model ranks the project location as very high risk for archaeological sites, examination of historical maps indicates the proposed barrier wall was located in Commencement Bay northwest of the Tacoma tidelands during the late nineteenth century. The development of the Port of Tacoma extensively modified the tidelands, likely removing extant archaeological materials in the process. During project activities, isolated post-contact materials may be encountered in fill deposits. Intact post-contact sites eligible for listing on the NRHP as well as disturbed or intact pre-contact archaeological sites are unlikely to be encountered.

No additional cultural resources investigation is recommended at this time. If project activities result in the discovery of archaeological materials, project staff should halt work in the immediate area and contact the technical staff at DAHP and representatives of identified area Tribes, as outlined in the inadvertent discovery protocol described below (Appendix B). Work should be stopped until further investigation and appropriate consultation have concluded. In the event that human remains are inadvertently revealed, project staff should immediately stop work, cover, and secure the remains against further disturbance, and contact law enforcement personnel, consistent with the provisions set forth in RCW 27.44.055 and RCW 68.60.055.

5.0 Limitations of this Assessment

No cultural resources study can assess with complete certainty whether archaeological sites, historic properties, or traditional cultural properties exist at a project location. The information presented in this report is based on professional opinions derived from CRC's analysis and interpretation of available documents, records, and literature identified in this report. The conclusions and recommendations presented apply to current and reasonably foreseeable project conditions. The data, conclusions, and interpretations in this report should not be construed as a warranty of subsurface conditions. They do not apply to site changes of which CRC is not aware and has not had the opportunity to evaluate.

6.0 References

Ames, K. M., C. M. Smith, W. L. Cornett, E. A. Sobel, S. C. Hamilton, J. Wolf, and D. Raetz
1999 *Archaeological Investigations at 45CL1 Cathlapotle (1991-1996), Ridgefield National Wildlife Refuge, Clark County, Washington: A Preliminary Report.* Cultural Resource Series Number 13, U.S. Department of the Interior, Fish and Wildlife Service, Region 1.

Ames, K. M., and H. D. G. Maschner
1999 *Peoples of the Northwest Coast.* Thames and Hudson, New York.

Atwater, B. F., and A. L. Moore
1992 A Tsunami about 1000 Years Ago in Puget Sound, Washington. *Science* 258(5088):1614-1617.

Bagley, C. B.
1915 Journal of Occurrences at Nisqually House, 1833. *The Washington Historical Quarterly* 6(3):179-197.

Barnes, A. H.
1919 Waterways from the City Hall, Tacoma, Washington, approximately 1919. University of Washington Libraries, Special Collections, Barnes 28. Albert Henry Barnes Photograph Collection, PH Coll 542.

Berger, M.
2010 *Cultural Resources Assessment for the 4916 Marine View Drive Project, Tacoma, Pierce County, WA.* Cultural Resource Consultants, LLC. Report prepared for Port of Tacoma.

Berger, M., G. Hartmann, and J. McNett
2015 *Cultural Resources Assessment for the Tacoma LNG Project, Pierce County, WA.* Cultural Resource Consultants, LLC. Report submitted to Puget Sound Energy.

Berger, M., S. Medville, and J. Chambers
2008 *Cultural Resources Assessment for the Blair-Hylebos Redevelopment Project, Tacoma, Pierce County, Washington.* Cultural Resource Consultants, Inc. Report prepared for Grette Associates.

Booth, D. B.
1994 Glaciofluvial Infilling and Scour of the Puget Lowland, Washington, During Ice-Sheet Glaciation. *Geology* 22(8):695-698.

Booth, D. B., R. A. Haugerud, and K. G. Troost
2003 The Geology of Puget Lowland Rivers. In *Restoration of Puget Sound Rivers*, edited by D. Montgomery, S. Bolton, and D. B. Booth, pp. 14-45. University of Washington Press, Seattle.

Booth, D. B., T. J. Walsh, K. G. Troost, and S. A. Shimel
2012 *Geologic Map of the East Half of the Bellevue South 7.5' x 15' Quadrangle, Issaquah Area, King County, Washington*. Scientific Investigations Map SIM-3211. U.S. Geological Survey, Washington, D.C.

Bortleson, G. C., M. J. Chrzastowski, and A. K. Helgerson
1980 *Historical Changes of Shoreline and Wetland at Eleven Major Deltas in the Puget Sound Region, Washington*. Hydrologic Investigations Atlas HA-617. U.S. Geological Survey, Washington, D.C.

Brack, M. L.
1985 State of Washington Historic Property Inventory Form. Fire Station No. 15. On file at DAHP, Olympia.

Bretz, H.
1913 Glaciation of the Puget Sound Region. *Bulletin No. 8. Washington Geological Survey*, Olympia, Washington.

Bucknam, R. C., E. Hemphill-Haley, and E. B. Leopold
1992 Abrupt Uplift within the Past 1700 Years at Southern Puget Sound, Washington. *Science* 258(5088):1611-1614.

Carlson, R.
1990 Cultural Antecedents. In *Handbook of North American Indians, Volume 7: Northwest Coast*, edited by W. Suttles, pp. 60-69. Smithsonian Institution, Washington, D.C.

Carpenter, C. S.
1996 *Tears of Internment: The Indian History of Fox Island and the Puget Sound Indian War*. Tahoma Research Service, Tacoma.

Chambers, J.
2007 *Cultural Resources Assessment for the 1501 Taylor Way Project, Tacoma, Pierce County, Washington*. Cultural Resource Consultants, LLC. Report submitted to American Construction Company, Inc.

Cooper, J. B.
2009a *Cultural Resources Assessment for the Freeman Road Property and Inner Hylebos Property, Pierce County, Washington*. AMEC Earth & Environmental, Inc. Report submitted to SSA Containers, Inc., Meridian Engineers, Inc., Marine View Ventures, Inc., and Puyallup Tribe of Indians.
2009b State of Washington Archaeological Site Inventory Form. 45PI975. On file at DAHP, Olympia.

Douglas, M.
2016 Puyallup Land Claims Settlement (1990). Electronic document, https://www.historylink.org/File/20157, accessed December 30, 2020.

Downing, J.
1983 *The Coast of Puget Sound*. University of Washington Press, Seattle.

Dragovich, J., P.T. Pringle, and T.J. Walsh.
1994 Extent and Geometry of the Mid-Holocene Osceola Mudflow in the Puget Sound Lowland—Implications for Holocene Sedimentation and Paleogeography. *Washington Geology* 22(3):3-26.

Eronen, M., T. Kankainen, and M. Tsukada
1987 Late Holocene Sea Level Record in a Core from the Puget Lowland, Washington. *Quaternary Research* 27(2):147-159.

Franklin, J. F., and C. T. Dyrness
1973 *Natural Vegetation of Oregon and Washington*. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-8. U.S. Government Printing Office, Washington D.C.

Greengo, R. E. (editor)
1983 *Prehistoric Places on the Southern Northwest Coast*. Thomas Burke Memorial Washington State Museum, University of Washington, Seattle.

Haeberlin, H., and E. Gunther
1930 The Indians of Puget Sound. *University of Washington Publications in Anthropology* 4(1):1-84.

James, T. S., J. J. Clague, K. Wang, and I. Hutchinson
2000 Postglacial Rebound at the Northern Cascadia Subduction Zone. *Quaternary Science Reviews* 19(14-15):1527-1541.

Kauhi, T. C., and J. Markert
2009 *Washington Statewide Archaeology Predictive Model*. GeoEngineers. Report submitted to DAHP, Olympia.

Kelleher, A.
2016 President Franklin Pierce Establishes the Muckleshoot Reservation by Executive Order on January 20, 1857. Electronic document, https://www.historylink.org/File/20261, accessed December 8, 2020.

Kent, R. J.
2004 *Cultural Resource Reconnaissance Survey for the U.S. Army Reserve's Pier 23 Project Port of Tacoma, Pierce County, Washington*. U.S. Army Corps of Engineers, Seattle District.

Kopperl, R. E., A. K. Taylor, C. J. Miss, K. M. Ames, and C. M. Hodges
2015 The Bear Creek Site (45KI839), a Late Pleistocene-Holocene Transition Occupation in the Puget Sound Lowland, King County, Washington. *PaleoAmerica* 1(1):116-120.

Kopperl, R., C. Hodges, C. Miss, J. Shea, and A. Spooner
2016 *Archaeology of King County, Washington: A Context Statement for Native American Archaeological Resources*. SWCA Environmental Consultants. Report submitted to the King County Historic Preservation Program.

Kroll Map Company
1915 *Kroll's Atlas of Pierce County, Wash. T. 21 N. R. 3 E. W.M.* Kroll Map Company, Seattle.

Kruckeberg, A. R.
1991 *The Natural History of Puget Sound Country*. University of Washington Press, Seattle.

Larson, L. L, and D. E. Lewarch (editors)
1995 *The Archaeology of West Point, Seattle, Washington: 4,000 Years of Hunter-Fisher-Gatherer Land Use in Southern Puget Sound.* Larson Anthropological Archaeological Services, Gig Harbor, Washington.

Ludwin, R. S., C. P. Thrush, K. James, D. Buerge, C. Jonientz-Trisler, J. Rasmussen, K. Troost, and A. de los Angeles
2005 Serpent Spirit-power Stories along the Seattle Fault. *Seismological Research Letters* 76(4):426-431.

MacIntosh, H. M., and D. Wilma
1999 Northern Pacific Railroad Announces Tacoma Terminus on July 14, 1873. Electronic resource, https://historylink.org/File/922, accessed January 5, 2021.

Magden, R.
2008 Port of Tacoma – Thumbnail History, Part 1. Electronic document, https://www.historylink.org/File/8592, accessed January 5, 2021.

McKee, B.
1972 *Cascadia: The Geologic Evolution of the Pacific Northwest.* McGraw Hill Book Company, New York.

Metsker, C. F.
1951 *Township 21 N., Range 3 E. W.M., King & Pierce Counties, Wash.* C. F. Metsker, Seattle.

Metsker, T. C.
1960 *Township 21 N., Range 3 E. W.M., Southeast Quarter, Pierce County, Washington.* T. C. Metsker, Seattle.

Miller, H. L., and B. Bowden
2006 *Hylebos Bridge Rehabilitation Project Historic, Cultural, and Archaeological Discipline Report.* Historical Research Associates, Inc. Report prepared for Parsons Brinckerhoff Quade & Douglas, Inc. and City of Tacoma

Moore, D. W., L. A. Gotcher, T. Dudley, H. Prather, L. Smith, and L. Roberson
2008 *Historic Resources Survey (Update) of Naval and Marine Corps Reserve Center (N&MCRC) Tacoma, Washington.* HHM Inc. Report prepared for HELIX Environmental Planning, Inc.

Muckleshoot Indian Tribe
2020 Overview: History of the Muckleshoot Indian Tribe and its Reservation. Electronic document, http://www.muckleshoot.nsn.us/about-us/overview.aspx, accessed December 30, 2020.

Munsell, D. A.
1981 Cultural Resources Site Survey Record. 45PI47. On file at DAHP, Olympia.

Nationwide Environmental Title Research, LLC (NETR)
2020 Historic Aerials. Electronic document, https://historicaerials.com/viewer, accessed January 5, 2021.

Nelson, C. M.
1990 Prehistory of the Puget Sound Region. In *Handbook of North American Indians, Volume 7: Northwest Coast*, edited by Wayne Suttles, pp. 481-484. Smithsonian Institution Press, Washington, D.C.

Nicholson, L. A.
1910 *Nicholson's Atlas of Tacoma and Vicinity, Tacoma Tide Flats for Railway Terminals & Manufacturing Sites*. L.A. Nicholson, Tacoma.

Nunnally, D.
2017 Hooker Chemical Cleanup Planning a Messy Process. *The News Tribune* 1 April, Tacoma.

Oldham, K.
2008a Development Plan for Port of Tacoma is Approved on May 31, 1919. Electronic document, https://www.historylink.org/File/9759, accessed January 5, 2021.
2008b Port of Tacoma – Thumbnail History. Electronic document, https://www.historylink.org/File/8662, accessed January 5, 2021.
2008c Port of Tacoma – Thumbnail History. Electronic document, https://www.historylink.org/File/8668, accessed January 5, 2021.
2010 Public Port Districts in Washington: Origins. Electronic document, https://www.historylink.org/File/9614, accessed January 5, 2021.

Pater, D.E., S.A. Bryce, T.D. Thorson, J. Kagan, C. Chappell, J.M. Omernik, S.H. Azevedo, and A. J. Woods
1998 *Ecoregions of Western Washington and Oregon*. U.S. Geological Survey, Reston, VA.

Plummer, F. G.
1890 *Whitney's Map of the City of Tacoma and Environs, Washington*. W. H. Whitney.

Port of Tacoma
2018 Port of Tacoma's Centennial – 100 Years. A Million Stories. Electronic document, https://pot.maps.arcgis.com/apps/MapSeries/index.html?appid=5cead9e072cb47a0ac723ed067f85682, accessed January 5, 2021.

Puget Sound River History Project
2003 Duwamish, Puyallup, White, Black, Green, and Carbon Rivers Orthophotos – 1940. Electronic document, http://riverhistory.ess.washington.edu/index.html, accessed January 5, 2021.

Puyallup Indian Commission
1892a *Letter to the Secretary of the Interior to the President, with Report of the Puyallup Indian Commission and Accompanying Papers, February 6, 1892*. S. Ex. Doc. No. 34, 52nd Congress, 1st Session.
1892b *Map of the Puyallup Indian Reservation Washington to Accompany Report of the Puyallup Indian Commission*. Government Printing Office, Washington, D.C.

Puyallup Tribe of Indians
2020 spuyaləpabš: syəcəb ʔə tiił ʔiišədčəł Puyallup Tribe: The Story of Our People. Electronic document, http://www.puyallup-tribe.com/ourtribe/, accessed December 30, 2020.

Roberts, C. R.
2015 Scrapping the Kalakala: Tacoma Lays to Rest What Seattle Chose Not to Save. *The News Tribune* 4 January, Tacoma.

Rodrigues, S., and G. F. Petershagen
2005 National Register of Historic Places Registration Form. MV Kalakala. On file at DAHP, Olympia.

Ruby, R. H., J. A. Brown, and C. C. Collins
2010 *A Guide to the Indian Tribes of the Pacific Northwest*. 3rd ed. University of Oklahoma Press, Norman.

Samuels, S. R. (editor)
1994 *Ozette Archaeological Project Research Reports, Volume II, Fauna*. Reports of Investigations 66. Department of Anthropology, Washington State University, Pullman, and National Park Service, Pacific Northwest Regional Office, Seattle.

Schalk, R., and D. Rhode
1985 *Archaeological Investigations on the Shoreline of Port Madison Indian Reservation, Kitsap County, Washington*. Office of Public Archaeology, Institute of Environmental Studies, University of Washington, Seattle.

Schuster, J. E., A. A. Cabibbo, J. F. Schilter, and I. J. Hubert
2015 *Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington*. Map Series 2015-03. Washington State Department of Natural Resources, Olympia.

Scott, K.M., and J.W. Vallance.
1995 *Debris Flow, Debris Avalanche, and Flood Hazards at and downstream from Mount Rainier, Washington*. Hydrologic Investigations Atlas HA-729. U.S. Geological Survey, Washington, D.C.

Shong, M., and C. Miss
2010 *Results of Archaeological Monitoring for the Hylebos Bridge Rehabilitation Project, Pierce County, Washington*. Northwest Archaeological Associates, Inc. Report submitted to PB Americas, Inc.

Smith, M. W.
1940 *The Puyallup-Nisqually*. Columbia University Press, New York.

Spier, L.
1936 Tribal Distribution in Washington. *General Series in Anthropology, No 3*. George Banta Publishing Company, Menasha, Wisconsin.

Suttles, W., and B. Lane
1990 Southern Coast Salish. In Handbook of *North American Indians, Volume 7: Northwest Coast*, edited by W. Suttles, pp. 485-502. Smithsonian Institution Press, Washington, D.C.

Tate, C.
2010 Public Port Districts and the Environment. Electronic document, https://www.historylink.org/File/9609, accessed January 5, 2021.

Thorson, R. M.
1980 Ice-Sheet Glaciation of the Puget lowland, Washington, during the Vashon Stade (late Pleistocene). *Quaternary Research* 13(3):303-321.
1981 *Isostatic Effects of the Last Glaciation in the Puget Lowland, Washington.* U.S. Geological Survey, Open-File Report 81-370, Washington, D.C.
1989 Glacio-Isostatic Response of the Puget Sound Area, Washington. *Geological Society of American Bulletin* 101(9):1163-1174.

Thrush, C.
2017 *Native Seattle: Histories from the Crossing-Over Place.* 2nd ed. University of Washington Press, Seattle.

Troost, K. G., and D. E. Booth
2008 Geology of Seattle and the Seattle Area, Washington. In *Landslides and Engineering Geology of the Seattle, Washington, Area*, edited by R. L. Baum, J. W. Godt, and L. M. Highland, pp. 1-35. Geological Society of America, Boulder, CO.

United States Coast Survey (USCS)
1877 *T-1453 Topography of Commencement Bay, Puget Sound, Wash. Ter.* Scale 1:10,000. U.S. Coast Survey, Washington, D.C.

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS)
2020 Web Soil Survey, Washington. Electronic document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, December 30, 2020.

United States General Land Office (GLO)
1874 *Puyallup Indian Reservation Townships 20 & 21 North Ranges 3 & 4 East Willamette Meridian.*

United States Geological Survey (USGS)
1897 *Topographic Sheet: Washington Tacoma Quadrangle.* 1:125,000. U.S. Geological Survey, Washington, D.C.
2020 *Tacoma North Quadrangle, Washington.* 1:24,000. 7.5-Minute Series. U.S. Geological Survey, Washington, D.C.

Vallance, J.W., and K.M. Scott.
1997 The Osceola Mudflow from Mount Rainier: Sedimentology and Hazard Implications of a Huge Clay-Rich Debris Flow. *Geological Society of America Bulletin* 109(2):143-163.

Veracini, L.
2011 Introducing Settler Colonial Studies. *Settler Colonial Studies* 1(1):1-12.

Viloudaki, A., and S. Amell
2019 *Cultural Resource Monitoring of the Port of Tacoma Harbor Dredged Material Characterization Project, Tacoma, Pierce County, Washington*. Aqua Terra Cultural Resource Consultants. Report prepared for Anchor QEA.

Waitt, R. B., and R. M. Thorson
1983 The Cordilleran Ice Sheet in Washington, Idaho, and Montana. In *Late Quaternary Environments of the United States*, edited by S. C. Porter, pp. 53-70. University of Minnesota Press, Minneapolis.

Washington State Department of Archaeology and Historic Preservation (DAHP)
2020a Washington Information System for Architectural and Archaeological Records Data (WISAARD) database. Electronic document, https://secureaccess.wa.gov/dahp/wisaard/, accessed December 3, 2020.
2020b Washington State Standards for Cultural Resources Reporting 2020. On file at DAHP, Olympia.

Washington State Department of Ecology (WAECY)
2020a Cleanup Sites. Electronic document, https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-sites, access January 5, 2021.
2020b Occidental Chemical Corp 605 Alexander Ave, Tacoma, WA 98421-4209. Electronic document, https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=4326, accessed January 5, 2021.
2020c Washington Coastal Atlas. Electronic document, https://geo.wa.gov/datasets/8ef27802b6cf4b61b814c80dd91d6e9e, accessed January 5, 2021.

Washington State Department of Natural Resources (WA DNR)
2020 Washington Interactive Geologic Map. Division of Geology and Earth Resources – Washington's Geological Survey. Electronic document, https://fortress.wa.gov/dnr/geology/, accessed December 30, 2020.

Waterman, T. T.
2001 *sda?da? gweł dibeł lešucid ?acaciłtalbixw Puget Sound Geography*. V. Hilbert, J. Miller, and Z. Zahir, contributing editors. Lushootseed Press, Federal Way, Washington.

Weaver, R. M.
2003 *Letter to John O'Laughlin Regarding Puyallup River Side Channel Habitat Restoration Project Cultural Resource Section 106 Assessment*. The Environmental History Company. Report submitted to City of Tacoma.

White, D. H.
1928 *White's Atlas of Pierce County, Washington Tp. 21 N. R. 3 E. W.M. Wash.* D. H. White, Tacoma.

Wilkes, C.
1841 The Narrows at the Entrance of Puget Sound with Commencement Bay. In *Atlas of the Narrative of the United States Exploring Expedition During the Years, 1839, 1840, 1841, 1842*. C. Sherman, Philadelphia.

Wilma, D.
2006 Puyallup Tribe of Indians Accepts a $162 Million Settlement for Lost Land on March 25, 1990. Electronic resource, https://www.historylink.org/File/7969, accessed December 30, 2020.

Wilma, D., and W. Crowley
2003 Tacoma – Thumbnail History. Electronic document, https://www.historylink.org/File/5055, accessed January 5, 2021.

Wilson, D.
2018 The Fort and the Village: Landscape and Identity in the Colonial Period of Fort Vancouver. In *British Forts and Their Communities*, edited by C. R. DeCorse and Z. J. M. Beier, pp. 91-125. University Press of Florida, Gainesville.

Appendix A. Assessment Correspondence

Cultural Resource Consultants

Puyallup Tribe of Indians
Brandon Reynon
3009 East Portland Ave
Tacoma, WA 98404

December 7, 2020

Re: Cultural Resources Assessment for the Occidental Chemical Corporation Barrier Wall Project, Tacoma, Pierce County, Washington

Dear Brandon,

I am writing to inform you of a cultural resources assessment for the above referenced project and to seek additional information about the project area the Tribe may have that is not readily available through other written sources. This letter is on a technical staff-to-technical staff basis to inquire about project-related cultural information or concerns. It is not intended as formal government-to-government consultation to be initiated by the appropriate regulatory agency.

The project is located in Section 27, Township 21 North, Range 03 East Willamette Meridian at 605 & 709 Alexander Ave in Tacoma, Pierce County, Washington. The project proposes to install a barrier wall structure to be located along the Hylebos Waterway (Hylebos) adjacent to the Occidental Chemical Corporation (OXY) property in Tacoma, Washington. The barrier wall will be approximately 2,200 linear feet (lf) and 78 ft in depth in the marine channel of the Hylebos, an inlet to Puget Sound's Commencement Bay. The primary purpose of the barrier wall is to eliminate the horizontal discharge from seeps and shallow groundwater with high pH to the Hylebos. In addition, the barrier wall would limit transient tidal effects on shallow groundwater levels, thereby resulting in less contaminant "flushing" in the vicinity of the embankment and more consistent performance of the groundwater extraction system in this area. The barrier wall would also contain the contaminated embankment area, the Navy Todd Dump, the N Landfill, and the 709 Embankment Fill areas. Additionally, approximately 25 to 30 percent of Area 5106 would be contained within (i.e., west of) the barrier wall.

We are in the process of reviewing available information. Background research will include a site files search at the Washington State Department of Archaeology and Historic Preservation, review of previously recorded cultural resource reports, and review of pertinent published literature and ethnographies. Results of our investigations will be presented in a technical memo.

We are aware that not all information is contained within published sources. Should the Tribe have additional information to support our assessment, we would very much like to include it in our study. Please contact me at sonja@crewa.com or 360-395-8879 should you wish to provide any comments. I appreciate your assistance in this matter and look forward to hearing from you.

Sincerely,

Sonja Kleinschmidt, Projects Manager

CULTURAL RESOURCE CONSULTANTS, LLC · PO BOX 41019 · SEATTLE, WA 98104
Phone: 206.853.9020 · sonja@crewa.com

Appendix B. Inadvertent Discovery Protocol

In accordance with RCW 27.44 Indian Graves and Records Act, RCW 27.53 Archaeological Sites and Resources, RCW 68.50 Human Remains, and RCW 68.60, Abandoned and Historic Cemeteries and Historic Graves, the following steps will be taken in the event that archaeological materials and/or human remains are discovered:

Procedures for Discovery of Potential or Actual Cultural Resources
Upon discovery of a potential or actual archaeological site or cultural resources as defined by RCW 27.44 Indian Graves and Records Act and RCW 27.53 Archaeological Sites and Resources, project contractors and sub-contractors shall:

(a) Immediately cease or halt ground disturbing, construction, or other activities around the area of the discovery and secure the area with a perimeter of not less than 30 feet until all procedures are completed and the parties agree that activities can resume. If such a perimeter would materially impact agency functions mandated by law, related to health, safety, or environmental concerns, then the secured area shall be of a size and extent practicable to provide maximum protection to the resource under the circumstances. Project activities that are not ground disturbing may continue outside the secured perimeter around the findings. No one shall excavate any findings and all findings will be left in place, undisturbed and without analysis, until consultation with DAHP and identified area Tribes regarding a final disposition of the findings has been completed. In accordance with RCW 27.53.060, no one shall knowingly remove or collect any archaeological objects without obtaining a permit.

(b) Notify the State Archaeologist at DAHP and identified area Tribes of the discovery as soon as possible and no later than 24 hours of the discovery. If human remains are found, the project proponent shall follow notification procedures specified below.

(c) Arrange for the parties to conduct a joint viewing of the discovery within 48 hours of the notification or at the earliest possible time thereafter. After the joint viewing, taking into account any recommendations made by the Tribes and DAHP, the parties shall discuss the potential significance, if any, of the discovery.

(d) Consult with the identified area Tribes and DAHP on the transfer and final disposition of artifacts. Until the Tribe has a repository that meets the standards of curation established 36 CFR Part 79, artifacts shall be curated using an institution or organization that meets curation standards, selected through consultation with the Tribes.

Procedures for Discovery of Human Skeletal Remains

Upon discovery of human skeletal remains on non-federal and non-Tribal land and in accordance with RCWs 68.50.645, 27.44.055, and 68.60.055, project contractors and sub-contractors shall take the following steps:

(a) If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity must cease that may cause further disturbance to those remains and the area of the find must be secured and protected from further disturbance. In addition, the finding of human skeletal remains must be reported to the Pierce County Medical Examiner's Office and Pierce County Sheriff's Office in the most expeditious manner possible. The remains should not be touched, moved, or further disturbed.

(b) The Pierce County Medical Examiner's Office will assume jurisdiction over the human skeletal remains and make a determination as to whether the remains are forensic or non-forensic. If the county medical examiner determines the remains are non-forensic, they will report that finding to DAHP who will then take jurisdiction over the remains and report them to the appropriate cemeteries and affected Tribes. The State Physical Anthropologist will make a determination as to whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected Tribes.

(c) DAHP will handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains if no federal agency is involved.

Confidentiality of Information

The project proponent and their authorized representative recognizes that archaeological sites are sensitive cultural resources that can become targets of vandalism and illegal removal activities. The project proponent or their authorized representative shall keep and maintain as confidential all information regarding any discovered cultural resources, particularly the location of known or suspected archaeological property, and exempt all such information from public disclosure consistent with RCW 42.17.300.

Contact Information

The lead representatives and primary contacts of each party under this plan are as identified below. The parties may identify other individuals as primary contacts before the commencement of any particular project element.

Puyallup Tribe of Indians

3009 East Portland Avenue, Tacoma, WA 98404
Primary Contact: Brandon Reynon, Cultural Resources, 253-573-7986,
brandon.reynon@puyalluptribe-nsn.gov

U.S. Army Corps of Engineers (Lead Agency)
P.O. Box 3755, Seattle, WA 98124-3755
Primary Contact: Lance Lundquist, Archaeologist, 206-764-6909,
lance.a.lundquist@usace.army.mil or
Stephanie Neil, Archaeologist, 206-764-6941, Stephanie.L.Neil@usace.army.mil

Washington Department of Archaeology and Historic Preservation (DAHP)
P.O. Box 48343, Olympia, WA 98504-8343
Primary Contact: Rob Whitlam, State Archaeologist, 360-890-2615, rob.whitlam@dahp.gov.wa
Primary Contact for Human Remains: Guy Tasa, State Physical Anthropologist, 360-790-1633,
Guy.Tasa@dahp.wa.gov

Pierce County Sheriff's Office
County-City Building, First Floor, 930 Tacoma Avenue S, Tacoma, WA 98402
Primary Contact: Brent Bomkamp, 253-798-7530

Pierce County Medical Examiner's Office
3619 Pacific Avenue, Tacoma, WA 98418
Primary Contact: Karen Cline-Parhamovich, Chief Medical Examiner, 253-798-6494