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WASHINGTON STATE

Joint Aquatic Resources Permit Application (JARPA) Form [help]

US Army Corps of Engineers®
Seattle District

AGENCY USE ONLY
Date received:
Agency reference #: ______
Tax Parcel #(s): ______

USE BLACK OR BLUE INK TO ENTER ANSWERS IN WHITE SPACES BELOW.

Part 1–Project Identification

1. Project Name (A unique name for your project that you create. Examples: Smith's Dock or Seabrook Lane Development) [help]
Boulevard/Cornwall Overwater Pedestrian Walkway Project

Part 2–Applicant

The person or organization responsible for the project. [help]

2a. Name (Last, First, Middle) and Organization (if applicable)			
Gina Gobo Austin, City of Bellingham Parks and Recreation, Design and Development Division			
2b. Mailing Address (Street or PO Box)			
3424 Meridian Street			
2c. City, State, Zip			
Bellingham, Washington 98225-1764			
2d. Phone (1)	**2e.** Phone (2)	**2f.** Fax	**2g.** E-mail
(360) 778-7000	(360) 778-7014	(360) 778-7001	GAustin@cob.org

Part 3–Authorized Agent or Contact

Person authorized to represent the applicant about the project. (Note: Authorized agent(s) must sign 11b. of this application.) [help]

3a. Name (Last, First, Middle) and Organization (if applicable)			
Derek Koellmann, Anchor QEA, LLC			
3b. Mailing Address (Street or PO Box)			
1605 Cornwall Avenue			
3c. City, State, Zip			
Bellingham, Washington 98225-4634			
3d. Phone (1)	**3e.** Phone (2)	**3f.** Fax	**3g.** E-mail
(360) 733-4311 x221	(360) 303-4106	(360) 733-4312	dkoellmann@anchorqea.com

Part 4–Property Owner(s) [help]

Contact information for people or organizations owning the property(ies) where the project will occur. [help]

☐ Same as applicant. (Skip to Part 5.)

☐ Repair or maintenance activities on existing rights-of-way or easements. (Skip to Part 5.)

☒ There are multiple property owners. Complete the section below and use JARPA Attachment A for each additional property owner.

4a. Name (Last, First, Middle) and Organization (if applicable)			
City of Bellingham Parks and Recreation, Design and Development Division			
4b. Mailing Address (Street or PO Box)			
3424 Meridian Street			
4c. City, State, Zip			
Bellingham, Washington 98225-1764			
4d. Phone (1)	**4e.** Phone (2)	**4f.** Fax	**4g.** E-mail
(360) 778-7000	(360) 778-7014	(360) 778-7001	GAustin@cob.org

Part 5–Project Location(s)

Identifying information about the property or properties where the project will occur. [help]

☒ There are multiple properties or project locations (e.g., linear projects). Complete the section below and use JARPA Attachment B for each additional property.

5a. Street Address (Cannot be a PO Box. If there is no address, provide other location information in 5n.) [help]			
The Project is located at the north end of Boulevard Park (470 Bayview Road, Bellingham, Washington 98225), the south end of the former Cornwall Avenue Landfill site (southern end of Cornwall Avenue, Bellingham, Washington 98225), and over state-owned aquatic lands managed by WDNR (Lease #22-084455)			
5b. City, State, Zip (If the project is not in a city or town, provide the name of the nearest city or town.) [help]			
Bellingham, Washington 98225			
5c. County [help]			
Whatcom County			
5d. Provide the section, township, and range for the project location. [help]			
¼ Section	**Section**	**Township**	**Range**
SE/SW	36	38N	2E
5e. Provide the latitude and longitude of the project location. [help] • Example: 47.03922 N lat. / -122.89142 W long			
48.735519 N lat. / -122.331931 W long.			
5f. List the tax parcel number(s) for the project location. [help] • The local county assessor's office can provide this information.			
The Project is located at the north end of Boulevard Park (Tax Parcel 370 201 090 495 0000), the south end of the former Cornwall Avenue Landfill (Tax Parcel 380 236 386 308 0000), and over state-owned aquatic lands managed by WDNR (Lease #22-084455) that are under public ownership and are not assigned tax parcel numbers.			

5g. Indicate the type of ownership of the property. (Check all that apply.) [help]

☒ State Owned Aquatic Land ☐ Tribal ☐ Private
☒ Other publicly owned (federal, state, county, city, special districts like schools, ports, etc.)

5h. Contact information for all adjoining property owners, lessees, etc. (If you need more space, use JARPA Attachment C.) [help]

Name	Mailing Address	Tax Parcel # (if known)
City of Bellingham Parks and Recreation Department	3424 Meridian St. Bellingham, Washington 98225-1764	Boulevard Park (Tax Parcel 370 201 090 495 0000)
Burlington Northern Santa Fe Railway	3017 Lou Menk Drive Fort Worth, Texas 76131-2800	BNSF Railroad Line
Port of Bellingham and the City of Bellingham	P.O. Box 1677 Bellingham, Washington 98227-1677	Cornwall Avenue Landfill (Tax Parcel 380 236 386 308 0000)
Washington Department of Natural Resources	P.O. Box 47027 Olympia, Washington 98504-7027	Aquatic Lands Lease #22-084455

5i. Is any part of the project area within a 100-year flood plain? [help]

☒ Yes ☐ No ☐ Don't know

5j. Briefly describe the vegetation and habitat conditions on the property. [help]

Habitat on both ends of the proposed overwater walkway structure is degraded. At the Boulevard Park end, vegetation is primarily composed of maintained lawn with a mix of trees and shrubs adjacent to asphalt paths and other park facilities. There is no shoreline vegetation and the overall habitat value provided through vegetation is very limited. There is a small pocket beach at the northeast corner of the park, but the remainder of the shoreline is heavily armored with rock and concrete riprap. Habitat conditions at the former Cornwall Avenue Landfill site are gravely degraded. Non-native and invasive herbaceous plant species dominate the area near the proposed landing site. The shoreline is heavily armored with riprap and concrete rubble. The upland portion of the site is currently undeveloped and contains a mix of gravelly non-vegetated and vegetated areas; vegetation on the site is unmaintained. There is an existing unmaintained gravel path that extends from the north end of the property to the edge of the riprap at the south end of the property and several concrete foundations are located adjacent to this path, north of the proposed landing. The overwater pedestrian walkway is located within the boundaries of three Model Toxics Control Act (MTCA) sites that are regulated by the Washington State Department of Ecology (Ecology): the Boulevard Park (also known as the South State Street Manufactured Gas Plant [MGP] Site), Cornwall Avenue Landfill, and Whatcom Waterway sites. These sites are detailed in Section 1.5, MTCA Remedial Actions Associated with the Overwater Walkway, of the attached Project Description (Attachment 2).

The bathymetry of the embayment between Boulevard Park and the former Cornwall Avenue Landfill site indicates that the shoreline is gently sloping from the upland toward the Whatcom Waterway navigation channel. The substrate along the shoreline of the Project area and waterward of the riprap at each landing site primarily consists of gravel, mud, cobble, sand, and shell fragments. A geotechnical study was conducted for the Project in October 2009, and borings indicated the material below elevation -20 feet mean lower low water (MLLW) to be primarily composed of sand, soft clay, and silt. Native eelgrass (*Zostera marina*) beds are located in the embayment from approximately -2 feet MLLW to a depth of approximately -8 feet MLLW as described in the *Boulevard Park Overwater Walkway Eelgrass Survey* by Grette Associates (2009) (Attachment 3). Near the Boulevard Park landing, eelgrass density is lowest and the eelgrass band is narrowest at the existing pier. Near the former Cornwall Avenue Landfill site, eelgrass density is generally consistent along the entire shoreline area.

In addition, macroalgae was consistently found landward of the eelgrass bed surveyed. Fucus and Ulva were present on most transects, and sparse Laminaria was observed further waterward on some transects (Grette Associates 2009).

5k. Describe how the property is currently used. [help]

Boulevard Park is a major public waterfront park facility in Bellingham that is owned, managed, and maintained by the City of Bellingham (City) Parks and Recreation Department (Parks). The park is heavily used year-round for recreational purposes (also see section 5l below). The former Cornwall Avenue Landfill site is located within the City's Waterfront District redevelopment area. The upland portion is currently undeveloped and public access is restricted (also see section 5l below). The outermost portion of the embayment (a part of Bellingham Bay) between Boulevard Park and the former Cornwall Avenue Landfill site is presently used for transient and derelict vessel moorage; however, these transient vessels do not have Washington Department of Natural Resources (WDNR) authorization to moor in this area.

5l. Describe how the adjacent properties are currently used. [help]

Boulevard Park is an approximately 14-acre public park used primarily for recreational purposes. The park is currently the northernmost terminus of an existing public walkway system including Taylor Avenue Dock and Pattle Point Trestle and serves as the main parking and access facility in this area. The Burlington Northern Santa Fe (BNSF) railroad is located east of the Project site. Farther east are primarily residential properties within the South Hill neighborhood. At the northern terminus of the Project, the former Cornwall Avenue Landfill site, is the Bellingham Central Business District, which consists primarily of a mix of industrial and commercial properties. The property north of and adjacent to the Project area is the former Georgia Pacific property, including Cornwall Avenue Landfill, which is currently planned for redevelopment into a multi-use property. Bellingham Bay, to the west of the Project area, is used for commercial and recreational marine activities including boating, fishing, and kayaking.

5m. Describe the structures (above and below ground) on the property, including their purpose(s). [help]

An existing wharf and pier are located at the north end of Boulevard Park in the approximate location of the southern terminus of the proposed overwater pedestrian walkway (Photo 1). The pier, previously used for public viewing and boat moorage, is in structurally unsafe condition and is closed to the public. The overwater portion of the pier is supported by pier bents supported by 1-foot by 1-foot timber caps and eight corroded steel H-piles. The overwater portion of the wharf is supported by approximately 87 creosote-treated timber piles. A low concrete wall topped with riprap supports the wharf on the landward side.

Photo 1 – View from Boulevard Park of the existing pier where the southern end of the overwater pedestrian walkway will land (facing north)

Upland from the Project area, Boulevard Park contains a small performance stage, public restrooms, picnic facilities, parking, trails, and 'The Woods' coffee shop. The former Cornwall Avenue Landfill within the Project area contains five derelict creosote-treated piles that are located immediately offshore of the southwest corner of the property.

5n. Provide driving directions from the closest highway to the project location, and attach a map. [help]

From Seattle, Washington, take Interstate 5 (I-5) northbound approximately 85 miles to exit 250 (State 11 South/Old Fairhaven Parkway). Turn LEFT onto Connelly Avenue/Old Fairhaven Parkway and drive approximately 1.5 miles. Turn RIGHT onto 12th street for approximately 0.2 miles, then take a slight LEFT onto Finnegan Way and remain on Finnegan Way as it turns into 11th Street, and then South State street for approximately 0.5 mile. Turn LEFT onto Bayview Drive/Boulevard Park Street and continue for approximately 0.4 mile until the Project area is reached (see Sheet 1 in Attachment 4 for a vicinity map).

Part 6–Project Description

6a. Summarize the overall project. You can provide more detail in 6d. [help]

Parks proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site (see Sheet 1 in Attachment 4 for a vicinity map). The new facility will include a new overwater pedestrian walkway, 7 to 14 feet in width, with benches. The walkway will be constructed of steel and concrete with wood pedestrian guardrails to meet Americans with Disabilities Act (ADA) requirements. The landing to the south will connect to Boulevard park, which is connected to the Coast Millennium Trail route. The connection to the north at Cornwall is connected to the waterfront district.

The Project will occur across several parcels under varying ownership: Boulevard Park is owned by the City, the former Cornwall Avenue Landfill site is jointly owned by the City and the Port of Bellingham, and aquatic lands are owned by WDNR.

Project elements include:

- Removal of an existing pier, wharf, and derelict piles
- Installation of in-water piles
- Construction of a pile supported overwater structure, including precast and cast-in-place pile caps, precast deck panels, a finish slab, pedestrian guardrails meeting ADA requirements, deck lighting, and benches
- Landings and associated improvements at both Boulevard Park and the former Cornwall Avenue Landfill site

The proposed improvements are detailed in section 6d and are shown on Sheets 3 through 12 (Attachment 4). Additional information related to the Project is included in the attached Project Description (Attachment 2).

6b. Indicate the project category. (Check all that apply.) [help]

☐ Commercial ☐ Residential ☐ Institutional ☒ Transportation ☒ Recreational
☐ Maintenance ☐ Environmental Enhancement

6c. Indicate the major elements of your project. (Check all that apply.) [help]

☐ Aquaculture	☐ Culvert	☐ Float	☐ Road
☐ Bank Stabilization	☐ Dam / Weir	☐ Geotechnical Survey	☐ Scientific Measurement Device
☐ Boat House	☐ Dike / Levee / Jetty	☐ Land Clearing	☐ Stairs
☐ Boat Launch	☐ Ditch	☐ Marina / Moorage	☐ Stormwater facility
☐ Boat Lift	☐ Dock / Pier	☐ Mining	☐ Swimming Pool
☐ Bridge	☐ Dredging	☐ Outfall Structure	

☐ Bulkhead ☐ Buoy ☐ Channel Modification	☐ Fence ☐ Ferry Terminal ☐ Fishway	☒ Piling ☐ Retaining Wall (upland)	☐ Utility Line
☒ Other: Construction of pile supported overwater structure and associated improvements			

6d. Describe how you plan to construct each project element checked in 6c. Include specific construction methods and equipment to be used. [help]

- Identify where each element will occur in relation to the nearest waterbody.
- Indicate which activities are within the 100-year flood plain.

Overwater Walkway Structure

The proposed overwater structure will span approximately 2,350 feet across a portion of Bellingham Bay. The structure will be supported by 48 bents spaced at approximately 50 feet on center; each bent includes two 24-inch steel piles for a total of 96 piles, and a precast/cast-in-place concrete pile cap. The piles will be installed using a vibratory hammer and then proofed with an impact hammer to ensure vertical load requirements are met. Four of the piles will be located over areas of high bedrock and will be secured to the bedrock using steel rock anchors.

The proposed overwater structure will mostly occur over water, spanning a portion of the Bellingham Bay embayment connecting the north end of Boulevard Park to the south end of the former Cornwall Avenue Landfill site. According to the Federal Emergency Management Agency Flood Insurance Rate Maps for Bellingham, Project activities located waterward of the shoreline of Boulevard Park and the former Cornwall Avenue Landfill site are located within a Zone A 100-year flood hazard area. Zone A is a designation that is given to 100-year flood hazard areas where base flood elevations have not been determined. Upland portions of the project, including landings and connecting walkways will not occur within the 100-year flood plain (FEMA 2004).

Removal of Existing Structures

The existing wharf and pier (including the eight steel H-piles) at the north end of Boulevard Park, four additional existing creosote-treated timber piles in the embayment to the north of the existing timber pier on the Boulevard Park side, and the isolated timber piles at the former Cornwall Avenue Landfill site will be removed by a derrick barge or land-based conventional crane (see Sheet 4 for the demolition plan).

Best management practices (BMPs; see Attachment 5) as identified by the U.S. Army Corps of Engineers (USACE) Dredged Materials Management Office and the WDNR Puget Sound Initiative will be employed during removal of the piles. Timber piles would be removed in whole, wherever possible, by pulling. Removal of whole piles is the preferred method, because it would ensure the removal of the creosote preservative adhering to the piles. During removal, if a pile were to break above the mudline, an attempt would be made to pull the remainder of the pile to minimize disturbance of sediments. All creosote-treated wood that is removed would be disposed of in accordance with Washington State’s Dangerous Waste Regulations (WAC 173-303) and Excluded Categories of Waste (WAC 173-303-071). All waste and debris generated by the Project would be collected and removed to a legally permitted waste disposal or recycling site.

Installation of New Structures

Upland Work

Upland work (above ordinary high water [OHW] and mean higher high water [MHHW]) will be performed using standard heavy construction equipment. Construction areas will be secured with temporary fencing to prohibit public access during construction. BMPs will be implemented to prevent sediment and other deleterious materials from entering waters of the United States.

In-water and Overwater Work

Piles will be driven using a vibratory hammer from a derrick barge or land-based crane, which consists of pairs of a spring-isolated hammer head and a set of hydraulic pile clamps. This process begins by placing a choker around the pile and lifting it into vertical position with the crane. The pile is then lowered into position and set in place at the mudline. The pile is held steady while the vibratory hammer installs the pile to 5 feet above the required tip elevation. To ensure load-bearing capacity, the pile will be driven with an impact hammer for the remaining distance. Four of the piles need to be anchored to the bedrock to support the design loads.

Duration of vibratory pile driving time depends on the substrate conditions. Once the pile is set in place, pile installation with a vibratory hammer can take less than 15 minutes under steady substrate conditions, to more than an hour under difficult substrate conditions (such as glacial till and bedrock, or exceptionally loose material in which the pile repeatedly moves out of position). The Project location is not expected to have difficult conditions. During the construction period, 96 piles will be driven, four of which are located above MHHW. Based on this information, a conservative estimate of pile driving time could extend to approximately 30 to 60 hours of pile driving.

The bottom part of the precast concrete pile caps and deck panels will be set in place by a barge-mounted or land-based crane and secured in place. The concrete for the cast-in-place top part of the pile caps will be delivered and placed by barge. The concrete finish slab will be applied once the deck panels are in place. Concrete for the finish slab will be applied from either land or a barge. BMPs will be implemented to ensure that no uncured concrete comes into contact with surface waters. Wood pedestrian guardrails meeting ADA requirements, lighting, and viewing benches will be installed after the finish slab has cured.

Construction Timing and Schedule

The entire Project, including demolition and construction, is expected to take approximately 42 to 46 weeks to complete. In-water work is expected to take approximately 14 weeks to complete. However, the duration and total period of in-water work would be affected by several factors, including the type of construction equipment and procedures selected by the contractor, and the sequencing of work elements. If it is necessary to perform certain work at night during a low tide, appropriate City, Whatcom County, and any other necessary approvals would be obtained. Approximate durations for various construction activities are listed in Table 1.

Table 1
Approximate In-Water Activity Durations

Project Element	Approximate Duration
Remove isolated timber piles	1 day
Remove timber wharf, piles, and pier	2 days
Install landings	2 weeks
Install walkway	40 weeks

In-water work will occur according to the allowable USACE and Washington Department of Fish and Wildlife (WDFW) work windows for Bellingham Bay and/or in accordance with the requirements and conditions of the Hydraulic Project Approval (HPA) issued by WDFW and appropriate concurrence recommendations identified by the federal agencies during Endangered Species Act (ESA) consultation. The expected in-water work window for the Project is from July 16 to January 21 in the years in which construction will occur. Table 2 details the in-water work windows for the Project.

Table 2
In-water Work Windows

	Month												
Species	J	F	M	A	M	J	J	A	S	O	N	D	Approved Work Windows by Species
Salmon													July 2 to March 2
Bull Trout													July 16 to February 15
Herring													June 15 to January 21
Sand Lance													March 2 to October 14
Surf Smelt													N/A[1]

Note:
1 Surf smelt spawning occurs year-round.

6e. What are the start and end dates for project construction? (month/year) [help]

- If the project will be constructed in phases or stages, use JARPA Attachment D to list the start and end dates of each phase or stage.

Start date: July 16, 2012 End date: Spring 2013 ☐ See JARPA Attachment D

6f. Describe the purpose of the work and why you want or need to perform it. [help]

The purpose of the proposed overwater pedestrian walkway is to improve public access to the Bellingham Bay shoreline and provide trail access to current and future waterfront development.

6g. Fair market value of the project, including materials, labor, machine rentals, etc. [help]

$7.1 to $7.25 million

6h. Will any portion of the project receive federal funding? [help]

- **If yes**, list each agency providing funds.

☒ Yes ☐ No ☐ Don't know

Federal Enhancement Grant via FHWA

Part 7–Wetlands: Impacts and Mitigation

☐ Check here if there are wetlands or wetland buffers on or adjacent to the project area.
(If there are none, skip to Part 8.)

7a. Describe how the project has been designed to avoid and minimize adverse impacts to wetlands. [help]

☒ Not applicable

No wetlands or wetland buffers are located on or adjacent to the Project area.

7b. Will the project impact wetlands? [help]

☐ Yes ☒ No ☐ Don't know

7c. Will the project impact wetland buffers? [help]

☐ Yes ☒ No ☐ Don't know

7d. Has a wetland delineation report been prepared? [help]

- **If yes**, submit the report, including data sheets, with the JARPA package.

☐ Yes ☒ No

7e. Have the wetlands been rated using the Western Washington or Eastern Washington Wetland Rating System? [help]

- **If yes**, submit the wetland rating forms and figures with the JARPA package.

☐ Yes ☐ No ☐ Don't know

7f. Have you prepared a mitigation plan to compensate for any adverse impacts to wetlands? [help]

- **If yes**, submit the plan with the JARPA package.

☐ Yes ☐ No ☒ Not applicable

7g. Use the table below to list the type and rating of each wetland that will be impacted; the extent and duration of the impact; and the type and amount of compensatory mitigation proposed. If you are submitting a compensatory mitigation plan with a similar table, you may simply state (below) where we can find this information in the mitigation plan. [help]

Activity causing impact (fill, drain, excavate, flood, etc.)	Wetland type and rating category[1]	Impact area (sq. ft. or acres)	Duration of impact[2]	Proposed mitigation type[3]	Wetland mitigation area (sq. ft. or acres)

[1] Ecology wetland category based on current Western Washington or Eastern Washington Wetland Rating System. Provide the wetland rating forms with the JARPA package.

[2] Indicate the time (in months or years, as appropriate) the wetland will be measurably impacted by the activity. Enter "permanent" if applicable.

[3] Creation (C), Re-establishment/Rehabilitation (R), Enhancement (E), Preservation (P), Mitigation Bank/In-lieu fee (B)

Page number(s) for similar information in the mitigation plan, if available: ______________________________

7h. For all filling activities identified in 7g., describe the source and nature of the fill material, the amount in cubic yards that will be used, and how and where it will be placed into the wetland. [help]

No wetlands or wetland buffers are located on or adjacent to the Project area.

7i. For all excavating activities identified in 7g., describe the excavation method, type and amount of material in cubic yards you will remove, and where the material will be disposed. [help]

No wetlands or wetland buffers are located on or adjacent to the Project area.

7j. Summarize what the compensatory mitigation plan is meant to accomplish, and describe how a watershed approach was used to design the plan. [help]

No wetlands or wetland buffers are located on or adjacent to the Project area.

Part 8–Waterbodies (other than wetlands): Impacts and Mitigation

In Part 8, "waterbodies" refers to non-wetland waterbodies. (See Part 7 for information related to wetlands.) [help]

☒ Check here if there are waterbodies on or adjacent to the project area. (If there are none, skip to Part 9.)

8a. Describe how the project is designed to avoid and minimize adverse impacts to the aquatic environment. [help]

☐ Not applicable

Avoidance and minimization measures for the Project are detailed in Section 1.4.3, Mitigation, in the attached Project Description (Attachment 2). The following bullets outline the proposed avoidance and minimization measures as well as mitigation actions for the Project:

- Removal of an existing timber pier, piles, and wharf at the north end of Boulevard Park
- Removal of nine additional creosote-treated timber piles in the embayment between Boulevard Park and the former Cornwall Avenue Landfill
- Project design minimizes impacts to nearshore habitat (e.g., the widened deck portions will be located over areas with seafloor depths of -12 feet MLLW or lower; see Table 1 in the attached Project Description [Attachment 2] for a summary of changes in overwater cover to the intertidal zone)
- Location of the overwater pedestrian walkway crosses over the narrowest area of eelgrass near the Boulevard Park landing (at the approximate location of the existing pier) and avoids crossing over the eelgrass areas near the former Cornwall Avenue Landfill site landing to minimize new macroalgae shading impacts from the overwater pedestrian walkway
- The new structure was designed to include grating of spans located above nearshore areas (-12 feet MLLW or higher): the three spans closest to the Boulevard Park landing and the five spans closest to the former Cornwall Avenue Landfill site landing; the grating will be sized to provide 70% light transmission
- All proposed fill material, including riprap, will be placed above OHW and MHHW
- Steel piling is used for the Project instead of chemically treated-wood piles to minimize adverse impacts

to the aquatic environment

- No piles treated with pentachlorophenol will be used.
- Piles will be installed with a vibratory hammer where practicable to minimize impacts to the aquatic environment.

In addition to the proposed avoidance and minimization measures, all in-water work will be conducted within the in-water work window for Bellingham Bay (July 16 to January 21) and BMPs will be implemented during Project construction. BMPs are construction work methods that are generally accepted to avoid and/or minimize the potential for adverse environmental effects. BMPs to be implemented for the overwater pedestrian walkway construction Project are included in Attachment 5 and the Project Mitigation Report is included in Attachment 6.

8b. Will your project impact a waterbody or the area around a waterbody? [help]

☒ Yes ☐ No

8c. Summarize impact(s) to each waterbody in the table below. [help]

Activity causing impact (clear, dredge, fill, pile drive, etc.)	Waterbody name	Impact location[1]	Duration of impact[2]	Amount of material to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Existing wharf, piles, and pier removal	Intertidal area, Bellingham Bay	In waterbody, north shoreline of Boulevard Park	Permanent	Approximately 3,332 square feet of overwater cover will be removed	Approximately 3,332 square feet
Existing treated-timber pile removal	Bellingham Bay	In waterbody, north shoreline of Boulevard Park and southwest corner of former Cornwall Avenue Landfill	Permanent	Four creosote-treated, 12-inch-diameter timber piles at Boulevard Park will be removed and five creosote-treated 12-inch-diameter timber piles will be removed from the former Cornwall Avenue Landfill	Approximately 7 square feet
Overwater cover	Bellingham Bay	In waterbody and on shorelines adjacent to Boulevard Park and the former Cornwall Avenue Landfill	Permanent	No decking will be placed into the waterbody	Approximately 34,000 square feet of new decking will be installed over Bellingham Bay as part of the Project
New steel pile installation	Bellingham Bay	In waterbody	Permanent	96 24-inch-diameter steel piles will be installed	Approximately 302 square feet

[1] Indicate whether the impact will occur in or adjacent to the waterbody. If adjacent, provide the distance between the impact and the waterbody and indicate whether the impact will occur within the 100-year flood plain.
[2] Indicate the time (in months or years, as appropriate) the waterbody will be measurably impacted by the work. Enter "permanent" if applicable.

8d. Have you prepared a mitigation plan to compensate for the project's adverse impacts to non-wetland waterbodies? [help]

- **If yes**, submit the plan with the JARPA package.

☒ Yes ☐ No ☐ Not applicable

*Please see Attachment 6 for the Project Mitigation Report

8e. Summarize what the compensatory mitigation plan is meant to accomplish. Describe how a watershed approach was used to design the plan.

- If you already completed 7j., you do not need to restate your answer here. [help]

The Project Mitigation Report (Attachment 6) describes avoidance and minimization measures and mitigation actions proposed to offset impacts to Bellingham Bay caused by the Project. Potential impacts to the watershed, including potential effects to eelgrass and fish species, were discussed during early action meetings with local agencies and the appropriate measures were incorporated into the design of the Project.
8f. For all activities identified in 8c., describe the source and nature of the fill material, amount (in cubic yards) you will use, and how and where it will be placed into the waterbody. [help]
No fill material will be placed below MHHW as a result of the proposed Project.
8g. For all excavating or dredging activities identified in 8c., describe the method for excavating or dredging, type and amount of material you will remove, and where the material will be disposed. [help]
No excavation will occur below OHW and no dredging activities are included in the proposed Project.

Part 9–Additional Information

Any additional information you can provide helps the reviewer(s) understand your project.

9a. If you have already worked with any government agencies on this project, list them below. [help]

Agency Name	Contact Name	Phone	Most Recent Date of Contact
WDNR	Terry Carten	(360) 856-3500	4/16/10
WDNR	Lisa Kaufman	(360) 854-2808	4/16/10
WDNR	David Roberts	(360) 854-2805	4/16/10
USACE	Randel Perry	(206) 764-6985	4/14/10
WDFW	Brian Williams	(360) 466-4345 x250	2/5/10
WDFW	Rebekah Padgett	(425) 649-7129	4/16/10
Ecology	Barry Wenger	(360) 715-5220	4/16/10
City of Bellingham	Steve Sundin	(360) 778-8300	4/6/10

9b. Are any of the wetlands or waterbodies identified in Part 7 or Part 8 on the Washington Department of Ecology's 303(d) List? [help]

- **If yes,** list the parameter(s) below.
- If you don't know, use Washington Department of Ecology's Water Quality Assessment tools at: http://www.ecy.wa.gov/programs/wq/303d/.

☒ Yes ☐ No

The majority of the Project area contains sediments listed under Category 4A. A Category 4A listing includes "sediments where the data show that a characteristic use is impaired by a pollutant, but a Total Maximum Daily Load (TMDL) addressing that impairment has already been developed and been approved by the USEPA" (Ecology 2008).

9c. What U.S. Geological Survey Hydrological Unit Code (HUC) is the project in? [help]

- Go to http://cfpub.epa.gov/surf/locate/index.cfm to help identify the HUC.

Strait of Georgia Watershed – 17110002

9d. What Water Resource Inventory Area Number (WRIA #) is the project in? [help]

- Go to http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm to find the WRIA #.

WRIA 1 – Nooksack Basin

9e. Will the in-water construction work comply with the State of Washington water quality standards for turbidity? [help]

- Go to http://www.ecy.wa.gov/programs/wq/swqs/criteria.html for the standards.

☒ Yes ☐ No ☐ Not applicable

9f. If the project is within the jurisdiction of the Shoreline Management Act, what is the local shoreline environment designation? [help]

- If you don't know, contact the local planning department.
- For more information, go to: http://www.ecy.wa.gov/programs/sea/sma/laws_rules/173-26/211_designations.html.

☐ Rural ☒ Urban ☐ Natural ☐ Aquatic ☒ Conservancy ☐ Other ______________

9g. What is the Washington Department of Natural Resources Water Type? [help]

- Go to http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesApplications/Pages/fp_watertyping.aspx for the Forest Practices Water Typing System.

☒ Shorelines ☐ Fish ☐ Non-Fish perennial ☐ Non-Fish seasonal

9h. Will this project be designed to meet the Washington Department of Ecology's most current stormwater manual? [help]

- **If no**, provide the name of the manual your project is designed to meet.

☒ Yes ☐ No

9i. If you know what the property was used for in the past, describe below. [help]

The properties where the overwater pedestrian walkway is to be constructed were historically used as a log storage area and more recently as a navigation channel and a vessel moorage area.

9j. Has a cultural resource (archaeological) survey been performed on the project area? [help]

- **If yes**, attach it to your JARPA package.

☒ Yes ☐ No

*See Attachment 7 – *An Archaeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham, Washington* by Wessen and Associates, Inc. (2010)

9k. Name each species listed under the federal Endangered Species Act that occurs in the vicinity of the project area or might be affected by the proposed work. [help]

Table 3 details ESA-listed species that may potentially occur in the vicinity of the Project area or might be affected by the proposed work as detailed in the Biological Assessment (Attachment 8).

Table 3
ESA Species Potentially in the Vicinity of the Boulevard/Cornwall Overwater Pedestrian Walkway Project

Species	Status	Agency	Critical Habitat Status
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU	Threatened	NMFS	Designated
Steelhead (*Oncorhynchus mykiss*) Puget Sound DPS	Threatened	NMFS	None proposed or designated
Green sturgeon (*Acipenser medirostris*) Southern DPS	Threatened	NMFS	None in Puget Sound
Pacific eulachon (*Thaleichthys pacificus*) Southern DPS	Threatened	NMFS	None proposed or designated
Bocaccio (*Sebastes paucispinus*) Georgia Basin DPS	Endangered	NMFS	None proposed or designated
Yelloweye rockfish (*Sebastes ruberrimus*) Georgia Basin DPS	Threatened	NMFS	None proposed or designated
Canary rockfish (*Sebastes pinninger*) Georgia Basin DPS	Threatened	NMFS	None proposed or designated

Killer whale (*Orcinus orca*) Southern Resident DPS	Endangered	NMFS	Designated
Humpback whale (*Megaptera novaeangliae*)	Endangered	NMFS	None proposed or designated
Steller sea lion (*Eumetopias jubatus*)	Threatened	NMFS	None in Washington State
Bull trout (*Salvelinus confluentus*) Coastal Puget Sound DPS	Threatened	USFWS	Designated
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	None in action area

Notes:
NMFS – National Marine Fisheries Service
USFWS – U.S. Fish and Wildlife Service

9l. Name each species or habitat on the Washington Department of Fish and Wildlife's Priority Habitats and Species List that might be affected by the proposed work. [help]

The WDFW Priority Habitats and Species (PHS) maps (2008) show that the Project area is located in a priority Estuarine Zone. There is no surf smelt (*Hypomesus pretiosus*) or sand lance (*Ammodytes hexapterus*) spawning documented in the Project footprint, but it is documented in three areas within the action area: south of the Project, on the north side of Bellingham Bay, and along Portage Island and in Portage Bay (WDFW 2000). WDFW's SalmonScape network (WDFW 2000) also notes approximately 300 feet of potential spawning habitat at the Boulevard Park end of the Action Area. Priority species that might be affected by the proposed work include chum salmon (*Oncorhynchus keta*), coho salmon (*O. kisutch*), sea-run cutthroat trout (*O. clarkii clarkii*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*). Additionally, two priority harbor seal (Phoca vitulina) haul-out sites occur on log booms located offshore of the embayment between Boulevard Park and the former Cornwall Avenue Landfill. Documented priority Pacific herring (*Clupea harengus pallasi*) holding areas, Dungeness crab (*Cancer magister*), and Pandalid shrimp (*Pandalidae* spp.) are all located within 1-mile of the Project area. Priority aquatic vegetation and macroalgae species in the Project area include eelgrass and turf algae (*Endocladia muricata*). A detailed analysis of the eelgrass beds located in the vicinity of the Project is included in Part 1 – Project Description and the document containing the survey confirming the location of the beds is included in Attachment 3. A bald eagle (*Haliaeetus leucocephalus*) nest is located approximately 1.25 miles to the southwest of the Project area (WDFW 2008). In July 2007, the bald eagle was removed from protection under the federal ESA. However, two other federal laws provide protection for the bald eagle: the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. These laws primarily address nest tree protection and protection from harassment.

REFERENCES

Ecology (Washington State Department of Ecology), 2008. 2008 Washington State Water Quality Assessment. Available at: http://www.ecy.wa.gov/Programs/wq/303d/2008/index.html. Accessed on March 1, 2009.

FEMA (Federal Emergency Management Agency), 2004. Flood Insurance Rate Maps (FIRM). Map numbers 53073C1632D and 53073C1651D; January 16, 2004.

Grette Associates LLC, 2009. Boulevard Park Overwater Walkway Eelgrass Habitat Memorandum. Prepared for Reid Middleton, Inc. on May 7, 2008 and revised on February 15, 2009.

WDFW (Washington Department of Fish and Wildlife), 2008. WDFW Priority Habitats and Species Map in the Vicinity of T37R02E Section 2. August 19, 2008.

WDFW, 2000. Salmonscape Interactive mapper – Salmon presence; forage fish spawning habitat. Available at: http://wdfw.wa.gov/mapping/salmonscape/. Accessed on April 30, 2010.

Wessen & Associates, Inc., 2010. *An Archaeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham Washington.* April 2010.

Part 10–Identify the Permits You Are Applying For

Use the resources and checklist below to identify the permits you are applying for.

- Online Project Questionnaire at http://apps.ecy.wa.gov/opas/.
- Governor's Office of Regulatory Assistance at (800) 917-0043 or help@ora.wa.gov.

10a. Compliance with the State Environmental Policy Act (SEPA). (Check all that apply.) [help]

- For more information about SEPA, go to www.ecy.wa.gov/programs/sea/sepa/e-review.html.

☐ A copy of the SEPA determination or letter of exemption is included with this application.

☒ A SEPA determination is pending with the City of Bellingham. The expected decision date is Fall 2010.

☐ I am applying for a Fish Habitat Enhancement Exemption. (Check the box below in 10b.)

- Submit the Fish Habitat Enhancement Project form with this application. The form can be found at: http://www.epermitting.wa.gov/site/alias_resourcenter/jarpa_jarpa_form/9984/jarpa_form.aspx.

☐ This project is exempt (choose type of exemption below).

☐ Categorical Exemption. Under what section of the SEPA administrative code (WAC) is it exempt?

____

☐ Other: ______________________________

☐ SEPA is pre-empted by federal law. [help]

10b. Indicate the permits you are applying for. (Check all that apply.) [help]

LOCAL GOVERNMENT

Local Government Shoreline permits:

☒ Substantial Development ☒ Conditional Use ☐ Variance

☐ Shoreline Exemption Type (explain): ______________

Other city/county permits:

☐ Floodplain Development Permit ☐ Critical Areas Ordinance

STATE GOVERNMENT

Washington Department of Fish and Wildlife:

☒ Hydraulic Project Approval (HPA) ☐ Fish Habitat Enhancement Exemption

http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=REG&pagename=Home_Page

Washington Department of Ecology:

☒ Section 401 Water Quality Certification

Washington Department of Natural Resources:

☒ Aquatic Resources Use Authorization

FEDERAL GOVERNMENT

United States Department of the Army permits (U.S. Army Corps of Engineers):

☒ Section 404 (discharges into waters of the U.S.) ☒ Section 10 (work in navigable waters)

United States Coast Guard permits:

☐ General Bridge Act Permit ☐ Private Aids to Navigation (for non-bridge projects)

Part 11–Authorizing Signatures

Signatures required before submitting the JARPA package.

11a. Applicant Signature (required) [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities, and I agree to start work only after I have received all necessary permits.

I hereby authorize the agent named in Part 3 of this application to act on my behalf in matters related to this application. ___GA___ (initial)

By initialing here, I state that I have the authority to grant access to the property. I also give my consent to the permitting agencies entering the property where the project is located to inspect the project site or any work related to the project. ___GA___ (initial)

GM Austin — Applicant

6/11/10 — Date

11b. Authorized Agent Signature [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities and I agree to start work only after all necessary permits have been issued.

Authorized Agent

6/11/10 — Date

11c. Property Owner Signature (if not applicant) [help]

I consent to the permitting agencies entering the property where the project is located to inspect the project site or any work. These inspections shall occur at reasonable times and, if practical, with prior notice to the landowner.

GM Austin — Property Owner

6/11/10 — Date

18 U.S.C §1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious, or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years or both.

If you require this document in another format, contact The Governor's Office of Regulatory Assistance (ORA). People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341.
ORA publication number: ENV-019-09

ATTACHMENT 1
JARPA ATTACHMENT A – ADDITIONAL PROPERTY OWNERS

2 0 0 9

WASHINGTON STATE
Joint Aquatic Resources Permit Application (JARPA) Form [help]

US Army Corps of Engineers®
Seattle District

AGENCY USE ONLY

Date received:

Agency reference #: ______________________

Tax Parcel #(s): ______________________

____

JARPA Attachment A:
For additional property owner(s) [help]

TO BE COMPLETED BY APPLICANT [help]

UPI #: **N/A**

Project Name: **Boulevard/Cornwall Overwater Pedestrian Walkway Project**

Use this attachment only if you have more than one property owner.

Use black or blue ink to enter answers in white spaces below.

4a. Name (Last, First, Middle) and Organization (if applicable)			
Shirley McFearin, Real Estate Development Manager, Port of Bellingham			
4b. Mailing Address (Street or PO Box)			
1801 Roeder Avenue			
4c. City, State, Zip			
Bellingham, Washington 98225			
4d. Phone (1)	**4e.** Phone (2)	**4f.** Fax	**4g.** E-mail
(360) 676-2500	(360) 739-2519	( )	shirleym@portofbellingham.com
Address or tax parcel number of property you own:			
Former Cornwall Avenue Landfill			

4a. Name (Last, First, Middle) and Organization (if applicable)			
Washington State Department of Natural Resources (WDNR), Aquatic Resources Division (Lease #22-084455)			
4b. Mailing Address (Street or PO Box)			
P.O. Box 47027			
4c. City, State, Zip			
Olympia, Washington 98504-7027			
4d. Phone (1)	**4e.** Phone (2)	**4f.** Fax	**4g.** E-mail
(360) 902-1100	( )	(360) 902-1786	ard@dnr.wa.gov

ORA publication number: ENV-020-09

ATTACHMENT 2
PROJECT DESCRIPTION

BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY PROJECT DESCRIPTION

Prepared for

City of Bellingham Parks and Recreation Department
3424 Meridian Street
Bellingham, Washington 98225

Prepared by

Anchor QEA, LLC
1605 Cornwall Avenue
Bellingham, Washington 98225

June 2010

1 PROJECT DESCRIPTION

The City of Bellingham (City) Parks and Recreation Department (Parks) proposes construction of an overwater pedestrian walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site (see Sheet 1 for a vicinity map). The construction of the proposed overwater walkway will significantly improve public shoreline access along Bellingham's waterfront by providing a continuous shoreline trail between Fairhaven and the former Cornwall Avenue Landfill site, and by connecting to the Coast Millennium Trail route at Boulevard Park and the water district at the Cornwall Avenue site. The proposed overwater walkway complements the existing overwater walkway system including Taylor Avenue Dock and the Pattle Point Trestle located to the south of the proposed Boulevard/Cornwall Overwater Pedestrian Walkway Project (Project).

1.1 Project Background

The proposed overwater walkway has been identified in several planning documents as an important link in the network of Bellingham's waterfront trail system, including the 2002 *City of Bellingham Parks, Recreation and Open Space Plan* (COB Parks 2002) and its 2008 update (COB Parks 2008); the 2004 *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay* (WFG 2004); the 2006 *New Whatcom Preliminary Draft Framework Plan* (COB and POB 2006); the 2009 draft update of the *City of Bellingham Shoreline Master Program* (COB 2009); and the mayor's 2008 *Waterfront Connections Plan* (COB 2008). The Project has also been part of a Bellingham public vote, the third greenways levy, which was approved by voters in 2006. Prior to the vote, in an adopted ordinance, the Bellingham City Council recorded intent to pursue a list of potential greenway projects that included the overwater walkway. The list was assembled by citizens who examined the City's current plans and needs.

The Project will occur across several parcels under varying ownership: Boulevard Park is owned by the City, the former Cornwall Avenue Landfill site is jointly owned by the City and the Port of Bellingham, and aquatic lands are owned by the Washington Department of Natural Resources (WDNR).

1.2 Existing Conditions

The southern terminus of the proposed overwater walkway will be located within Boulevard Park, a major public waterfront park facility in Bellingham that is owned, managed, and maintained by Parks. The park is located adjacent to Bellingham Bay between the Fairhaven District (south) and the Bellingham Waterfront District (north), and includes maintained lawn and landscaping, a small performance stage, public restrooms, picnic facilities, parking, trails, and 'The Woods' coffee shop. The park and its trails are used extensively for recreation by locals and visitors due to their scenic value and central location on Bellingham Bay. There is no shoreline access except for a small pocket beach at the northeast corner of the park (Photo 1). The remainder of the shoreline is heavily armored with rock and concrete riprap.

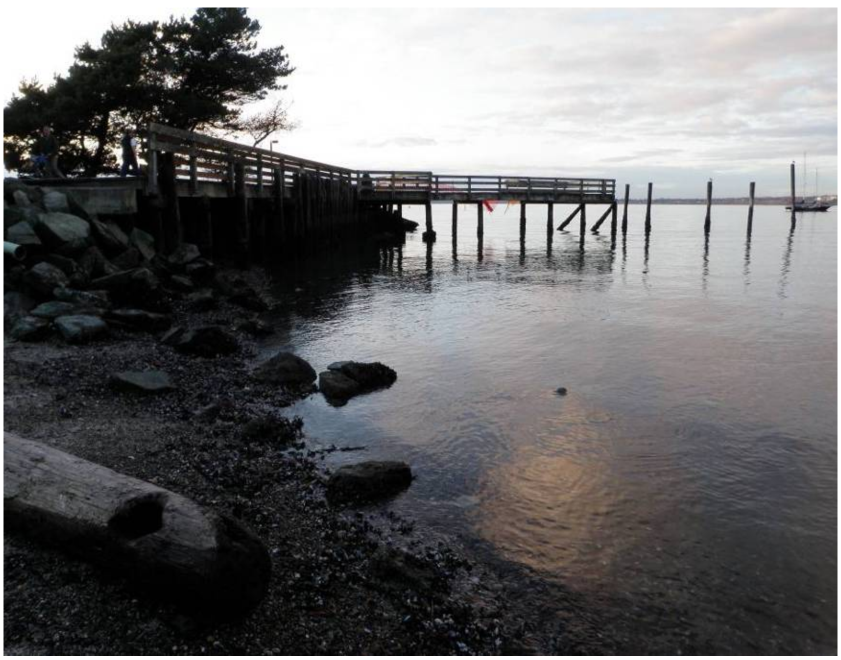


Photo 1 – Profile view of the existing pier at Boulevard Park from the adjacent pocket beach located at the northeast corner of Boulevard Park (facing west)

An existing wharf and pier are located at the north end of Boulevard Park in the location of the southern terminus of the proposed overwater walkway (Photo 2). The pier is in structurally unsafe condition and is closed to the public. The overwater portion of the pier is supported by pier bents supported by 1-foot by 1-foot timber caps and eight corroded steel

H-piles. The overwater portion of the wharf is supported by approximately 87 creosote-treated timber piles. A low concrete wall supports the wharf on the landward side.

Photo 2 – View from Boulevard Park of the existing pier where the southern end of the overwater walkway will land (facing north)

The former Cornwall Avenue Landfill site is located at the north end of the proposed walkway within the City's Waterfront District redevelopment area. The upland portion is currently undeveloped and public access is restricted. Vegetation on the site is unmaintained. Non-native and invasive herbaceous plant species dominate the area near the proposed landing site. The shoreline is heavily armored with riprap and concrete rubble. Five derelict creosote-treated piles are located immediately offshore of the southwest corner of the property in the vicinity of the proposed walkway (Photo 3).

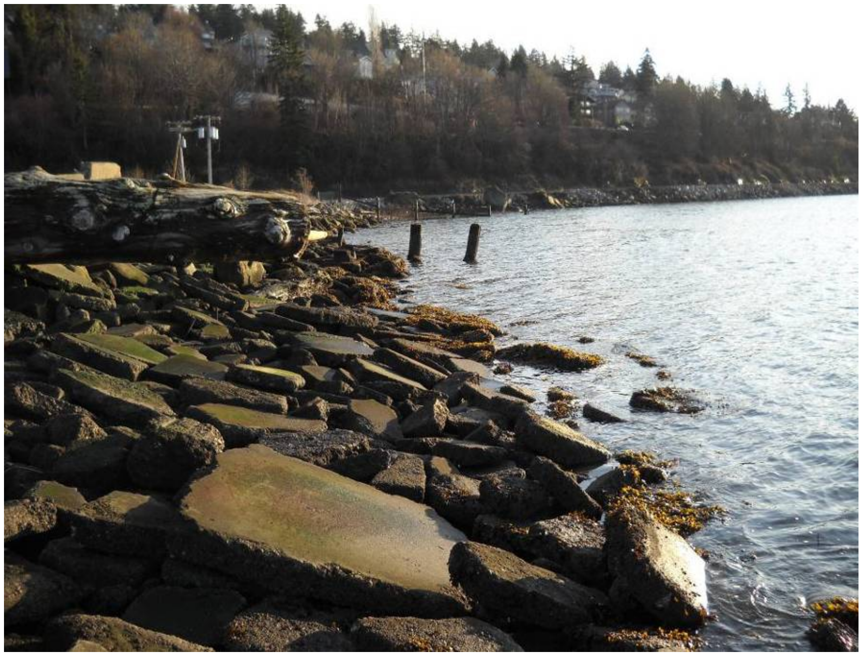


Photo 3 – View of the former Cornwall Avenue Landfill site where the north abutment of the proposed overwater walkway will land (facing southeast)

The outermost portion of the embayment (a part of Bellingham Bay) between Boulevard Park and the former Cornwall Avenue Landfill site (Photo 4), is presently used for transient and derelict vessel moorage; however, these transient vessels do not have WDNR authorization to moor in this area. The bathymetry of the embayment between Boulevard Park and the former Cornwall Avenue Landfill site indicates that the shoreline is gently sloping from the upland toward the Whatcom Waterway navigation channel. The substrate along the shoreline of the Project area waterward of the riprap at each landing site primarily consists of gravel, mud, cobble, sand, and shell fragments. A geotechnical study was conducted for the Project in October 2009, and borings indicated the material below elevation -20 feet mean lower low water (MLLW) is primarily composed of sand, soft clay, and silt.

Photo 4 – View of proposed overwater walkway location from the existing pier at Boulevard Park where the southern end of the walkway will land (facing northeast)

Native eelgrass (*Zostera marina*) beds are located in the embayment from approximately -2 feet MLLW to a depth of approximately -8 feet MLLW. See Sheet 2 for location and extent of the eelgrass beds. In addition, macroalgae was found mostly landward of the eelgrass (Grette Associates 2009).

1.3 Proposed Improvements

Parks proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site. The new facility will include a new overwater pedestrian walkway, 7 to 14 feet in width, with benches. The walkway will be constructed of steel and concrete with wood pedestrian guardrails to meet Americans with Disabilities Act (ADA) requirements. The landing to the south will connect to Boulevard Park, which is connected to the Coast Millennium Trail route. The connection to the north at the former Cornwall Avenue Landfill site is connected to the waterfront district. Project elements include:

- In-water piles
- Overwater precast and cast-in-place pile caps, precast deck panels, a finish slab, posts

and pedestrian guardrails meeting ADA requirements, deck lighting, and benches
- Landings and associated improvements at both Boulevard Park and the former Cornwall Avenue Landfill site

The proposed improvements are detailed in Sections 1.3.1 and 1.3.2 and shown on Sheets 3 through 12.

1.3.1 Overwater Walkway Structure

The proposed overwater structure will span approximately 2,350 feet across a portion of Bellingham Bay. The structure will be supported by 48 bents spaced at approximately 50 feet on center; each bent includes two 24-inch steel piles for a total of 96 piles, and a precast/cast-in-place concrete pile cap. The piles will be installed using a vibratory hammer and then proofed with an impact hammer to ensure vertical load requirements are met. Four of the piles will be located over areas of high bedrock and will be secured to the bedrock using steel rock anchors.

The bents will support 50-foot-long precast concrete double tee deck panels. A cast-in-place concrete finish slab will be installed over the top of the concrete panels. The final top of deck elevation will be +16.8 feet MLLW. In total, approximately 34,000 square feet of new decking will be installed as part of the Project. 1,515 square feet of grating will be integrated into the deck surface, including the three spans located closest to the Boulevard Park terminus and five spans located closest to the former Cornwall Avenue Landfill site. Approximately 30% of the surface of these nearshore spans will be grated. The proposed grating will allow 70% light transmission.

The walkway deck will generally be 14 feet wide, except where it is widened to create alcoves for bench seating. The alcove areas will be 18.5 feet wide and 20 feet long, and will be located at approximately 200-foot intervals along the walkway. Wood pedestrian guardrails will be installed along both sides of the length of the overwater walkway.

Directional light-emitting diode (LED) lighting fixtures will be installed on the posts of the wood pedestrian guardrails of each walkway span (four per span, two on each side of the span) for a total of 188 LED lights. The power source for the lighting fixtures will be a main utility line that will run underground on the Boulevard Park side of the Project from the existing restroom located approximately 80 feet south of the proposed landing. The line splits to each side of the walkway from the landing and will run parallel below the underside of the boardwalk and on the outside edges, avoiding the openings in the grating. The light from these fixtures will be low voltage and directed at the overwater walkway deck, away from the water surface.

1.3.2 Landings and Associated Improvements

Landings for the overwater walkway will be developed at both Boulevard Park and the former Cornwall Avenue Landfill site (see Sheet 4). On the Boulevard Park end, an existing timber wharf and timber pier will be demolished. Additionally, four existing creosote-treated timber piles located in the embayment to the north of the existing timber pier will be removed. Removal of the timber wharf, pier, and creosote-treated piles is expected to provide partial mitigation for Project impacts. Four existing evergreen trees, approximately 18 to 36 inches diameter at breast height (dbh), and an existing asphalt path will be removed as well. Debris from the demolished structures will be disposed of at an approved upland facility and all creosote-treated wood will be disposed of in accordance with Washington State's Dangerous Waste Regulations (Washington Administrative Code [WAC] 173-303) and Excluded Categories of Waste (WAC 173-303-071).

At the former Cornwall Avenue Landfill site landing, five existing creosote-treated timber piles located immediately offshore of the southwest corner of the property will be removed.

At the Boulevard Park landing, approximately 600 cubic yards (cy) of fill will be placed over an upland area of approximately 5,600 square feet, raising the grade up to 6 feet over existing grade to accommodate a paved ADA accessible path leading to the overwater walkway. This path will connect the structure with the current path system at the park. Concrete wingwalls will be constructed where the paths connect to the overwater walkway structure. Approximately 6,700 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above mean higher high water [MHHW]) of the new fill in the vicinity of the proposed landing. Sheet 6 shows the proposed grading and layout for the Boulevard Park landing and Sheet 9 provides typical sections of the ADA accessible paths for both the Boulevard Park and the former Cornwall Avenue Landfill site landings, as well as wingwalls and abutments for the landings.

The new landing at the former Cornwall Avenue Landfill site will be constructed similar to the Boulevard Park landing at the north end of the structure. Approximately 800 cy of fill will be placed over an area of approximately 12,300 square feet, raising the existing grade to provide an ADA accessible crushed rock path leading to the overwater walkway (constructed at a 1:20 slope). Concrete abutments will be constructed and approximately 2,300 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above MHHW) of the new fill in the vicinity of the proposed landing to provide slope protection. The landing for the overwater walkway at the former Cornwall Avenue Landfill site has been developed so that it will not interfere with future park development plans. Sheet 7 shows the grading and layout for the former Cornwall Avenue Landfill site landing and Sheet 9 provides typical sections of the ADA accessible path.

1.4 Environmental Considerations

1.4.1 Eelgrass Beds

Grette Associates conducted an underwater eelgrass survey within the embayment and mapped the extent of existing eelgrass beds. This survey occurred June 3 through June 5, 2008 (Grette Associates 2009), and employed a modified version of the Washington Department of Fish and Wildlife (WDFW) Intermediate Eelgrass/Macroalgae survey methods, modified to meet the needs of the Project and approved by WDFW (WDFW 2007). The results of the survey (Grette Associates 2009) showed that eelgrass is present along the entire shoreline of the embayment between Boulevard Park and the former Cornwall Avenue Landfill site. In general, eelgrass begins at an upper elevation of approximately -1.7 to -2.0 feet MLLW and extends waterward to approximately -8 to -10 feet MLLW. At the Boulevard Park landing, eelgrass density is lowest and the eelgrass band is narrowest at the existing pier. At the former Cornwall Avenue Landfill site, eelgrass density is generally similar along the entire shoreline area.

In addition, macroalgae was consistently found landward of the eelgrass bed surveyed. Fucus and Ulva were present on most transects, and sparse Laminaria was observed further waterward on some transects (Grette Associates 2009).

1.4.2 Historic and Cultural Resources

A cultural and historical resources report entitled *An Archeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham Washington* was prepared for the Project by Wessen & Associates, Inc. (2010) and is included as Appendix D. This report will be submitted to the Federal Highways Administration (FHWA) for review, approval, and submission to the Department of Archaeology and Historic Preservation (DAHP). The final documentation from FWHA and DAHP will be provided to the U.S. Army Corps of Engineers (USACE) when received.

1.4.3 Mitigation

The proposed mitigation for the Project includes removing an existing timber pier and wharf at the north end of Boulevard Park and nine additional creosote-treated timber piles in the embayment. The pier is supported by eight steel H-piles (each 8 inches square) and the wharf is supported by approximately 87 creosote-treated piles, all of which will be removed. The wharf is supported on the southern (landward) end by an existing concrete wall that may also be removed, depending on the nature and level of contamination behind the wall. Further evaluation of sediment quality behind the wall will be conducted in the summer of 2010.

Four creosote-treated, 12-inch-diameter timber piles located immediately north of the existing pier at Boulevard Park and five creosote-treated, 12-inch-diameter timber piles immediately offshore of the southwest corner of the former Cornwall Avenue Landfill site will be removed.

The removal of the pier, wharf, and piles will result in a significant reduction of overwater cover. In addition, approximately 30% of the spans of the proposed structure located above nearshore areas (-12 feet MLLW or higher) will be grated: the three spans closest to the Boulevard Park landing and the five spans closest to the former Cornwall Avenue Landfill site landing. The grating will be sized to provide 70% light transmission. Table 1 summarizes the anticipated changes in overwater cover resulting from the Project.

Table 1
Summary of Changes in Overwater Cover/Shading in the Intertidal Zone

Project Component	Removal of Existing Overwater Cover [1]	Total New Overwater Cover [1]	New Overwater Grated Areas [1, 3]	Net Change in Overwater Shading [1, 2]
Existing wharf, piles, and pier to be removed	-3,332	0	0	-3,332
Existing isolated piles (nine total) to be removed [4]	-7	0	0	-7
Proposed overwater walkway structure	0	5,396	1,515 (1,060.5 open area)	4,335.5
Total	-3,339	5,396	1,515 (1,060.5 open area)	996.5

Table Notes:
1. All areas are in square feet
2. Changes in overwater cover are only detailed for intertidal areas where the seafloor elevations range between -12 feet MLLW and +8.5 feet MLLW (MHHW)
3. New overwater grated areas were calculated based on quantities and specifications provided by BergerABAM (approximately 30% grating—for areas described under item 2 above—with 70% openings)
4. Pile square footage is approximate and based on outside dimensions of the piles

Other avoidance and minimization measures are built into the Project design to minimize impacts to nearshore habitat (e.g., the widened deck portions will be located over areas with seafloor depths of -12 feet MLLW or lower). In addition, the preliminary overwater walkway design was modified based on discussions with WDFW (Williams, pers. comm. 2010) to ensure that the overwater walkway crosses over the narrowest area of eelgrass near the Boulevard Park landing (at the approximate location of the existing pier) and avoids crossing over the eelgrass areas near the former Cornwall Avenue Landfill site landing to minimize new macroalgae shading impacts from the overwater walkway (see Sheets 5 and 6).

1.5 MTCA Remedial Actions Associated with the Overwater Walkway

The overwater walkway is located within the boundaries of three Model Toxics Control Act (MTCA) sites that are regulated by the Washington State Department of Ecology (Ecology):

the Boulevard Park (also known as the South State Street Manufactured Gas Plant [MGP] Site), Cornwall Avenue Landfill, and Whatcom Waterway sites. The Boulevard Park site is undergoing investigation under an Ecology Agreed Order (AO) for soil and groundwater contamination related to the former South State Street MGP. The Cornwall Avenue Landfill site is undergoing investigation under an Ecology AO for contamination associated with a former municipal landfill. The landings of the overwater walkway will fall within the boundaries of the Boulevard Park and Cornwall Avenue Landfill MTCA sites. The overwater walkway structure will cross over aquatic lands that are within the natural recovery area of the Whatcom Waterway site, which is undergoing cleanup and long-term monitoring consistent with the Whatcom Waterway Consent Decree. The Boulevard/Cornwall Overwater Pedestrian Walkway Project and the various MTCA projects are coordinated by the City. The landings for the walkway have been designed not to interfere with any future proposed restoration actions at the Boulevard Park and Cornwall Avenue Landfill MTCA sites.

To accommodate the construction of the overwater walkway landings, one or more MTCA interim remedial actions may need to occur to avoid delaying the implementation of the Project. Any needed remedial activities will be coordinated through, and approved by, Ecology.

1.6 Construction Methods

The proposed improvements will likely be constructed as described in Sections 1.6.1 and 1.6.2.

1.6.1 Removal of Existing Structures

The existing wharf and pier (including the eight steel H-piles) at the north end of Boulevard Park, and the isolated timber piles at the former Cornwall Avenue Landfill site will be removed by a derrick barge or land-based conventional crane (see Sheet 4 for the demolition plan).

Best management practices (BMPs; see Appendix E) as identified by the USACE Dredged Materials Management Office (DMMO) and the WDNR Puget Sound Initiative will be employed during removal of the piles. Timber piles would be removed in whole, wherever possible, by pulling. Removal of whole piles is the preferred method, because it would ensure the removal of the creosote preservative adhering to the piles. During removal, if a pile were to break above the mudline, an attempt would be made to pull the remainder of the pile to minimize disturbance of sediments. All creosote-treated wood that is removed would be disposed of in accordance with Washington State's Dangerous Waste Regulations (WAC 173-303) and Excluded Categories of Waste (WAC 173-303-071). All waste and debris generated by the Project would be collected and removed to a legally permitted waste disposal or recycling site.

1.6.2 Installation of New Structures

1.6.2.1 Upland Work

Upland work (above ordinary high water [OHW] and MHHW) will be performed using standard heavy construction equipment. Construction areas will be secured with temporary fencing to prohibit public access during construction. BMPs will be implemented to prevent sediment and other deleterious materials from entering waters of the United States.

1.6.2.2 In- and Overwater Work

Piles will be driven using a vibratory hammer from a derrick barge or land-based crane, which consists of pairs of a spring-isolated hammer head and a set of hydraulic pile clamps. This process begins by placing a choker around the pile and lifting it into vertical position with the crane. The pile is then lowered into position and set in place at the mudline. The pile is held steady while the vibratory hammer installs the pile to 5 feet above the required tip elevation. To ensure load bearing capacity, the pile will be driven with an impact hammer for the remaining distance. Four of the piles need to be anchored to the bedrock to support the design loads.

Duration of vibratory pile driving time depends on the substrate conditions. Once the pile is set in place, pile installation with a vibratory hammer can take less than 15 minutes under steady substrate conditions, to more than an hour under difficult substrate conditions (such as glacial till and bedrock, or exceptionally loose material in which the pile repeatedly moves out of position). The Project location is not expected to have difficult conditions. During the construction period, 96 piles will be driven, four of which are located above MHHW. Based on this information, a conservative estimate of pile driving time could extend to approximately 30 to 60 hours of pile driving.

The bottom part of the precast concrete pile caps and deck panels will be set in place by a barge-mounted or land-based crane and secured in place. The concrete for the cast-in-place top part of the pile caps will be delivered and placed by barge. The concrete finish slab will be applied once the deck panels are in place. Concrete for the finish slab will be applied from either land or a barge. BMPs will be implemented to ensure that no uncured concrete comes into contact with surface waters. Pedestrian guardrails, lighting, and viewing benches will be installed after the finish slab has cured.

1.7 Construction Timing and Schedule

The entire Project, including demolition and construction, is expected to take approximately 42 to 46 weeks to complete. In-water work is expected to take approximately 14 weeks to complete. However, the duration and total period of in-water work would be affected by several factors, including the type of construction equipment and procedures selected by the contractor, and the sequencing of work elements. If it is necessary to perform certain work at night during a low tide, appropriate City, Whatcom County, and any other necessary approvals would be obtained. Approximate durations for various construction activities are listed in Table 2.

Table 2
Approximate In-Water Activity Durations

Project Element	Approximate Duration
Remove isolated timber piles	1 day
Remove timber wharf, piles, and pier	2 days
Install landings	2 weeks
Install walkway	40 weeks

In-water work will occur according to the allowable USACE and WDFW work windows for Bellingham Bay and/or in accordance with the requirements and conditions of the Hydraulic Project Approval (HPA) issued by WDFW and appropriate concurrence recommendations identified by the federal agencies during Endangered Species Act (ESA) consultation. The expected in-water work window for the Project is from July 16 to January 21 in the years in which construction will occur. Table 3 details the in-water work windows for the Project.

Table 3
In-water Work Windows

Species	Month												Approved Work Windows by Species
	J	F	M	A	M	J	J	A	S	O	N	D	
Salmon													July 2 to March 2
Bull Trout													July 16 to February 15
Herring													June 15 to January 21
Sand Lance													March 2 to October 14
Surf Smelt													N/A[1]

Note:
1 Surf smelt spawning occurs year-round.

2 REFERENCES

COB (City of Bellingham), 2009. *Final Draft Shoreline Master Program*. Prepared by the City of Bellingham Planning Commission on June 2009.

COB, 2008. *Waterfront Connections Plan*. Prepared for Mayor Dan Pike of the COB. September 2008.

COB Parks (City of Bellingham Parks and Recreation Department), 2008. *Parks, Recreation and Open Space Plan*. Updated and amended 2008.

COB Parks, 2002. *Parks, Recreation and Open Space Plan*. Drafted by the COB for the COB Comprehensive Plan. 2002.

COB and POB (City of Bellingham and Port of Bellingham), 2006. *New Whatcom Preliminary Draft Framework Plan 2016*. Summary and map presented by the COB and POB. September 25, 2006.

Grette Associates LLC, 2009. Boulevard Park Overwater Walkway Eelgrass Habitat Memorandum. Prepared for Reid Middleton, Inc. on May 7, 2008 and revised on February 15, 2009.

WDFW (Washington Department of Fish and Wildlife), 2007. Eelgrass/Macro Algae Habitat Survey Guidelines.

Wessen & Associates, Inc., 2010. *An Archeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham Washington.* April 2010.

WFG (Waterfront Futures Group), 2004. *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay*. Drafted by the WFG. December 2004.

Williams, Brian, personal communication, 2010. Meeting between Louis Klusmeyer of BergerABAM, Brian Williams of WDFW, and Paul Schlenger and Derek Koellmann of Anchor QEA, LLC. February 5, 2010.

ATTACHMENT 3
EELGRASS SURVEY

TECHNICAL MEMORANDUM

Prepared for: Reid Middleton — Date: July 14, 2008

Prepared by: Grette Associates[LLC] — File No.: 404.003

Re: Boulevard Park Overwater Walkway Eelgrass Survey

INTRODUCTION

Grette Associates[LLC] was hired by Reid Middleton to conduct an eelgrass survey for the City of Bellingham from the Cornwall Landfill site to Boulevard Park in Bellingham, WA (Figure 1). The survey was conducted in accordance with the Washington Department of Fish and Wildlife (WDFW) Intermediate Eelgrass/macroalgae Habitat Survey guidelines, which are designed to determine the presence and density of eelgrass. This Technical Memorandum presents the results of the eelgrass survey conducted on June 3-5, 2008. The purpose of the survey was to assess the potential impacts to eelgrass as a result of the construction of an overwater walkway through the embayment, and to provide information for any future projects in the area. The walkway would extend northeast from Boulevard Park to the Cornwall Landfill site and would span the embayment between the two sites. The survey entailed a detailed delineation of the landward and waterward extents of the eelgrass beds, as well as a density survey. Density surveys were conducted along the northeastern shoreline of Boulevard Park (southwest end of the proposed walkway) and the Cornwall Landfill site (northeast end of the proposed walkway), where impacts to eelgrass may potentially occur (Figure 2).

METHODS

The eelgrass survey employed a modified version of the WDFW Intermediate Eelgrass/Macroalgae survey methods (WDFW 2007). WDFW staff reviewed and approved the survey methods prior to the implementation of the field effort. The survey entailed a detailed delineation of the landward and waterward extents of the eelgrass beds, as well as a density survey at the landing locations. Densities were not collected in the embayment as the walkway will be constructed waterward of the eelgrass bed.

EELGRASS DELINEATION

The landward and waterward edges of the existing eelgrass beds in the embayment between Boulevard Park landing and the Cornwall Landfill site were delineated using Differential Global Positioning Satellite (dGPS, horizontal accuracy ±1m). The landward edge of the eelgrass bed was surveyed by walking the edge at low tide and recording the boundary with dGPS. Divers delineated the waterward edge of the eelgrass beds by swimming along the eelgrass/non-eelgrass boundary, and holding a rope attached to a surface buoy at intervals determined by the complexity of the edge (typically between 20 to 30-foot intervals). In areas where the edge was complex, the distance between buoys was reduced to capture the complexity. The dive tender then positioned the boat over the buoy, pulled the line tight (with the diver holding onto the anchor end of the line to keep it in place), and logged the position into the dGPS data recorder. This process was repeated until the eelgrass beds were delineated. In addition, nine perpendicular transects were conducted in the embayment, four of which were 500 feet long, and five of which were 300 ft long. These transects were to verify the edge of the eelgrass and assess macroalgae and substrates within the embayment. Upland monument positions were also logged in order to tie the survey to existing base maps.

The locations of sampling points recorded in the dGPS data logger were downloaded to GPS Pathfinder Office 2.90 software and converted to NAD-83 state plane coordinates. The state plane coordinate data were then converted to an AutoCAD file and plotted on an aerial photograph of the site.

EELGRASS DENSITY SURVEY

Eelgrass density data were collected at both shore landing locations. Seven (7) transects were sampled at the Boulevard Park landing and 16 transects were sampled at the Cornwall Landfill landing. Transects were spaced 40 ft apart over approximately 230 linear ft of shoreline at Boulevard Park and approximately 600 linear ft at Cornwall landfill, and encompassed the entire shoreline area within which a future walkway landing may be constructed. After the transects were established, turion counts were collected at 5 evenly spaced locations along the transects and within the eelgrass beds. Densities were sampled using a 0.25 m^2 quadrat. Divers also recorded macroalgae presence and substrate characteristics.

RESULTS

The eelgrass delineation revealed an eelgrass band as depicted in Figures 3-5. The eelgrass band is present along the entire Boulevard Park shoreline, extending northeast through the embayment to the Cornwall Landfill site. Eelgrass presence ends abruptly at approximately Transect 14 at the Cornwall Landfill site, with the exception of 3 very small, isolated patches northeast of Transect 14. Concrete slabs present in the water north of Transect 14 also impede eelgrass presence. The eelgrass band begins at an upper elevation of approximately -1.7 ft to -2.0 ft MLLW and extends waterward to approximately -8 to -10 ft MLLW. No eelgrass is present in deeper water beyond this waterward edge. The landward edge of eelgrass presence was strongly determined by the substrate. Eelgrass begins in the lower intertidal where gravel and cobble transition to mud and silt.

The eelgrass band varies in width. At Boulevard Park, the eelgrass band is a maximum of approximately 130 ft in the southern portion of the shoreline, and is narrowest at Transects 2 and 3 near the existing pier, at approximately 36 ft. At the Cornwall Landfill site, eelgrass is a maximum of approximately 150 ft wide in the southern portion of the Cornwall Landfill site, tapering to a minimum of approximately 30 ft in the northern portion. In the embayment area, the eelgrass band is a maximum width of approximately 110 ft.

Eelgrass densities surveyed at Boulevard Park and at the Cornwall Landfill site are listed in Table 1 below. No densities were collected on the 9 embayment transects. Transects 14-23 in the northern end of the Cornwall Landfill site showed no eelgrass.

Table 1. Turion densities and macroalgae coverage by transect

Transect	Average Turion Count (/m^2)	Macroalgae
Boulevard 1	73.6	None
Boulevard 2	59.2	None
Boulevard 3	24	None
Boulevard 4	86.4	Ulva/Fucus at landward end; ~30% coverage
Boulevard 5	82.4	Ulva/Fucus at landward end; ~35% coverage
Boulevard 6	60.0	Ulva/Fucus at landward end; ~11% coverage
Boulevard 7	60.8	Ulva/Fucus at landward end; ~8% coverage
Average	**63.8**	
Cornwall 8	44.0	Ulva/Fucus at landward end; ~8% coverage
Cornwall 9	78.4	Fucus at landward end; ~8% coverage
Cornwall 10	72.0	None
Cornwall 11	69.6	Fucus at landward end; ~8% coverage
Cornwall 12	53.6	Fucus at landward end; minimal coverage
Cornwall 13	61.6	Fucus at landward end
Cornwall 14-23	No Eelgrass Present	Fucus at landward end; some laminaria waterward (~10% typ. coverage)
Average[1]	**63.2**	

[1] Represents the average of transects on which eelgrass was encountered

The average density of the Boulevard Park transects was 63.8 turions per square meter; the average density at the Cornwall Landfill site (on transects containing eelgrass) was 63.2 turions per square meter. It should be noted that, at Boulevard Park, lowest eelgrass densities were recorded in Transects 2 and 3, which are nearest the existing pier. The eelgrass band is also narrowest at the existing pier (Figure 3). Thus, potential impacts to eelgrass of the proposed walkway landing would be minimized by locating the walkway landing at the existing pier location. At the Cornwall Landfill site, as mentioned above, eelgrass ends at Transect 14 (Figure 4). Thus, eelgrass impacts would be avoided completely by locating the walkway landing north of Transect 14, or at the point of the Cornwall Landfill site. Additionally, concrete slabs located at approximately -2 to -3 ft MLLW north of Transect 14 limit eelgrass presence. It is possible that, were these slabs removed, eelgrass would establish in these locations.

Sparse stands of macroalgae were present on several of the transects. Macroalgae was consistently found landward of eelgrass. Fucus and Ulva were present on most transects, and sparse Laminaria was observed further waterward on some transects.

The dominant substrate within the eelgrass beds was mud and silt. Substrate at the Boulevard Park landing consisted of moderately sloped riprap and cobble in the upper intertidal zone, transitioning to silt and sand further waterward. Substrate at the Cornwall Landfill consisted cobble and rip rap moderately sloped to the water, then transitioned to silt and sand. As mentioned above, some concrete slabs are also present. Substrate in the embayment consists of riprap transitioning to cobble and eventually silt approximately 50 ft waterward of the toe of the riprap slope.

References

Washington Department of Fish and Wildlife. 2007. Eelgrass/Macro Algae Habitat Survey Guidelines.

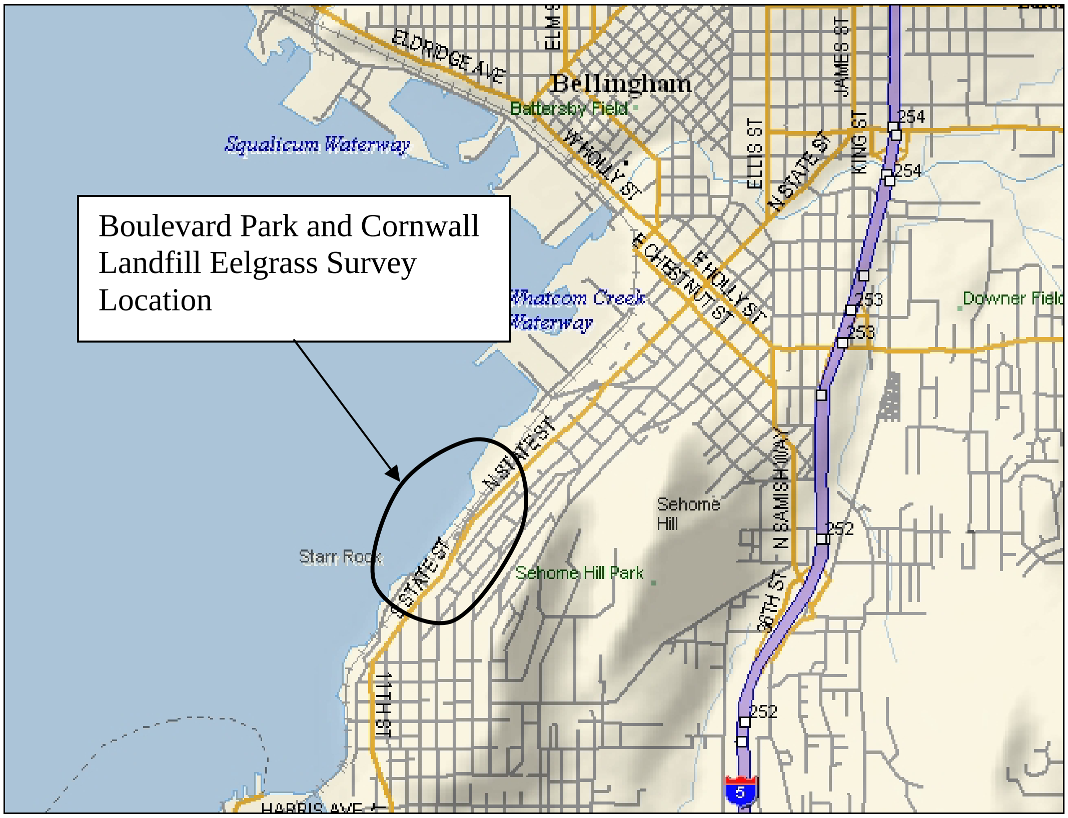


Figure 1: Vicinity Map

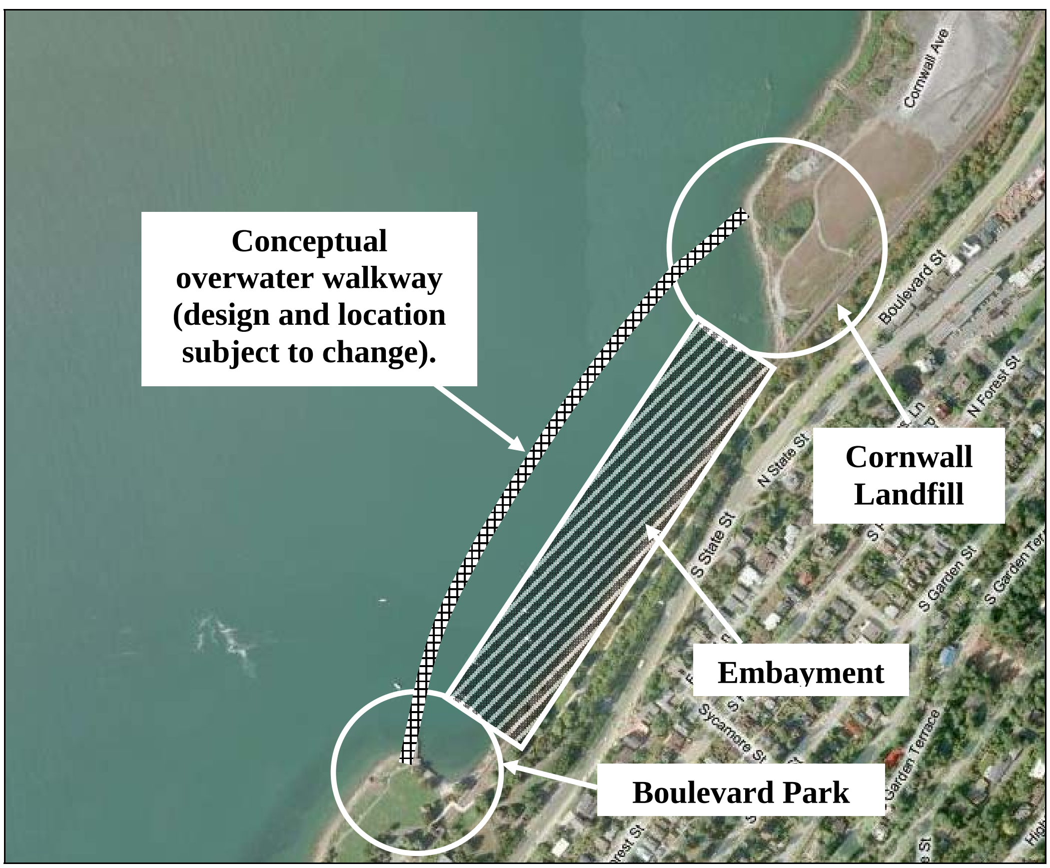


Figure 2. Eelgrass delineation site map

Figure 3. Boulevard Park transects, eelgrass bed

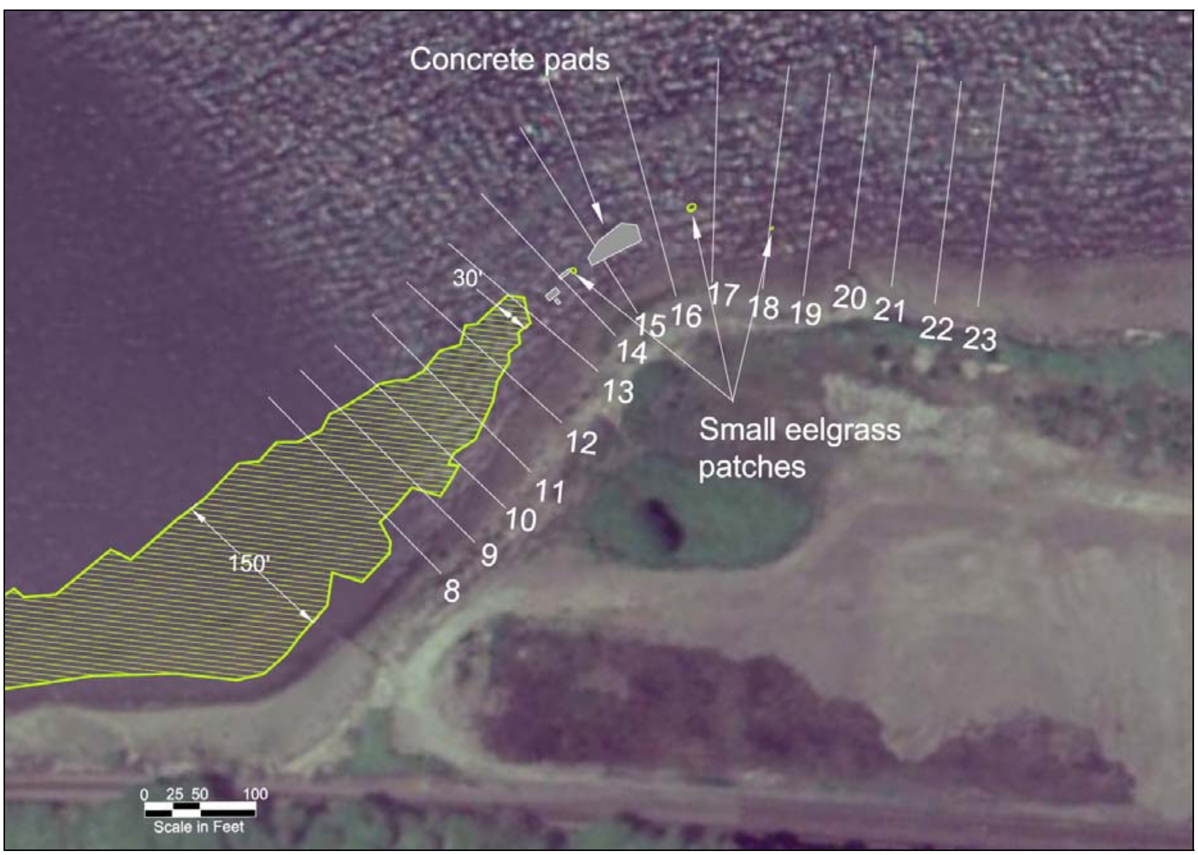


Figure 4. Cornwall Landfill transects, eelgrass bed

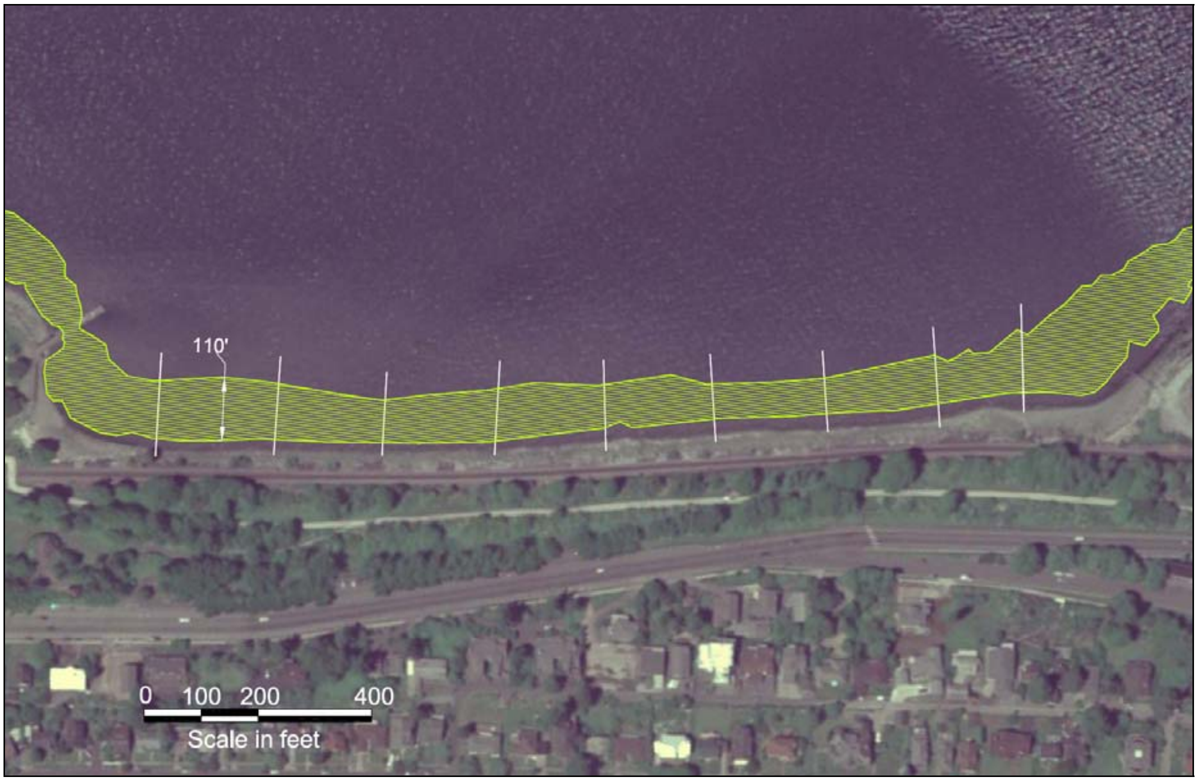
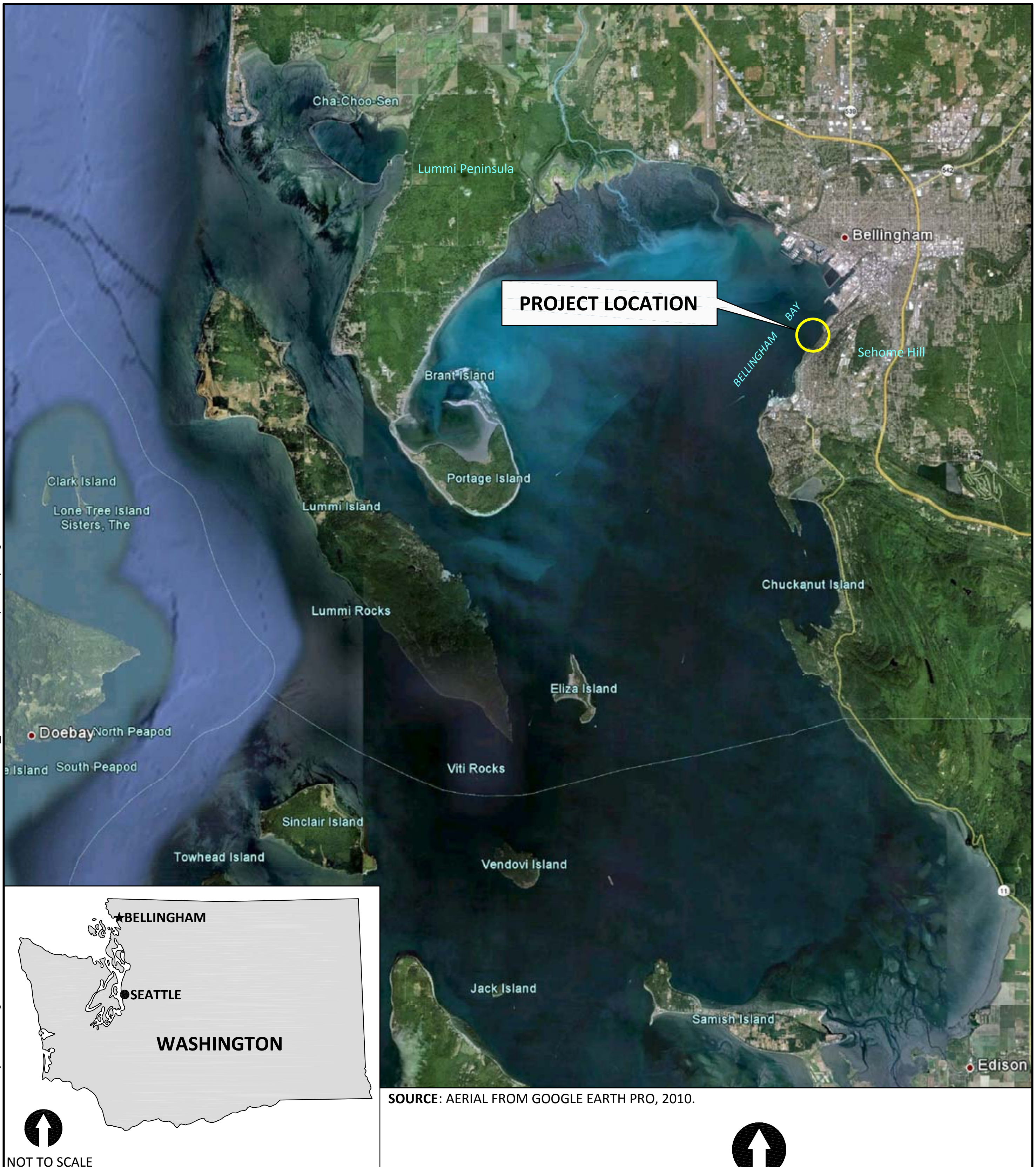


Figure 5: Embayment transects, eelgrass landward and waterward location

ATTACHMENT 4
JARPA DRAWING SHEETS



SOURCE: AERIAL FROM GOOGLE EARTH PRO, 2010.

0 2
SCALE IN MILES

VICINITY MAP

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 36-38N-2E

SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
3 - PORT OF BELLINGHAM
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010 SHEET: 1 OF 9

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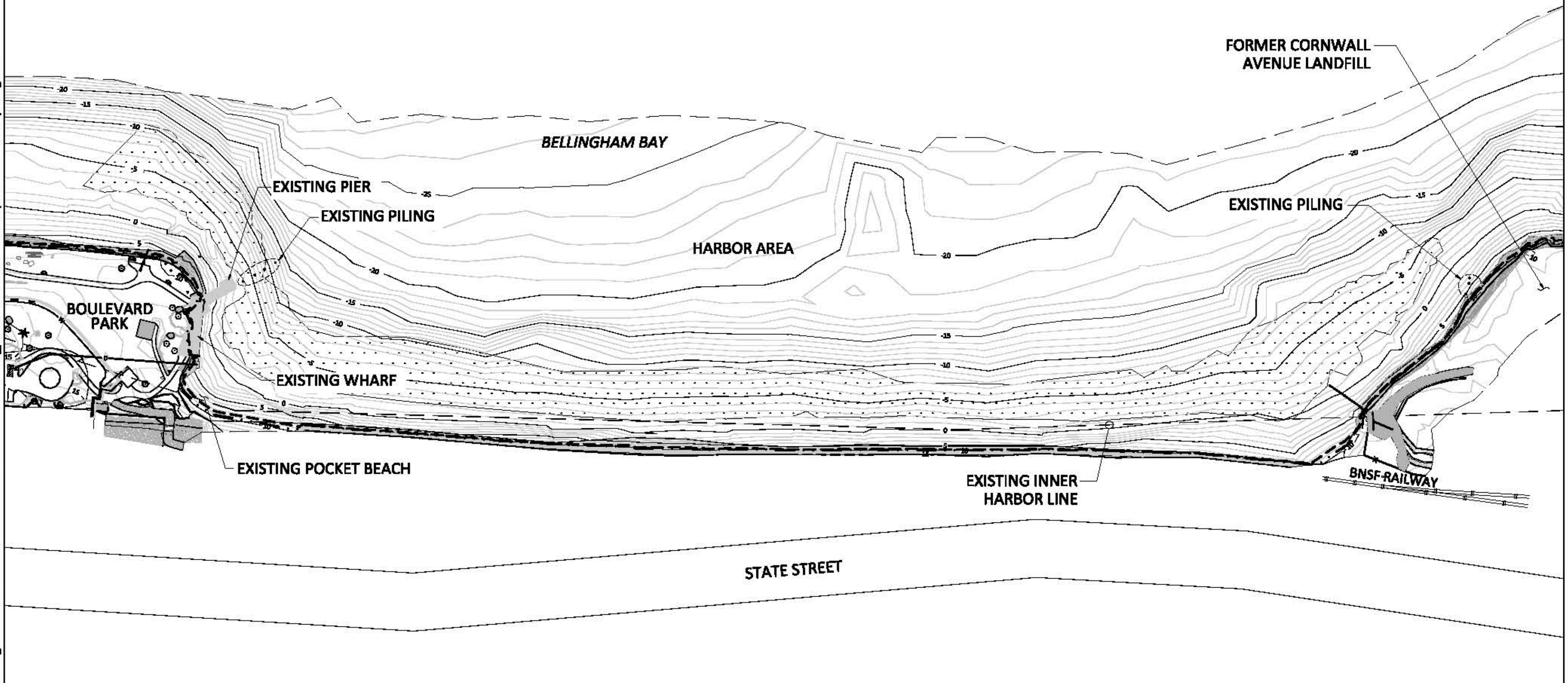
Jun 08, 2010 11:06am heriksen



LEGEND:

EXISTING EELGRASS BED

MEAN HIGHER HIGH WATER (+8.51' MLLW)

ORDINARY HIGH WATER MARK (+9.51' MLLW)

0 260
SCALE IN FEET

SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.
NOTES: ELEVATION DATUM MLLW

EXISTING CONDITIONS

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 22-21N-3E

SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
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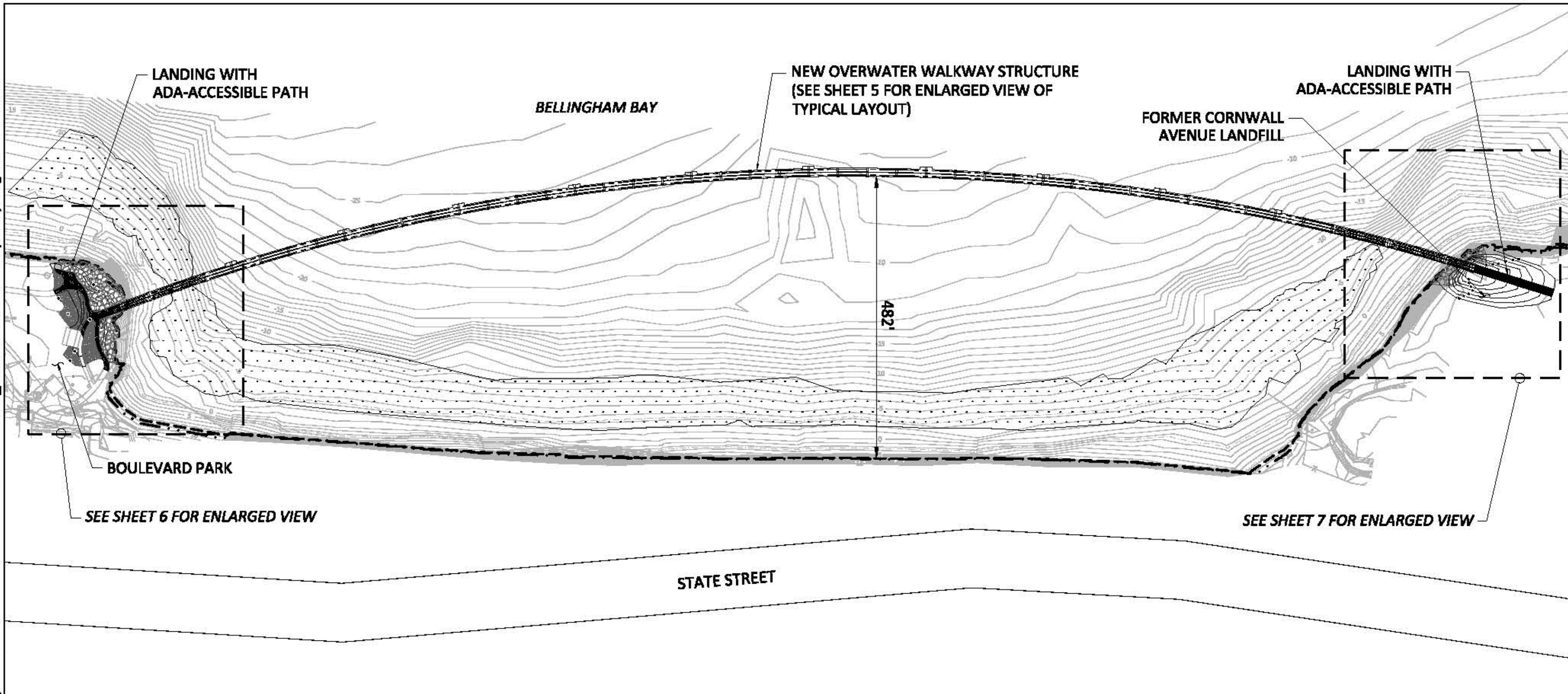
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010

Jun 04, 2010 3:45pm cdavidson



LEGEND:

- EXISTING EELGRASS BED
- MEAN HIGHER HIGH WATER (+8.51' MLLW)
- ORDINARY HIGH WATER MARK (+9.51' MLLW)

0 260
SCALE IN FEET

SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.
NOTE: FOR TYPICAL STRUCTURE LAYOUT SEE SHEET 5.

COMPOSITE SITE PLAN

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 22-21N-3E

SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
3 - PORT OF BELLINGHAM
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010

SHEET: 3 OF 9

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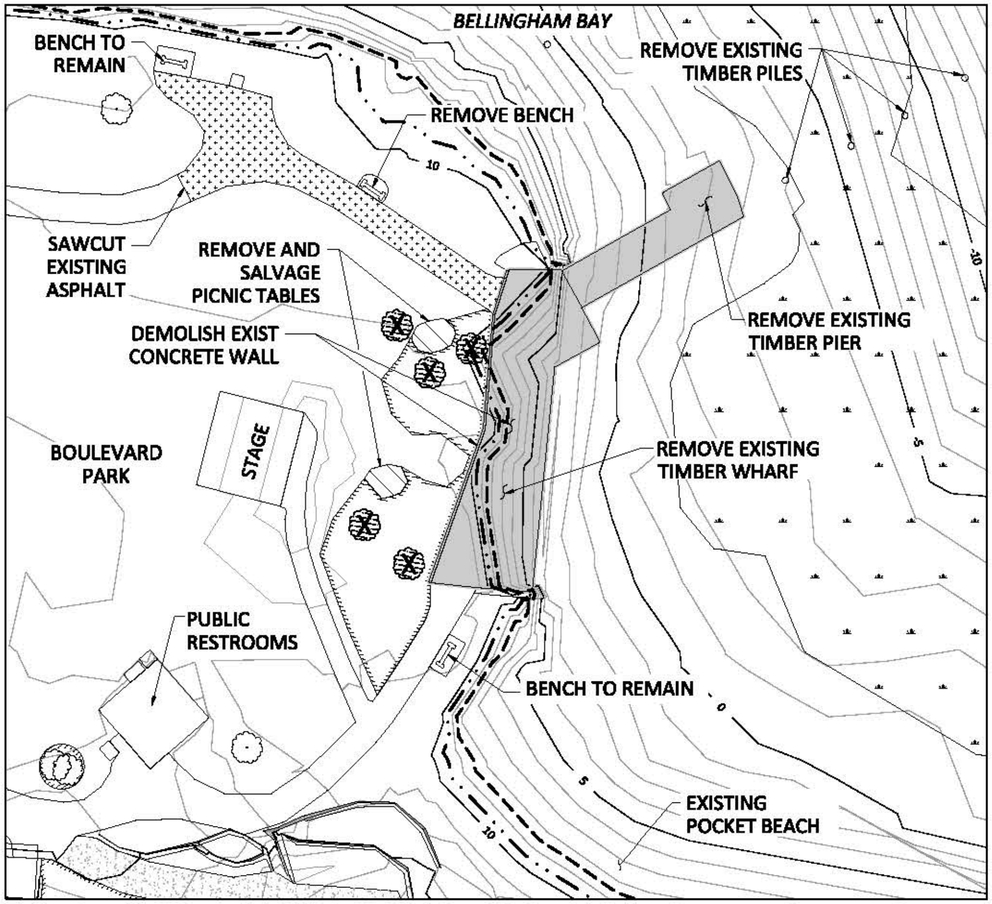
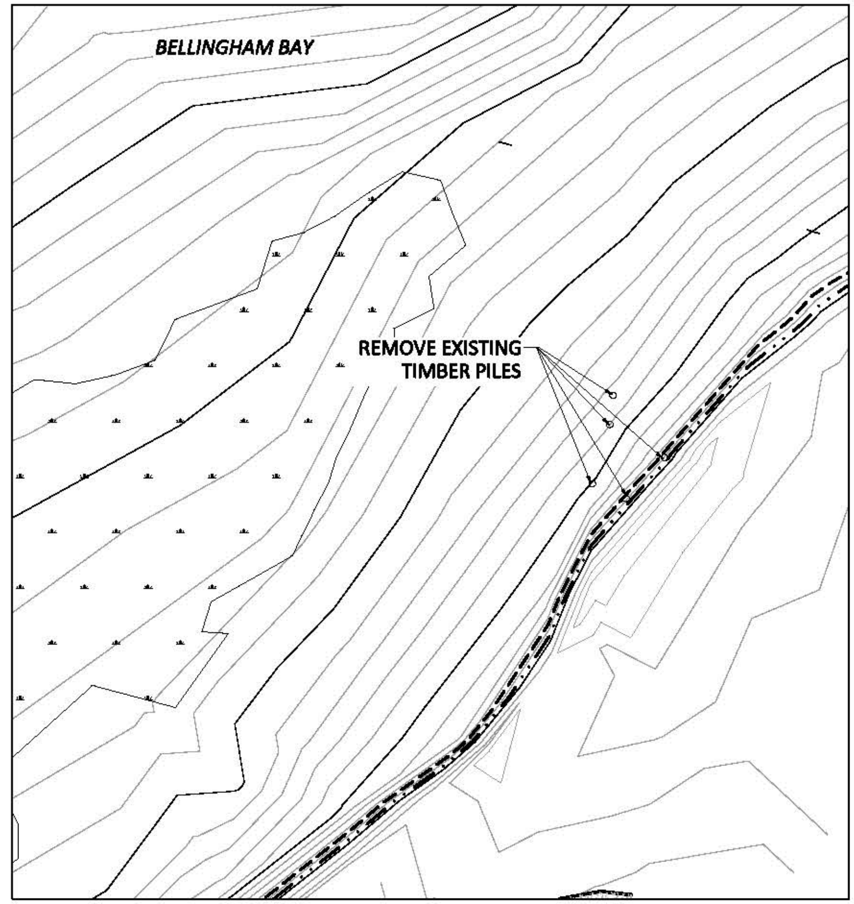


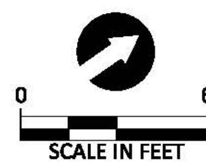
BOULEVARD PARK



FORMER CORNWALL AVENUE LANDFILL

LEGEND:

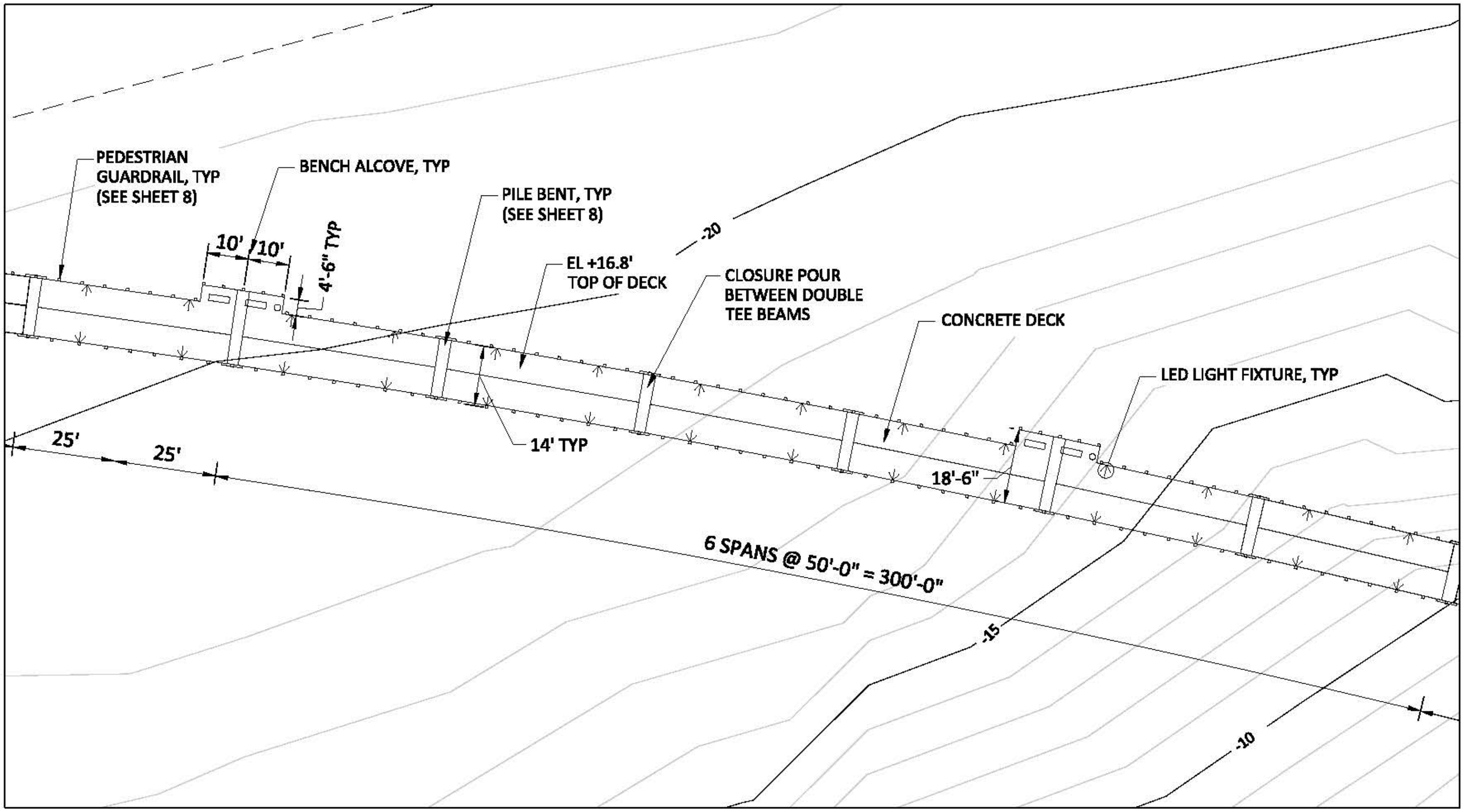
- DEMOLISH EXISTING STRUCTURE
- DEMOLISH EXISTING ASPHALT PATH
- TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- EXISTING EELGRASS BED
- ORDINARY HIGH WATER MARK (OHW, +9.51' MLLW)
- MEAN HIGHER HIGH WATER (MHHW, +8.51' MLLW)



SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

DEMOLITION PLAN

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS DATUM: MLLW 0.0' LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W S-T-R: 22-21N-3E SITE LOCATION ADDRESS: BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL, STATE-OWNED AQUATIC LANDS (LEASE #22-084455) BELLINGHAM, WASHINGTON 98225	NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY ADJACENT PROPERTY OWNERS: 1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT 2 - BURLINGTON NORTHERN SANTA FE 3 - PORT OF BELLINGHAM 4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES	PROPOSED: OVERWATER WALKWAY IN: BELLINGHAM BAY NEAR/AT: BELLINGHAM COUNTY OF: WHATCOM STATE: WASHINGTON DATE: JUNE 2010 SHEET: 4 OF 9



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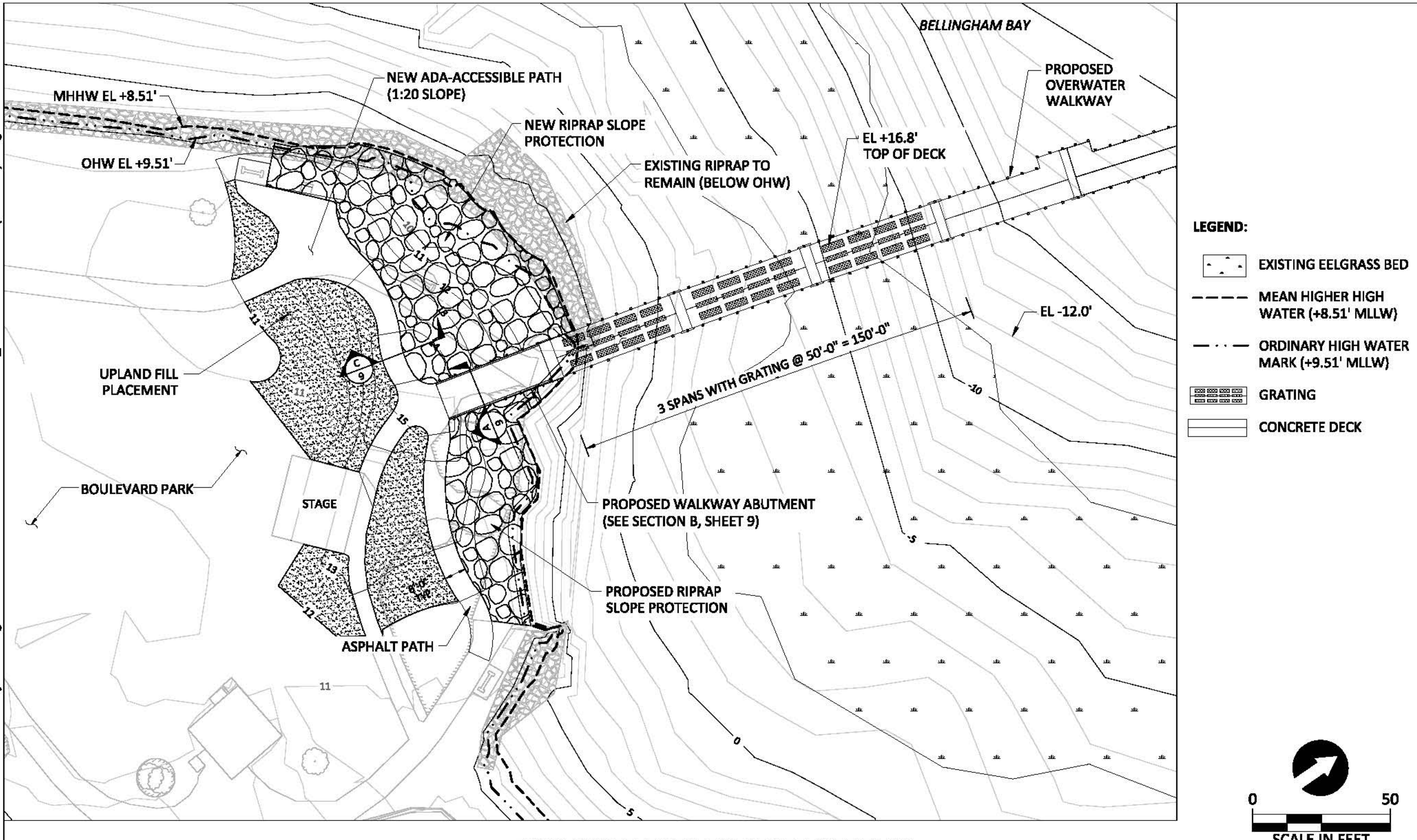
SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

OVERWATER WALKWAY TYPICAL LAYOUT (ENLARGED)

Jun 04, 2010 1:27pm cdavidson

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS DATUM: MLLW 0.0' LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W S-T-R: 22-21N-3E SITE LOCATION ADDRESS: BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL, STATE-OWNED AQUATIC LANDS (LEASE #22-084455) BELLINGHAM, WASHINGTON 98225	NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY ADJACENT PROPERTY OWNERS: 1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT 2 - BURLINGTON NORTHERN SANTA FE 3 - PORT OF BELLINGHAM 4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES	PROPOSED: OVERWATER WALKWAY IN: BELLINGHAM BAY NEAR/AT: BELLINGHAM COUNTY OF: WHATCOM STATE: WASHINGTON DATE: JUNE 2010 SHEET: 5 OF 9



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Jun 04, 2010 1:24pm cdavidson

SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

BOULEVARD PARK ENLARGED SITE PLAN

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 22-21N-3E

SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

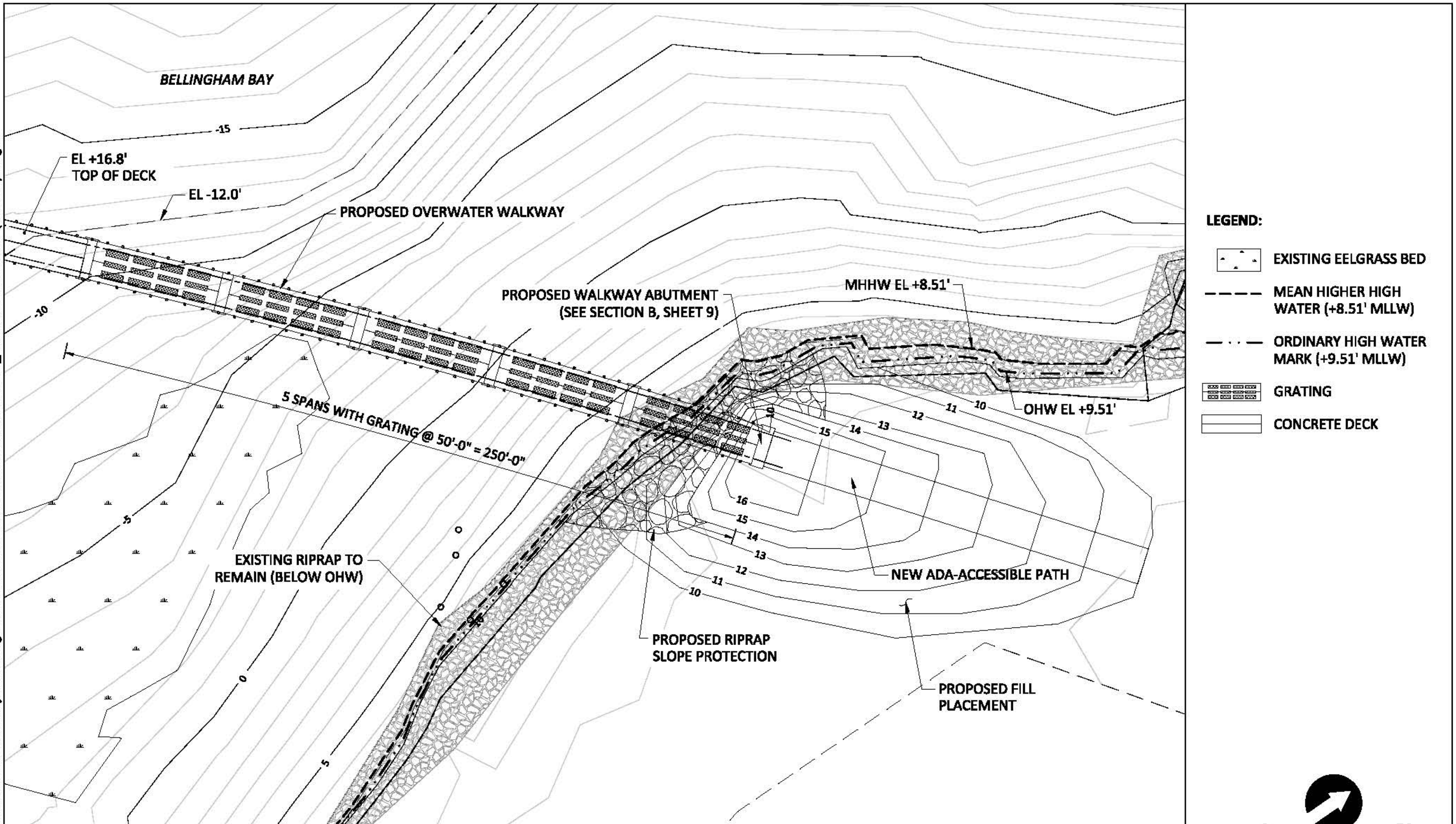
NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
3 - PORT OF BELLINGHAM
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010



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SCALE IN FEET

SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

FORMER CORNWALL AVENUE LANDFILL ENLARGED SITE PLAN

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS DATUM: MLLW 0.0' LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W S-T-R: 22-21N-3E SITE LOCATION ADDRESS: BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL, STATE-OWNED AQUATIC LANDS (LEASE #22-084455) BELLINGHAM, WASHINGTON 98225	NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY ADJACENT PROPERTY OWNERS: 1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT 2 - BURLINGTON NORTHERN SANTA FE 3 - PORT OF BELLINGHAM 4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES	PROPOSED: OVERWATER WALKWAY IN: BELLINGHAM BAY NEAR/AT: BELLINGHAM COUNTY OF: WHATCOM STATE: WASHINGTON DATE: JUNE 2010 SHEET: 7 OF 9

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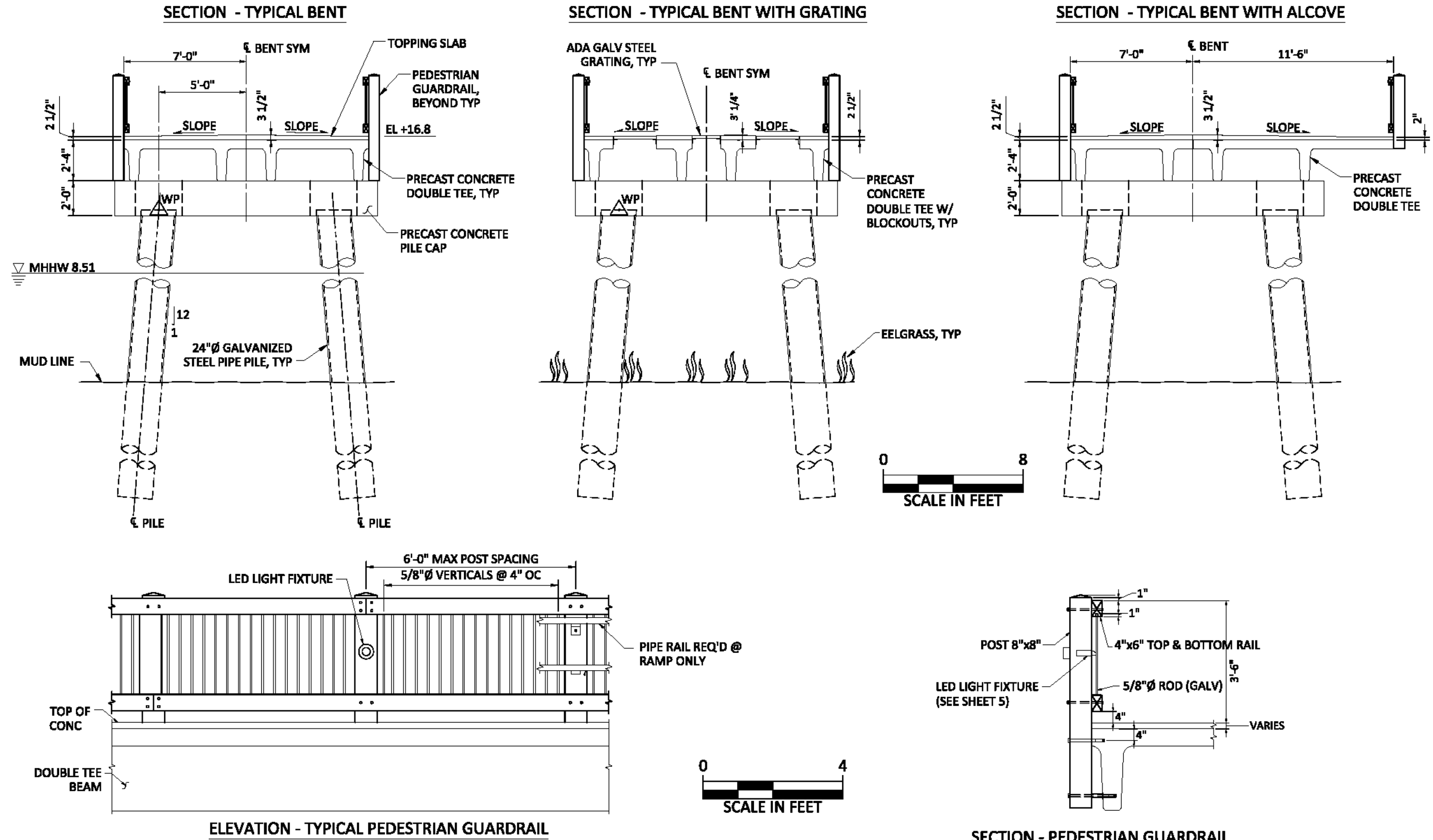


SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

DETAILS

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 22-21N-3E
SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

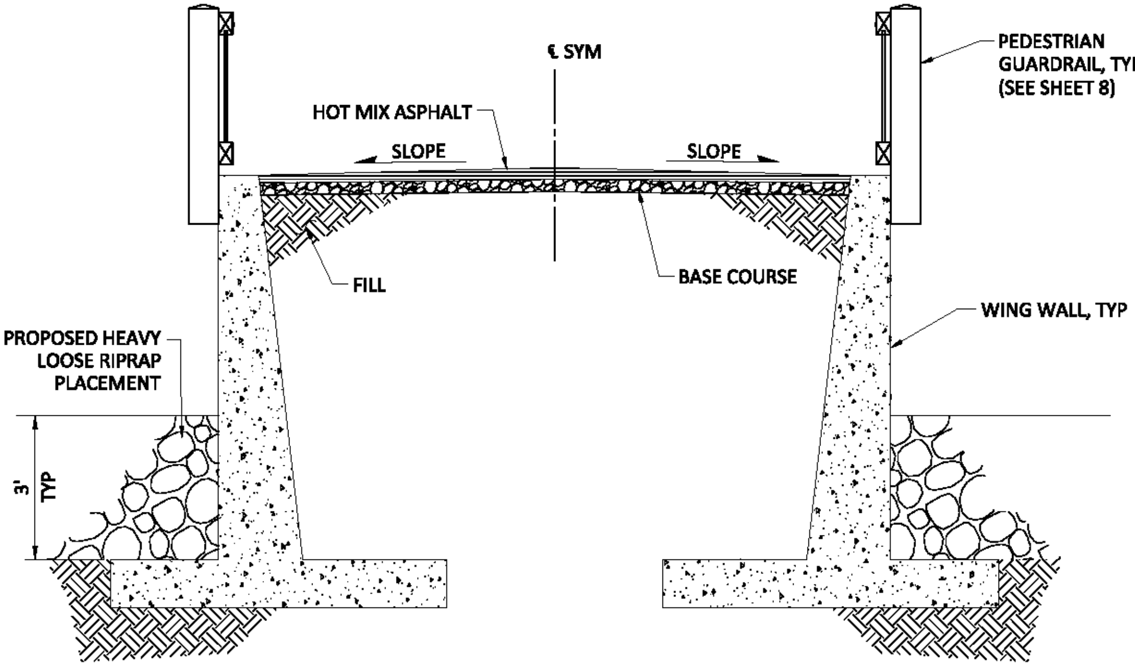
ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
3 - PORT OF BELLINGHAM
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

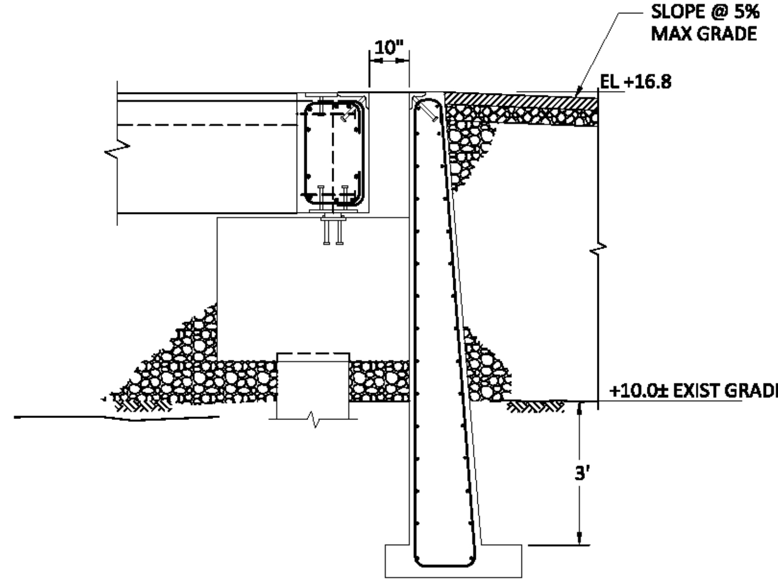
IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010

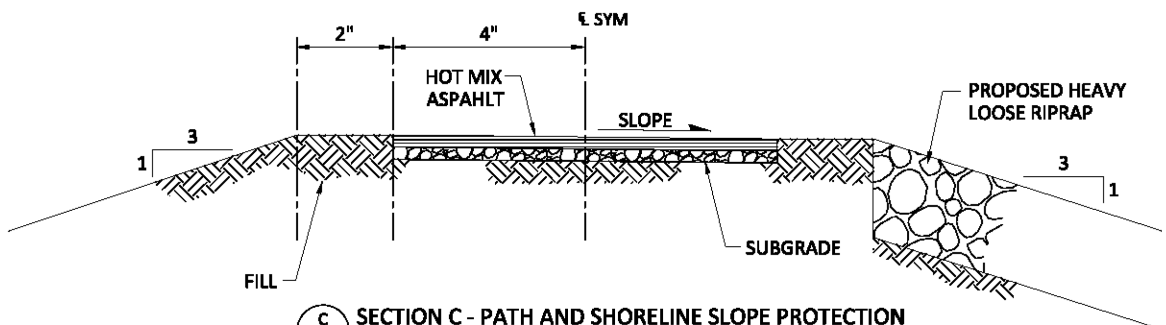
SHEET: 8 OF 9



A/6 SECTION A - BOULEVARD PARK LANDING



B/6 SECTION B - WALKWAY ABUTMENT



C/6 SECTION C - PATH AND SHORELINE SLOPE PROTECTION

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SOURCE: DRAWING BY BERGER/ABAM DATED 3/2010.

LANDING AND ABUTMENT DETAILS

PURPOSE: IMPROVE PUBLIC SHORELINE ACCESS

DATUM: MLLW 0.0'
LATITUDE: 48°44'07.87"N, LONGITUDE: -122°19'54.95"W
S-T-R: 22-21N-3E
SITE LOCATION ADDRESS:
BOULEVARD PARK, FORMER CORNWALL AVENUE LANDFILL,
STATE-OWNED AQUATIC LANDS (LEASE #22-084455)
BELLINGHAM, WASHINGTON 98225

NAME: BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

ADJACENT PROPERTY OWNERS:
1 - CITY OF BELLINGHAM PARKS AND RECREATION DEPARTMENT
2 - BURLINGTON NORTHERN SANTA FE
3 - PORT OF BELLINGHAM
4 - WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

PROPOSED: OVERWATER WALKWAY

IN: BELLINGHAM BAY
NEAR/AT: BELLINGHAM
COUNTY OF: WHATCOM
STATE: WASHINGTON

DATE: JUNE 2010

SHEET: 9 OF 9

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ATTACHMENT 5
BMP LIST

General

- All applicable permits for the Project will be obtained prior to construction of the overwater walkway. All work will be performed according to the requirements and conditions of these permits.
- In-water work (not including mobilization) will occur during the U.S. Army Corps of Engineers (USACE) approved work window, or an approved extension of the work window for Bellingham Bay. The work window for listed/protected salmonids, bull trout, and forage fish is July 16 to January 21.
- Construction of the proposed Project will comply with water quality requirements imposed by the Washington State Department of Ecology (Ecology) (Chapter 173-201A Washington Administrative Code [WAC]), which specify a mixing zone beyond which water quality standards cannot be exceeded. Compliance with Ecology's standards is intended to ensure that fish and aquatic life are protected to the extent feasible and practical.
- The contractor will be responsible for the preparation and implementation of a Spill Prevention, Control, and Countermeasures (SPCC) plan to be used for the duration of the Project. The plan will be submitted to the project engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
  - The SPCC plan will identify construction planning elements and recognize potential spill sources at the site. The plan will outline responsive actions in the event of a spill or release, and will identify notification and reporting procedures. The plan will also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
  - The SPCC plan will outline which measures the contractor will take to prevent the release or spread of hazardous materials, either found on site or encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to, gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."

- The contractor will maintain at the job site the applicable equipment and materials designated in the SPCC plan.

- The contractor will be required to ensure that fresh concrete will not come into contact with marine waters before it is set.
- Excess or waste materials will not be disposed of or abandoned waterward of ordinary high water (OHW) or allowed to enter waters of the State.
- Barges will not be allowed to ground out during construction.
- No petroleum products, fresh cement, lime or concrete, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
- The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Erosion control measures will be addressed in a Temporary Erosion and Sediment Control (TESC) plan prepared by the contractor and adhered to during construction activities.
- Demolition and construction materials will not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.
- When practical, work will occur when tides are low enough to prevent incidental contact of material with marine waters during restoration and construction activities, including demolition and grading.

Pile Installation and Removal

- The Project will comply with guidance developed by the National Marine Fisheries Service (NMFS) for monitoring and/or attenuating sound pressures generated during steel pile driving. This will likely include use of a bubble curtain during impact pile driving of steel piles.
- The removal of the creosote-treated piles shall be consistent with conditions issued as part of the Derelict Creosote Pile Removal Project Hydraulic Project Approval (HPA), issued to the Washington Department of Natural Resources (WDNR) Northwest Region (Control Number 106389 – 3, Issued August 08, 2007).

Eelgrass

- The contractor will be advised that eelgrass beds are protected under both state and federal laws. The contractor will adhere to the following restrictions during the life of the contract. The contractor will not perform any of the following:
  - Place derrick spuds or anchors in the areas designated as “eelgrass”; or allow any chains or wires passing over the eelgrass areas to contact the eelgrass at any tidal stage
  - Shade the same area of the eelgrass beds for a period of time greater than 3 consecutive days during the growing season from March until August
  - Conduct activities that may cause scouring of sediments within the eelgrass beds or result in sediments transferring out of or into the eelgrass beds

ATTACHMENT 6
MITIGATION REPORT

BOULEVARD/CORNWALL OVERWATER PEDESTERIAN WALKWAY MITIGATION REPORT

Prepared for

City of Bellingham Parks and Recreation Department

Prepared by

Anchor QEA, LLC

1605 Cornwall Avenue

Bellingham, Washington 98225

June 2010

BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

MITIGATION REPORT

Prepared for

City of Bellingham Parks and Recreation Department

3424 Meridian Street

Bellingham, Washington 98225

Prepared by

Anchor QEA, LLC

1605 Cornwall Avenue

Bellingham, Washington 98225

June 2010

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1 INTRODUCTION

The City of Bellingham (City) Parks and Recreation Department (Parks) proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site (see Figure 1 for a vicinity map and Figure 2 for existing conditions). The construction of the proposed overwater walkway will significantly improve public shoreline access along Bellingham's waterfront by providing a continuous shoreline trail between Fairhaven and the former Cornwall Avenue Landfill site, and by connecting to the Coast Millennium Trail route at Boulevard Park and the water district at the Cornwall Avenue site. The proposed overwater walkway complements the existing overwater walkway system including Taylor Avenue Dock and the Pattle Point Trestle located to the south of the proposed Boulevard/Cornwall Overwater Pedestrian Walkway Project (Project).

1.1 Project Background

The proposed overwater walkway has been identified in several planning documents as an important link in the network of Bellingham's waterfront trail system, including the 2002 *City of Bellingham Parks, Recreation and Open Space Plan* (COB Parks 2002) and its 2008 update (COB Parks 2008); the 2004 *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay* (WFG 2004); the 2006 *New Whatcom Preliminary Draft Framework Plan* (COB and POB 2006); the 2009 draft update of the *City of Bellingham Shoreline Master Program* (COB 2009); and the mayor's 2008 *Waterfront Connections Plan* (COB 2008). The Project has also been part of a Bellingham public vote, the third greenways levy, which was approved by voters in 2006. Prior to the vote, in an adopted ordinance, the Bellingham City Council recorded intent to pursue a list of potential greenway projects that included the overwater walkway. The list was assembled by citizens who examined the City's current plans and needs.

The Project will occur across several parcels under varying ownership: Boulevard Park is owned by the City, the former Cornwall Avenue Landfill site is jointly owned by the City and the Port of Bellingham, and aquatic lands are owned by the Washington Department of Natural Resources (WDNR).

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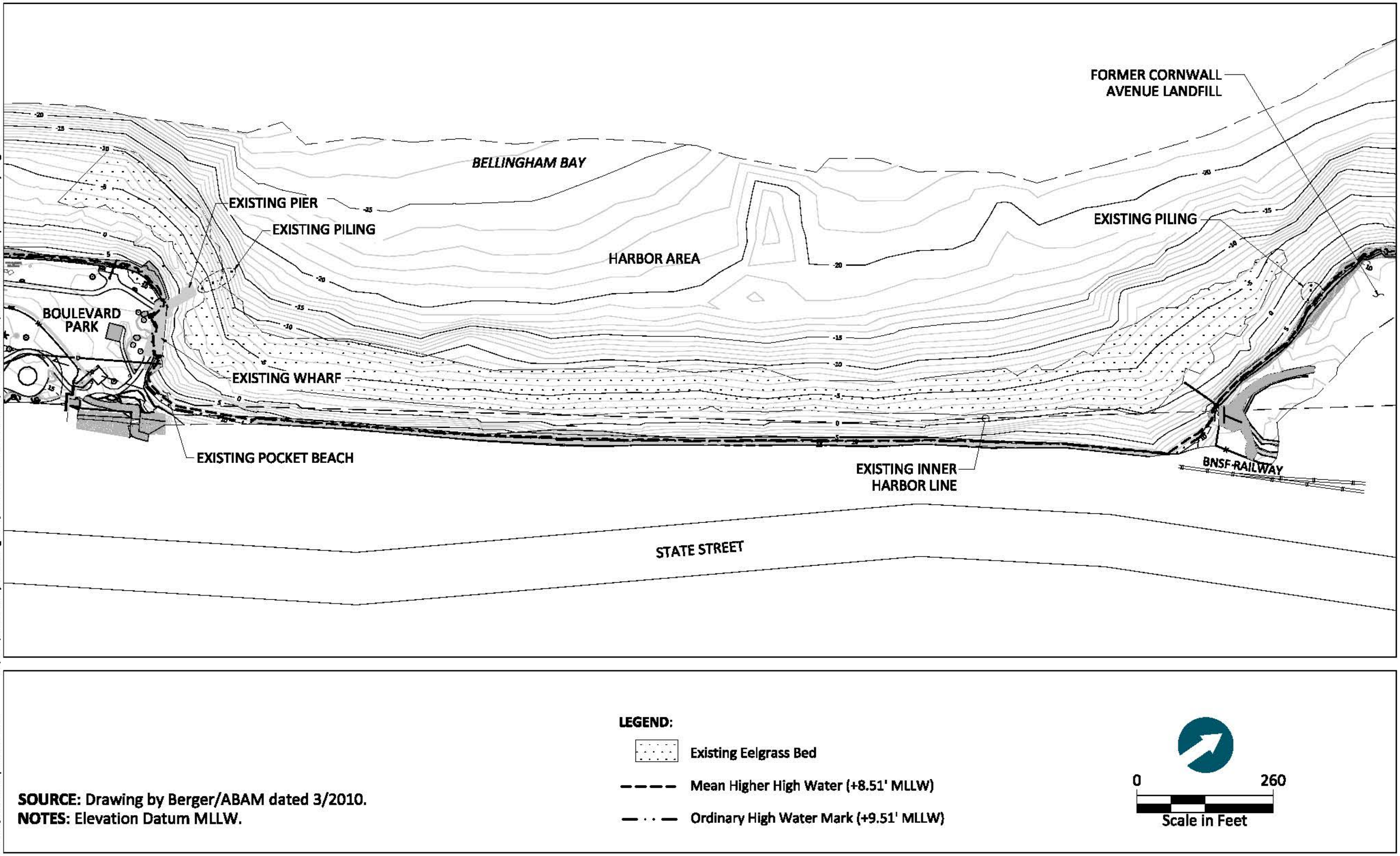
Scale in Miles

Figure 1
Vicinity Map
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.
NOTES: Elevation Datum MLLW.

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ANCHOR QEA

Figure 2
Existing Conditions
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

2 PROJECT DESCRIPTION

Parks proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site. The new facility will include a new overwater pedestrian walkway, 7 to 14 feet in width, with benches. The walkway will be constructed of steel and concrete with wood pedestrian guardrails to meet Americans with Disabilities Act (ADA) requirements. The landing to the south will connect to Boulevard Park, which is connected to the Coast Millennium Trail route. The connection to the north at the former Cornwall Avenue Landfill site is connected to the waterfront district. Project elements include:

- In-water piles
- Overwater precast and cast-in-place pile caps, precast deck panels, a finish slab, posts and pedestrian guardrails meeting ADA requirements, deck lighting, and benches
- Landings and associated improvements at both Boulevard Park and the former Cornwall Avenue Landfill site

Proposed improvements are detailed in Sections 2.1 and 2.2, and shown on Figures 3 through 9.

2.1 Overwater Walkway Structure

The proposed overwater structure will span approximately 2,350 feet across a portion of Bellingham Bay. The structure will be supported by 48 bents spaced at approximately 50 feet on center; each bent includes two 24-inch steel piles for a total of 96 piles, and a precast/cast-in-place concrete pile cap. The piles will be installed using a vibratory hammer and then proofed with an impact hammer to ensure vertical load requirements are met. Four of the piles will be located over areas of high bedrock and will be secured to the bedrock using steel rock anchors.

The bents will support 50-foot-long precast concrete double tee deck panels. A cast-in-place concrete finish slab will be installed over the top of the concrete panels. The final top of deck elevation will be +16.8 feet mean lower low water (MLLW). In total, approximately 34,000 square feet of new decking will be installed as part of the Project. 1,515 square feet of grating will be integrated into the deck surface, including the three spans located closest to the Boulevard Park terminus and five spans located closest to the former Cornwall Avenue Landfill site. Approximately 30% of the surface of these nearshore spans will be grated. The proposed grating will allow 70% light transmission.

The walkway deck will generally be 14 feet wide, except where it is widened to create alcoves for bench seating. The alcove areas will be 18.5 feet wide and 20 feet long, and will be located at approximately 200-foot intervals along the walkway. Wood pedestrian guardrails will be installed along both sides of the length of the overwater walkway.

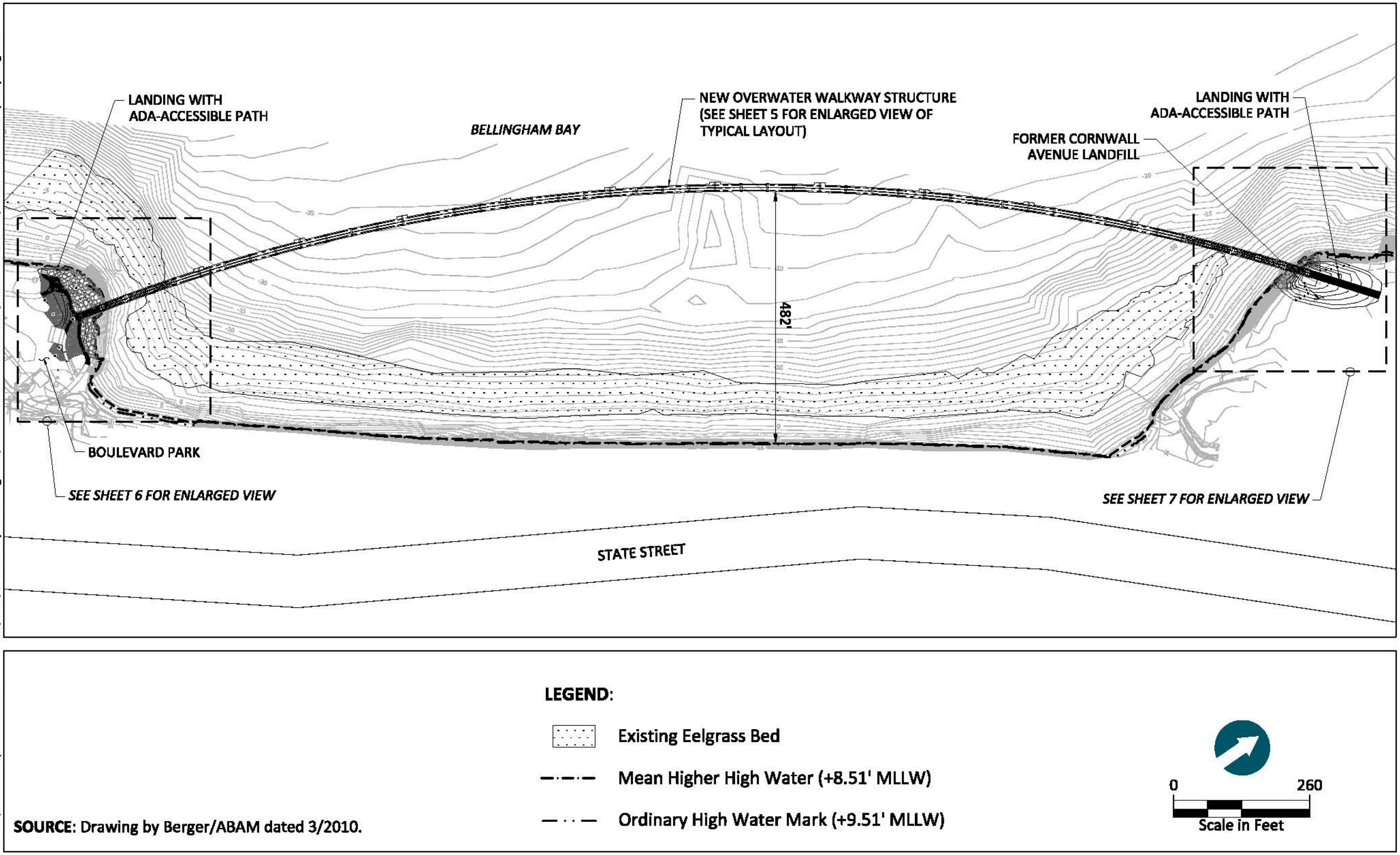
2.2 Landings and Associated Improvements

Landings for the overwater walkway will be developed at both Boulevard Park and the former Cornwall Avenue Landfill site (see Figure 4). On the Boulevard Park end, an existing timber wharf and timber pier will be demolished. Additionally, four existing creosote-treated timber piles located in the embayment to the north of the existing timber pier will be removed. Removal of the timber wharf, pier, and creosote-treated piles is expected to provide partial mitigation for project impacts. Four existing evergreen trees, approximately 18 to 36 inches diameter at breast height (dbh), and an existing asphalt path will be removed as well. Debris from the demolished structures will be disposed of at an approved upland facility and all creosote-treated wood will be disposed of in accordance with Washington State's Dangerous Waste Regulations (Washington Administrative Code [WAC] 173-303) and Excluded Categories of Waste (WAC 173-303-071).

At the former Cornwall Avenue Landfill site landing, five existing creosote-treated timber piles located immediately offshore of the southwest corner of the property will be removed.

At the Boulevard Park landing, approximately 600 cubic yards (cy) of fill will be placed over an upland area of approximately 5,600 square feet, raising the grade up to 6 feet over existing grade to accommodate a paved ADA accessible path leading to the overwater walkway. This path will connect the structure with the current path system at the park. Concrete wingwalls will be constructed where the paths connect to the overwater walkway structure. Approximately 6,700 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above mean higher high water [MHHW]) of the new fill in the vicinity of the proposed landing. Figure 6 shows the proposed grading and layout for the Boulevard Park landing and Figure 9 provides typical sections of the ADA accessible paths for both the Boulevard Park and the former Cornwall Avenue Landfill site landings, as well as wingwalls and abutments for the landings.

The new landing at the former Cornwall Avenue Landfill site will be constructed similar to the Boulevard Park landing at the north end of the structure. Approximately 800 cy of fill will be placed over an area of approximately 12,300 square feet, raising the existing grade to provide an ADA accessible crushed rock path leading to the overwater walkway (constructed at a 1:20 slope). Concrete abutments will be constructed and approximately 2,300 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above MHHW) of the new fill in the vicinity of the proposed landing to provide slope protection. The landing for the overwater walkway at the former Cornwall Avenue Landfill site has been developed so that it will not interfere with future park development plans. Figure 7 shows the proposed grading and layout for the former Cornwall Avenue Landfill site landing and Figure 9 provides typical sections of the ADA accessible path.



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SOURCE: Drawing by Berger/ABAM dated 3/2010.

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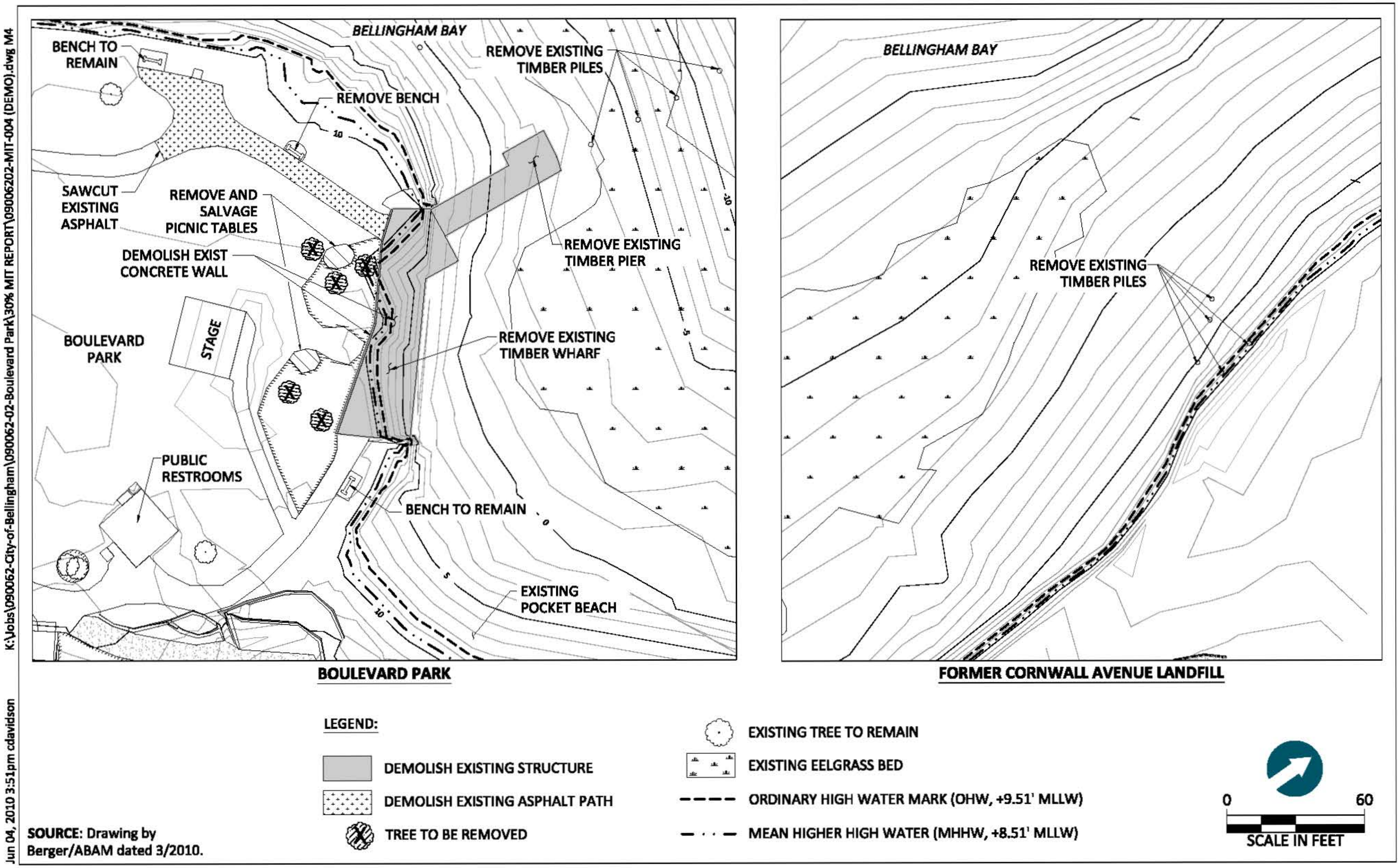
Figure 3
Composite Site Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 4
Demolition Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

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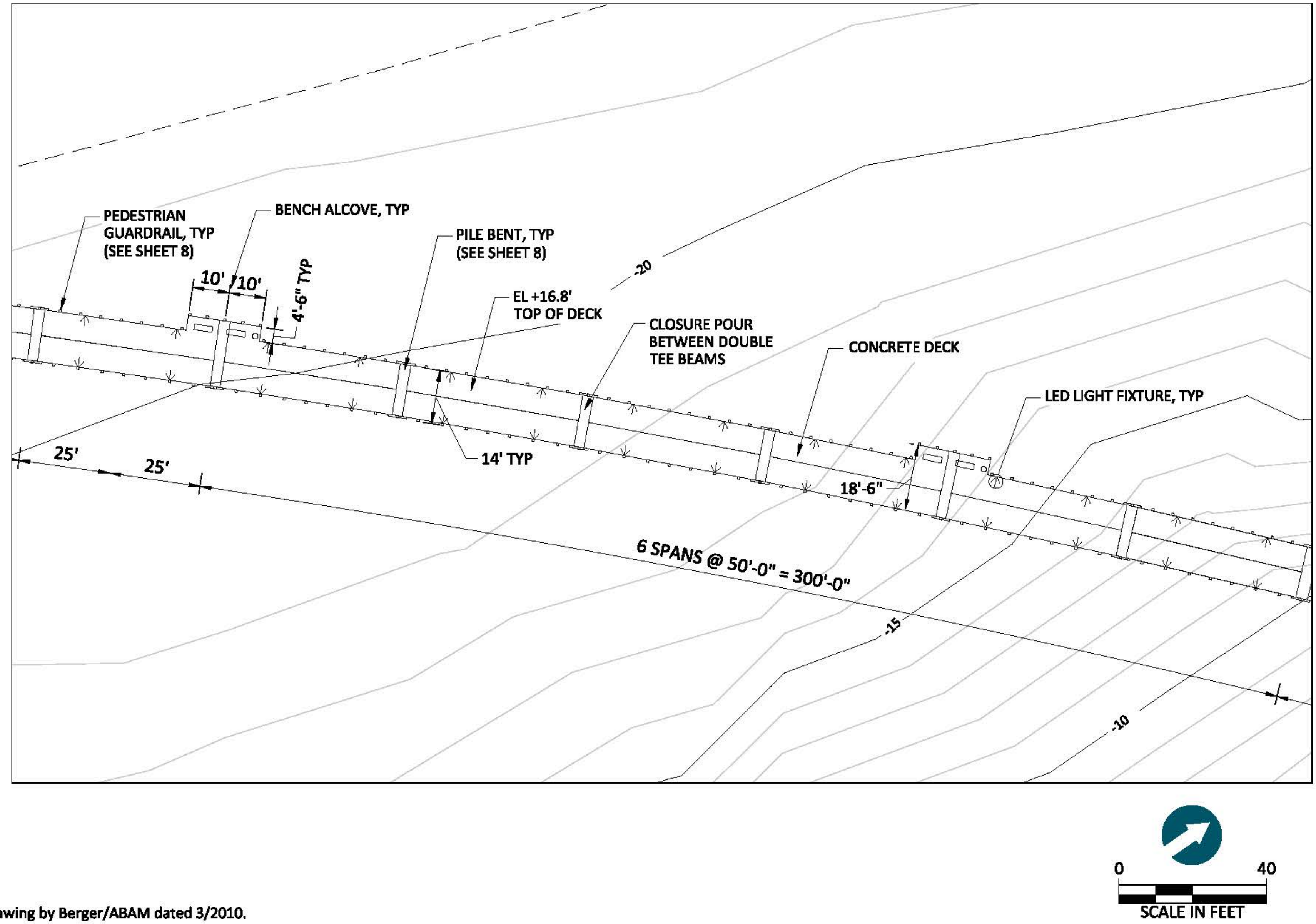

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SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 5
Overwater Walkway Typical Layout Plan (Enlarged)
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

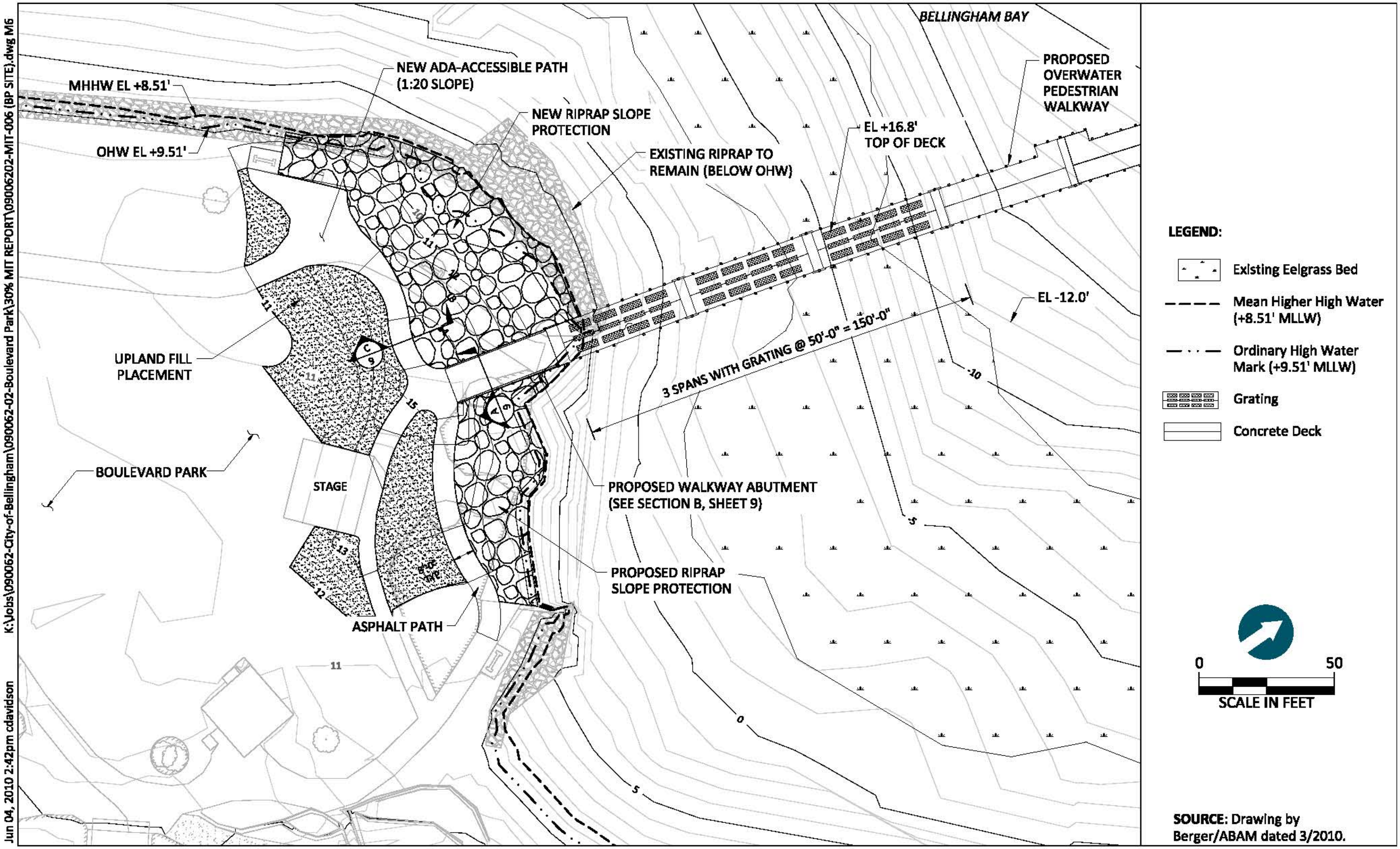

Figure 6
Boulevard Park Enlarged Site Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

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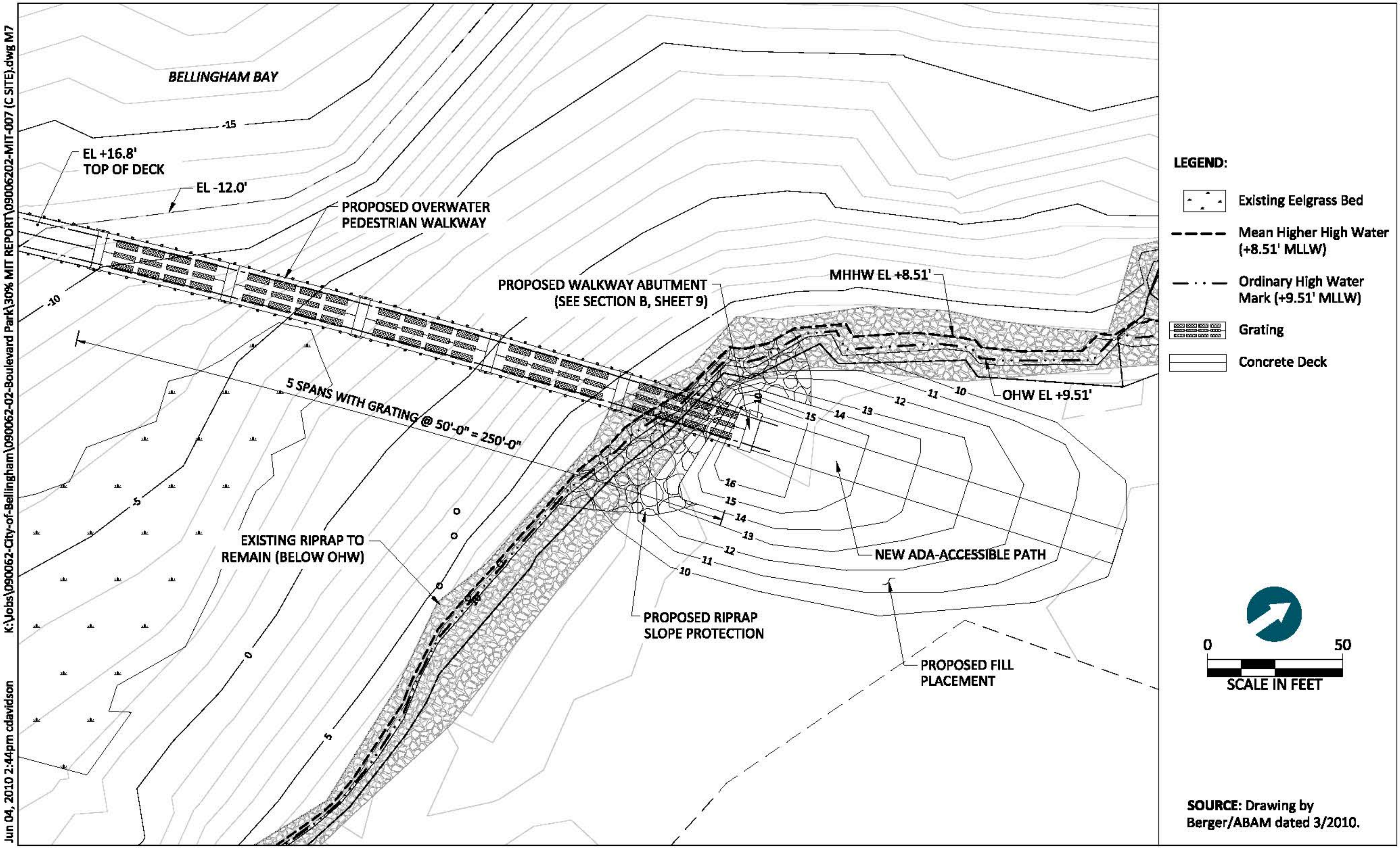
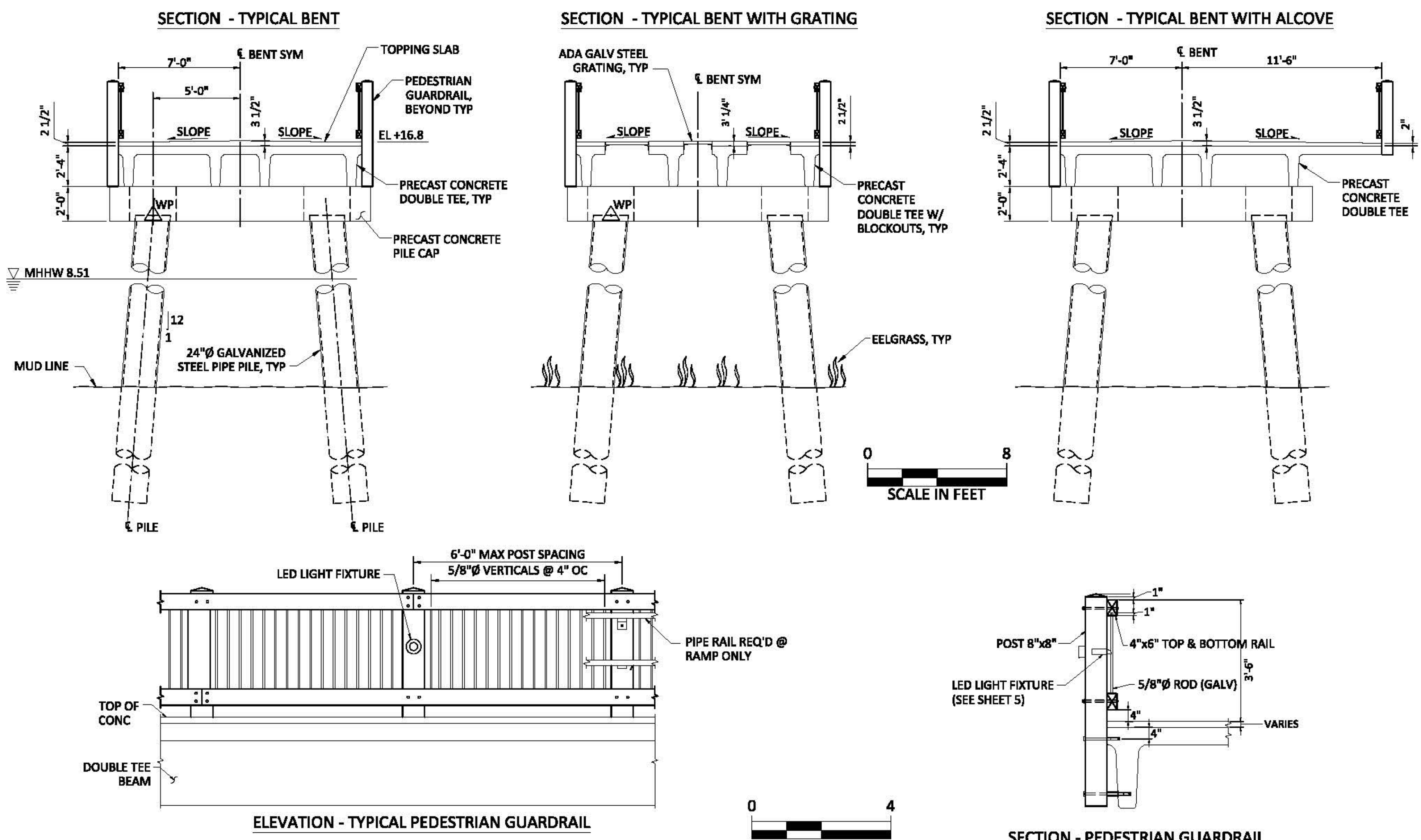


Figure 7
Former Cornwall Avenue Landfill Englared Site Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.

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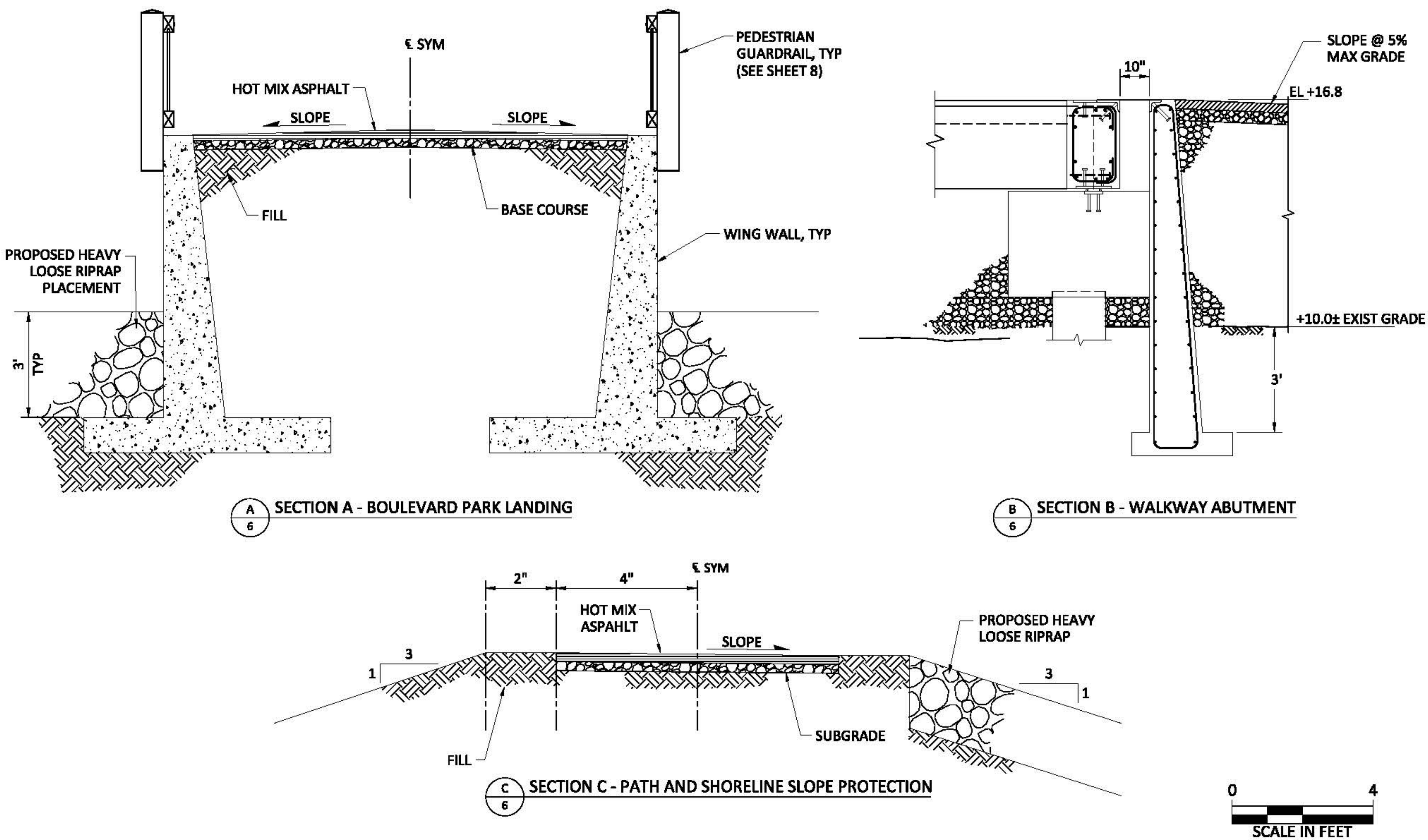
Figure 8
Typical Pile Bent Details
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 9
Landing and Abutment Details
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

3 EXISTING CONDITIONS

3.1 Existing Conditions/Site Characterization

The Boulevard/Cornwall overwater pedestrian walkway will span the Bellingham Bay embayment to connect the north end of Boulevard Park to the south end of the former Cornwall Avenue Landfill site (see Figure 2 for existing conditions). In-kind mitigation for the Project will occur on site, elements of which are described in Section 5 and illustrated in Figure 10.

The southern terminus of the proposed overwater walkway will be located within Boulevard Park, a major public waterfront park facility in Bellingham that is owned, managed, and maintained by Parks. The park is located adjacent to Bellingham Bay between the Fairhaven District (south) and the Bellingham Waterfront District (north), and includes maintained lawn and landscaping, a small performance stage, public restrooms, picnic facilities, parking, trails, and 'The Woods' coffee shop. The park and its trails are used extensively for recreation by locals and visitors due to their scenic value and central location on Bellingham Bay. Subsurface conditions of the park are characterized by relatively soft soils and soft fill, with borings near the proposed overwater walkway encountering approximately 5 feet of earthen fill, 19 feet of wood waste fill, and 1 foot of sandy beach deposits over bedrock (Landau 2009). There is no shoreline access except for a small pocket beach at the northeast corner of the park (Photo 1). The remainder of the shoreline is heavily armored with rock and concrete riprap.

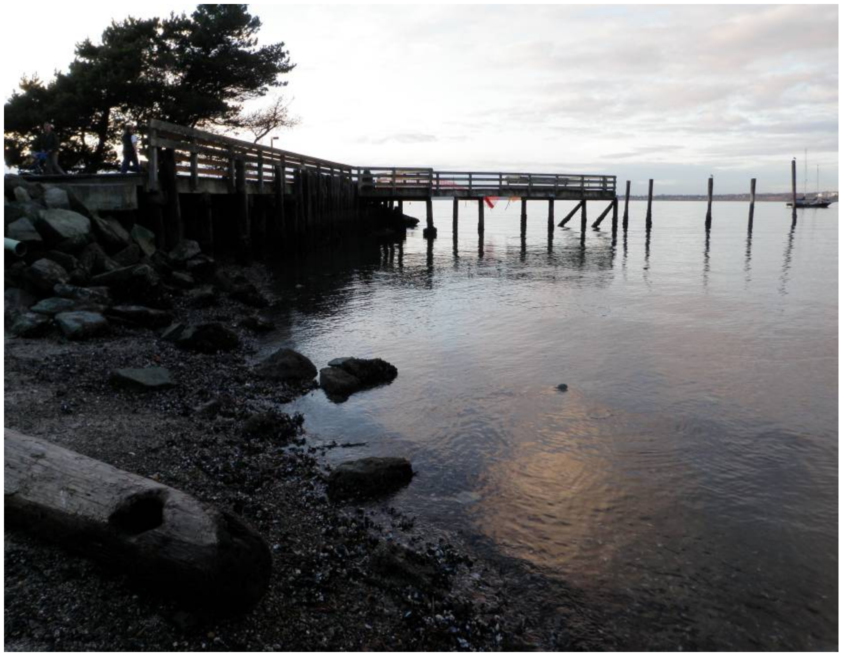


Photo 1 – Profile view of the existing pier at Boulevard Park from the adjacent pocket beach located at the northeast corner of Boulevard Park (facing west)

An existing wharf and pier are located at the north end of Boulevard Park in the approximate location of the southern terminus of the proposed overwater walkway (Photo 2). The pier is in structurally unsafe condition and is, therefore, closed to the public. The overwater portion of the pier is supported by pier bents supported by 1-foot by 1-foot timber caps and eight corroded steel H-piles. The overwater portion of the wharf is supported by approximately 87 creosote-treated timber piles. A low concrete wall topped with riprap supports the wharf on the landward side. The wharf, pier, and associated piles will be removed as part of the compensatory mitigation described in Section 5.

Photo 2 – View from Boulevard Park of the existing pier where the southern end of the overwater walkway will land (facing north)

The former Cornwall Avenue Landfill site is located at the north end of the proposed walkway within the City's Waterfront District redevelopment area. The upland portion is currently undeveloped and public access is restricted. Vegetation on the site is unmaintained. Non-native and invasive herbaceous plant species dominate the area near the proposed landing site. Subsurface conditions at the former Cornwall Avenue Landfill site are somewhat similar to Boulevard Park, in that the conditions include mostly soft soils and soft fill. Borings near the proposed overwater walkway landing encountered about 2 feet of granular fill, 23 feet of landfill refuse, 10 feet of wood waste fill and 8 feet of Nooksack Deposits/Glaciomarine Drift over bedrock (Landau 2009). The shoreline is heavily armored with riprap and concrete rubble.

Five derelict creosote-treated piles are located immediately offshore of the southwest corner of the property in the vicinity of the proposed walkway (Photo 3). These piles will be removed as part of the compensatory mitigation described in Section 5.

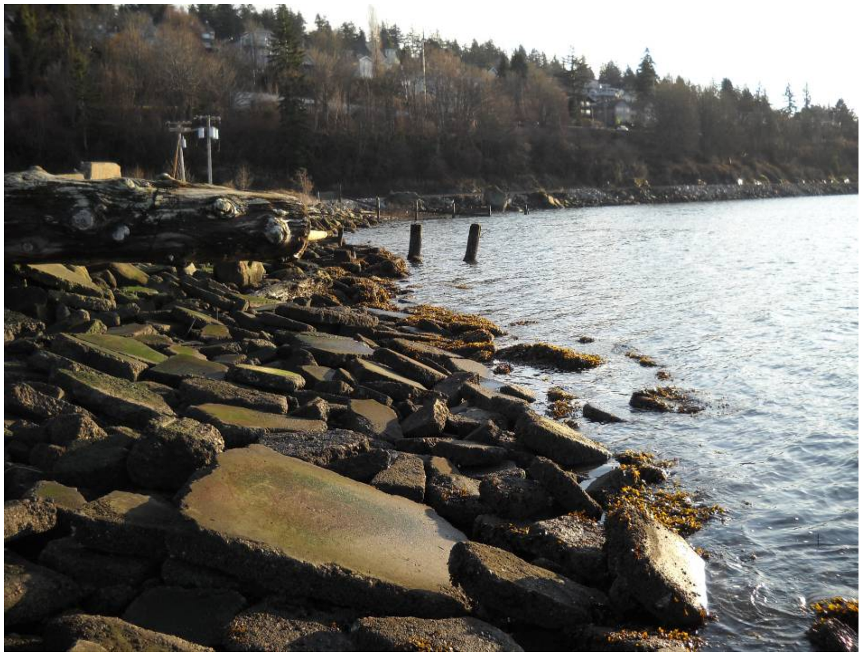


Photo 3 – View of the former Cornwall Avenue Landfill site where the north abutment of the proposed overwater walkway will land (facing southeast)

The outermost portion of the embayment (a part of Bellingham Bay) between Boulevard Park and the former Cornwall Avenue Landfill site (Photo 4), is presently used for transient vessel moorage; however, these transient vessels do not have WDNR authorization to moor in this area. The bathymetry of the embayment between Boulevard Park and the former Cornwall Avenue Landfill site indicates that the shoreline is gently sloping from the upland toward the Whatcom Waterway navigation channel. The substrate along the shoreline of the Project area waterward of the riprap at each landing site primarily consists of gravel, cobble, sand, and shell fragments. A geotechnical study was conducted for the Project in October 2009, and borings indicated the material below elevation -20 feet MLLW is primarily composed of sand, soft clay, and silt. Four isolated creosote-treated piles are located within this portion of the embayment; these piles will be removed as part of the compensatory mitigation described in Section 5.

Photo 4 – View of proposed overwater walkway location from the existing pier at Boulevard Park where the southern end of the walkway will land (facing northeast)

Grette Associates conducted an underwater eelgrass survey within the embayment and mapped the extent of existing eelgrass beds. This survey occurred June 3 through June 5, 2008 (Grette Associates 2009), and employed a modified version of the Washington Department of Fish and Wildlife (WDFW) Intermediate Eelgrass/Macroalgae survey methods, modified to meet the needs of the Project and approved by WDFW (WDFW 2007). The results of the survey (Grette Associates 2009) showed that eelgrass is present along the entire embayment between Boulevard Park and the former Cornwall Avenue Landfill site. In general, eelgrass begins at an upper elevation of approximately -1.7 to -2.0 feet MLLW and extends waterward to approximately -8 to -10 feet MLLW. At the Boulevard Park landing, eelgrass density is lowest and the eelgrass band is narrowest at the existing pier. At the former Cornwall Avenue Landfill site, eelgrass density is generally similar along the entire shoreline area.

In addition, macroalgae was consistently found landward of the eelgrass bed surveyed. Fucus and Ulva were present on most transects, and sparse Laminaria was observed further waterward on some transects (Grette Associates 2009).

Further biological conditions of the Project site are discussed in detail in the Biological Assessment (Anchor QEA 2010). While the Project site is located within the 100-year floodplain, there are no streams or wetlands within the Project site. Generally, wildlife within the area includes mammals such as harbor seal, California sea lion, and harbor porpoise; fish including salmon, herring, and forage fish species; and upland bird species including heron, eagle, and songbirds.

3.2 MTCA Remedial Actions Associated with the Overwater Walkway

The proposed overwater walkway is located within the boundaries of three Model Toxics Control Act (MTCA) sites that are regulated by the Washington State Department of Ecology (Ecology): the Boulevard Park (also known as the South State Street Manufactured Gas Plant [MGP] Site), Cornwall Avenue Landfill, and Whatcom Waterway sites. The Boulevard Park site is undergoing investigation under an Ecology Agreed Order (AO) for soil and groundwater contamination related to the former South State Street MGP. The Cornwall Avenue Landfill site is undergoing investigation under an Ecology AO for contamination associated with a former municipal landfill. The landings of the overwater walkway will fall within the boundaries of the Boulevard Park and Cornwall Avenue Landfill MTCA sites. The overwater walkway structure will cross over aquatic lands that are within the natural recovery area of the Whatcom Waterway site, which is undergoing cleanup and long-term monitoring consistent with the Whatcom Waterway Consent Decree. The Boulevard/Cornwall Overwater Pedestrian Walkway Project and the various MTCA projects are coordinated by the City. The landings for the walkway have been designed not to interfere with any future proposed restoration actions at the Boulevard Park and Cornwall Avenue Landfill MTCA sites.

4 POTENTIAL IMPACTS

4.1 Short-term (Temporary) Impacts

During construction activities, temporary impacts to aquatic resources could occur. Construction equipment, specifically equipment used for pile driving and pile removal may result in short-term noise impacts. In-water work and grading activities near the shoreline could also generate increased turbidity that may be harmful to aquatic fish and animals. Accidental release of hazardous liquids on-site (fuels, lubricants, paints, and other coatings) could impact water quality and harm marine organisms. Best management practices (BMPs) will be used to avoid or minimize short-term impacts. Table 1 summarizes the potential short-term/temporary impacts associated with construction activities.

Table 1

Proposed Project Action Potential Temporary Impacts

Project Component	Potential Temporary Impacts
Pile installation	Generates turbidity and sound pressure that may be harmful to plants/animals.
Pile removal	May generate turbidity that may be harmful to plants/animals.
Use of heavy construction equipment	Construction noise may disrupt wildlife feeding, rearing, and resting activities. Construction equipment uses fuel, lubricants, coolants, and hydraulic fluids, additional containers of which may be present on site. Accidental release of these liquid materials could impact water quality and/or harm marine and terrestrial organisms living in the Project area.

4.2 Long Term Impacts

The design attempts to minimize long term impacts to the greatest degree possible; however, some impacts were determined to be unavoidable in order to develop a usable overwater walkway. Installation of piles may cause physical harm to organisms and would displace seafloor substrate. Increased overwater cover in the intertidal area (-12 to 8.5 feet MLLW) could displace areas used by juvenile fish for feeding, rearing, and migration, as well as impacting other marine resources. Shoreline armoring will only be placed above MHHW and thus will not directly affect the intertidal zone. However, the rock riprap will ensure an absence of shoreline vegetation within these areas. Table 2 summarizes the potential long term impacts associated with Project elements; Table 3 quantifies these long-term impacts.

Table 2

Proposed Project Action Potential Long Term Impacts

Project Component	Potential Long Term Impacts
Pile Installation	Piles will displace seafloor substrate Physical harm to organisms
Overwater Coverage	Overwater cover within the intertidal zone will displace marine organisms
Shoreline Armoring	Prevents establishment of riparian vegetation

Table 3

Summary of Impacts

Project Component	Proposed (above MHHW)	Proposed (below MHHW)
Overwater Cover		34,000 sf
Piles	4 steel piles	92 steel piles
Rock and rubble revetments	9,000 sf	

5 PROPOSED MITIGATION APPROACH

This section discusses the mitigation approach including goals and objectives of mitigation, fundamentals of the mitigation elements, and performance standards to be used to evaluate the effectiveness of the proposed mitigation.

5.1 Goals

Construction impacts related to the proposed overwater walkway structure were first and foremost avoided, minimized, and rectified to the maximum extent practicable. Additional mitigating measures were incorporated into the Project to help compensate for unavoidable impacts.

The goal of the Project's proposed mitigation is to compensate for the unavoidable overwater shading and construction impacts on the intertidal area. Specifically, the overall mitigation goals include:

1. Minimize permanent overwater structure shading within the intertidal zone
2. Compensate for permanent overwater structure shading within the intertidal zone
3. Provide protection and enhancement of sensitive eelgrass beds within the Project area

5.2 Objectives

To achieve the goals, the following objectives have been identified for the mitigation action:

1. Integrate grating into the deck surface of the overwater walkway over intertidal areas (between MHHW and -12 feet MLLW), allowing for light penetration
2. Remove and dispose of 3,332 square feet of timber frame pier and wharf structures, and 87 associated creosote-treated timber piles and 8 steel H-piles
3. Monitor Project site eelgrass beds and follow adaptive management and contingency plan if further shading impacts occur

5.3 Mitigation Sequencing

5.3.1 Mitigation Sequencing Followed

According to the Washington State Environmental Policy Act (SEPA) (Chapter 197.11 WAC), mitigation requires the following sequence of steps:

1. Avoid the impact altogether
2. Minimize impacts
3. Rectify impacts by repairing, rehabilitating, or restoring the affected environment
4. Reduce or eliminate impacts over time
5. Compensate for impacts by replacing, enhancing, or providing substitute resources or environments
6. Monitor the impact and take appropriate corrective actions

5.3.2 Avoidance and Minimization

The proposed overwater walkway cannot be modified to entirely avoid impacts to the intertidal area and existing eelgrass beds because the walkway must cross over intertidal areas in order to connect the two upland landing sites.

Avoidance and minimization measures are built into the Project design to lessen impacts to nearshore habitat. The location of the overwater walkway partially occurs over the footprint of the existing pier to be removed. Locating the walkway within this area consolidates intertidal impacts to an area that will already be disturbed due to demolition activities, rather than impacting a new, relatively pristine portion of the site. The design of the overwater walkway minimizes impacts to eelgrass beds by locating the widened deck portions over areas with a seafloor depth of -12 feet MLLW or lower. In addition, the preliminary overwater walkway design was modified based on discussions with WDFW (Williams, pers. comm. 2010) to ensure that the overwater walkway crosses over the narrowest area of eelgrass near the Boulevard Park landing (at the approximate location of the existing pier) and avoids crossing over the eelgrass areas near the former Cornwall Avenue Landfill site landing. In addition to the above measures designed to minimize new macroalgae shading impacts, approximately 30% of the spans of the proposed structure located above nearshore areas (-12 feet MLLW or higher) will be grated at a size to provide 70% light transmission.

Finally, piles used for the proposed walkway will be steel rather than treated wood; thus, they will not be pollution generating.

5.3.3 Compensatory Mitigation

The proposed compensatory mitigation for the Project includes removing an existing timber pier and wharf at the north end of Boulevard Park and nine additional creosote-treated timber piles in the embayment. The pier is supported by eight steel H-piles (each 8 inches square) and the wharf is supported by approximately 87 creosote-treated piles, all of which will be removed. The wharf is supported on the southern (landward) end by an existing concrete wall that will also be removed.

Four creosote-treated, 12-inch-diameter timber piles located immediately north of the existing pier at Boulevard Park and five creosote-treated, 12-inch-diameter timber piles immediately offshore of the southwest corner of the former Cornwall Avenue Landfill site will also be removed. BMPs (see Section 3.5 of the Biological Assessment; Anchor QEA 2010) as identified by the U.S. Army Corps of Engineers (USACE) Dredged Materials Management Office (DMMO) and the WDNR Puget Sound Initiative will be employed during removal of the piles.

The removal of the pier, wharf, and piles will decrease the amount of pollution-generating surfaces at the Project site. Removal of the wharf will increase the area of the existing pocket beach, potentially increasing habitat area for juvenile salmon and forage fish. Table 4 summarizes the anticipated changes in overwater cover resulting from the Project; Table 5 summarizes the changes in piling.

Table 4
Summary of Changes in Overwater Cover/Shading in the Intertidal Zone

Project Component	Removal of Existing Overwater Cover [1]	Total New Overwater Cover [1]	New Overwater Grated Areas [1, 3]	Net Change in Overwater Shading [1, 2]
Existing wharf, piles, and pier to be removed	-3,332	0	0	-3,332
Existing isolated piles (nine total) to be removed [4]	-7	0	0	-7
Proposed overwater walkway structure	0	5,396	1,515 (1,060.5 open area)	4,335.5
Total	-3,339	5,396	1,515 (1,060.5 open area)	996.5

Table Notes:
1. All areas are in square feet
2. Changes in overwater cover are only detailed for intertidal areas where the seafloor elevations range between -12 feet MLLW and +8.5 feet MLLW (MHHW)
3. New overwater grated areas were calculated based on quantities and specifications provided by BergerABAM (approximately 30% grating—for areas described under item 2 above—with 70% openings)
4. Pile square footage is approximate and based on outside dimensions of the piles

Table 5
Summary of Changes in Piling

Project Component	Removal of Existing Piles	New Piles
Piles	9 isolated piles 8 H-piles 87 creosote treated piles	96[1] steel piles

Table Notes:
1 Four of these piles are above MHHW

5.4 Proposed Mitigation Timing and Schedule

The entire mitigation project, including demolition and disposal of the existing pier, wharf, and piles, is expected to take approximately 1 week to complete. However, the duration and total period of in-water work, including piling removal, would be affected by several factors, including the type of construction equipment and procedures selected by the contractor, and the sequencing of work elements. If it is necessary to perform certain work at night during a low tide, appropriate City, Whatcom County, and any other necessary approvals would be obtained.

In-water work will occur according to the allowable USACE and WDFW work windows for Bellingham Bay and/or in accordance with the requirements and conditions of the Hydraulic Project Approval (HPA) issued by WDFW and appropriate concurrence recommendations identified by the federal agencies during Endangered Species Act (ESA) consultation, and during potential work window extensions. The expected in-water work window for the Project is from July 16 to January 21 in the years in which construction will occur. Table 6 details the in-water work windows for the Project.

Table 6
In-water Work Windows

Species	Month												Approved Work Windows by Species
	J	F	M	A	M	J	J	A	S	O	N	D	
Salmon													July 2 to March 2
Bull Trout													July 16 to February 15
Herring													June 15 to January 21
Sand Lance													March 2 to October 14
Surf Smelt													N/A[1]

Note:
1 Surf smelt spawning occurs year-round.

5.5 Performance Standards

Performance standards for the Project correspond to the design goals and objectives identified in Sections 5.1 and 5.2. They define measurable criteria that are evaluated to predict when a mitigation element has been successfully implemented or accomplished and whether overall mitigation goals have been met at the end of the monitoring program. Noise monitoring during pile driving activities and monitoring of Project and reference site eelgrass beds will occur to assess the success of the performance standards, and a contingency plan of additional mitigation will be triggered in the event of a failure to meet these standards. The monitoring plan and impacts determination analysis are described in more detail in Section 6; the adaptive management and contingency plan is described in Section 7. Table 7 summarizes the design goals, design criteria, and final performance standards associated with the proposed mitigation approach.

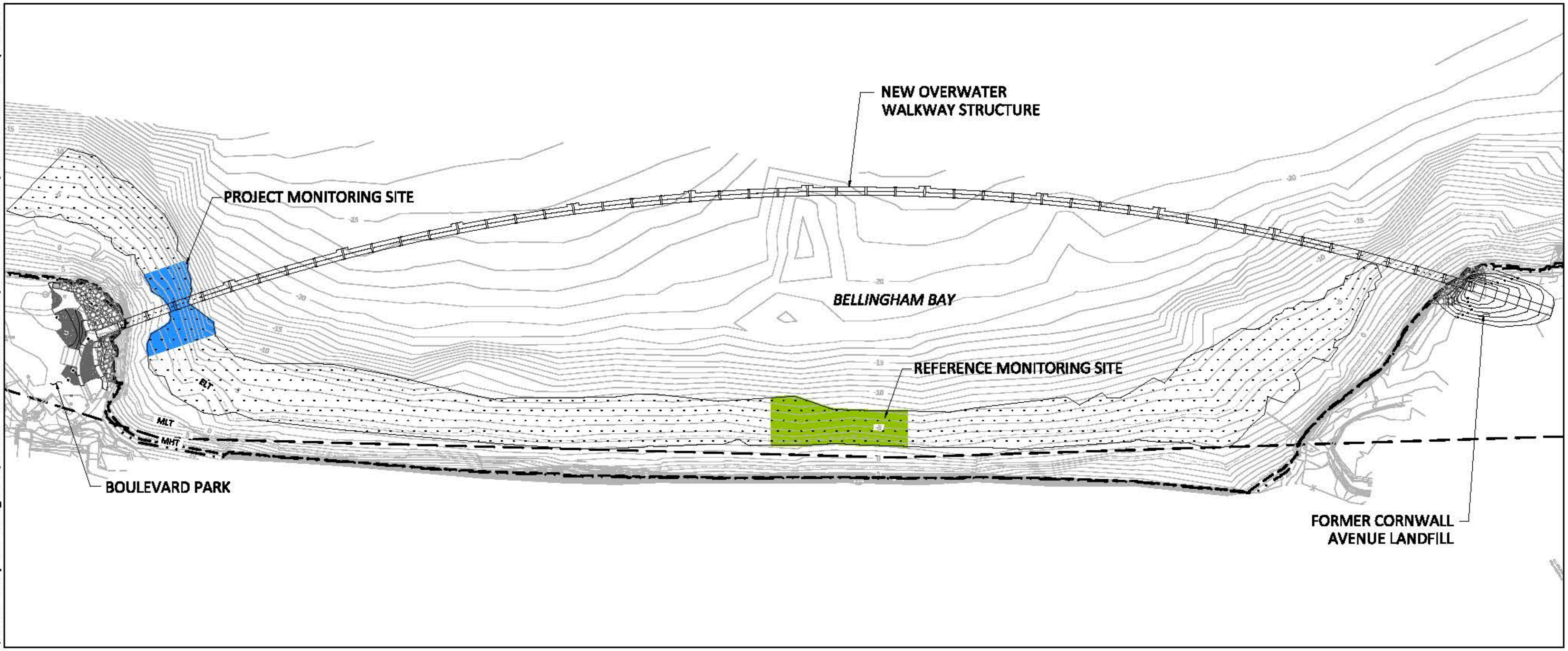
Table 7
Mitigation Goals with Associated Design Criteria and Final Performance Standards

Design Goals	Design Criteria	Final Performance Standards
Minimize permanent overwater structure shading within the intertidal zone	Locate overwater structure over footprint of existing structures (to be removed) and mostly outside of intertidal area (with seafloor depths of -12 feet MLLW or lower). Provide grating within walkway depth over intertidal areas.	70% of walkway shall be located over seafloor depths of -12 feet MLLW or lower. Approximately 30% of overwater walkway shall contain grating sized to provide 70% light transmission.
Compensate for permanent overwater structure shading within the intertidal zone	Remove and dispose of existing pollution-generating derelict structures and piles.	Remove 3,332 sf of pier, wharf, and 95 associated piles adjacent to Boulevard Park. Remove five isolated piles adjacent to the former Cornwall Avenue landfill site. Remove four isolated piles within the Project embayment.
Provide protection and enhancement of sensitive eelgrass beds within the Project area	Avoid crossing eelgrass beds with walkway when possible. Maintain or expand eelgrass area within the overwater walkway Project monitoring site. [1]	After 5 years, Project site eelgrass area will be equal to or greater than Project site pre-construction eelgrass area. [2]

Notes:

1 See Figure 10 for Project monitoring site area.

2 Pre- and post-construction Project site eelgrass area shall be compared with reference site eelgrass beds to account for regional inter-annual trends in eelgrass density. The process of monitoring and analyzing performance standards/determining eelgrass impacts is described in more detail in Section 6.



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Jun 04, 2010 2:56pm cdavidson

SOURCE: Drawing by Berger/ABAM dated 3/2010.

NOTES:

1. Sampling methods will follow Washington State Department of Fish and Wildlife's Eelgrass/Microalgae Habitat Interim Survey guidelines.
2. A minimum of 30 samples will be taken at both the project and reference site.
3. Samples will include counts of all eelgrass shoots within a quarter square-meter quadrant.

LEGEND:

- Project Monitoring Site
- Reference Monitoring Site
- Existing Eelgrass Bed
- Mean Higher High Water (+8.51' MLLW)
- Ordinary High Water Mark (+9.51' MLLW)

0 260
Scale in Feet

Figure 10
Monitoring Plan
Mitigation Report
Boulevar/Cornwall Overwater Pedestrian Walkway

ANCHOR QEA

6 MONITORING PLAN

The City proposes to monitor potential short and long-term impacts to natural resources through noise monitoring during construction and eelgrass bed monitoring following construction. This section discusses the monitoring methods, data analysis, and impact determination process that will be utilized.

6.1 Short-term Noise Monitoring

Because construction activities will include vibratory and impact pile driving, underwater noise levels will be monitored to ensure pile driving noise does not exceed the threshold and result in physical harm to fish, marine mammals, and bird species. Noise reduction assumptions as detailed in the Biological Assessment (Anchor QEA 2010) include a 10 decibel (dB) reduction in underwater noise through the use of a bubble curtain, lowering the anticipated peak sound pressure to 179 dB_{RMS} and 202 dB_{PEAK}.

6.1.1 Methodology

Two hydrophones will be placed underwater 10 meters horizontally from the pile: one will be located at mid-depth, the other will be lowered to just above the seafloor bottom. The boat that staff will be working from will be anchored or tied down in order to maintain its position. The horizontal location of the hydrophones will be recorded using differential global positioning system (GPS) and the depth (measured through 1-meter increments recorded on the line) will also be recorded. The calibration of the hydrophones will occur at the start of each monitoring activity. Positioning of the hydrophones will occur prior to the initiation of pile driving.

Environmental data will be gathered prior to and during pile driving activities. This data will include wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather, and other factors that may contribute to the underwater sound measured (e.g., boats, traffic, aircraft).

Peak levels of underwater noise will be monitored in real time to determine if construction activities exceed 202 dB_{PEAK}. When monitoring is able to determine that this exceedance level has not been reached for three piles in a row, it will be assumed that further pile driving will also avoid exceeding this threshold and no further noise monitoring will be conducted. If the threshold is reached, the City will work with the Project contractor to make changes to the existing noise attenuation measures or employ additional measures until the required reduction can be met. If exceedances continue to persist, the size of the monitoring area will be reevaluated and increased. The City will immediately notify the U.S. Fish and Wildlife Service (USFWS) if there is an increase in the size of the monitoring area.

If fish are observed to be in distress or a fish kill occurs, all work will cease and WDFW will be notified immediately, as anticipated to be required by the HPA to be issued for the Project. Work can recommence with the authorization of the WDFW-certified biologist.

6.1.2 Data Analysis

Post-analysis of the noise monitoring data will include determination of:

- Absolute peak under and over-pressure levels recorded for each pile
- Root Mean Square (dB_{RMS}) value for each absolute peak pile strike (calculated between where 5% and 95% of the pulse energy occurs)
- Rise time (the time taken for the impulse to reach its peak pressure)
- Average duration of the sound level for each pile strike
- Average number of strikes per pile
- Sound Exposure Level (dB_{SEL}) of the absolute peak pile strike (calculated from data between 5% and 95% of the pulse energy)
- Mean db_{SEL}
- Cumulative db_{SEL} (accumulated SEL = single strike SEL + 10*log(# hammer strikes)

6.1.3 Reporting

A final report summarizing the data collected will be submitted by the City to USFWS and the National Marine Fisheries Service (NMFS) within 90 days of the termination of noise monitoring. Any anomalous bird or fish behavior observed in the area by trained observers in the field will be correlated to underwater sound levels occurring at that time. Additionally, a comparison between the measurements made at the hydrophones will be included.

6.2 Long-term Eelgrass Monitoring

The City proposes to assess impacts from the proposed overwater walkway by monitoring eelgrass density underneath the proposed structure (Project site) and comparing it to monitoring results from an on-site reference eelgrass patch (reference site).

The locations of the Project and reference sites are shown on Figure 10. The reference monitoring will provide data to account for regional inter-annual trends in eelgrass density. This information will be necessary to correctly assign changes in eelgrass data to impacts from construction or shading from the proposed overwater walkway. Sampling methods will follow WDFW's Eelgrass/Macroalgae Habitat Interim Survey Guidelines for both the Project and reference sites (WDFW 2007).

6.2.1 Methodology

Monitoring of the Project site will include pre and post-construction sampling efforts in years 3 and 5. Sampling will occur during extreme low tides (-2 feet MLLW or lower) to avoid the need for dive surveys. Samples will be taken in areas that have potential shading impacts from the proposed overwater walkway (Project Monitoring Site, Figure 10). A minimum of 30 samples will be taken along a transect line at approximately -4 feet MLLW (±0.5 feet vertical). Samples will include counts of all eelgrass shoots within a 1/4 meter² quadrant. The linear distance of the affected portion of the site is approximately 100 feet; therefore samples will be taken approximately every 3.3 feet in order to collect 30 samples. The transect line's start, end, and each sample point will be recorded using differential GPS, for duplication of locations during future sampling efforts. The 30 sample densities will be averaged to compare to the average reference site samples (described below).

Reference site monitoring will occur within the Project's embayment and within the same eelgrass bed, outside of the overwater walkway's shadow (Reference Monitoring Site, Figure 10). Approximately 30 samples will be taken following the same techniques as the Project site monitoring; densities will be recorded within a ¼ m² quadrant along an approximately -4 feet MLLW (±0.5 feet vertical) transect. As with the Project site monitoring, the start, end, and sampling points along the transect line will all be recorded using GPS.

6.2.2 Data Analysis

Impacts of shading will be determined by comparing pre- and post-construction eelgrass densities within the Project site transect and using the reference site samples to validate the Project site data, accounting for changes in density that are a result of normal, seasonal variations instead of a result of shading impacts.

Pre- and post-construction density data will be compared using a two-sampled, one-tailed t-test (α=0.10, power (1-β) = 0.90).

6.2.3 Impact Determination Process

Table 8 illustrates the impact determination process.

Table 8
Impact Determination Process

Row	Test 1: Project Site Comparisons	Test 2: Reference Site Comparisons	Conclusions	Test 3: Project Site Comparisons	Conclusions	Mitigation Needed
1	Post-Construction Eelgrass Density ≥ Pre-Construction Eelgrass Density	Post-Construction Eelgrass Density ≤ Pre-Construction Eelgrass Density	No Impact			No Mitigation
		Post-Construction Eelgrass Density > Pre-Construction Eelgrass Density	Potential Impact	Post-Construction Eelgrass Density ÷ Pre-Construction Eelgrass Density ≥ 0.9	No Impact	No Mitigation
				Post-Construction Eelgrass Density ÷ Pre-Construction Eelgrass Density < 0.9	Impact	Mitigation based on the percent decrease in pre-construction and post-construction turion densities at the Project Site plus percent increase at the Reference Site.
2	Post-Construction Eelgrass Density < Pre-Construction Eelgrass Density	Post-Construction Eelgrass Density ≥ Pre-Construction Eelgrass Density	Impact			No Mitigation
		Post-Construction Eelgrass Density < Pre-Construction Eelgrass Density	Potential Impact	**Project Site** Post-Construction Eelgrass Density ÷ Pre-Construction Eelgrass Density ≥ **Reference Site** Post-Construction Eelgrass Density ÷ Pre-Construction Eelgrass Density	No Impact	No Mitigation
				Project Site Pre-Construction Eelgrass Density ÷ Post-Construction Eelgrass Density < **Reference Site** Pre-Construction Eelgrass Density ÷ Post-Construction Eelgrass Density	Impact	Mitigation for the impact will be based on the difference in percent turion density between the pre- and post-construction Reference site data and pre- and post-construction project site data.

The comparison between pre and post-construction data will be tested following the null hypothesis:

Hypothesis 1: Post-construction eelgrass density at the Project site will be statistically greater or equal to the pre-construction eelgrass density at the Project site (evaluated in Row 1, Test 1 of Table 8).

Outcome 1: Hypothesis is not rejected (Project site post-construction density is greater than or equal to pre-construction density, shown in Row 1, Test 1 of Table 8).
If Project site post-construction eelgrass density is greater than or equal to pre-construction density, the null hypothesis cannot yet be rejected, because it is possible that a region-wide increase in eelgrass density occurred and was not seen at the Project site; this could indicate an impact. To test for this occurrence, a similar statistical comparison with the reference site would be performed. This will be tested by the null hypothesis:

Hypothesis 2a: Post-construction eelgrass density at the reference site will be statistically less than the pre-construction eelgrass density at the reference site (Evaluated in Row 1, Test 2 of Table 7).
If the reference site post-construction eelgrass density is less than pre-construction density, hypothesis 2a is not rejected. This would indicate that a regional increase in eelgrass density has not occurred and therefore would validate the results of testing Hypothesis 1, thus signifying that no impacts to Project site eelgrass have occurred from shading. No additional mitigation would be triggered.

Conversely, if the reference site post-construction eelgrass density is significantly greater than pre-construction eelgrass density, hypothesis 2a is rejected. This would indicate that eelgrass density has increased significantly at the reference site and likely at region-wide sites. If a decrease in density is shown at the Project site, shading impacts have likely occurred. This possibility will be tested by a non-statistical test to examine the rate of decrease in eelgrass density at the Project site (evaluated in Row 1, Test 3 of Table 8). The rate of decrease is determined by dividing post-construction density by pre-construction density. If density levels are shown to have decreased by 90% or greater from pre-Project eelgrass density, it will be assumed that shading related impacts have occurred and additional mitigation will be triggered.

Outcome 2: Hypothesis is rejected (Project site post-construction eelgrass density is less than Project site pre-construction density, shown in Row 2, Test 1 of Table 8).
If Project site post-construction eelgrass density is less than pre-construction density, it is likely but not decisively evident that there has been a shading impact on the Project site. There is a chance that decreases in eelgrass density are due to a regional pattern, rather than a Project impact. To test for this occurrence, a similar test will be performed against the reference site, as illustrated in the null hypothesis:

Hypothesis 2b: Post-construction eelgrass density at the reference site will be statistically less than the pre-construction eelgrass density at the reference site. (Outcomes are shown in Row 2, Test 2 of Table 8).
If this hypothesis is rejected and therefore reference site post-construction eelgrass density is greater than or equal to pre-construction density, this would signify that a regional decline in eelgrass density has not occurred. This would further validate the testing results of Hypothesis 1 and indicate that shading impacts have occurred at the Project site and additional mitigation could be triggered.

If reference site density has decreased between the pre- and post-construction sampling, this indicates that a region-wide decrease may have occurred. Whether this decrease is due solely to regional elements or combined regional and shading impacts is determined through a non-statistical comparison illustrated in Row 2, Test 3 of Table 8.

The rate of decrease is determined by dividing post-construction density by pre-construction density. If the rate of decrease at the Project site is greater than or equal to the rate of decrease at the reference site, it is assumed that a shading impact has occurred and mitigation would be triggered. If the rate of decrease at the Project site is less than the reference site rate, it is assumed that no shading impact has occurred and therefore no additional mitigation is required.

7 ADAPTIVE MANAGEMENT AND CONTINGENCY PLAN

If conclusions from eelgrass bed monitoring and sample testing indicate that shading impacts have occurred at the Project site, mitigation needs would be calculated based on the area subject to shading from the overwater walkway. At this time, the area of potential eelgrass shading is assumed to be the area of walkway over the existing eelgrass bed, approximately 360 square feet. The area of potential construction impacts would include areas within a 50-foot buffer from the walkway footprint.

Mitigation requirements would be determined based on the nature of the impacts. It is assumed that for all impacts resulting in eelgrass density loss, a 2:1 mitigation ratio would be applied. The possible impact scenarios include varying degrees of Project site eelgrass density loss in comparison to the reference site eelgrass density.

Impact Type 1: Project site eelgrass density does not decrease significantly; however, it does decrease by at least 10%, and eelgrass density at the reference site increases significantly.

Mitigation Result: This result would indicate that a regional inter-annual increase in eelgrass density seen at the reference site was not reflected at the Project site, indicating a shading impact. Mitigation would be determined by the Project site percent decrease in eelgrass densities between pre- and post-construction time periods plus the percent increase in density at the reference site. A 2:1 mitigation ratio would be applied to this area, resulting in the amount of eelgrass restoration required.

Impact Type 2: Project site eelgrass density decreases significantly and reference site eelgrass density increases significantly or remains the same.

Mitigation Results: Mitigation under this scenario would be equal to the percent decrease between pre- and post-construction densities at the Project site. A 2:1 mitigation ratio would be applied to this area, resulting in the amount of eelgrass restoration required.

Impact Type 3: Both the Project and reference sites eelgrass densities decrease significantly; however, the Project site eelgrass density decreases at a higher rate than the reference site.

Mitigation Result: Mitigation required would be based on the difference in percent decreases between the two sites. A 2:1 mitigation ratio would be applied to this area, resulting in the amount of eelgrass restoration required.

7.1 Contingency Planning

If eelgrass bed impact Types 1, 2 or 3 (described above) are determined after monitoring years 3 and 5, the City proposes to establish new eelgrass areas based on the calculated need described above. Removing concrete rubble or pulling creosote piles within the elevation bands of -1.7 and -10 feet MLLW, would provide the necessary substrate and area for eelgrass reestablishment. These mitigation actions could occur on site, if sufficient amounts of rubble remain after 5 years of eelgrass monitoring. If needed, off-site mitigation sites could also be identified.

If monitoring and statistical testing results after year 3 and year 5 indicate no impacts, the monitoring plan will conclude and no mitigation will be triggered. If impacts are not shown after monitoring year 3 but impacts are detected after year 5, a mitigation plan would be prepared based on the amount of mitigation needed, described above. If impacts are detected in year 3 monitoring, mitigation would be anticipated; however, a mitigation plan would not be finalized until after results of year 5 monitoring are collected.

8 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2010. Biological Assessment: Boulevard Park Overwater Walkway. May 2010.

COB (City of Bellingham), 2009. *Final Draft Shoreline Master Program*. Prepared by the City of Bellingham Planning Commission on June 2009.

COB, 2008. *Waterfront Connections Plan*. Prepared for Mayor Dan Pike of the COB. September 2008.

COB Parks (City of Bellingham Parks and Recreation Department), 2008. *Parks, Recreation and Open Space Plan*. Updated and amended 2008.

COB Parks, 2002. *Parks, Recreation and Open Space Plan*. Drafted by the COB for the COB Comprehensive Plan. 2002.

COB and POB (City of Bellingham and Port of Bellingham), 2006. *New Whatcom Preliminary Draft Framework Plan 2016*. Summary and map presented by the COB and POB. September 25, 2006.

Grette Associates LLC, 2009. Boulevard Park Overwater Walkway Eelgrass Habitat Memorandum. Prepared for Reid Middleton, Inc. on May 7, 2008 and revised on February 15, 2009.

Landau (Landau Associates), 2009. Initial Geotechnical Engineering Evaluation: Boulevard Park Shoreline and Overwater Walkway. Prepared for Reid Middleton, Inc. on April 8, 2009.

WDFW (Washington Department of Fish and Wildlife), 2007. Eelgrass/Macro Algae Habitat Survey Guidelines.

WFG (Waterfront Futures Group), 2004. *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay*. Drafted by the WFG. December 2004.

Williams, Brian, personal communication, 2010. Meeting between Louis Klusmeyer of BergerABAM, Brian Williams of WDFW, and Paul Schlenger and Derek Koellmann of Anchor QEA, LLC. February 5, 2010.

ATTACHMENT 7
ARCHAEOLOGICAL REPORT

AN ARCHAEOLOGICAL SURVEY OF THE BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY PROJECT AREA, BELLINGHAM, WASHINGTON

By

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Prepared for

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MANAGEMENT SUMMARY

The City of Bellingham's Parks/Design & Development Division has proposed to construct a pedestrian overwater walkway from the northern end of Boulevard Park to the southern end of the Cornwall Landfill. Planning for this effort included an assessment of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area's archaeological potential. To this end, BergerABAM - - the lead consultant for the project - - secured the services of Wessen & Associates, Inc. to make the required archaeological assessment.

Our study of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area has found no evidence of potentially significant archaeological resources. There are no indications of the presence of prehistoric or early historic archaeological deposits or features and we believe that the potential for as yet undetected such resources being present is very low. All of the terrestrial sediments to be affected by the proposed project are landfill materials which have been deposited in their present locations during the mid 20th Century. Geotechnical sampling of sediments in the subtidal portion of the project area indicates that only marine and glacial deposits are present. While the vicinity has been marked by considerable late 19th and 20th Century industrial developments, most of the built features associated with these activities were located near, rather than within, the project area. The most significant overlap between older industrial features and the proposed project is that of the late 19th Century Blue Canyon Coal Mine overwater coal bunker which formerly spanned the planned walkway alignment at a point approximately 600 feet south of the Cornwall landfill. This structure was demolished in 1904 and we know of no physical evidence of it in the project area today. Another earlier industrial structure which appears to have extended slightly into the project area is the northern end of a large wooden deck which was a part of the E. K. Woods Mill complex in what is now Boulevard Park. Eighteen old pilings identified in and near the southern end of the project area probably include pilings which were associated with this structure. This portion of the deck was built sometime between 1913 and 1917 and was destroyed by a fire in 1925. Pilings which had been used to secure log rafts may also be present here. This group of pilings is a historic archaeological feature - - and has now been designated 45WH861 - - but we do not believe that it represents a potentially significant archaeological resource. All of the pilings are in poor condition and they appear to represent only a few of the pilings which were formerly present in this area. A second group of five old pilings is present just outside of the northern end of the project area. This group of pilings does not appear to represent any known late 19th or early 20th Century structure and they may also have been used to secure log rafts. We have noted the presence of this feature, but have not formally recorded it as a historic archaeological site.

In sum then, we have found no evidence of the presence of potentially significant archaeological resources in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area and believe that the likelihood of as yet undetected such resources being present is very low. A single historic archaeological site has been identified here - - the complex of 18 old pilings now designated 45WH861 - - but we believe that the significance of this site is limited and that it is very unlikely to be eligible for listing with the National Register of Historic Places. Moreover, the pilings now designated 45WH861 have been treated with creosote are considered to be an environmental hazard. Some of the pilings are in locations which directly conflict with the planned overwater walkway. The combination of the latter two conditions (i.e., creosote contamination and direct interference with proposed construction) has led to a proposal to remove all 18 of these pilings. We do not consider their removal to be a potentially significant adverse impact. All of these pilings have been mapped and can therefore be related to any additional pilings thought to be associated with the E. K. Woods Mill complex which may be identified by possible future studies conducted elsewhere in the Boulevard Park area. As such, no additional archaeological resource protection or mitigation measures appear to be warranted at this time.

The cover picture is a view of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. The terrestrial surface in the foreground is the vicinity of the northern abutment at the southern edge of the Cornwall Landfill. Boulevard Park is visible on the middle distance shore, near the center of this image. View is to the southwest.

ACKNOWLEDGEMENTS

This study of the Boulevard/Cornwall Overwater Pedestrian Walkway Improvement Project Area has benefited from the interest and support of a number of people. Louis Klusmeyer of BergerABAM has been the principal point of contact with Wessen & Associates, Inc. and has provided background information and direction for our effort. Communication between Wessen & Associates and the Lummi Indian Nation was maintained with the assistance of Lummi Tribal Historic Preservation Officer Lena Tso. Suquamish Tribal Historic Preservation Officer Dennis Lewarch provided comments on behalf of the Suquamish Tribe. Tim Wahl of the City of Bellingham's Parks/Design & Development Division provided important background information about the history of the project area. Gina Austin, also of the City of Bellingham's Parks/Design & Development Division, provided additional valuable background information. Aaron McCain and Aaron Hartvigsen of Geoengineers, Inc. assisted in the monitoring of geotechnical borings and the interpretation of sediments recovered during this effort. Derek Koellmann and Joshua Jensen of Anchor QEA assisted in the mapping of historic pilings and the preparation of some of the maps used in this report. Washington State Department of Natural Resources Archaeologist Lee Stilson provided helpful information about historic pilings in the vicinity of the project area and his department's Puget Sound Creosote Removal Program.

Finally, Gloria Gould-Wessen of Wessen & Associates, Inc. prepared additional graphics and edited text for this report.

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1 INTRODUCTION

The City of Bellingham's Parks/Design & Development Division has proposed to construct a pedestrian overwater walkway from the northern end of Boulevard Park to the southern end of the Cornwall Landfill. Planning for this effort included an assessment of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area's archaeological potential. To this end, BergerABAM - - the lead consultant for the project - - secured the services of Wessen & Associates, Inc. to make the required archaeological assessment. The study was conducted by Gary Wessen, Ph.D. Field activities undertaken as a part of the effort occurred between late October of 2009 and early January of 2010.

This report describes the background, goals, methods, fieldwork, findings, conclusions, and recommendations of our study of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. Field notes and photographs taken during the study are on file with Wessen & Associates, Inc.

2 BACKGROUND

Appropriate areas of background consideration for this presentation include the basic character of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area and its environmental, cultural, and archaeological settings.

2.1 Project Area

The Boulevard/Cornwall Overwater Pedestrian Walkway Project Area is a long narrow corridor that spans a marine embayment between the northern end of Boulevard Park and the southern end of the Cornwall Landfill, in the southwestern portion of Bellingham, Washington (see Figure 1). Specifically, it is located in the southern half of Section 36, Township 38 North, Range 2 East. The entire project area - - including the landings at its northern and southern ends - - is located on DNR public aquatic lands; the Harbor Lease Number is: 22-084455.

The principal feature of the project is an approximately 2,300 foot long, 14 foot wide, pedestrian walkway which will be built on steel pipe pile bents driven into subtidal surfaces in Bellingham Bay (see Figure 2). Ninety six 24 inch diameter piles will be used. Beyond the steel piles, impacts to terrestrial, intertidal, and subtidal surfaces will be quite limited. The greatest of the latter will be associated with the abutments at each end of the walkway structure. Each abutment will occupy an area of approximately 45 by 15 feet. Excavations for the abutments will reach a maximum depth of no more then 10 feet below the existing surface in each area. Some additional disturbances will occur in the immediate vicinity of the southern abutment with the removal of an existing pier, wharf, and seawall at this location. The area to be effected by this effort is approximately 0.08 acre. Finally, the project area also includes a contractor's storage and laydown area near the northern abutment and a work area near the southern abutment. The storage and laydown area near the northern abutment is approximately 0.8 acre. The work area near the southern abutment is approximately 0.15 acre. No excavations are planned in either of the last two locations, although it is possible that limited very shallow ground disturbances could occur in either area. In sum, the total area to be effected by the

Figure 1 The location of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham, Washington.

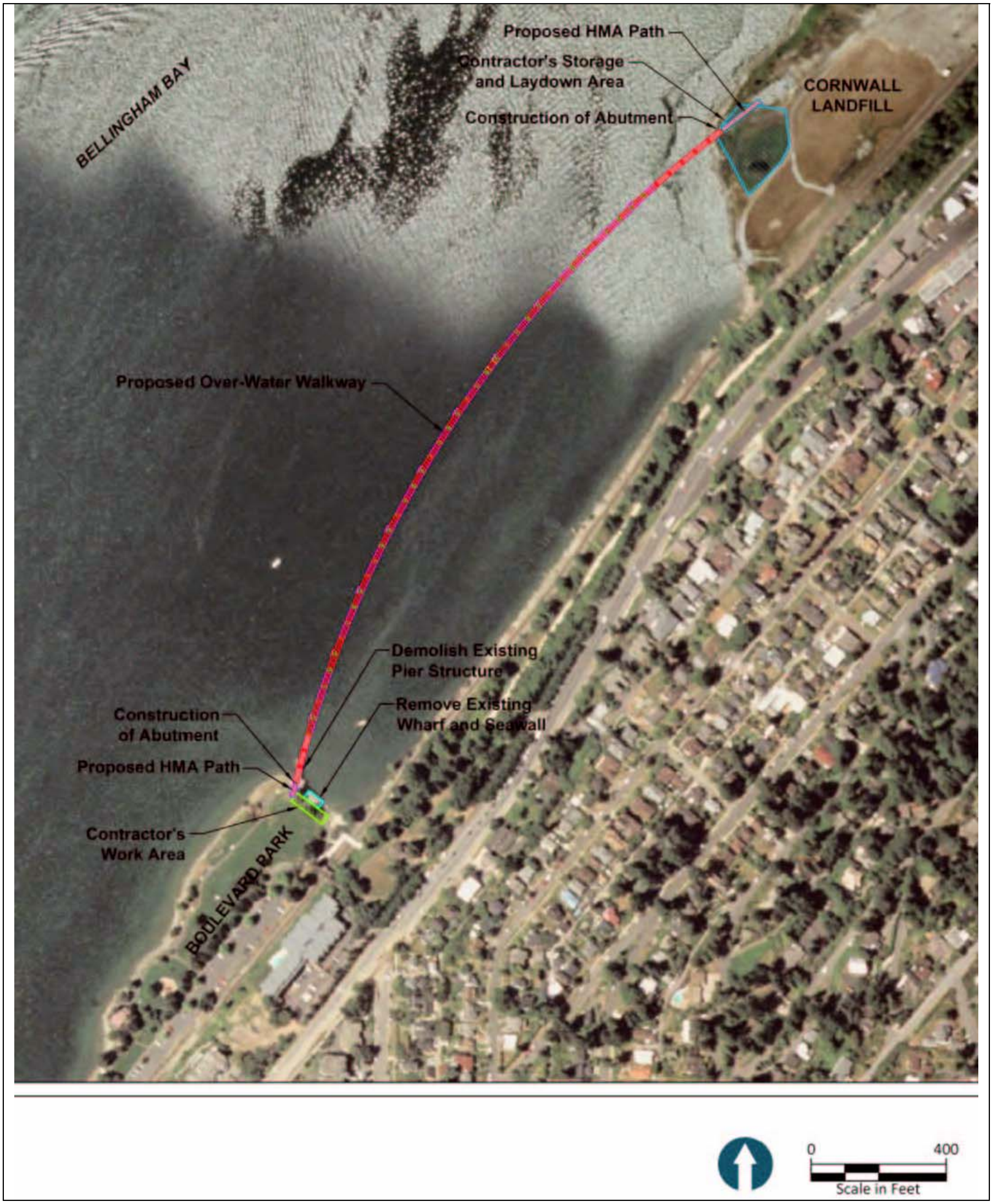


Figure 2 The Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham, Washington.

project amounts to slightly less than 1 acre of terrestrial surfaces and much less than 1 acre of intertidal and subtidal surfaces.

At the time of this study, the terrestrial surfaces at the ends of the project area offered very different conditions. The vicinity of the southern abutment is currently a portion of the northern end of Boulevard Park. The area contains a pier, wharf, and seawall along the shoreline and a complex of maintained lawns, small trees, and paved pedestrian paths just interior to the latter (see Figures 3 and 4). The vicinity of the northern abutment is a former industrial area which has recently been cleared (see Figures 5 and 6). Background research indicates that both areas are historic landfills (see Section 2.2).

2.2 Environmental Setting

The Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, as just described, consists largely of a marine embayment which is a part of Bellingham Bay. It also includes small terrestrial areas at the northern and southern ends of the planned overwater structure. The general vicinity has had a considerable history of industrial and other disturbances, and both terrestrial surfaces are known to be historic landfills of what were formerly shallow subtidal areas (see Section 2.3.2). Both terrestrial surfaces are less than 15 feet above sea level (MLLW) and are marked by artificially armored shorelines containing a significant fraction of concrete and other construction debris. The historic landfill areas are backed by a steep coastal bluff which rises to heights of between 50 and 70 feet above sea level. Thus, prior to land filling actions, the early historic shoreline in the vicinity of the project area was marked by a narrow exposed beach at the toe of a steep coastal bluff. Bottom contours of the adjacent portion of Bellingham Bay, however, lack a steep gradient and the average depth of the subtidal surface in the proposed walkway alignment is approximately 20 feet below sea level (MLLW). There do not appear to be any surface fresh water resources in or near the project area today. While there may be closer seeps or very small streams, the nearest significant sources we are aware of are Padden Creek, approximately 1.2 miles to the south and Whatcom Creek, approximately 1.3 miles to the north.

The entire project area is underlain by Chuckanut Formation sandstone and bedrock exposures of this material are exposed at Pattle Point and elsewhere in the general vicinity (Easterbrook and Rahm 1971). Early historic records indicate that bedrock outcrops were much more conspicuous in this area, and that much of this material has been removed during various industrial developments (Wahl 2003).

The Whatcom County Soil Survey (Goldin 1992: Map 38) describes the sediments at the northern end of Boulevard Park as a “Squalicum – Urban Land Complex soil” and those at the southern end of the Cornwall Landfill simply as a “Urban Land”. The former is a soil mapping unit that includes an intricate mosaic of Everett, Chuckanut, Labounty, Squalicum, Sehome, and Whatcom series soils. Typically, areas mapped with this classification are approximately 50% Squalicum gravelly sandy loams and complex mixtures of some or all of the remaining soil types. All are relatively deep, moderately well to well drained soils that have developed in a combination of alluvium and/or colluvium, volcanic ash, glacial till, glacial outwash, and sandstone. The term “Urban Land” is used for extensively developed areas which lack surface exposures of soil. In fact, both reviews of historic documents (Wahl 2003 and 2009) and recent geotechnical studies (Integral Consulting 2007, Landau 2009, and Herrenkohl and Landau 2009) demonstrate that both terrestrial portions of the project area are landfills. Each contains at least

Figure 3 An overview of the vicinity of the southern abutment location in the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area. View is to the north.

Figure 4 The vicinity of the southern abutment location in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. The abutment will be located where the pier meets the wharf in the middle distance. View is to the northwest.

Figure 5 An overview of the vicinity of the northern abutment location in the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area. View is to the north.

Figure 6 The vicinity of the southern abutment location in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. The abutment will be located at the 'point' in the middle distance. View is to the northwest.

several feet of sand, gravel, and construction debris overlying a much thicker layer of historic mill waste materials (i.e., wood, bark, and saw dust). Further, the Landau (2009) study indicates that the subtidal portion of the project area contains fill materials and both Holocene and Late Pleistocene marine sediments. There are no indications of the presence of submerged terrestrial sediments.

Vegetation in the immediate vicinity of the project area has been extensively altered by historic activities. Boulevard Park is now a landscaped area containing maintained lawns, ornamental plantings, and relatively young second growth trees. The southern end of the Cornwall landfill is marked by a thin cover of invasive weeds and occasional stands of brushy plants such as Himalayan blackberry (*Rubus discolor*). Prior to historic development, both of these areas were shallow subtidal setting which did not support terrestrial vegetation. Upland areas nearby were probably covered by a dense nearshore coastal forest dominated by trees such as Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*). The understory was probably thick and plants such as sword fern (*Polystichum munitum*) would have been well represented. We have not determined when the original forest vegetation was removed from the area, but we are confident that this occurred sometime prior to 1900.

It should be noted that a small remnant of a native plant community which may be indicative of the late prehistoric shoreline vegetation near the project area is present in the rocky meadow openings on the sea bluff just to the north of Boulevard Park. This meadow remnant includes chocolate lily (*Fritillaria lanceolata*), Columbia lily (*Lilium columbianum*), and a species of grassland saxifrage. Other scattered native species including beaked hazel (*Corylus cornuta*) and blue elder (*Sambucus cerulea)* persist along the nearby shoreline and may suggest a landscape with openings encouraged by prehistoric land management practices and featuring breaks in the original forest canopy.

Finally, while this discussion of the project area's environmental setting has focused on its current conditions, it is also worthwhile to briefly consider the character of past environments here. All of Whatcom County was covered by the Puget Lobe of the Cordilleran Ice Sheet in the Late Pleistocene, but this area was probably ice free by ca. 12,000 to 14,000 years ago (Porter and Swanson 1998). A recent reconstruction of Late Pleistocene and Holocene sea level history for southwestern British Columbia suggests that the project area may have been significantly below sea level until sometime between ca. 13,500 and 11,500 years ago and then relative sea levels lower than the modern stand probably characterized much of the Early and Middle Holocene period (Gowan 2007). The modern sea level has probably been in place for approximately the last ca. 3,000 to 5,000 years. Thus, the project area may have been a shoreline area briefly ca. 12,000 years ago, but it was probably at least somewhat interior to the shore for much of the following 7,000 to 9,000 years. While there have been significant changes in the vegetation of this region during the Holocene, pollen data suggests that forest communities much like those of the early historic period have probably been present in western Whatcom County for the last ca. 3,500 to 5,000 years (Whitlock 1992). In sum, environmental conditions in and near the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area have probably approximated those of the early historic period for much of the second half of the Holocene. A more open (i.e., less forested) landscape was probably present prior to that time.

2.3 Cultural Setting

The cultural setting of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area includes both the Native American and Euro-American use of the vicinity. The following sections briefly consider each.

2.3.1 The Native American Presence

The late prehistoric and early historic Native American occupants of western Whatcom County were members of a broad grouping of peoples referred to as the Coast Salish. Coast Salish peoples are widespread in Western Washington and southwestern British Columbia and are divisible into a number of smaller regional groups. The people of the Whatcom, north-western Skagit, and San Juan County areas are considered to be members of the Central Coast Salish (Suttles 1990). They are distinguished from their neighbors by the language they speak: Lkungen, as opposed to the Lushootseed spoken by other local Salish groups further to the south. They also differ in their pursuit of a distinctive subsistence and settlement system which traditionally placed a heavy emphasis upon exploiting the marine resources, particularly the reef-netting of sockeye salmon, within their traditional territory.

The Central Coast Salish people have often been divided into a number of tribal groups, but it is worthwhile to note that such tribal groups may be historic phenomena and the term "tribe" may not be directly applicable to the pre-contact inhabitants of the area. Most types of economic, political and social affiliation appear to have focused on local lineal groups (i.e., families). Family control of resource collection localities and ownership of the rights to ceremonial properties such as dances, songs, titles, and masks was the rule. The historic tribal groups most frequently mentioned in southwestern Whatcom County include the Lummi, Samish and Noo-wha-ah Indians.

There appears to be very little ethno-historical information about the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area and its general vicinity. We know that the Lummi People occupied much of the land to the north during historic times and that the Samish and Noo-wha-ah lands were mostly to the south. There is no clear agreement regarding the boundary between these territories. Indeed, there is even reason to believe that such boundaries have probably changed over time (Allen 1976). Stern (1934) places the southern boundary of Lummi Territory a few miles to the south of Chuckanut Creek (approximately 4 to 6 miles to the south of the project area). Suttles (1951) places the southern boundary of Lummi Territory just to the north of Chuckanut Creek (approximately 2.5 mile to the south of the project area). Sampson (1972) places the northern boundary of Noo-wha-ah Territory well to the north of Chuckanut Creek. Thus, at least two of these three sources place the project area within Lummi Territory.

There are also a few very limited references to yet another Native American group in the vicinity of the project area. Wahl (2003) notes that at least one account from an Indian Agent and oral traditions from some of the first Euro-American settlers in the Bellingham Bay area make reference to a group referred to as the Mamosee who occupied the southern part of the Bellingham Bay shoreline in the vicinity of what is now Fairhaven and Boulevard Park. The Mamosee people were largely gone by the 1850s and little is known about them. As such, the specific details of their territory and relationships with neighboring groups is largely unknown.

None of the above sources, nor any other source we are aware of, specifically describes Native American settlements - - or other activities by Indian people - - either within, or close to, the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. Most of the closest Lummi settlements which we are aware of were located farther to the north and west on Hale Passage and the tributaries of today's Nooksack River. Suttles (1951:34) identifies a number of early historic Lummi villages and smaller seasonal camps on the west side of Bellingham Bay, on Portage Island, and on Lummi Island, all 5 to 7 miles to the west. He also noted a Lummi settlement at the mouth of Squalicum Creek, approximately 2.5 miles to the northwest, but was uncertain whether this community predated the early historic period. The closest reported settlement to the south was a seasonal camp on the north side of Chuckanut Bay, approximately 2.5 miles away. Suttles (1951:42) attributes this settlement to the Samish Indians, people who may have had an association with the Noo-wha-ah.

While this discussion may appear to suggest there were no Native American settlements at, or close to the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, it is likely that this appearance is - - at least in part - - a reflection of incomplete ethnographic data. At least 16 prehistoric archaeological sites are present within 3 miles of the project area (see Section 2.4), many of which are concentrated near the mouth of Padden Creek and in the vicinity of Chuckanut Bay. This density of sites is not suggested by the ethnographic data and argues that at least one or more unreported late prehistoric or early historic settlements may have been present near the project area. Having acknowledged this, it is important to add that it is very unlikely that any such settlements would have been located within the project area. The entire project area was a part of Bellingham Bay prior to historic landfilling here.

2.3.2 The Euro-American Presence

The earliest known Euro-American activities in the general vicinity of the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area are associated with Bellingham Bay (Carhart 1926, Edson 1968). The first European to enter the area was probably Jose Narvaez, sailing for Francisco Eliza, who briefly visited Bellingham Bay in 1791. The following year Galiano and Valdez inspected and mapped Bellingham Bay in greater detail, and were shortly followed by a boat crew under Joseph Whidbey, dispatched from Birch Bay by George Vancouver. The Spaniards first named the adjoining body of water "Gaston Bay", although the Vancouver expedition gave it the persisting name "Bellingham Bay" on its charts. The name honored Sir William Bellingham, an associate of Vancouver's in the British Navy. The first US land claimant on Bellingham Bay was William Pattle, who arrived in 1852. Additional settlers arrived in the next few years and several communities, including Whatcom, Sehome, Bellingham, and Fairhaven, were present along the eastern shore of the bay by the 1880s (Scott and Turbeville III 1983). The smaller communities gradually merged to become the modern City of Bellingham in 1904.

Within this general context, the specific histories of the Boulevard Park and Cornwall Landfill areas share many parallels (Griffin 2007, Miert 2004, and Wahl 2003 and 2009a). The vicinity of each of these areas was first settled in the 1850s, was a focus of substantial late 19th and early 20th Century mill developments, and was substantially altered by land filling during the 20th Century.

The Boulevard Park area was a portion of William Pattle's 1852 Donation Land Claim. Pattle's home was located near Pattle Point, approximately 700 feet south of the proposed south abutment location for the Boulevard/Cornwall Overwater Walkway. The latter area was approximately 200 feet offshore at that time. Pattle and his partners briefly operated a coal mine in the area, but the venture was not successful and it was largely abandoned by the early 1860s.

The next phase of development in this area began with the construction of the Bellingham Bay Mill at Pattle Point in the early 1880s. The mill changed hands twice in the following years. It saw its largest operations during the first two decades of the 20th Century, at which time it was known as the E. K. Wood Lumber Company Mill. It was destroyed by a fire in 1925. While some of the mill complex was built on land at the point, much of it was constructed atop pilings which extended out over the water (see Figure 7). It is likely that the first significant filling of tidelands in the Boulevard Park area began while the mill operated.

A variety of other industrial developments occurred in the vicinity of Boulevard Park after the 1925 mill fire, but none were located in the immediate vicinity of the proposed south abutment location for the Boulevard/Cornwall Overwater Walkway. The mill site itself was largely vacant until after World War II. A plat was filed in 1946 and it appears that significant filling of the area north of Pattle point had occurred by this time. Additional filling in the vicinity of the proposed south abutment location occurred during the 1950s. Actions in support of a park began to gain momentum in the 1960s and much of the current Boulevard Park infrastructure was in place by 1980. The existing pier at the proposed south abutment location was built in 1978.

The Cornwall Landfill area was adjacent to Charles Vail's Donation Land Claim. Vail arrived shortly after Pattle and was a locally prominent figure by the mid 1850s (Edson 1968). We have not determined the precise location of Vail's home, but are confident that it was not in the landfill area. Early coal mining activity also occurred to the north of this area and at least two structures - - the Bellingham Bay Coal Company wharf and the Sehome wharf - - were present on the shoreline, approximately 1,500 to 1,800 feet northeast of the proposed north abutment location for the Boulevard/Cornwall Overwater Walkway by 1859.

Mill development in this area began when Pierre Cornwall constructed the Bellingham Bay Improvement Company Mill here in 1889. Like the early noted E. K. Wood Lumber Company Mill, much of the latter was built on pilings which extended out over the water (see Figure 7). Again like the latter, it is likely that the first filling of the area occurred in association with construction of the mill. The Bellingham Bay Improvement Company Mill was destroyed by a fire in 1898 and was subsequently rebuilt. The complex was sold to Bloedel-Donavan in 1913 and it continued to operate until 1946. The property was acquired by the Port of Bellingham in 1947 and was a municipal waste dump in the 1950s and 1960s. Wahl's (2003) analysis of the Bellingham Bay shoreline indicates that filling in the vicinity of the proposed north abutment location for the Boulevard/Cornwall Overwater Walkway probably occurred between 1953 and 1965.

Our consideration of the history of this project area has also addressed the water body which the overwater walkway structure will span. While the area is accurately described as a marine embayment, the preceding discussion makes it clear that this feature is a product of the historic landfills which have extended out into a portion of Bellingham Bay. Early historic maps clearly indicate that this was formerly a straight stretch of exposed shoreline (see Figure 7). Beyond the development of the Boulevard Park and Cornwall Landfill landforms, the 'embayment' itself has also been impacted by historic industrial activities. These include the

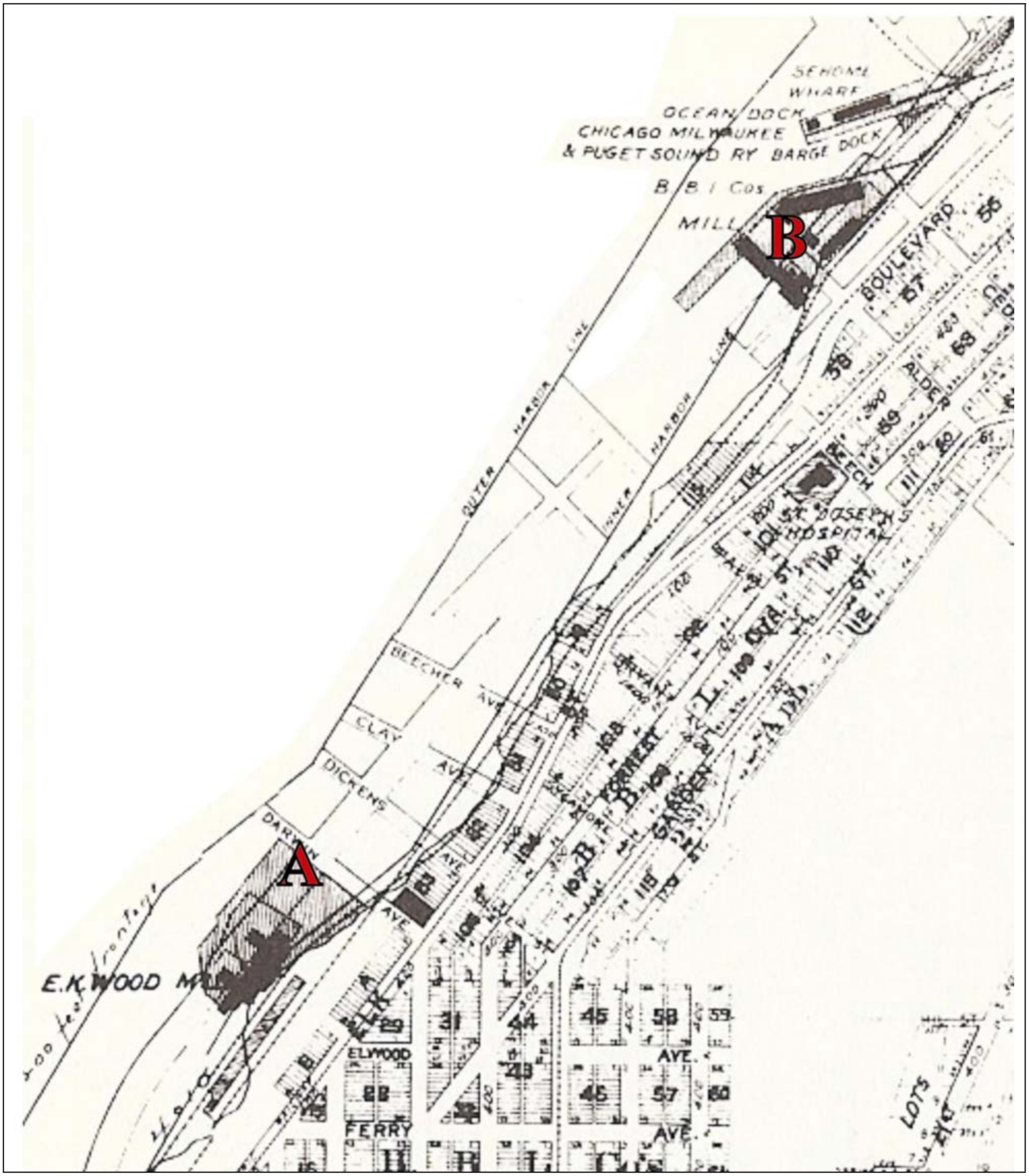


Figure 7 Detail of the vicinity of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, as shown in the 1912 Hincks' Map of Bellingham. Note that both the E. K. Wood Mill (A) and the Bellingham Improvement Company Mill (B) have large decks which extend out over the water and that the Boulevard Park and Cornwall Landfill areas are not yet present.

construction of overwater railroad grades, an overwater coal bunker, and its use as a log storage area for nearby mills.

The construction of railroads along the Bellingham Bay shoreline began to impact the vicinity of the project area during the late 19th and early 20th Centuries. The first railroad grade in the area was built in 1889 or 1890. Originally built as the Fairhaven and Southern Railroad, it was soon acquired by the Great Northern Railroad. This alignment, along the shoreline, still exists and is now the Burlington Northern & Santa Fe Railroad mainline through the Bellingham area. It is more than 200 feet east of the proposed overwater walkway. A second railroad track in the area was built in 1892. This was an overwater spur line of the Bellingham Bay and Eastern Railroad which terminated in a large coal bunker used to support the shipping of coal from the Blue Canyon Coal Mine on Lake Whatcom. It was in use from 1892 to 1904, by which time it was apparently in poor condition. The entire structure was demolished in 1904 (BH 1904). Wahl's (2009b) analysis indicates that the coal bunker crossed the proposed overwater walkway alignment at a point approximately 600 feet to the south of the north abutment location (see Figure 8). Finally, a third railroad line - - also built by the Bellingham Bay and Eastern Railroad - - was constructed in 1901. This line passed across the Pattle Point and continued northward, on piles across the water, to the vicinity of the Bellingham Bay Improvement Company Mill (i.e., what is now the Cornwall Landfill area). The Bellingham Bay and Eastern Railroad was purchased by the Northern Pacific Railroad in 1904 and the Northern Pacific used this route until at least the 1940s. The overwater alignment of this track was relatively close to the shoreline and it did not extend into the area where the proposed Boulevard/Cornwall Overwater Walkway structure will be built. This structure is no longer present.

Photographs of this area from the 1940s clearly indicate that large numbers of logs were stored in the waters just off Boulevard Park and Cornwall Landfill landforms (see Figure 9). These are rafts of logs which have been cut at various locations and then floated to Bellingham Bay for the mills. Presumably, many of the logs in Figure 9 were subsequently delivered to the Bloedel-Donavan Mill. We have not determined when the rafting of logs to this location began, but it is likely that at least some of the logs used by both the Bellingham Bay Mill at Pattle Point and the Bellingham Bay Improvement Company Mill farther to the north were logs floated to the area in the 1890s. There do not appear to have been any dock or wharf structures in or close to the alignment of the proposed Boulevard/Cornwall Overwater Walkway structure, but a number of individual pilings must have been present to support the securing and movement of these logs.

In sum, the current Boulevard/Cornwall Overwater Pedestrian Walkway Project Area represents a landscape which has been extensively by historic activity. Land filling, most of which occurred during the 20th Century, created both the terrestrial surfaces at the northern and southern ends of the proposed overwater structure and gave the embayment to be spanned its present character. While a number of late 19th and early 20th Century industrial features were present in the general vicinity, few of them appear to have been located within the project area. The clearest example of an historic structure extending into the project area is the large over-water coal bunker which was present from 1892 to 1904. This bunker probably crossed the proposed walkway alignment at a point approximately 600 feet to the south of the north abutment location. A second historic structure which appears to have extended into the project area is the large overwater deck of the E. K. Wood Mill. An expansion of the deck, built sometime between 1913 and 1917, probably reached the vicinity of the south abutment location. This deck was destroyed in a fire in 1925.

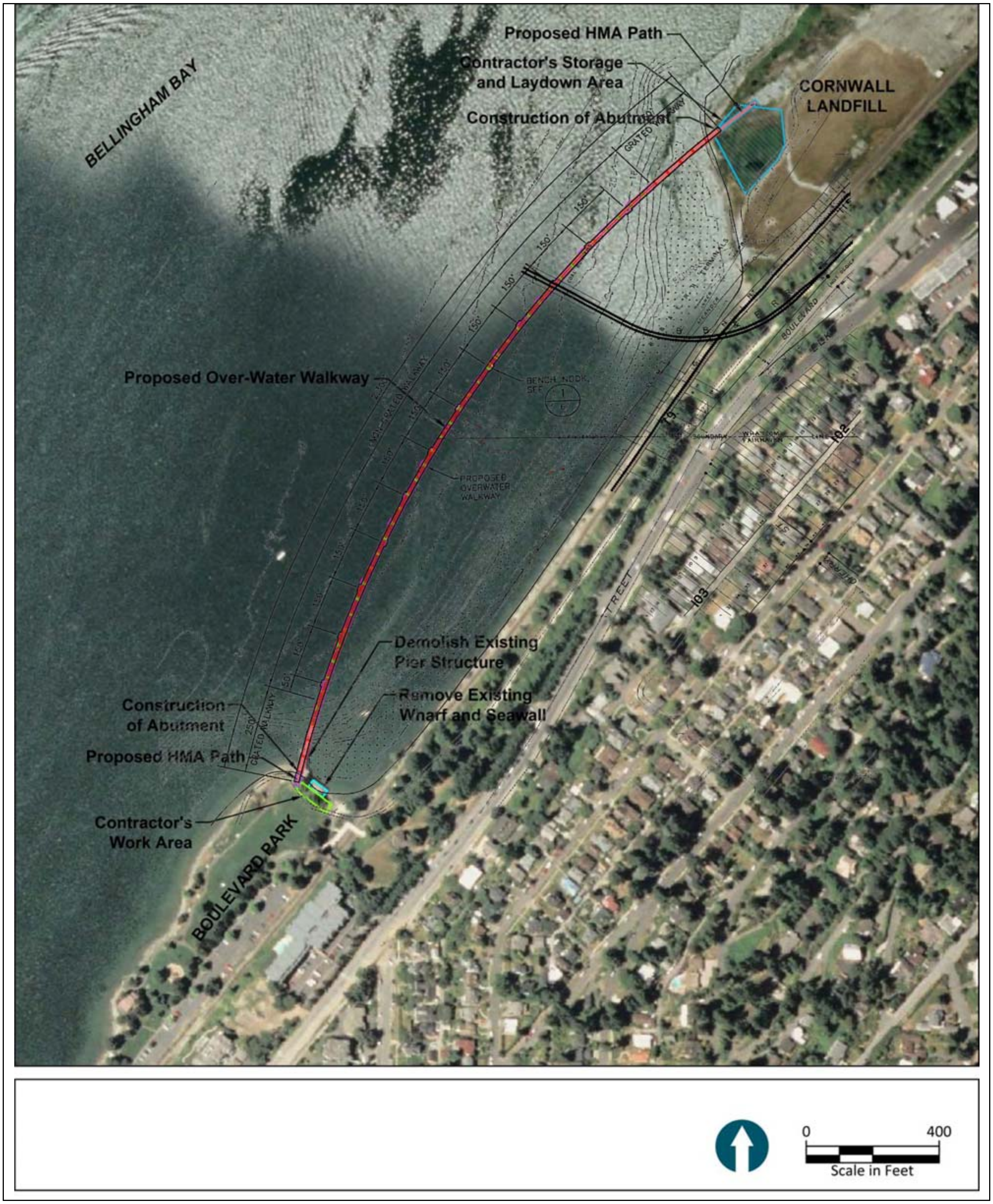


Figure 8 Wahl's (2009b) reconstruction of the relationship of the 1892 Blue Canyon Coal Mine bunker to the proposed walkway alignment in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area.

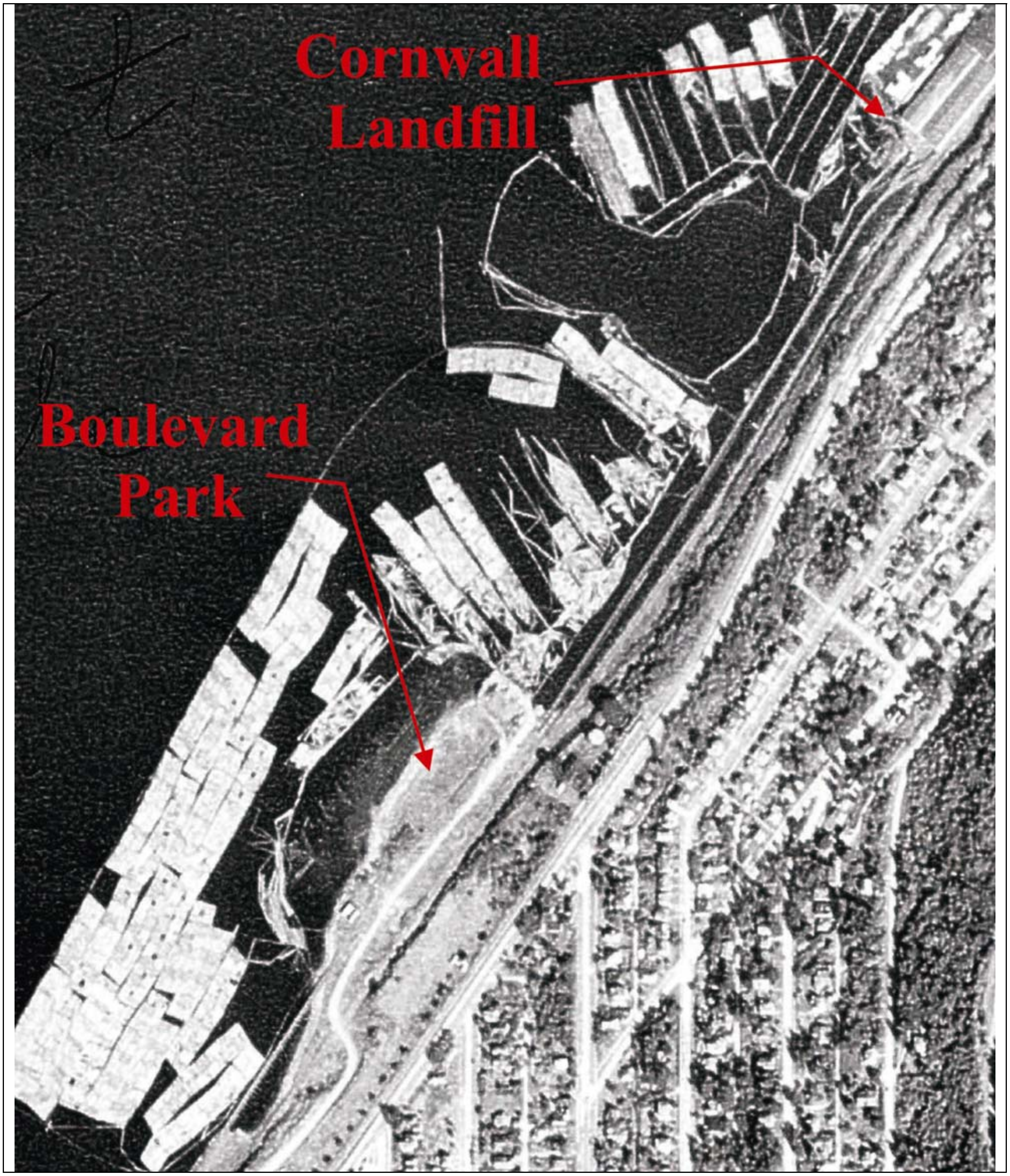


Figure 9 An aerial view of the vicinity of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area in 1943. The numerous white rectangular blocks in the waters near Boulevard Park and the Cornwall Landfill are rafts of logs.

2.4 Archaeological Setting

Appreciation of the archaeological context of the present study requires brief reviews of both the history of archaeology research in western Whatcom County and Bellingham Bay and of previous archaeological efforts in and near Boulevard Park and the Cornwall Landfill.

2.4.1 Western Whatcom County and Bellingham Bay

The history of archaeological research in the northern Puget Sound Basin begins shortly before the beginning of the 20th Century, but the vast majority of such activities have occurred during the last 50 years. The earliest efforts were associated with the American Museum of Natural History's Jessup North Pacific Expedition, and these resulted in what are essentially reconnaissance reports of prehistoric cultural resources by Harlan Smith and Gerald Fowke (1901), and Smith (1907). Smith and Fowkes noted the presence of shell middens sites on the northern part of Bellingham Bay, but they provided very little information about them. Writing shortly later, Albert Reagan (1917) also identified several midden sites on the northern part of Bellingham Bay, but he also offered few details about any of these places. After Smith, Fowke, and Reagan, there were virtually no further archaeological studies in western Whatcom County until the early 1970s. At that time, Garland Grabert and his students at Western Washington University initiated a wide-ranging survey and excavation studies in this area. Grabert was active for more than 20 years and, directly or indirectly, had a role in the recording of more than 100 sites in Whatcom County. Grabert's replacement at Western Washington University, Sarah Campbell, remains active in the archaeology of this region today. Most of the recorded archaeological sites in western Whatcom County are shell middens associated with the modern marine shoreline. These sites probably represent late prehistoric to early historic settlements. Present in lesser numbers are grave sites, petroglyph (rock art) sites, and lithic sites. Only a small percentage of western Whatcom County's sites have been dated with radiometric techniques and most of the latter are from a few hundred to a few thousand years old. Nevertheless, assessments of site age based upon stylistic comparisons, suggest that some Whatcom County sites are probably much older.

2.4.2 Previous Archaeological Research at and near Boulevard Park and the Cornwall Landfill

There are no recorded archaeological sites either within, or in the immediate vicinity of, the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. The closest known sites are all historic features. They include a shipwreck and two arrays of old log pilings. The closest of these is 45WH833, a submerged shipwreck located approximately 900 feet northeast of the proposed overwater walkway's north abutment (Major 2008). The wreck has not been positively identified, but it is thought to be that of the TYEE, a tugboat which sank in this area in 1945. 45WH846 is an array of more than 200 old log pile bases which are located in a small cove on the south side of Pattle Point, approximately 1,500 feet southwest of the proposed overwater walkway's south abutment (Wessen 2009a). It represents a portion of the Bellingham Bay and Eastern Railroad track built across the Pattle Point area in 1901. The last of these three sites - - 45WH762 - - is a complex of old log pilings which may represent the remains of at least two different structures: the mid 19th Century Bellingham Bay Coal Company wharf and an early 20th

Century railroad ferry slip (Stilson 2007). It is located approximately 1,750 feet northeast of the proposed overwater walkway's north abutment.

Given that two of the three historic sites located near the project area are groups of old log pilings, some further consideration of this type of resource is useful. The recording of log pilings as historic resources is a relatively new practice in this region and it was a significant issue during the Washington State Department of Natural Resources' Puget Sound Creosote Removal Project (M. Stilson, personal communication). This effort, which removed creosote contaminated pilings, recently addressed a number of groups of old log pilings in Bellingham Bay. Some of the latter were located near the shoreline between Boulevard Park and the Cornwall Landfill. The Department of Natural Resources sought direction from the Washington State Department of Archaeology and Historic Preservation regarding the potential significance of such pilings. The latter concluded that pilings which can be attributed to structures such as older wharfs, railroad grades, or other large built features should be recorded as historic archaeological sites. However, pilings which were only used to support the securing and movement of mill-related log rafts are not considered to be historic cultural resources and do not need to be recorded as sites. The Department of Natural Resources subsequently removed a number of such pilings from the vicinity of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area without recording them as historic archaeological sites. It should also be noted that all of the log piling groups which have been recorded as historic archaeological sites in Bellingham Bay are in poor condition and none are currently listed with the National Register of Historic Places. One such site - - 45WH757, the Squalicum Pier - - was recently recorded by the Department of Natural Resources (Stilson and Kaufman 2007) and then removed as a part of the Puget Sound Creosote Removal Project's effort. Removals of recorded old piling historic sites, because of creosote contamination, have also occurred elsewhere in the Puget Sound Basin.

The closest prehistoric archaeological sites include both shell midden deposits and lithic sites thought to be associated with either the lowermost portion of the Padden Creek Channel, or the marine shoreline of Bellingham Bay, approximately 1 to 1.25 miles to the southwest. Most of these sites were recorded by Garland Grabert and/or his students in the 1970s. Unfortunately, none of these sites have been subjects of study - - beyond their initial recording - - and thus, very little is known about them. While it is likely that most of them represent relatively recent late prehistoric occupations, none of these sites appear to be ethno-historically reported Native American villages.

The absence of recorded archaeological sites in or near the project area must be seen in light of the fact that there have been no previous surveys here[1]. The closest surveys include an investigation of a historically-filled portion of Bellingham Bay immediately north of the Cornwall Landfill (Goetz, Tingwall, Kanaby, and Rust 2009) and an investigation of a portion of the small cove on the south side of Pattle Point (Wessen 2009b). The Goetz et al. study is of particular relevance because it located a concentration of marine shell and stone objects - - beneath historic fill materials - - which may represent a cultural deposit. These materials were found at depths between 15 and 22 feet below the surface in an area approximately 1 mile northeast of the proposed overwater walkway's north abutment. They were recovered from what appeared to be an intertidal or shallow subtidal deposit, but their identification as a cultural deposit remains uncertain and the location has not been recorded as an archaeological site.

1 There are no reported archaeological surveys of this area, but it seems likely that Grabert - - and/or some of his students - - undertook at least an informal inspection of the Boulevard Park area. If this is correct, we can conclude that they found nothing of interest, since no sites were recorded.

Despite the lack of direct inspections, however, there have been at least three separate studies which addressed the archaeological potential of all, or a portion of, the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area. The first of these was an assessment of the potential for inundated prehistoric sites in intertidal and shallow subtidal areas of western Washington (Grebmeier 1983). Grebmeier used a number of modern and paleo-environmental parameters to rate the potential for inundated prehistoric sites to have been preserved at numerous locations in this region. While she did not directly address the embayment between Boulevard Park and the Cornwall Landfill, she did consider the potential for such sites in Bellingham Bay to be "Good". The second study is an overview of approximately 16 miles of Bellingham Bay shoreline (Dugas and Larson 1999). A major goal of this effort was to identify high, moderate, and low probability areas for archaeological and historic resources. A number of high and moderate potential areas were identified, but none of the latter included either Boulevard Park or the Cornwall Landfill area. The closest moderate and high potential areas they identified are in the lower Padden Creek area, approximately 1 mile to the southwest. Finally, Kanaby et al. (2009) prepared an initial evaluation of the potential of the Boulevard Park and the Cornwall Landfill area, undertaken as part of the planning effort for several proposed park improvements (including the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area). Their study does not reference the earlier Dugas and Larson (1999) work and concludes that this area has a high probability of containing both late prehistoric and historic archaeological resources. It is important to note that this last assessment collectively addresses the entire Boulevard Park - Cornwall Landfill area and there is no direct consideration of the potential of the immediate vicinities of the project area identified in Section 2.1 of this report.

3 RESEARCH DESIGN

The activities described in this report represent a limited program of study designed to offer an assessment of the archaeological potential of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. The research design for the effort included both a clear statement of goals and an identified set of appropriate methods.

3.1 Goals

The goals of this study were to identify any potentially significant archaeological resources which might be present in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area and to offer recommendations regarding how the proposed walkway structure can be built without adversely impacting such resources. Archaeological resources here could include shell midden deposits similar to those known to be present elsewhere along the Bellingham Bay shoreline, deposits and/or structural features associated with the earlier historic industrial activities here, and/or any other archaeological materials which might be present. To this end, the archaeological investigation reviewed the entire project area and considered adjoining areas. The effort was descriptive and documentary in nature. As such, the articulation of study findings within any particular proposed regional cultural framework was not a high priority. Similarly, the study results cannot be considered to be a test of any particular model of prehistoric settlement and subsistence patterns or other cultural process dynamics.

3.2 Methods

The work plan for this study relied upon standardized archaeological techniques. The effort consisted of background research and field activities including both a ground surface inspection and a limited program of subsurface testing.

Background research for the study included the review of relevant documents on file with the Department of Archaeology and Historic Preservation, the City of Bellingham's Parks/ Design & Development Division, Northwest collections at libraries in Bellingham and Seattle, in the author's possession, and available on the Internet. We have also contacted cultural resource representatives of the Lummi, Nooksack, Samish, Swinomish, Sauk-Suiattle, and Suquamish Tribal Communities in order to advise them of the project and solicit relevant information.

The characteristics of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area had important implications for the fieldwork planned for this study. The project area, as noted earlier, includes both terrestrial and subtidal surfaces. Each of these settings imposed particular constraints on our effort.

The terrestrial surfaces in the project area were initially investigated by a ground surface inspection. Given the relatively small size of the effected areas, the surface inspection was designed to employ a judgmental (rather than a transect interval) approach, but we were confident that all portions of the project area and adjacent areas would be addressed. Ground surface visibility was expected to be variable and range from good to poor. Good conditions were anticipated on the beach surfaces and along bank faces in the vicinities of the abutments at each end of the walkway structure. In contrast, we expected that most areas interior to the bank faces at both Boulevard Park and the Cornwall Landfill were likely to be obscured by vegetation, paved paths, and possibly other built features. Our work plan also included the option to undertake limited subsurface testing if background research and observations made during the surface inspection indicated that this was appropriate. Such testing would be conducted using a combination of small (i.e., 15 inch diameter) shovel test pits and exposed bank face profiles. Sediments recovered from the test pits and bank profiles would be screened through 1/8 inch hardware mesh in order to facilitate the recognition of any cultural materials which might be present. The represented depositional structure at each test location would be recorded, but no cultural samples would be collected. All test pits would be back-filled immediately after examination.

The subtidal portion of the project area offered more serious challenges. An inspection by a diver was briefly considered and then rejected. Visibility conditions were anticipated to be poor and a recent bathymetric survey of the area had already determined that no ship wrecks or other large structural features are present on the bottom in or near the project area (Herrenkohl and Landau 2009). Recent geotechnical borings in the subtidal portion of the project area have already provided significant information about the depositional structure. While the latter give no suggestions of a subtidal cultural deposit, we were uncertain whether geologists focusing on geotechnical issues would have recognized one. We then learned that additional geotechnical borings were planned and recommended that the recovery of the additional subtidal sediment samples be monitored by an archaeologist. This work was conducted using a 1.5 inch split hollow tube and near-continuous sampling was conducted until glacial deposits were reached. All recovered materials were inspected while still intact in the recovery tube and selected samples of sediment were screened through 1/8 inch hardware mesh in order to facilitate the recognition of any cultural materials which might be present. The represented depositional structure exposed at each boring location was recorded, but no archaeological samples were collected.

3.3 Practical Expectations

Background research and previous archaeological experience in and near Boulevard Park suggested that the archaeological potential of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area was probably quite limited. We felt that the potentials for prehistoric and historic archaeological resources were somewhat different, but each seemed to be relatively low.

The potential for prehistoric archaeological resources in the project area seemed to be particularly low. Given that the terrestrial areas at both ends of the proposed walkway structure are known to be historic landfills, they cannot contain potentially intact prehistoric cultural deposits. While it is possible that re-deposited prehistoric archaeological materials could be present, this also seemed unlikely as both historical records and recent geotechnical studies indicate that most of the fill materials in these areas are either mill wastes or mid 20th Century municipal refuse. The intertidal and subtidal portions of the project area appeared to be the only areas where potentially intact prehistoric cultural deposits could be present. Submerged prehistoric deposits are known to occur on the southern Northwest Coast, and one may have been recently located approximately 1 mile northeast of the proposed overwater walkway's north abutment (Goetz, Tingwall, Kanaby, and Rust 2009). This finding, and Grebmeier's (1983) conclusion that Bellingham Bay offers relatively good conditions for such deposits, indicated that this potential should not be ignored. Nevertheless, the background data on subtidal sediments in the project area lacks any suggestion of the presence of submerged terrestrial deposits and this argued that submerged cultural deposits were not likely to be encountered.

The potential for historic archaeological resources in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area appeared to be somewhat greater. We felt that such resources, if present, were most likely to be related to late 19th and/or 20th Century industrial activities. Specifically, we felt that old piling bases represent the northern end of the E. K. Woods Mill deck might still be present at or near the southern abutment location in Boulevard Park. We felt that evidence of the large overwater coal bunker near the Cornwall Landfill was much less likely however, as a recent bathymetric survey of the area (Herrenkohl and Landau 2009) did not detect it. Evidence of still earlier mid 19th Century homesteads or other residential features seemed very unlikely. Moreover, the distribution of historic archaeological resources is likely to be influenced by the same conditions effecting possible prehistoric resources. While re-deposited historic archaeological materials may be encountered within the terrestrial landfills, these areas are very unlikely to contain potentially intact historic cultural deposits or features. Thus, once again, if potentially intact historic cultural deposits or features are present, they are most likely to be encountered in the intertidal and subtidal portions of the project area. We felt that submerged historic cultural deposits were relatively unlikely, but that structural features associated with mills, wharfs, overwater railroad tracks, and/or log booms could be present. If encountered, such features are likely to be in relatively poor condition.

4 FIELDWORK AND FIELD FINDINGS

Fieldwork activities conducted in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area were conducted between late October of 2009 and early January of 2010. All archaeological activities were conducted by Gary Wessen. The activities included both survey inspections of the terrestrial and intertidal portions of the project area and the monitoring of geotechnical borings in the subtidal portion of the project area. Each of these activities is addressed separately in the following sections.

4.1 Terrestrial and Intertidal Areas

Investigations of the terrestrial and intertidal portions of Boulevard/Cornwall Overwater Pedestrian Walkway Project Area occurred on several occasions. Inspection of the Boulevard Park area was conducted on the 20th of October and the Cornwall Landfill area was examined on the 27th of October. Mapping of old log piling features identified during those work episodes was conducted by Joshua Jensen of Anchor QEA on the 4th of January. Weather conditions varied somewhat during the field visits and are best described as seasonal.

Inspection of exposed terrestrial and intertidal surfaces were conducted in the immediate vicinities of both the north and south abutment locations. Shovel test equipment was available during both October inspections, but as background information clearly established that both abutment locations are relatively recent landfills, no shovel testing was conducted. Ground surface visibility conditions at both locations ranged from very good to poor. While we had originally anticipated that good exposures would be available along the shoreline margins of each area, this was not the case. In fact, the shorelines in both areas are well consolidated by concrete rubble bulkheads and exposures of terrestrial sediments are limited (see Figures 3 through 6). The few available exposures revealed bricks and other 20th Century historic debris within a brown (10YR4/3) to very dark grayish brown (10YR3/2) sandy loam matrix. Terrestrial surfaces interior to the shorelines also offered relatively poor conditions. These areas are consolidated by a combination of vegetation and built features (in Boulevard Park) or concrete rubble (at the Cornwall Landfill). Intertidal surfaces in the immediate vicinity of each abutment location were also examined. These areas are bare and, in contrast to the latter, offered very good conditions.

Few potential archaeological materials were encountered during the surface inspections. The only cultural features noted were small numbers of old log pilings. Groups of old pilings were noted along the shoreline in the vicinities of both abutment locations. While the two groups share many characteristics, there are also important differences between the two areas and it is therefore useful to consider each area separately.

Eighteen old pilings are present in the vicinity of the proposed south abutment location. Fourteen of the pilings are close to the existing dock in Boulevard Park and a few additional outliers are located within approximately 200 feet of this structure (see Figure 10). Thus, while some of these pilings are located in the project area, most of them are located just outside of it. Most of the pilings are located in the intertidal zone, although a group of five piles are present in the shallow subtidal area just beyond the northern end of the dock (see Figure 11). All of the pilings are in poor condition. Most are either cut off or broken. Moreover, all of the pilings appear to have been treated with creosote and are now considered to an environmental concern.

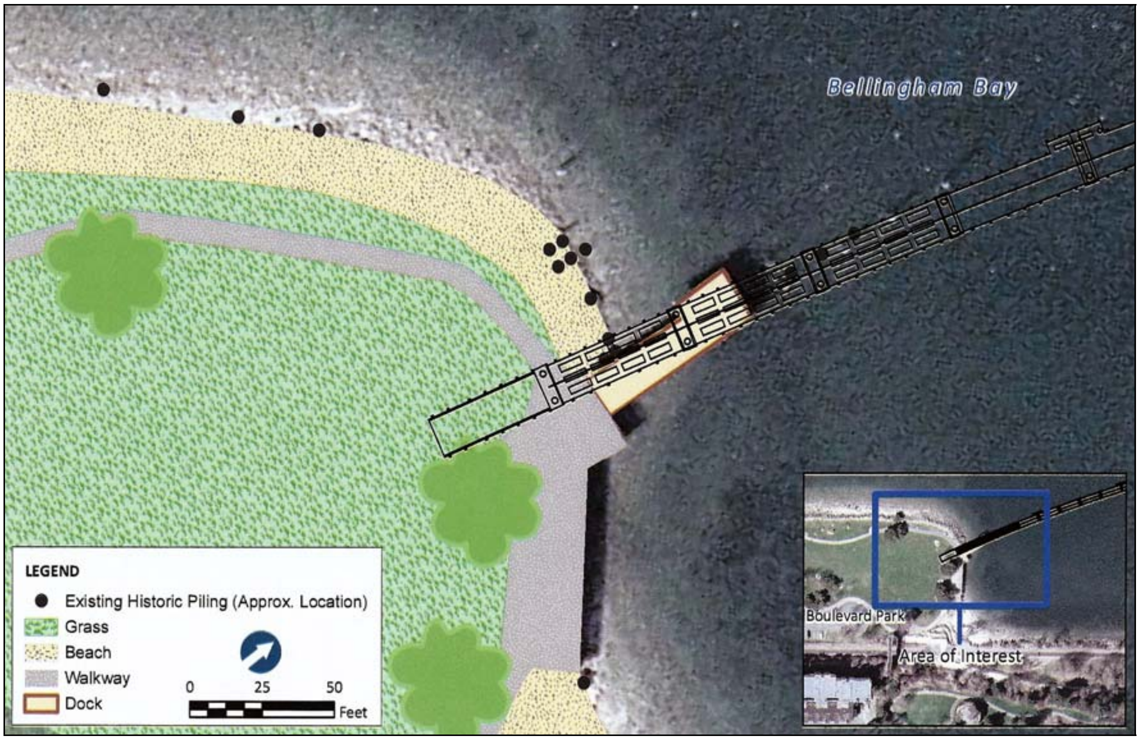


Figure 10 The distribution of old pilings in the vicinity of the southern end of the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area.

Figure 11 Old pilings in the vicinity of the southern end of the Boulevard/Cornwall Over-water Pedestrian Walkway Project Area. Note the existing dock in the right middle distance. View is to the northeast.

The irregular spacing of these pilings strongly suggests that they are incomplete remnants of a formerly larger and more extensive feature or features. In this regard, Wahl's (2009b) examination of historic maps and old photographs indicates that more than one historic structure is probably represented. Many - - if not all - - of the pilings close to shoreline of Boulevard Park probably represent a portion of the northern end of a large wooden deck which was a part of the E. K. Woods Saw Mill[2]. This portion of the deck was built sometime between 1913 and 1917 and was destroyed by a fire in 1925. The five pilings located just beyond the northern end of the dock, however, are unlikely to be associated with E. K. Woods Saw Mill deck and they may have been used to secure log rafts (although we cannot specifically document this interpretation). If the latter identification is correct, these five pilings could be contemporaneous with the E. K. Woods Mill, or they may be somewhat more recent. Given the likely association of many these pilings with the E. K. Woods Mill, we concluded that this feature represents a historic archaeological site. The feature was recorded on a Washington State Archaeological Site Inventory Form and filed with the Department of Archaeology and Historic Preservation (see Appendix A). It has now been assigned the site number 45WH861.

Five old pilings are present in the vicinity of the north abutment location. The five are concentrated in a single small group located in the intertidal zone approximately 125 feet south of the proposed overwater walkway alignment (see Figures 12 and 13). These pilings are also in poor condition. The tight clustering suggests that all of them are associated with a single feature, but the specific character of the represented feature is not readily apparent. The location of these piles indicates that they are very unlikely to be associated with either the wooden decks at the Bellingham Bay Improvement Company or later Bloedel-Donavan Mills or either of the overwater railroad grades in this area. They may be the remains of piles used to secure log rafts (similar to those just to the north of the existing dock at Boulevard Park) but we cannot specifically document this interpretation. Given that this group of pilings is not actually located in the project area, and that its significance (and antiquity) are not known, we have declined to record it as a second historic archaeological site.

4.2 The Subtidal Area

Geotechnical borings were conducted in the subtidal portion of Boulevard/Cornwall Overwater Pedestrian Walkway Project Area between the 19th and the 23rd of October 2009. The borings were conducted under the direction of Aaron Hartvigsen of Geoengineers, Inc. Analysis of the sediment samples recovered from the borings was conducted by Aaron McCain of Geoengineers, Inc. Archaeological monitoring of the recovery and initial examination of the sediments was done by this author. A detailed account of the borings and individual bore logs are provided in Appendix B of this report. However, a brief overview of the findings and their significance with respect to the archaeological potential of the subtidal portion of the project area is appropriate here.

Six geotechnical borings were made in the project area, all of which encountered very similar deposits. Five distinct depositional units were identified in the bore samples. All of the latter are widespread in the project area and most are probably common throughout Bellingham Bay. The uppermost deposit at all bore locations is a layer of wood waste and other organic

2 The deck of the E. K. Woods Mill was quite large and it extended southward for a distance of approximately 1,100 feet. Additional old pilings which are probably associated with this deck are present elsewhere in Boulevard Park.

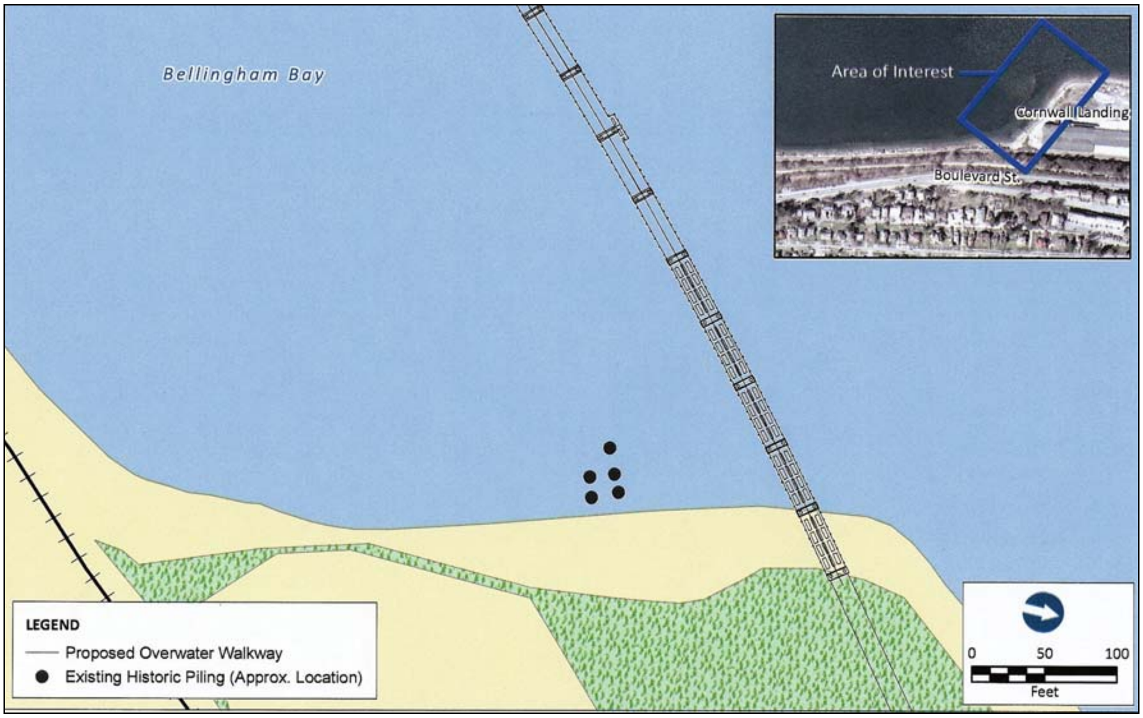


Figure 12 The distribution of old pilings in the vicinity of the northern end of the Boulevard/ Cornwall Overwater Pedestrian Walkway Project Area.

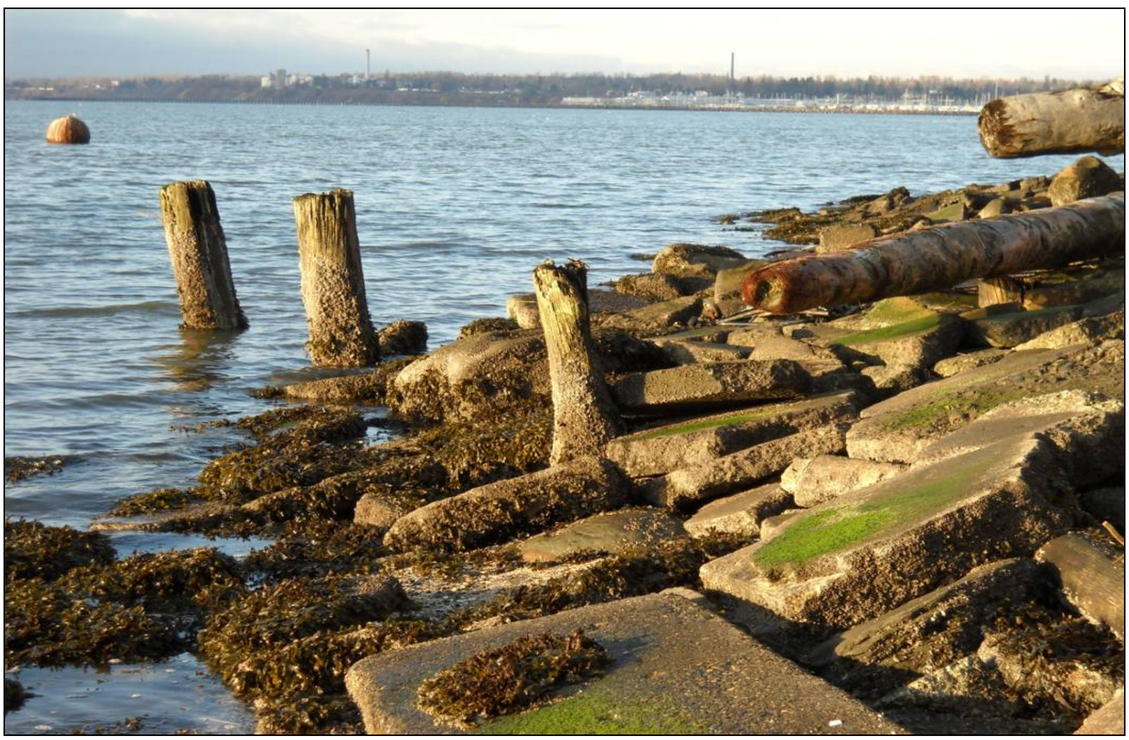


Figure 13 Old pilings in the vicinity of the northern end of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area. View is to the northwest.

matter which is thought to be associated with the former saw mill operations in the Boulevard Park and Cornwall Landfill areas. A small quantity of relatively recent historic debris was also encountered within it. This material ranges from 5 to 15 feet in thickness and is very loose. This layer of wood waste and other organic matter is underlain by approximately 15 feet of marine sediments. The Geoengineers report describes most of this material as an "organic silt" and areas of well-sorted sand are also present. Low densities of both whole bivalve shells and fragments of bivalve shells were occasionally encountered within these deposits. Many of the latter were not taxonomically identifiable, and nearly all of the identifiable specimens represented one or more varieties of the locally-occurring Macoma clams. Shell fragments were never associated with charcoal, bone, or stone objects. Three distinct glacial sediments are present beneath these marine sediments. An approximately 30 foot thick mass of soft to medium stiff clay immediately beneath the marine sediments has been identified as Bellingham (glaciomarine) Drift. From approximately 8 to 20 feet of very compact sand with varying amounts of silt beneath the clay has been identified as Deming Sand. A second, larger, mass of very stiff clay with varying amounts of sand and occasional gravel beneath the very compact sand has been identified as Kulshan (glaciomarine) Drift. Chuckanut Formation bedrock underlies the Kulshan (glaciomarine) Drift in the northern part of the project area and is assumed to be present in the southern part as well.

No potentially significant archaeological materials were encountered during the geotechnical borings. While the mill wastes and other relatively recent historic debris encountered near the subtidal surface are examples of cultural materials they are not potentially significant. The shell debris encountered in the marine sediments underlying the mill waste appear to be the remains of native shellfish.

The depositional structure revealed by these borings provide important insights into both the interval and the past depositional environments represented by the subtidal sediments in the project area. Clearly, the uppermost layer of wood and other organic matter thought to represent mill waste represents no more than the last 100 to 125 years. The marine sediments between the mill waste deposit and the clay identified as Bellingham (glaciomarine) Drift represents all, or some portion of, the Holocene. The Bellingham (glaciomarine) Drift, the Deming Sand, and the Kulshan (glaciomarine) Drift all represent the Everson Interstade of the Late Pleistocene. They represent deposition which occurred between approximately 10,000 and 15,000 years ago. Almost all of these sediments represent deposition in marine environments. Only the Deming Sands - - thought to have been deposited by glacial outwash streams during the Late Pleistocene - - represent deposition in a terrestrial setting.

These findings indicate that the potential for prehistoric archaeological resources in the subtidal portion of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area is very low. Prehistoric archaeological sites are most likely to have been established in terrestrial settings. Alternatively, such sites are very unlikely to be present in marine settings. Thus, the deeply buried Deming Sand appears to be the only subtidal stratum in this area with much potential to contain prehistoric archaeological materials. Having said this, it is important to note that the Deming Sand is a Late Pleistocene deposit. While Late Pleistocene archaeological materials are known to be present in western Washington, they are rare. No evidence of such materials was observed in the recovered samples from this stratum and we believe that the likelihood of as yet undetected Late Pleistocene archaeological resources being present here is relatively low.

5 DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This study of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area has found no evidence of potentially significant archaeological resources. There are no indications of the presence of prehistoric or early historic archaeological deposits and we believe that the potential for as yet undetected such resources being present is very low. All of the terrestrial sediments to be affected by the proposed project are landfill materials which have been deposited in their present locations during the mid 20th Century. Geotechnical sampling of sediments in the subtidal portion of the project area indicates that only marine and glacial deposits are present. While the vicinity has been marked by considerable late 19th and 20th Century industrial developments, most of the built features associated with these activities were located near - - rather than within - - the project area. The most significant overlap between older industrial features and the proposed project is that of the late 19th Century Blue Canyon Coal Mine overwater coal bunker which formerly crossed the planned walkway alignment at a point approximately 600 feet south of the Cornwall landfill. This structure was demolished in 1904 and we know of no physical evidence of it in the project area today. Another earlier industrial structure which appears to have extended slightly into the project area is the northern end of a large wooden deck which was a part of the E. K. Woods Mill complex in what is now Boulevard Park. Eighteen old pilings identified in and near the southern end of the project area probably include pilings which were associated with this structure. This portion of the deck was built sometime between 1913 and 1917 and was destroyed by a fire in 1925. Pilings which had been used to secure log rafts may also be present here. This group of pilings is a historic archaeological feature - - and has now been designated 45WH861 - - but we do not believe that it represents a potentially significant archaeological resource. All of the pilings are in poor condition and they appear to represent only a few of the pilings which were formerly present in this area. A second group of five old pilings is present just outside of the northern end of the project area. This second group of pilings does not appear to represent any known late 19th or early 20th Century structure and they may also have been used to secure log rafts. We have noted the presence of this group, but have not formally recorded it as a historic archaeological site.

In sum then, we have found no evidence of the presence of potentially significant archaeological resources in the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area and believe that the likelihood of as yet undetected such resources being present is very low. A single historic archaeological site has been identified here - - the complex of 18 old pilings now designated 45WH861 - - but we believe that the significance of this site is limited and that it is very unlikely to be eligible for listing with the National Register of Historic Places. Moreover, the pilings now designated 45WH861 have been treated with creosote are considered to be an environmental hazard. Some of the pilings are in locations which directly conflict with the planned overwater walkway. The combination of the latter two conditions (i.e., creosote contamination and direct interference with proposed construction) has led to a proposal to remove all 18 of these pilings. We do not consider their removal to be a potentially significant adverse impact. All of these pilings have been mapped and can therefore be related to any additional pilings thought to be associated with the E. K. Woods Mill complex which may be identified by possible future studies conducted elsewhere in the Boulevard Park area. As such, no additional archaeological resource protection or mitigation measures appear to be warranted at this time.

6 BIBLIOGRAPHY

Allen, Edwin J., Jr.
1976 Intergroup Ties and Exogamy Among the Northern Coast Salish. *Northwest Anthropological Research Notes* 10(2):161-172.

Bacon, George H.
1970 *Boom and Panicking on Puget Sound*. Whatcom Museum of History and Art. Bellingham.

BH
1904 Coal Bunkers Being Removed. *Bellingham Herald*. May 13, Page 1.

Carhart, Edith Beebe (editor)
1926 *A History of Bellingham, Washington*. The Argonaut Press. Bellingham.

Clague, John J.
1989 Late Quaternary Sea Level Change and Crustal Deformation, Southwestern British Columbia. *Geological Survey of Canada Paper* 89-1E:233-236.

Dugas, Amy E. and Lynn Larson
1999 Bellingham Bay Demonstration Project, Whatcom County Cultural Resources Overview. A report prepared for Anchor Environmental, LLC by Larson Anthropological/ Archaeological Services, Ltd. Gig Harbor.

Easterbrook, Don J. and David A. Rahm
1971 *Geology and Geomorphology of Western Whatcom County*. Western Washington State College. Bellingham.

Easton, Norm
1993 Underwater Archaeology in Montague Harbour. *Occasional Papers of the Northern Research Institute* No. 4. Yukon College. Whitehorse.

Edson, Lelah Jackson
1968 *The Fourth Corner – Highlights from the Early Northwest*. Whatcom County Museum of History and Art. Bellingham.

Galloway, Brent and Allen Richardson
1983 *Nooksack Place Names: An Ethnohistorical and Linguistic Approach*. A paper presented at the 18th International Conference on Salish and Neighboring Languages. August 10-12, 1983, University of Washington. Seattle.

Gillis, Nicolle A. and Lynn Larson
2004 Archaeological Resources Overview, Holly Street Landfill Project, Bellingham, Whatcom County, Washington. A report prepared for Anchor Environmental, LLC and the City of Bellingham by Larson Anthropological/Archaeological Services, Ltd. Gig Harbor.

Goetz, Linda Naoi, Douglas Tingwall, Kara Kanaby, and Thomas Rust
2009 Cultural Resources Report, Bellingham Railroad Relocation Report, Whatcom County, Washington. A report prepared for HDR Engineering, Inc. by Landau Associates, Inc. Edmonds.

Goldin, Alan
1992 *Soil Survey of Whatcom County Area, Washington*. U.S.D.A. Soil Conservation Service in Cooperation with Washington State Department of Natural Resources and the Washington State University Agricultural Research Center. Washington D.C.

Gowan, Evan James
2007 *Glacio-Isostatic Adjustment Modeling of Improved Relative Sea-Level Observations in Southwestern British Columbia, Canada*. A Masters Thesis prepared for the School of Earth and Ocean Sciences, University of Victoria. Victoria.

Grebmeier, Jacqueline M.
1983 Inundated Prehistoric Maritime Sites in Washington State Site Location Using A Predictive Survey. In: Prehistoric Places on the Southern Northwest Coast, edited by Robert E. Greengo. *Thomas Burke Memorial Washington State Museum, Research Report* No. 4. Seattle.

Griffin, Brian L.
2007 *Boulevard Park & Taylor Avenue Dock on the Old Bellingham Waterfront*. Knox Cellars Publishing Company. Bellingham.

Hartmann, Glenn D.
1999 A Cultural Resources Survey of the Washington State Department of Transportation's Pacific Northwest Rail Corridor, Western Washington. *Short Report* DOT99-42. Archaeology and Historical Services, Eastern Washington University. Cheney.

Herrenkohl and Landau
2009 Final Report, Focused Environmental Site Characterized, Boulevard Park Shoreline & Overwater Walkway, Bellingham, Washington. A report prepared for the City of Bellingham's Parks & Recreation Department Reid Middleton, Inc. by Herrenkohl Consulting, LLC (Bellingham) and Landau Associates, Inc. (Edmonds)

Hitchman, James H.
1972 Port of Bellingham 1920-1970. *Occasional Paper* No. 1. Center for Pacific Northwest Studies, Western Washington University. Bellingham.

Hutchinson, Ian
1992 Holocene Sea level Change in the Pacific Northwest: A Catalogue of Radiocarbon Dates and an Atlas of Regional Sea Level Curves. *Occasional Paper* No. 1., Institute of Quaternary Research, Simon Fraser University. Burnaby.

Integral Consulting, Inc.
2007 Letter Report for Focused Site Characterized, Pavilion Donation Project, Boulevard Park, Bellingham, Washington. A report prepared for the City of Bellingham by Integral Consulting, Inc. Bellingham.

Kanaby, Kara, Linda Naoi Goetz, Douglas Tingwall, and Thomas Rust.
2009 Initial Cultural Resources Evaluation, Phase I - Boulevard Park Shoreline & Overwater Walkway Project, City of Bellingham, Washington. A technological memorandum prepared for Reid Middleton, Inc. by Landau Associates, Inc. Edmonds.

Koert, Dorothy and Galen Biery
1982 *Looking Back*. Lyden Tribune. Lyden.

Landau Associates, Inc.
2009 Initial Geotechnical Engineering Evaluation Boulevard Park Shoreline & Overwater Walkway, City of Bellingham, Washington. A report prepared for Reid Middleton, Inc. by Landau Associates, Inc. Edmonds.

Lane, Barbara
1973 Anthropological Report on the Identity, Treaty Status, and Fisheries of the Lummi Tribe of Indians. Unpublished report in the author's possession.
1974 Identity and Treaty Status of the Nooksack Indians. Unpublished report in the author's possession.

Major, Maurice
2008 Archaeological Site Inventory Record for 45WH833. A record on file with the Washington State Department of Archaeology and Historic Preservation. Olympia.

Miert, Rosamond Ellis Van
2004 *Settlers, Structures, and Ships on Bellingham Bay*. Applied Digital Imaging. Bellingham

Mitchell, Donald H.
1971 Archaeology of the Gulf of Georgia Area, A Natural Region and its Culture Types. *Syesis* 4, Supplement 1.

Pierson, William H.
1953 *The Geography of the Bellingham Lowland, Washington*. University of Chicago Press. Chicago.

Porter, Stephen and Terry W. Swanson
1998 Radiocarbon Age Constraints on Rates of Advance and Retreat of the Puget Lobe of the Cordilleran Ice Sheet during the Last Glaciation. *Quaternary Research* 50:205-213.

Reagan, Albert B.
1917 Archaeological Notes on Western Washington and Adjacent British Columbia. *Proceeding of the California Academy of Science, Fourth Series*, VII(1):1-31.

Richardson, Allan
1974 *Traditional Fisheries and Traditional Villages, Camps, and Fishing Sites of the Nooksack Indians*. Nooksack Tribal Center. Deming.

Scott, James W. and Daniel E. Turbeville III
1980 *Early Industries of Bellingham Bay and Whatcom County: A Photographic Essay*. Fourth Corner Registry. Bellingham.
1983 *Whatcom County in Maps 1832-1937*. Center for Pacific Northwest Studies, Western Washington University. Bellingham.

Smith, Harlan I.
1907 Archaeology of the Gulf of Georgia and Puget Sound. American Museum of Natural History *Memoir* 4, Part 6. New York.

Smith, Harlan I. and Gerald Fowke
1901 Cairns of British Columbia and Washington. American Museum of Natural History *Memoir* 4, Part 2. New York.

Stern, Bernhard J.
1934 *The Lummi Indians of Northwest Washington*. Columbia University Press, New York.

Stilson, Malcom Lee
2007a Archaeological Site Inventory Record for 45WH762. A record on file with the Washington State Department of Archaeology and Historic Preservation. Olympia.
2007b Site Protection Plan for the Cornwall Avenue Barge Landing Facility, Puget Sound Creosote Removal Project. Washington State Department of Resources. Olympia.

Stilson, Malcom Lee and Lisa Kaufman
2007 Archaeological Site Inventory Record for 45WH757. A record on file with the Washington State Department of Archaeology and Historic Preservation. Olympia.

Suttles, Wayne P.
1951 *Economic Life of the Coast Salish of Haro and Rosario Straits*. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Washington. Seattle.
1990 Central Coast Salish. In: Northwest Coast, edited by Wayne Suttles. *Handbook of North American Indians,* Vol. 7. Smithsonian Institute, Washington D.C.

Thorson, Robert M.
1979 *Isostatic Effects of the Last Glaciation in the Puget Lowland, Washington*. Doctoral dissertation in Geological Sciences. University of Washington. Seattle.

Todd, Francis B.
1982 *The Trail Through the Woods - History of Western Whatcom County, Washington*. Gateway Press, Inc. Baltimore.

Tremaine, David G.
1975 Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. *Occasional Paper* No. 4. Center for Pacific Northwest Studies, Western Washington University. Bellingham.

Wahl, Tim
2003 Landfills & Headland Alterations on Northeastern Bellingham Bay, 1853-2003 A report prepared for the Lummi Nation Natural Resources Department by the author. Bellingham.
2009aBoulevard Park Structures & Shore Features, 1855-2009. A report prepared for Wessen & Associates, Inc. by the author. Bellingham.
2009bCoincidence of the BB&E Railroad Coal Bunker Structure & the Greenways Overwater Walkway III at “Mamosee” or “Bunker Bight”, Bellingham Bay, Washington. A report prepared for Wessen & Associates, Inc. by the author. Bellingham.

Wessen, Gary
2000 Archaeological Testing at 45WH107, Lummi Indian Reservation, Washington. A report prepared for the Cultural Department, Lummi Nation by Wessen & Associates, Inc. Burien.
2005 An Archaeological Survey and Evaluation of a Portion of the 45WH735 Site Area, Maritime Heritage Park, Bellingham, Washington. A report prepared for the City of Bellingham’s Parks & Recreation Department by Wessen & Associates, Inc. Burien.
2007 Archaeological Site Testing at 45WH735, Bellingham, Washington. A report prepared for the City of Bellingham’s Parks & Recreation Department by Wessen & Associates, Inc. Burien.
2009 An Archaeological Survey and Historic Property Assessment of the Pattle Point Trestle Project Area, Boulevard Park, Bellingham, Washington. A report prepared for the City of Bellingham’s Parks & Recreation Department by Wessen & Associates, Inc. Burien.

Wessen, Gary and Tim Wahl
2009 An Assessment of the Probable Archaeological Potential of the Pattle Point Trestle Walkway Project Area, Boulevard Park, Bellingham, Washington. A report prepared for Reid Middleton, Inc. by Wessen & Associates, Inc. Burien.

Whitlock, Cathy
1992 Vegetation and Climatic History of the Pacific Northwest During the Last 20,000 Years: Implications for Understanding Present-Day Biodiversity. *The Northwest Environmental Journal* 8:5-28.

APPENDIX A

Archaeological Site Inventory Form for 45WH861

STATE OF WASHINGTON
ARCHAEOLOGICAL SITE INVENTORY FORM

Smithsonian Number: 45WH861
***County:** Whatcom

***Date:** January 2010 *Compiler:** Gary Wessen

Location Information Restrictions: Unknown

SITE DESIGNATION

Site Name: North Boulevard Park Piling Complex

Field/ Temporary ID:

***Site Type:** Historic Water Structures

SITE LOCATION

***USGS Quad Map Name:** Bellingham South

***Legal Description: T**38N **R** 3E **Section:** 36 **Quarter Section:** SW

***UTM: Zone** 10 **Easting** 536707 **Northing** 5397919

Latitude: **Longitude:** **Elevation (ft):** less than 10 ft above sea level

Other Maps: **Type:**

Scale: **Source:**

Drainage, Major: Bellingham Bay **Drainage, Minor:** NA

River Mile: NA

Aspect: NA **Slope:** less than 10%

Location Description** *(General to Specific):** This site is located on the shoreline on the south-eastern part of Bellingham Bay, in western Whatcom County. The feature reported here is located in the intertidal and adjacent subtidal zones at the northern end of Boulevard Park in the City of Bellingham. A dock and wharf feature built on more recent pilings is also present in the site area.

Approach *(For Relocation Purposes)***:** From the intersection of Bayview Drive and S. State Street, proceed west approximately 0.3 mile on Bayview Drive until the latter becomes the parking lot for Boulevard Park. Drive to the northern end of the parking lot, park here and follow the paved path along the shoreline northwestward until you reach the dock and wharf at the northern end of the park. The site area is on the beach, and just offshore, in the immediate vicinity of these structures.

SITE DESCRIPTION

***Narrative Description:** The site is a complex of old log pilings. At least 18 such pilings are present. All of the observed pilings are either broken or cut, although some stand as much as 6 to 8 feet above the beach or adjacent water surface. The spacing of these pilings is irregular, strongly suggesting that they are incomplete remnants of a formerly larger and more extensive feature or features. In this regard, an analysis of historic maps and old photographs strongly suggests that more than one historic structure is probably represented. Many, if not all, of the pilings close to shoreline of Boulevard Park probably represent a portion of a large wooden deck which was a part of the E. K. Woods Saw Mill. This portion of the deck was built sometime between 1913 and 1917 and was destroyed by a fire in 1925. Pilings located offshore, further to the north, are unlikely to be associated with E. K. Woods Saw Mill deck and may have been used to anchor log booms. As such, the latter may be contemporaneous with the E. K. Woods Mill or somewhat more recent.

Note that the feature described here is limited by the boundaries of project responsible for recording it. Numerous additional old pilings - - many of which are probably also associated with E. K. Woods Saw Mill deck - - are present further to the south along the shoreline of Boulevard Park. Still more pilings associated with this deck may be present within landfill deposits in Boulevard Park.

***Site Type:** Historic Water Structures

***Site Dimensions**

***Length:** ~ 65 M ***Direction:** N-S ***Width:** ~ 60 M ***Direction:** E-W

***Method of Horizontal Measurement:** Surface observation

***Depth:** Unknown * **Method of Vertical Measurement:** None

Vegetation** *(On Site):** The intertidal portion of the site area is a bare rocky surface. Eelgrass (*Zostera* sp.) may be present in the shallow subtidal portion of the site area

Local: NA **Regional:** Western Hemlock Zone

Landforms *(On Site)***:** armored beach at the edge of historic landfill area

Local: Protected marine shoreline

Water Resources *(Type)***:** Padden Creek **Distance:** ~1 mile to the south

Permanence: Year round

CULTURAL MATERIALS AND FEATURES

***Narrative Description:** The only cultural materials clearly associated with the site are the log pilings. The pilings appear to vary somewhat in size, but most are between approximately 12 and 16 inches in diameter. None of the pilings are intact. Some are broken and others appear to have been cut. The exposed piles are in poor condition and wood surfaces exposed to either regular or permanent inundation support barnacles and other marine life.

***Method of Collection(s):** No materials collected.

***Location of Artifacts:** NA

SITE AGE

***Component:** NA *__Dates:__ Early to mid 20th Century ***Dating Method:** Historic documents

***Phase:** NA **Basis for Phase Designation:** NA

SITE RECORDERS

Observed by: **Address:**

***Date Recorded:** 20 November 2009

*__Recorded by:__ Gary Wessen

*__Affiliation:__ Wessen & Associates, Inc. *__Affiliation Phone Number:__ 206.242.0525

***Affiliation Address:** 15028 24th Avenue SW
Burien, WA 98166

***Affiliation E-mail:** gwessen@aol.com

Date Revisited: **Revisited By:**

SITE HISTORY

Previous Work: No previous work.

LAND OWNERSHIP

***Owner:** Washington State Department of Natural Resources, (public aquatic lands)

***Address:** 1111 Washington Street SE
Olympia, Washington 98504-7000

***Tax Lot/ Parcel No:** (Harbor Lease Number) 22-084455

RESEARCH REFERENCES

***Items/Documents Used In Research:**

Griffin, Brian L.
2007 *Boulevard Park & Taylor Avenue Dock on the Old Bellingham Waterfront*. Knox Cellars Publishing Company. Bellingham.

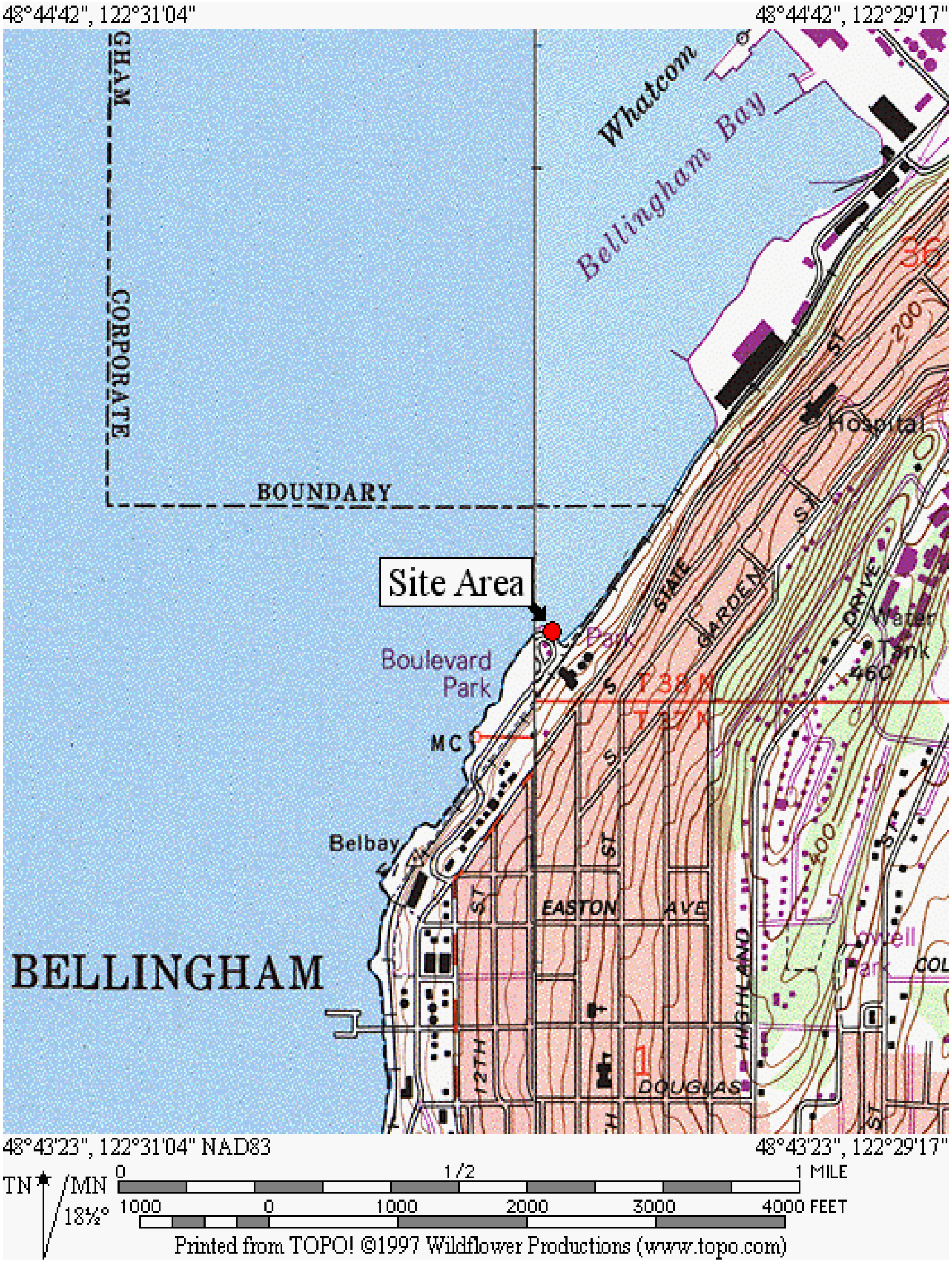
Wahl, Tim
2009 Boulevard Park Structures & Shore Features, 1855-2009. A report prepared for Wessen & Associates, Inc. by the author. Bellingham.

USGS MAP

***Quad Name:** Bellingham South

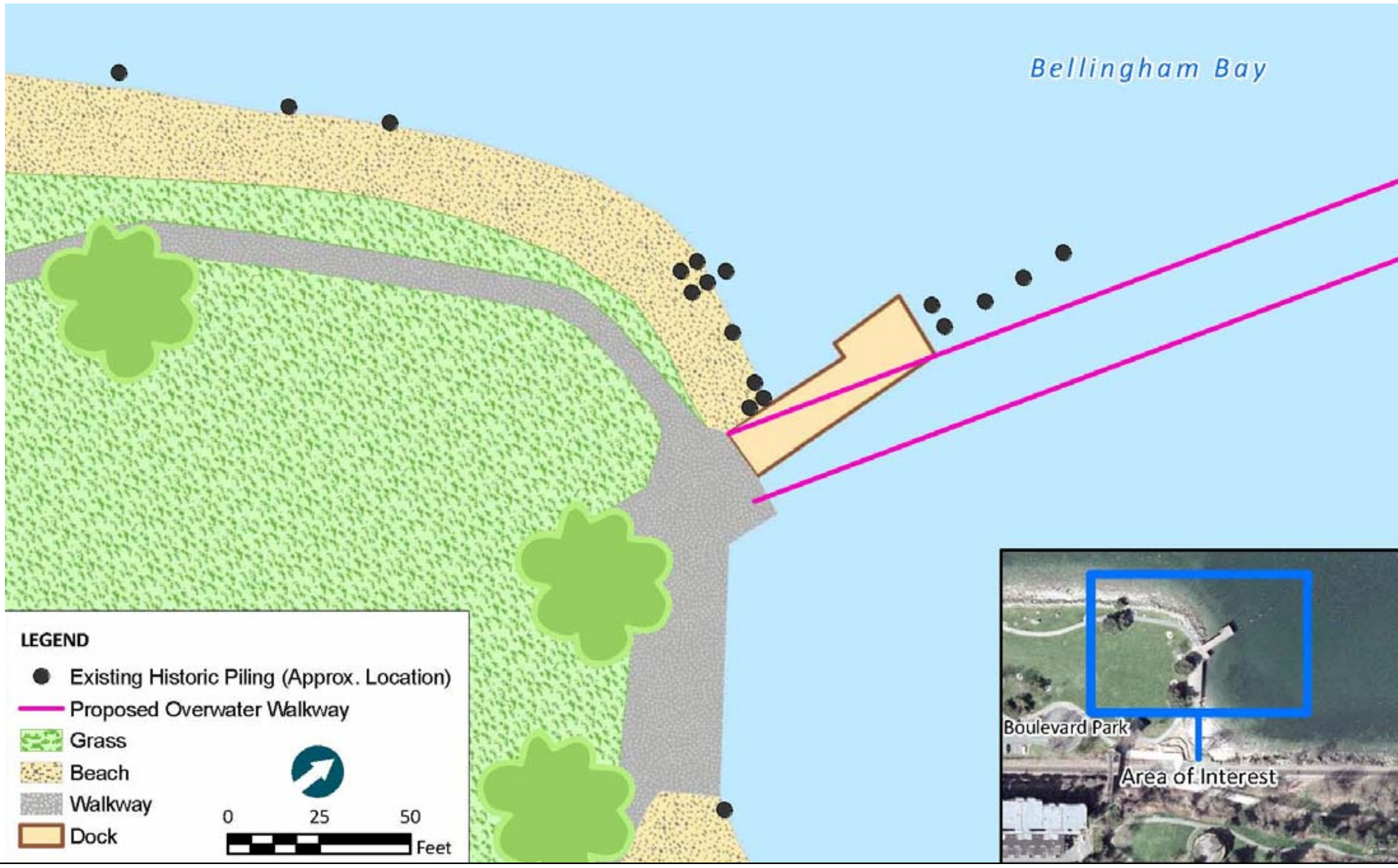
***Series:** 7.5 minute

***Date:** 1994



SKETCH MAP

***Sketch Map Description:**



PHOTOGRAPHS

Old pilings near the existing dock at the northern end of Boulevard Park, Bellingham, Washington. View is to the northeast.

Old pilings southwest of the existing dock at the northern end of Boulevard Park, Bellingham, Washington. View is to the southwest.

APPENDIX B

Boulevard/Cornwall Overwater Walkway Project, Geotechnical Exploration Summary

GEOENGINEERS

Memorandum

600 Dupont Street, Bellingham, WA 98225, Telephone: 360.647.1510, Fax: 360-647.5044 www.geoengineers.com

To:	Louis Klusmeyer, PE
From:	J. Gordon, PE and Aaron McCain, PE
Date:	December 8, 2009
File:	3125-025-00
Subject:	Boulevard Park Overwater Walkway Project – Geotechnical Exploration Summary

INTRODUCTION

This memorandum presents the results of our geotechnical engineering services performed to date for the proposed overwater walkway to be located at the north end of Boulevard Park continuing northeast to the Cornwall landfill site, for the City of Bellingham Parks Department. The walkway would become part of the extensive trail system in Bellingham and provide an additional overwater walkway similar to Taylor Dock that currently exists to the south of Boulevard Park. The location of the site is shown in the Vicinity Map, Figure 1. This memorandum describes the results of our research and site exploration program.

GEOLOGY

We reviewed a U.S. Geologic Survey (USGS) map, "Geologic Map of Western Whatcom County, Washington" by Easterbrook (1976) and Washington Department of Geology and Earth Resources map "Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington," (Lapen, 2000) for the project area. The geologic deposits in the project vicinity are the result of both glacial and non-glacial processes that have occurred during the last 12,000 years, and recent modified land by human activity. The most recent glacial events include the Vashon and Sumas Stades of the Fraser Glaciation and the intervening Everson Interstade. The Vashon and Sumas Stades were periods of glacial advancement, and the Everson Interstade was a period of glacial retreat. Sea level fluctuated significantly in response to the glacial advance and retreat (melting), relative to the land surface and present day sea level. The geologic maps indicate that the project site is in an area mapped near a combination of geologic units including artificial fill, Bellingham Drift, and Chuckanut Formation bedrock. Based on experience a typical geologic sequence encountered in Bellingham Bay consists of a surface or near-surface layer of marine deposits and Bellingham (glaciomarine) Drift underlain by Deming Sand, Kulshan (glaciomarine) Drift, and bedrock of the Chuckanut Formation.

The marine deposits in Bellingham Bay are the result of both geologic and oceanographic processes. Sediment material from rivers and creeks emptying into the Bay and shoreline erosion is deposited on the bay floor. This material is typically very soft/loose and can consist of sand or silt with varying organic content.

The Bellingham Drift is a glaciomarine drift deposit which consists of unsorted, unstratified silt and clay with varying amounts of sand, gravel, cobbles and occasional boulders. Glaciomarine drift is derived from sediment melted out of floating glacial ice that was deposited on the sea floor. The Bellingham Drift is a late Pleistocene sediment that was deposited during the Everson Interstade approximately 11,000 to 12,000 years ago while the land surface was depressed 500 to 600 feet from previous glaciations. The upper 5 to 15 feet of this unit in upland areas is typically stiff. However, the glaciomarine drift is typically soft to medium stiff clay in offshore environments and has relatively low shear strength and moderate to high compressibility characteristics.

The Deming Sand is a stratified, well sorted, fine to coarse grained sand with some layers of clay, silt and gravel deposited by glacial outwash streams. Deming Sand is also a late Pleistocene sediment that was deposited during the Everson Interstade.

The Kulshan Drift is also a glaciomarine drift. It is an unsorted and unstratified mixture of silt, clay, sand, and pebbles similar in nature and characteristics to the Bellingham Drift. Kulshan Drift is older than the Bellingham Drift and the Deming sand, but is also a late Pleistocene sediment that was deposited during the Everson Interstade. The Kulshan Drift is a normally consolidated deposit composed of debris melted out of floating glacier ice and deposited on the sea floor.

The Chuckanut Formation is a mixture of sandstone, conglomerate, shale, and coal. The sandstone is relatively hard and strong where unweathered. The formation was partially eroded and weathered prior to the Pleistocene age (about 3 million years ago), where it was subjected to glacial activity. The Chuckanut Formation had a local coal seam northeast of the project area which was actively mined in the 1800s.

SITE CONDITIONS

Surface Conditions

The project site is located in Bellingham Bay between the former Cornwall landfill to the north and Boulevard Park to the south as shown in the Site and Exploration Plan, Figure 2. The alignment is approximately 312 feet from the shoreline and the Burlington Northern Santa Fe (BNSF) right of way. For purposes of discussion, project North is assumed to be along the proposed trail alignment as shown in Figure 2.

The location of the northern terminus at the former Cornwall landfill is in an area with concrete rubble and hard armoring along the shoreline. We understand that the redevelopment of the landfill into a park is occurring simultaneously with the design of the overwater walkway. The final grade of the northern terminus is not currently known. An existing dock structure and small pier is located at the proposed location of the southern terminus at Boulevard Park. We understand that the existing structures will be removed and the proposed boardwalk will tie directly to the trail system that runs through the existing park.

The site bathymetry was performed by Golder Associates in 2008 as part of a previous report for the site by Landau Associates, and slopes gently downward toward the bay to the west. Depending on the tide, the mudline along the proposed alignment is approximately 20 to 35 feet below the water surface.

Eelgrass is located along the shoreline and crosses the proposed alignment near the northern and southern terminus. It is our understanding the terminus for the walkway is selected in part to minimize the impacts to the eelgrass.

SUBSURFACE CONDITIONS

Subsurface Explorations

Subsurface conditions were explored by drilling six borings (BL-1 through BL-6) along the proposed alignment of the walkway. The borings were completed to depths of 45 to 102.5 feet below the mudline the week of October 19 to 23, 2009 using subcontracted truck-mounted drilling equipment and a barge. The approximate locations of the explorations are shown in Figure 2. As discussed previously, the depth of the water ranged from 20 to 34 feet due to tides and location. A generalized cross section of the subsurface conditions is presented in Figure 3. An explanation of our boring logs is shown in Figure 4. Logs of the explorations have been provided as Figures 5 through 10.

Six geotechnical borings were completed from an anchored barge using a subcontracted truck-mounted drill rig.

Soil conditions near the mudline encountered in the borings were relatively uniform consisting of an upper layer of wood waste and organic material overlying marine sediment. The wood waste was previously identified as waste product from the historic saw mills located in the area. The wood waste is characterized as 5 to 15 feet thick and very loose/soft woody debris/organic silt. We did not spend a significant amount of effort attempting to sample the upper wood waste due to the surface sampling that has been previously completed along the proposed alignment and our first sample was taken at a depth of 5 feet below the mudline. Wood waste or silt with a high organic content (as noted by the high moisture content on the logs) was encountered in borings BL-3 through BL-6 and was thickest at BL-3 which was situated over the “ridge” identified in the bathymetric survey.

The marine sediment was encountered in each of the explorations and generally consisted of very soft greenish gray organic silt. The marine sediment extended down to Elevations that ranged from -34 feet to -48 feet. Silty fine sand with shells was encountered at the base of the marine sediment layer in borings BL-1, BL-3, and BL-6. The sand layer was approximately 2 to 6 feet thick.

Very soft to medium stiff clay with occasional sand and gravel was encountered in all of the explorations underlying the marine sediment. We interpret this material to be representative of the Bellingham (glaciomarine) Drift. This clay layer, approximately 20 to 30 feet thick, extended to Elevations ranging from -61 feet to -79 feet except at BL-6 where the layer was approximately 6 feet thick due to a shallow bedrock content at Elevation -54 feet. The clay extended the deepest at BL-3 in the middle of the alignment.

Medium dense to dense gray fine to medium sand with varying silt content consistent with Deming Sand, was encountered underlying the Bellingham Drift in all of our explorations except for boring BL-6 near the Cornwall Landfill. The sand extended to Elevations ranging from -78 feet to -98 feet and was approximately 20 feet thick at BL-1, BL-2, and BL-3. The layer became thinner in BL-4 and BL-5.

The Deming sand was underlain by Kulshan (glaciomarine) Drift which consisted of gray clay with varying amounts of sand and occasional gravel. The Kulshan Drift was encountered in each exploration except BL-6. Borings BL-1, BL-2, and BL-3 terminated in this material at Elevation -83.5 feet, -126.6 feet, and -106.5 feet, respectively.

Bedrock was encountered underlying the Kulshan Drift material in BL-4, BL-5, and BL-6 at Elevation -102.5feet, -86.5 feet , and -54 feet, respectively. As seen in Figure 3, the surface of the bedrock dips steeply. We cored into the rock at BL-5 and BL-6. The rock core in BL-5 encountered black siltstone. The core at BL-6 encountered gray sandstone. Both of these materials are typical of the Chuckanut Formation. Detailed description of the rock cores are presented on the BL-5 and BL-6 logs.

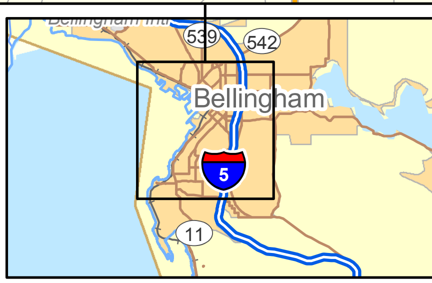
Groundwater Conditions

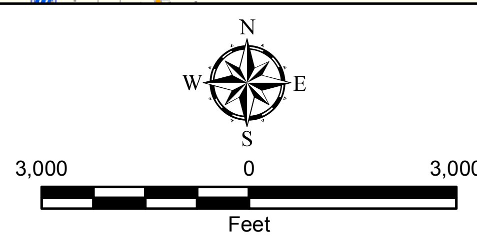
All of our explorations were completed in Bellingham Bay and therefore all the soils were saturated.

LIMITATIONS AND GUIDELINES FOR USE

This memorandum has been prepared for the exclusive use of Berger ABAM, and the City of Bellingham with regard to the Boulevard Park Overwater Walkway as discussed herein. The memorandum describes subsurface conditions at discrete points and is not intended for design. This memorandum is not intended for use by others, and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance to such reliance in writing.

GeoEngineers has relied upon certain data or information provided by others in the performance of our services. GeoEngineers makes no warranties or guarantees regarding the accuracy or completeness of information provided or compiled by others. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.





Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

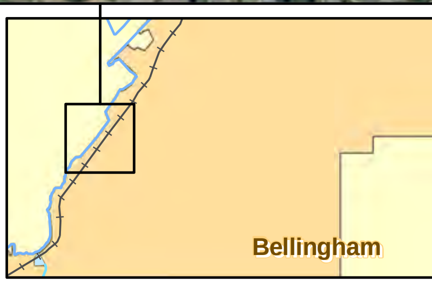
Vicinity Map

Boulevard Park Over-Water Walkway
Bellingham, Washington

GEOENGINEERS

Figure 1

Office: BELL Path: P:\3\3125-025\00\working\312502500 VM F1.mxd RMB:IMS 09/12/2008



Legend

BL-01 = Boring number and location

N S E W

300 0 300

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Site and Exploration Plan

Boulevard Park Over-Water Walkway
Bellingham, Washington

GEOENGINEERS

Figure 2

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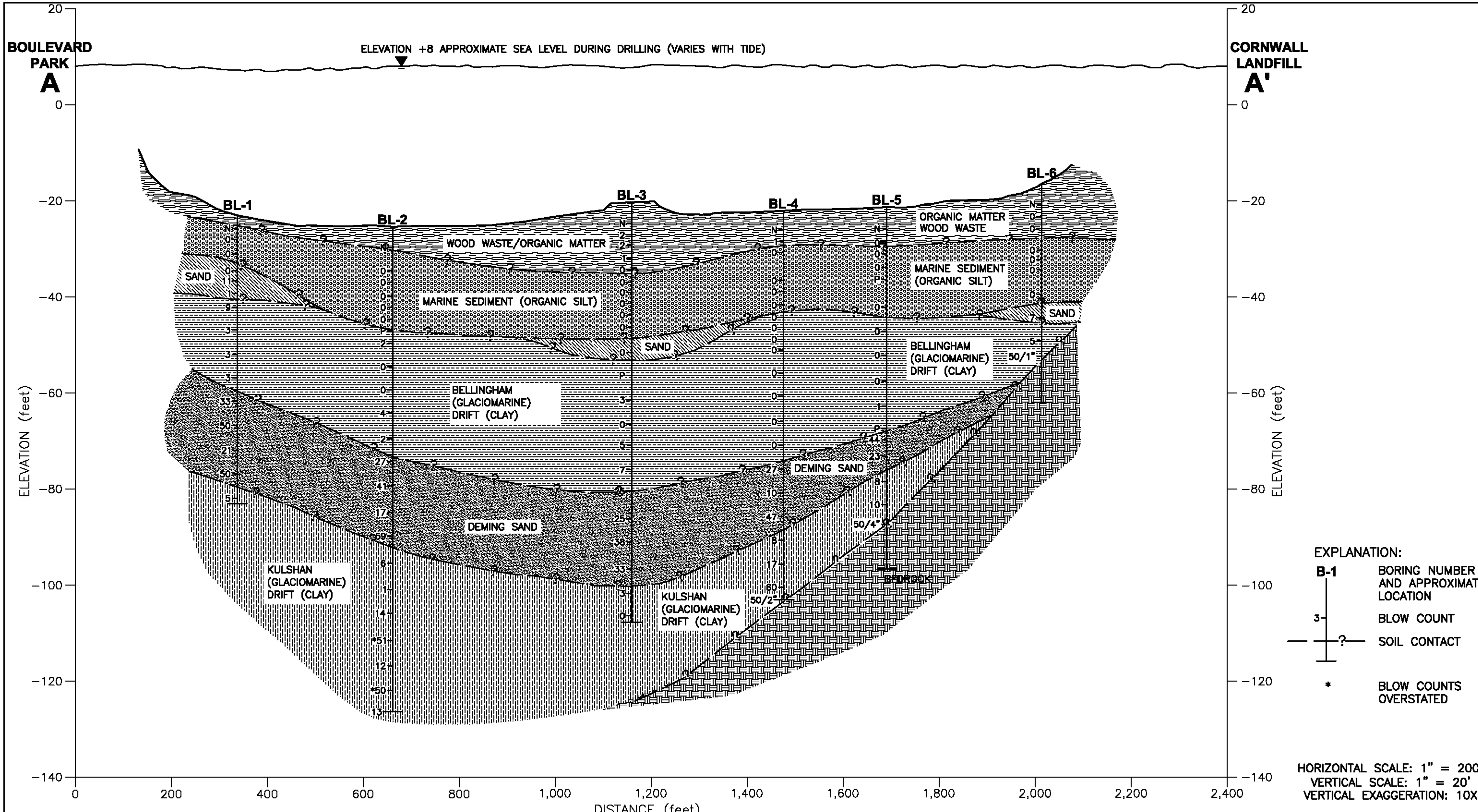

Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section.
3. Ground surface based on bathymetric data obtained by Golder Associates, Inc. (2008). Vertical datum: mean lower low water.
4. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Cross Section A-A'

Boulevard Park Overwater Walkway Project
Bellingham, Washington

GEOENGINEERS

Figure 3

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SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

Figure 4

Drilled	Start 10/19/2009	End 10/19/2009	Total Depth (ft)	60.5	Logged By AJH / Checked By AKM	Driller Cascade Drilling	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	-23.0 / MLLW	Hammer Data	140 lb Auto hammer
Drilling Equipment	CME High Torque Truck Mounted on Barge		
Easting (X) / Northing (Y)		System / Datum	

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Submerged

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0								OH	Greenish-gray organic silt (very soft, wet) (marine sediment)			
-25													
	5		12	0		1					154		
-30													
			6	0		2							
	10												
									SM	Gray silty fine sand with occasional shells (very loose, wet)			
-35			18	0		3							
			18	11		4							
	15									- occasional wood debris encountered, grades to medium dense			
				1		5a							
-40						5b			CL	Gray clay (soft, wet)	42		
						5c			SM	Gray silty fine sand with shells and occasional wood debris (medium dense, wet)	32		
									CL	Gray clay with occasional fine sand (soft to medium stiff, wet) (Bellingham [glaciomarine] Drift)			
			18	9		6					41		
	20												
-45													
			18	3		7							
	25									grades to soft			

Note: See Figure 4 for explanation of symbols.

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Log of Boring BL-1

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 5
Sheet 1 of 3

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	25											
-50												
		18	3		8				- occasional sand lenses encountered	38		
	30											
-55												
			3		9a							
	35				9b			SC	Brown-gray clayey fine to medium sand with occasional shells (loose, wet)			
-60												
								SP-SM	Gray fine to medium sand with silt (dense, wet) (Deming Sand)			
		18	33		10					25		
	40											
-65												
		18	50		11				- becomes very dense			
	45											
-70												
								SM	Gray silty fine to medium sand (medium dense, wet)			
		18	21		12					21		%F=22
	50											
-75												
		18	50		13				- becomes very dense, occasional gravel encountered			

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-1 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	55												
-80													
									CL	Gray clay with occasional fine to medium sand (medium stiff, wet) (Kulshan [glaciomarine] Drift)			
			18	5		14					31		
	60												

Note: See Figure 4 for explanation of symbols.

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Log of Boring BL-1 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 5
Sheet 3 of 3

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	10/19/2009	10/19/2009	102.5	AJH	AKM	Cascade Drilling	Hollow-stem Auger

Surface Elevation (ft)	-24.0
Vertical Datum	MLLW
Hammer Data	140 lb Auto hammer
Drilling Equipment	CME High Torque Truck Mounted on Barge
Easting (X)	
Northing (Y)	
System	
Datum	
Notes:	Submerged

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-24	0							OH symbol	OH	Greenish-gray organic silt with occasional organic matter (very soft, wet) (marine deposits)			
-25													
-30	5												
		sample	12	0		1					129		
-35	10												
		sample	0	0		2							No recovery
		sample	18	0		3					105		AL
-40	15												
		sample	18			4				- occasional shells encountered			
		sample	12	0		5					28		
-45	20												
		sample	18	P		6							
								CL symbol	CL	Gray clay with occasional sand (very soft, wet) (Bellingham [glaciomarine] Drift)			
		sample	18	1		7							
	25												

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-2

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	25												
-50													
			18	0		8					41		AL
	30												
-55													
			18	0		9							
	35												
-60													
			12	4		10				- grades to medium stiff	37		
	40												
-65													
			18	2		11				- occasional gravel encountered			
	45												
-70													
									SP-SM	Gray fine to medium sand with silt (medium dense, wet) (Deming Sand)			
			18	27		12					22		
	50												
-75													
			18	41		13				- becomes dense			

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-2 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-80	55								
-85	60	18	17	14			22		%F=9
-90	65	18	59	15		~1 inch clay layer encountered, medium sand grades out			
					CL	Gray clay with occasional fine to medium sand (medium stiff, wet) (Kulshan [glaciomarine] Drift)			
-95	70	18	6	16			37		
-100	75	18	1	17		- sand content increases	23		AL
-105	80	18	14	18		- gravel encountered, becomes stiff			

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-2 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-110	85		12	51		19					24		Blowcount overstated
-115	90		18	12		20					32		%F=67
-120	95		3	50/3"		21							Blowcount overstated
-125	100		3	13		22			GC	Gray clayey fine to coarse gravel (medium dense, wet) (transition zone)			

Note: See Figure 4 for explanation of symbols.

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Log of Boring BL-2 (continued)

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 6

Drilled	Start 10/22/2009	End 10/22/2009	Total Depth (ft)	87.5	Logged By AJH / Checked By AKM	Driller	Cascade Drilling	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) -19.0 / Vertical Datum MLLW	Hammer Data: 140 lb Auto hammer	Drilling Equipment	CME High Torque Truck Mounted on Barge
Easting (X) / Northing (Y)	System / Datum	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	
Notes: Submerged			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0								WD	Wood debris and organic matter			
-20													
-25	5												
			6	2		1					241		
			2	2		2					193		
-30	10												
			0	1		3							No recovery
			1	0		4					192		
-35	15								OH	Greenish-gray organic silt with organic matter (very soft, wet) (marine sediment)			
			6	0		5					133		
			6	0		6					137		
-40	20												
			12	0		7				- occasional sand and shells encountered	105		
			18	0		8							
	25												

Note: See Figure 4 for explanation of symbols.

Bellingham: Date:12/8/09 Path:P:\3\3125025\GINT\3125-025-00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring BL-3

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 7
Sheet 1 of 4

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-45	25		18	0		9					58		
									SM	Greenish-gray silty fine to medium sand with shells and occasional gravel (loose, wet)			
-50	30			0		10a					24		%F=34
						10b			CL	Gray clay (soft, wet) (Bellingham [glaciomarine] Drift)			
-55	35		18	P		11							
									SM	Dark gray silty fine sand (loose, wet)			
-60	40			3		12a							
						12b			CL	Gray clay (soft, wet)	39		
-65	45		18	0		13							
									SC	Dark gray clayey fine sand (loose, wet)			
-70	50			5		14a							
						14b			CL	Gray clayey fine sand (medium stiff, wet)	27		
									SC	Gray clayey fine sand (loose, wet)			

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-3 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 7

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-75	55		7	15a						
				15b		CL	Gray clay (medium stiff, wet)			
		12	0	9						
-80	60	18	25	16		SP	Gray fine to medium sand with trace silt (medium dense, wet) (Deming Sand)	23		
						SP-SM	Gray fine to medium sand with silt (medium dense, wet)			
-85	65	18	25	17						
-90	70	18	38	18			- becomes dense	21		
-95	75	18	33	19						
						CL	Gray clay with occasional sand (medium stiff, wet) (Kulshan [glaciomarine] Drift)			
-100	80	18	3	20				31		

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-3 (continued)

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 7

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
-105	85		12	0		21				- occasional gravel encountered			

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-3 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Drilled	Start: 10/22/2009	End: 10/22/2009	Total Depth (ft)	81	Logged By: AJH / Checked By: AKM	Driller: Cascade Drilling	Drilling Method: Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	-22.0 / MLLW	Hammer Data	140 lb Auto hammer
Drilling Equipment	CME High Torque Truck Mounted on Barge		
Easting (X) / Northing (Y)		System / Datum	

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Submerged

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0				ML	Dark gray silt and organic matter (very soft, wet) (wood waste)			
-25									
	5								
		18	1	1			118		
-30					OH	Greenish gray organic silt (very soft, wet) (marine sediment)			
		18	0	2			117		
	10								
-35									
		6	0	3					
	15								
		4	0	4		- occasional shells encountered			
-40									
		18	0	5			86		AL
	20								
		18	0	6	CL	Gray clay with occasional shells and sand (very soft, wet) (Bellingham [glaciomarine] Drift)	48		
-45									
		18	0	7					
	25								

Note: See Figure 4 for explanation of symbols.

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Log of Boring BL-4

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 8
Sheet 1 of 3

Elevation (feet)	Depth (feet)	Interval / Recovered (in)	Blows/foot	Collected Sample / Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	25						SC	Gray clayey fine to medium sand with shells (very loose, wet)			
		18	0	8					26		
								Gray clay with occasional shells (very soft, wet)			
-50		18	0	9							
	30										
-55		18	0	10							
	35										
-60		18	0	11					34		
	40										
-65		18	0	12				- occasional gravel encountered			
	45										
-70		18	0	13							
	50										
							SP-SM	Gray fine to medium sand with silt (medium dense, wet) (Deming Sand)			
-75		18	27	14					20		

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-4 (continued)

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	55									
-80		18	10	15						
	60									
-85		18	47	16						
	65									
						CL	Gray clay with sand (stiff, wet) (Kulshan [glaciomarine] Drift)			
-90		18	8	17				31		AL
	70									
-95		18	17	18						
	75									
						SM	Gray silty fine to medium sand with gravel (dense, wet) (transition zone)			
-100		18	60	19						
	80									
						RX	Gray sand/siltstone (Chuckanut Formation)			
		2	50/2"	20						

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-4 (continued)

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 8

Drilled	Start 10/20/2009	End 10/20/2009	Total Depth (ft) 75	Logged By AJH / Checked By AKM	Driller Cascade Drilling	Drilling Method Hollow-stem Auger

Surface Elevation (ft) -21.0 / Vertical Datum MLLW	Hammer Data 140 lb Auto hammer	Drilling Equipment CME High Torque Truck Mounted on Barge	
Easting (X) / Northing (Y)	System / Datum	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	
Notes: Submerged			

FIELD DATA

Elevation (feet)	Depth (feet)	Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							ML	Dark gray silt and wood waste (very soft, wet) (wood waste)			
-25	5											
		4	0		1					142		
-30								OH	Greenish gray organic silt with occasional shells and organic matter (very soft, wet) (marine sediment)			
		18	0		2					96		
	10											
		18	0		3							
-35		18	0		4							
	15											
-40	20	18	0		5					68		
-45								CL	Gray clay with occasional sand and shells (very soft, wet) (Bellingham [glaciomarine] Drift)			
	25											

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-5

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	25		18	0		6					33		
-50													
	30		18	0		7					38		AL
-55													
	35		18	0		8							
-60													
	40		18	1		9				- occasional gravel encountered	37		
-65													
	45		18	P		10							
			6	44		11a							
			12			11b			SM	Gray silty fine sand (dense, wet) (Deming Sand)			
-70													
	50												
			18	23		12			SP-SM	Gray fine to medium sand with silt (medium dense, wet)	22		
-75													

Note: See Figure 4 for explanation of symbols.

Log of Boring BL-5 (continued)

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Log of Boring BL-5 (continued)

Elevation (feet)	Depth (feet)	Interval / Recovered (in)	Blows/foot	Collected Sample / Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	55		8	13a							
				13b			CL	Gray clay (medium stiff, wet) (Kulshan [glaciomarine] Drift)			
-80	60	18	10	14				- sand seam encountered	20		
-85	65	8	50/4"	15			RX	Black sandstone/siltstone (Chuckanut Formation)			Switched to rock coring equipment
							DCBB	Siltstone; black; partly decomposed state; fragmented; dent quality; solid preferred breakage; no relative absorption - identifid by color and fabric; sedimentary rock 1: 45° open fracture 2: 20° open fracture 3: 25° open fracture 4: 60° open fracture 5: 60° open fracture 6: 80° open fracture 7: 55° open fracture			
-90	70						EEBC	Grades to completely decomposed state; modable quality			
-95	75						DCBB	Siltstone; black; partly decomposed state; fragmented; dent quality; solid preferred breakage; no relative absorption - identifid by color and fabric; sedimentary rock			

Note: See Figure 4 for explanation of symbols.

Drilled	Start 10/23/2009	End 10/23/2009	Total Depth (ft) 45	Logged By AJH / Checked By AKM	Driller Cascade Drilling	Drilling Method Hollow-stem Auger

Surface Elevation (ft) -18.0 Vertical Datum MLLW	Hammer Data 140 lb Auto hammer	Drilling Equipment CME High Torque Truck Mounted on Barge	
Easting (X) Northing (Y)	System Datum	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	

Notes: Submerged

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0								ML	Wood waste with dark gray silt with occasional sand, gravel and organic matter (very soft, wet) (wood waste)			
-20													
	5		18	0		1					164		
-25			18	0		2					122		
									OH	Greenish-gray organic silt with occasional sand and shells (very soft, wet) (marine sediment)			
	10												
-30			18	0		3					112		
			18	0		4							
	15												
-35			18	0		5							
	20												
-40			18	0		6					65		
	25												

Note: See Figure 4 for explanation of symbols.

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Log of Boring BL-6

GeoEngineers

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 10
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	25								SM	Gray silty fine to coarse sand with shells and gravel (medium dense, wet)			
45			18	7		7					17		
	30								CL	Gray clay with sand and occasional shells (medium stiff, wet) (Bellingham [glaciomarine] Drift)			
50			18	5		8					25		
	35		1	50/1"		9							Switched to rock coring equipment
									RX	Gray siltstone/sandstone (Chuckanut Formation)			
55									BABB	Siltstone; black; partly decomposed state; fragmented; dent quality; solid preferred breakage; no relative absorption - identifid by color and fabric; sedimentary rock 1: 60° open fracture 2: 50° open fracture 3: 60° open fracture			
										No fractures observed			
	40												
60										No fractures observed			
	45												

Note: See Figure 4 for explanation of symbols.

Bellingham: Date:12/8/09 Path:P:\3\3125025\GINT\3125-025-00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring BL-6 (continued)

GEOENGINEERS

Project: Boulevard Park Overwater Walkway
Project Location: Bellingham, Washington
Project Number: 3125-025-00

Figure 10
Sheet 2 of 2

ATTACHMENT 8
BIOLOGICAL ASSESSMENT

BIOLOGICAL ASSESSMENT
BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

Prepared for

City of Bellingham Parks and Recreation Department

Prepared by

Anchor QEA, LLC

1605 Cornwall Avenue

Bellingham, Washington 98225

June 2010

BIOLOGICAL ASSESSMENT BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY PROJECT

Prepared for

City of Bellingham Parks and Recreation Department
3424 Meridian Street
Bellingham, Washington 98225-1764

Prepared by

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Bellingham, Washington 98225-4427

June 2010

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1 PROJECT SUMMARY

This Biological Assessment (BA) has been prepared for the City of Bellingham (City) Parks and Recreation Department (Parks) Boulevard/Cornwall Overwater Pedestrian Walkway Project (Project) located in Bellingham Bay near the city of Bellingham, Washington (Figure 1). The Project is being proposed to provide increased overwater public access to the Bellingham Bay shoreline. Parks proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site. The new facility will include a new overwater pedestrian walkway, 7 to 14 feet in width, with benches. The walkway will be constructed of steel and concrete with wood pedestrian guardrails to meet Americans with Disabilities Act (ADA) requirements. The landing to the south will connect to Boulevard Park, which is connected to the Coast Millennium Trail route. The connection to the north at the former Cornwall Avenue Landfill site is connected to the waterfront district. Proposed mitigation for the Project includes removing an existing 3,332 square foot timber frame pier and wharf where the new south overwater walkway abutment will be located. Additionally, for mitigation, four isolated piles will be removed from the Boulevard Park side of the Project and five will be removed from the south side of the former Cornwall Avenue Landfill site.

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Figure 1
Vicinity Map
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

1.1 Purpose of Biological Evaluation

The National Marine Fisheries Service (NMFS) has identified the threatened Puget Sound evolutionarily significant unit (ESU) of Chinook salmon (*Oncorhynchus tshawytscha*) and the threatened Puget Sound distinct population segment (DPS) of steelhead (*O. mykiss*) as potentially occurring in the Project vicinity (NMFS 2010, provided in Appendix A). NMFS has also identified the threatened Southern DPS of green sturgeon (*Acipenser medirostris*), the endangered Georgia Basin DPS of bocaccio (*Sebastes paucispinus*), the threatened Georgia Basin DPS of yelloweye rockfish (*S. ruberrimus*), the threatened Georgia Basin DPS of canary rockfish (*S. pinninger*), the threatened Southern DPS of Pacific eulachon (*Thaleichthys pacificus*), the endangered Southern Resident DPS of killer whale (*Orcinus orca*), the endangered humpback whale (*Megaptera novaeangliae),* and the threatened Steller sea lion (*Eumetopias jubatus*) as possibly occurring in Puget Sound waters (NMFS 2010, provided in Appendix A). The U.S. Fish and Wildlife Service (USFWS) has identified the threatened Coastal-Puget Sound DPS of bull trout (*Salvelinus confluentus*) and the threatened marbled murrelet (*Brachyramphus marmoratus*) as potentially occurring in the vicinity of the Project (USFWS 2007, provided in Appendix A). This BA provides the biological information necessary to evaluate the potential effects of the Project on listed species for compliance with Section 7 of the Endangered Species Act (ESA).

This BA was prepared to determine how populations of ESA-listed and proposed species that may occur in the area would be affected by the proposed Project. The evaluation presented herein is based on literature reviews, site visits, and interviews with local and state agency biologists. Table 1 summarizes the effect determination findings.

Table 1
ESA Listed and Proposed Species and Critical Habitat in the Action Area[1]

Species	Status	Agency	Effects Determination	Critical Habitat Status	Critical Habitat Effects Determination
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU	Threatened	NMFS	LAA	Designated	NLAA
Steelhead (*Oncorhynchus mykiss*) Puget Sound DPS	Threatened	NMFS	NLAA	None proposed or designated	N/A
Green sturgeon (*Acipenser medirostris*) Southern DPS	Threatened	NMFS	No effect	None in Puget Sound	N/A
Pacific eulachon (*Thaleichthys pacificus*) Southern DPS	Threatened	NMFS	No effect	None proposed or designated	N/A
Bocaccio (*Sebastes paucispinus*) Georgia Basin DPS	Endangered	NMFS	LAA	None proposed or designated	N/A
Yelloweye rockfish (*Sebastes ruberrimus*) Georgia Basin DPS	Threatened	NMFS	LAA	None proposed or designated	N/A
Canary rockfish (*Sebastes pinninger*) Georgia Basin DPS	Threatened	NMFS	LAA	None proposed or designated	N/A
Killer whale (*Orcinus orca*) Southern Resident DPS	Endangered	NMFS	NLAA	Designated	NLAA
Humpback whale (*Megaptera novaeangliae*)	Endangered	NMFS	No effect	None proposed or designated	N/A
Steller sea lion (*Eumetopias jubatus*)	Threatened	NMFS	No effect	None in Washington State	N/A
Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound DPS	Threatened	USFWS	NLAA	Designated	NLAA
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	NLAA	None in Action Area	No effect

Table Notes:
NLAA – may affect, not likely to adversely affect
LAA – may affect, likely to adversely affect
ESU – Evolutionary Significant Unit
DPS – Distinct Population Segment
NMFS – National Marine Fisheries Service
USFWS – U.S. Fish and Wildlife Service
N/A – not applicable
1 – USFWS identifies the additional species of Canada lynx (*Lynx Canadensis*), gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), and Northern spotted owl (*Strix occidentalis caurina*) to be present in Whatcom County (USFWS 2007); however, these species are not addressed in this BA due to lack of suitable habitat within and adjacent to the Action Area.

This BA also serves as a resource document for concurrent Essential Fish Habitat (EFH) consultation with NMFS in compliance with the Magnuson-Stevens Fishery Conservation and Management Act (known as the Magnuson-Stevens Act). EFH consultations are required under the Magnuson-Stevens Act for federally managed fishery species, including the three EFH composite groups of groundfish, coastal pelagic fish, and Pacific salmon. Chinook, pink (*Oncorhynchus gorbuscha*), and coho (*O. kisutch*) salmon habitat comprise the Pacific salmon EFH composite, and these species may occur in the Project vicinity. This BA determines that the proposed Project **will not adversely affect EFH for salmonid, groundfish, and coastal pelagic species** (Appendix C).

2 PROJECT DESCRIPTION

Parks proposes construction of an overwater pedestrian walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site (see Figure 1 for a vicinity map). The construction of the proposed overwater walkway will significantly improve public shoreline access along Bellingham's waterfront by providing a continuous shoreline trail between Fairhaven and the former Cornwall Avenue Landfill site, and by and by connecting to the Coast Millennium Trail route at Boulevard Park and the water district at the Cornwall Avenue site. The proposed overwater walkway complements the existing overwater walkway system including Taylor Avenue Dock and the Pattle Point Trestle located to the south of the proposed Project.

2.1 Project Background

The proposed overwater walkway has been identified in several planning documents as an important link in the network of Bellingham's waterfront trail system, including the 2002 *City of Bellingham Parks, Recreation and Open Space Plan* (COB Parks 2002) and its 2008 update (COB Parks 2008); the 2004 *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay* (WFG 2004); the 2006 *New Whatcom Preliminary Draft Framework Plan* (COB and POB 2006); the 2009 draft update of the *City of Bellingham Shoreline Master Program* (COB 2009); and the mayor's 2008 *Waterfront Connections Plan* (COB 2008). The Project has also been part of a Bellingham public vote, the third greenways levy, which was approved by voters in 2006. Prior to the vote, in an adopted ordinance, the Bellingham City Council recorded intent to pursue a list of potential greenway projects that included the overwater walkway. The list was assembled by citizens who examined the City's current plans and needs.

The Project will occur across several parcels under varying ownership: Boulevard Park is owned by the City, the former Cornwall Avenue Landfill site is jointly owned by the City and the Port of Bellingham, and aquatic lands are owned by the Washington Department of Natural Resources (WDNR).

2.2 Existing Conditions

The southern terminus of the proposed overwater walkway will be located within Boulevard Park, a major public waterfront park facility in Bellingham that is owned, managed, and maintained by Parks. The park is located adjacent to Bellingham Bay between the Fairhaven District (south) and the Bellingham Waterfront District (north), and includes maintained lawn and landscaping, a small performance stage, public restrooms, picnic facilities, parking, trails, and 'The Woods' coffee shop. The park and its trails are used extensively for recreation by locals and visitors due to their scenic value and central location on Bellingham Bay. There is no shoreline access except for a small pocket beach at the northeast corner of the park (Photo 1). The remainder of the shoreline is heavily armored with rock and concrete riprap.

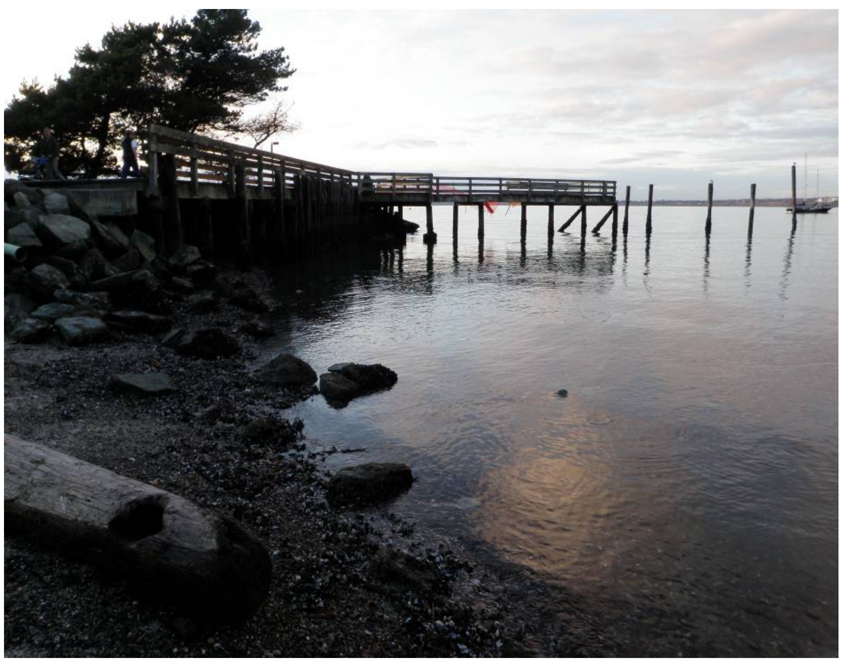


Photo 1 – Profile view of the existing pier at Boulevard Park from the adjacent pocket beach located at the northeast corner of Boulevard Park (facing west)

An existing wharf and pier are located at the north end of Boulevard Park in the location of the southern terminus of the proposed overwater walkway (Photo 2). The pier is in structurally unsafe condition and is closed to the public. The overwater portion of the pier is supported by pier bents supported by 1-foot by 1-foot timber caps and eight corroded steel

H-piles. The overwater portion of the wharf is supported by approximately 87 creosote-treated timber piles. A low concrete wall supports the wharf on the landward side.

Photo 2 – View from Boulevard Park of the existing pier where the southern end of the overwater walkway will land (facing north)

The former Cornwall Avenue Landfill site is located at the north end of the proposed walkway within the City's Waterfront District redevelopment area. The upland portion is currently undeveloped and public access is restricted. Vegetation on the site is unmaintained. Non-native and invasive herbaceous plant species dominate the area near the proposed landing site. The shoreline is heavily armored with riprap and concrete rubble. Five derelict creosote-treated piles are located immediately offshore of the southwest corner of the property in the vicinity of the proposed walkway (Photo 3).

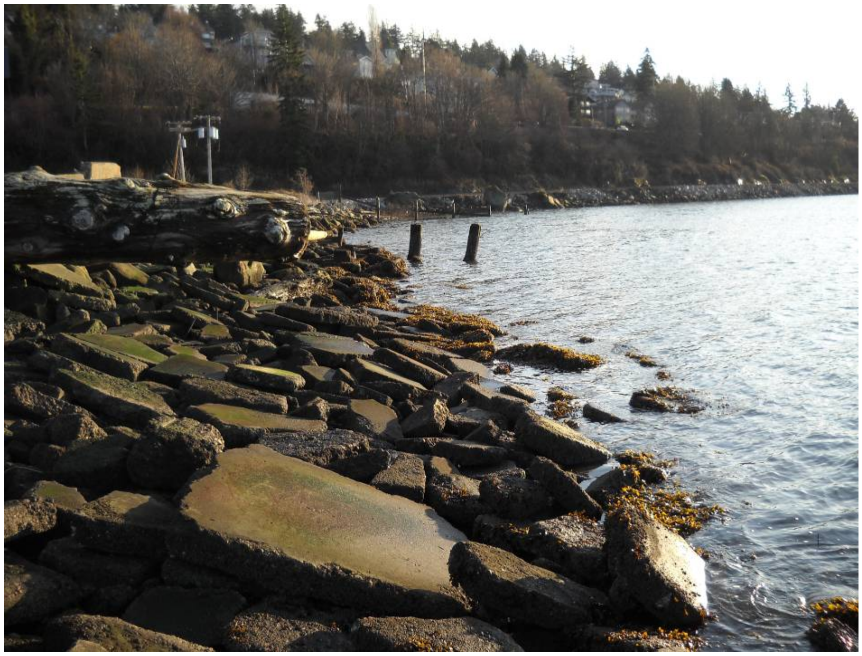
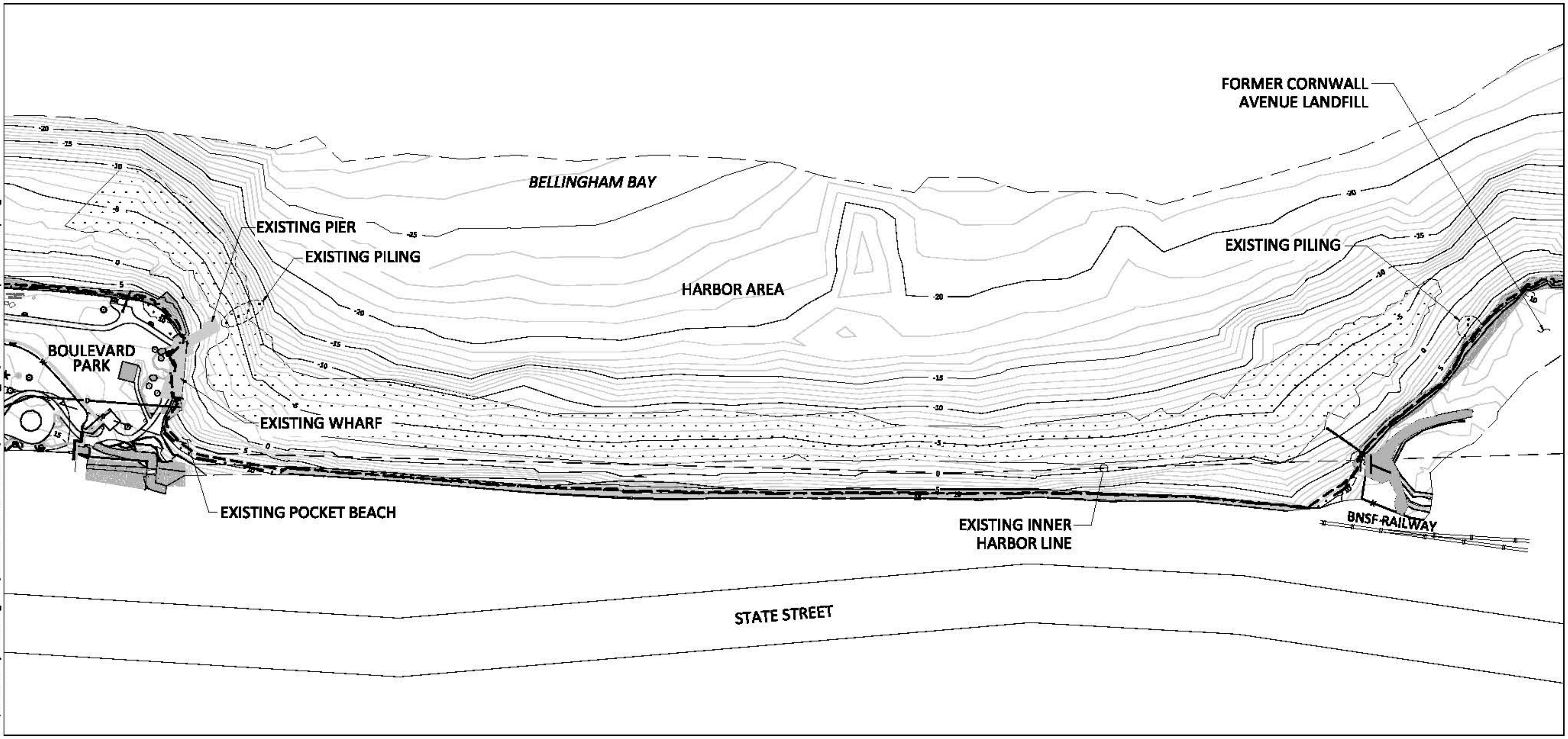


Photo 3 – View of the former Cornwall Avenue Landfill site where the north abutment of the proposed overwater walkway will land (facing southeast)

The outermost portion of the embayment (a part of Bellingham Bay) between Boulevard Park and the former Cornwall Avenue Landfill site (Photo 4), is presently used for transient and derelict vessel moorage; however, these transient vessels do not have WDNR authorization to moor in this area. The bathymetry of the embayment between Boulevard Park and the former Cornwall Avenue Landfill site indicates that the shoreline is gently sloping from the upland toward the Whatcom Waterway navigation channel. The substrate along the shoreline of the Action Area waterward of the riprap at each landing site primarily consists of gravel, mud, cobble, sand, and shell fragments. A geotechnical study was conducted for the Project in October 2009, and borings indicated the material below elevation -20 feet mean lower low water (MLLW) is primarily composed of sand, soft clay, and silt.

Photo 4 – View of proposed overwater walkway location from the existing pier at Boulevard Park where the southern end of the walkway will land (facing northeast)

Native eelgrass (*Zostera marina*) beds are located in the embayment from approximately -2 feet MLLW to a depth of approximately -8 feet MLLW. Figure 2 details the location and extent of the eelgrass beds. In addition, macroalgae was found mostly landward of the eelgrass (Grette Associates 2009).



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SOURCE: Drawing by Berger/ABAM dated 3/2010.
NOTES: Elevation Datum MLLW.

LEGEND:

- Existing Eelgrass Bed
- Mean Higher High Water (+8.51' MLLW)
- Ordinary High Water Mark (+9.51' MLLW)

0 260
Scale in Feet

Figure 2
Existing Conditions
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

2.3 Proposed Improvements

Parks proposes construction of an overwater walkway structure between Boulevard Park and the former Cornwall Avenue Landfill site, a future park site. The new facility will include a new overwater pedestrian walkway, 7 to 14 feet in width, with benches. The walkway will be constructed of steel and concrete with wood pedestrian guardrails to meet ADA requirements. The landing to the south will connect to Boulevard Park, which is connected to the Coast Millennium Trail route. The connection to the north at the former Cornwall Avenue Landfill site is connected to the waterfront district. Project elements include: Project elements include:

- In-water piles
- Overwater precast and cast-in-place pile caps, precast deck panels, a finish slab, posts and pedestrian guardrails meeting ADA requirements, deck lighting, and benches
- Landings and associated improvements at both Boulevard Park and the former Cornwall Avenue Landfill site

The proposed improvements are detailed in Sections 2.3.1 and 2.3.2 and shown on Figures 3 through 9.

2.3.1 Overwater Walkway Structure

The proposed overwater structure will span approximately 2,350 feet across a portion of Bellingham Bay. The structure will be supported by 48 bents spaced at approximately 50 feet on center; each bent includes two 24-inch steel piles for a total of 96 piles, and a precast/cast-in-place concrete pile cap. The piles will be installed using a vibratory hammer and then proofed with an impact hammer to ensure vertical load requirements are met. Four of the piles will be located over areas of high bedrock and will be secured to the bedrock using steel rock anchors.

The bents will support 50-foot-long precast concrete double tee deck panels. A cast-in-place concrete finish slab will be installed over the top of the concrete panels. The final top of deck elevation will be +16.8 feet MLLW. In total, approximately 34,000 square feet of new decking will be installed as part of the Project. 1,515 square feet of grating will be integrated into the deck surface, including the three spans located closest to the Boulevard Park terminus and five spans located closest to the former Cornwall Avenue Landfill site. Approximately 30% of the surface of these nearshore spans will be grated. The proposed grating will allow 70% light transmission.

The walkway deck will generally be 14 feet wide, except where it is widened to create alcoves for bench seating. The alcove areas will be 18.5 feet wide and 20 feet long, and will be located at approximately 200-foot intervals along the walkway. Wood pedestrian guardrails will be installed along both sides of the length of the overwater walkway.

Directional light-emitting diode (LED) lighting fixtures will be installed on the posts of the handrails of each walkway span (four per span, two on each side of the span) for a total of 188 LED lights. The power source for the lighting fixtures will be a main utility line that will run underground on the Boulevard Park side of the Project from the existing restroom located approximately 80 feet south of the proposed landing. The line splits to each side of the walkway from the landing and will run parallel below the underside of the boardwalk and on the outside edges, avoiding the openings in the grating. The light from these fixtures will be low voltage and directed at the overwater walkway deck, away from the water surface.

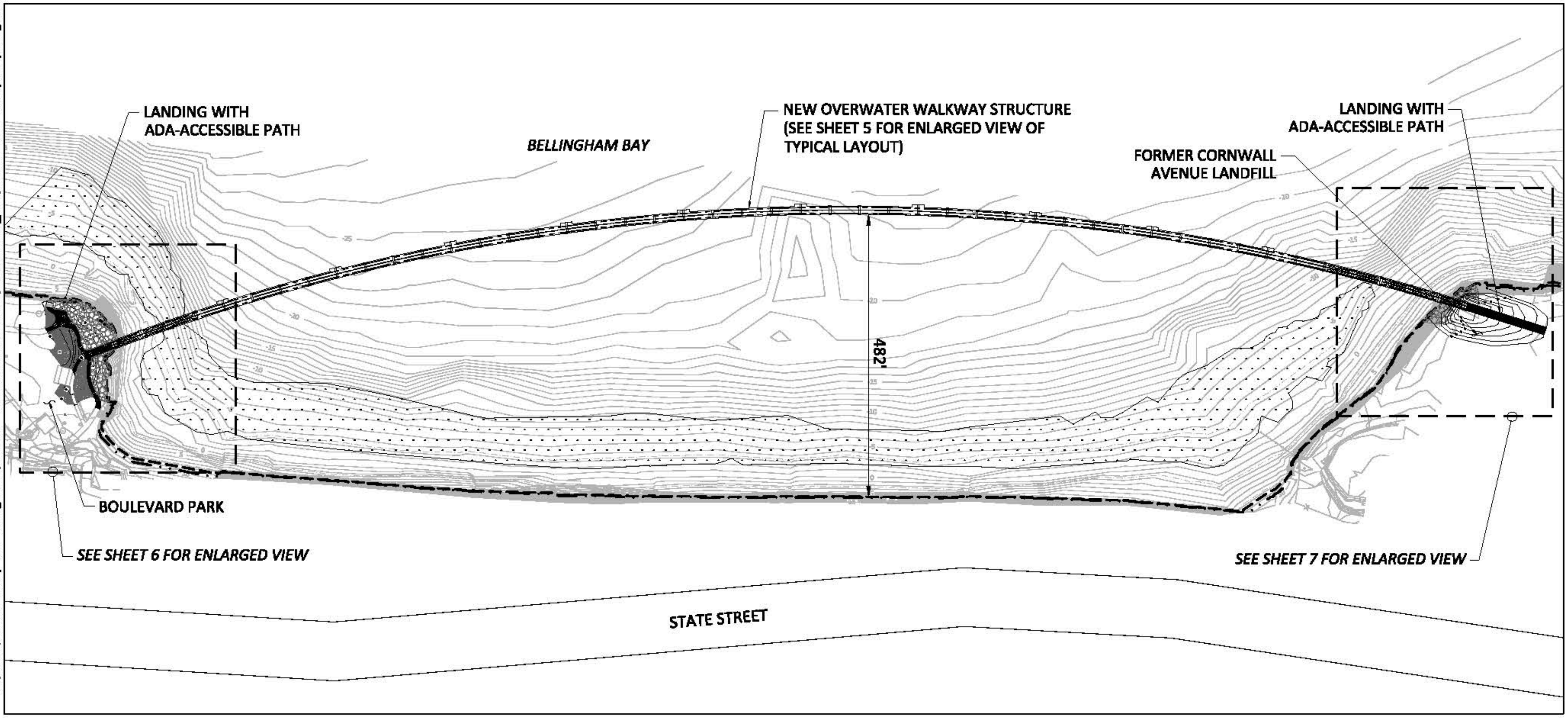
2.3.2 Landings and Associated Improvements

Landings for the overwater walkway will be developed at both Boulevard Park and the former Cornwall Avenue Landfill site (see Figure 3). On the Boulevard Park end, an existing timber wharf and timber pier will be demolished. Additionally, four existing creosote-treated timber piles located in the embayment to the north of the existing timber pier will be removed. Removal of the timber wharf, pier, and creosote-treated piles is expected to provide partial mitigation for Project impacts. Four existing evergreen trees, approximately 18 to 36 inches diameter at breast height (dbh), and an existing asphalt path will be removed as well. Debris from the demolished structures will be disposed of at an approved upland facility and all creosote-treated wood will be disposed of in accordance with Washington State's Dangerous Waste Regulations (Washington Administrative Code [WAC] 173-303) and Excluded Categories of Waste (WAC 173-303-071).

At the former Cornwall Avenue Landfill site landing, five existing creosote-treated timber piles located immediately offshore of the southwest corner of the property will be removed.

At the Boulevard Park landing, approximately 600 cubic yards (cy) of fill will be placed over an upland area of approximately 5,600 square feet, raising the grade up to 6 feet over existing grade to accommodate a paved ADA accessible path leading to the overwater walkway. This path will connect the structure with the current path system at the park. Concrete wingwalls will be constructed where the paths connect to the overwater walkway structure. Approximately 6,700 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above mean higher high water [MHHW]) of the new fill in the vicinity of the proposed landing. Figure 6 shows the proposed grading and layout for the Boulevard Park landing and Figure 9 provides typical sections of the ADA accessible paths for both the Boulevard Park and the former Cornwall Avenue Landfill site landings, as well as wingwalls and abutments for the landings.

The new landing at the former Cornwall Avenue Landfill site will be constructed similar to the Boulevard Park landing at the north end of the structure. Approximately 800 cy of fill will be placed over an area of approximately 12,300 square feet, raising the existing grade to provide an ADA accessible crushed rock path leading to the overwater walkway (constructed at a 1:20 slope). Concrete abutments will be constructed and approximately 2,300 square feet of heavy, loose riprap will be placed above existing riprap at the top of slope (above MHHW) of the new fill in the vicinity of the proposed landing to provide slope protection. The landing for the overwater walkway at the former Cornwall Avenue Landfill site has been developed so that it will not interfere with future park development plans. Figure 7 shows the grading and layout for the former Cornwall Avenue Landfill site landing and Figure 9 provides typical sections of the ADA accessible path.



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LEGEND:

Existing Eelgrass Bed

Mean Higher High Water (+8.51' MLLW)

Ordinary High Water Mark (+9.51' MLLW)

0 260

Scale in Feet

SOURCE: Drawing by Berger/ABAM dated 3/2010.

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Figure 3
Composite Site Plan
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

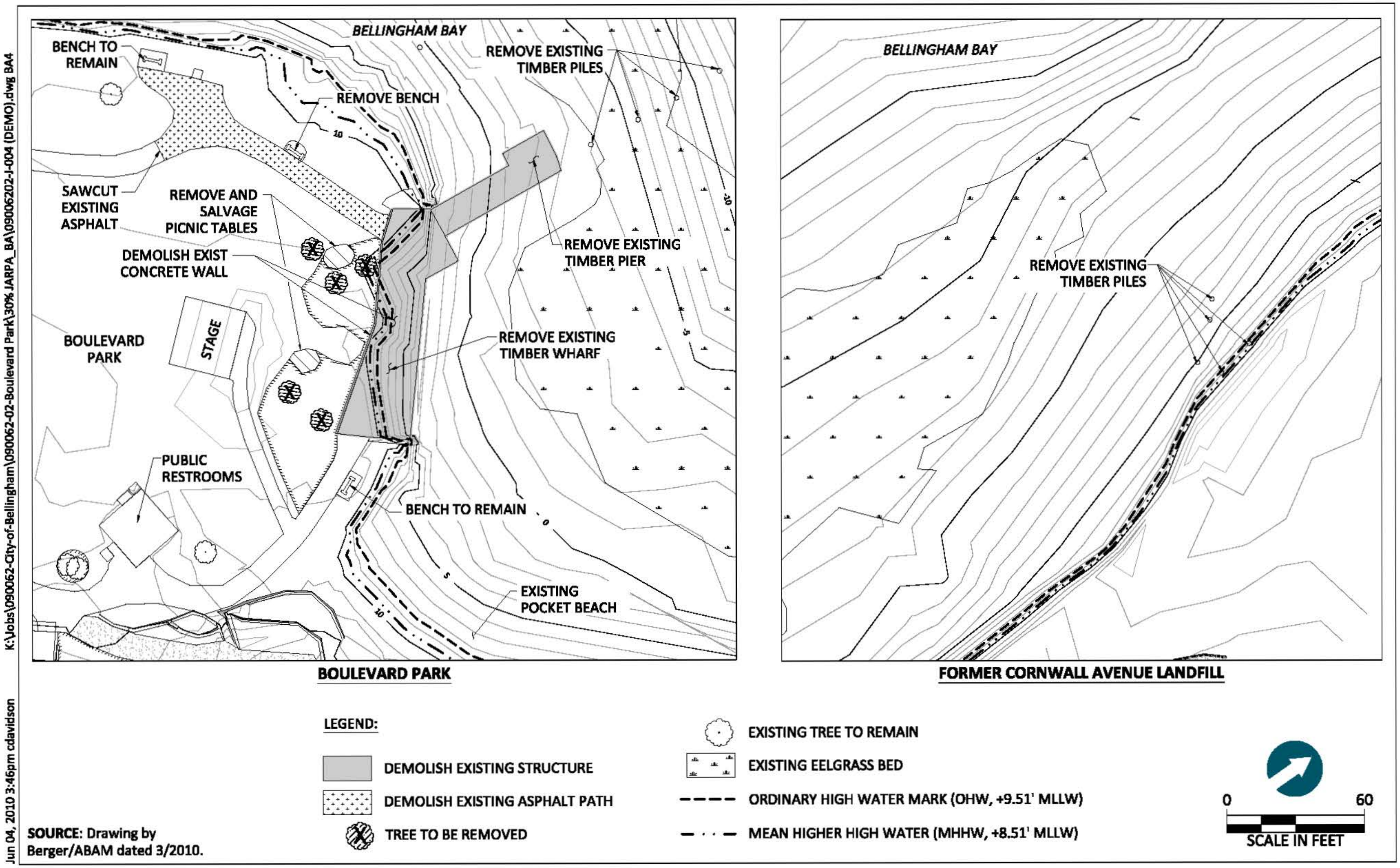

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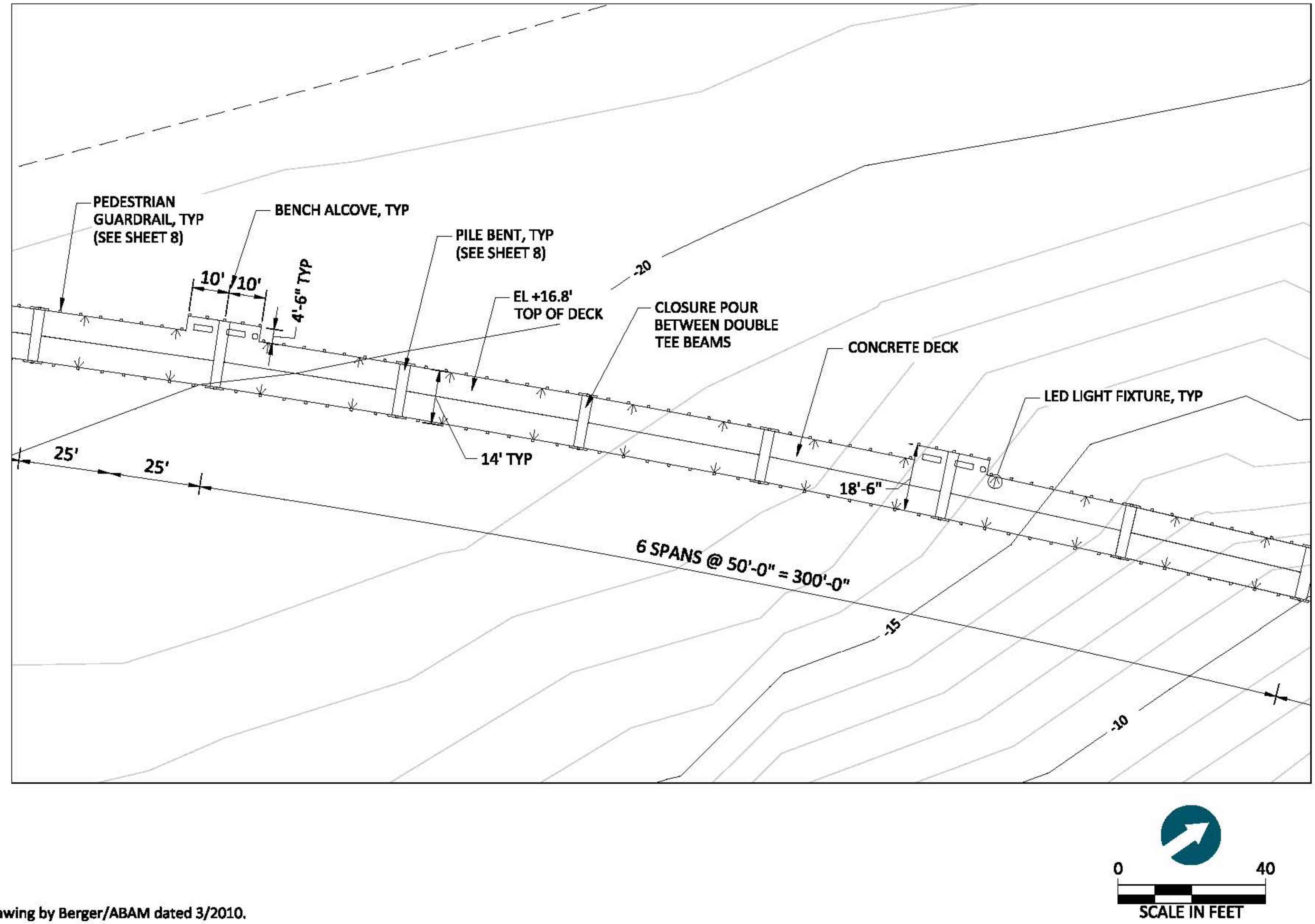
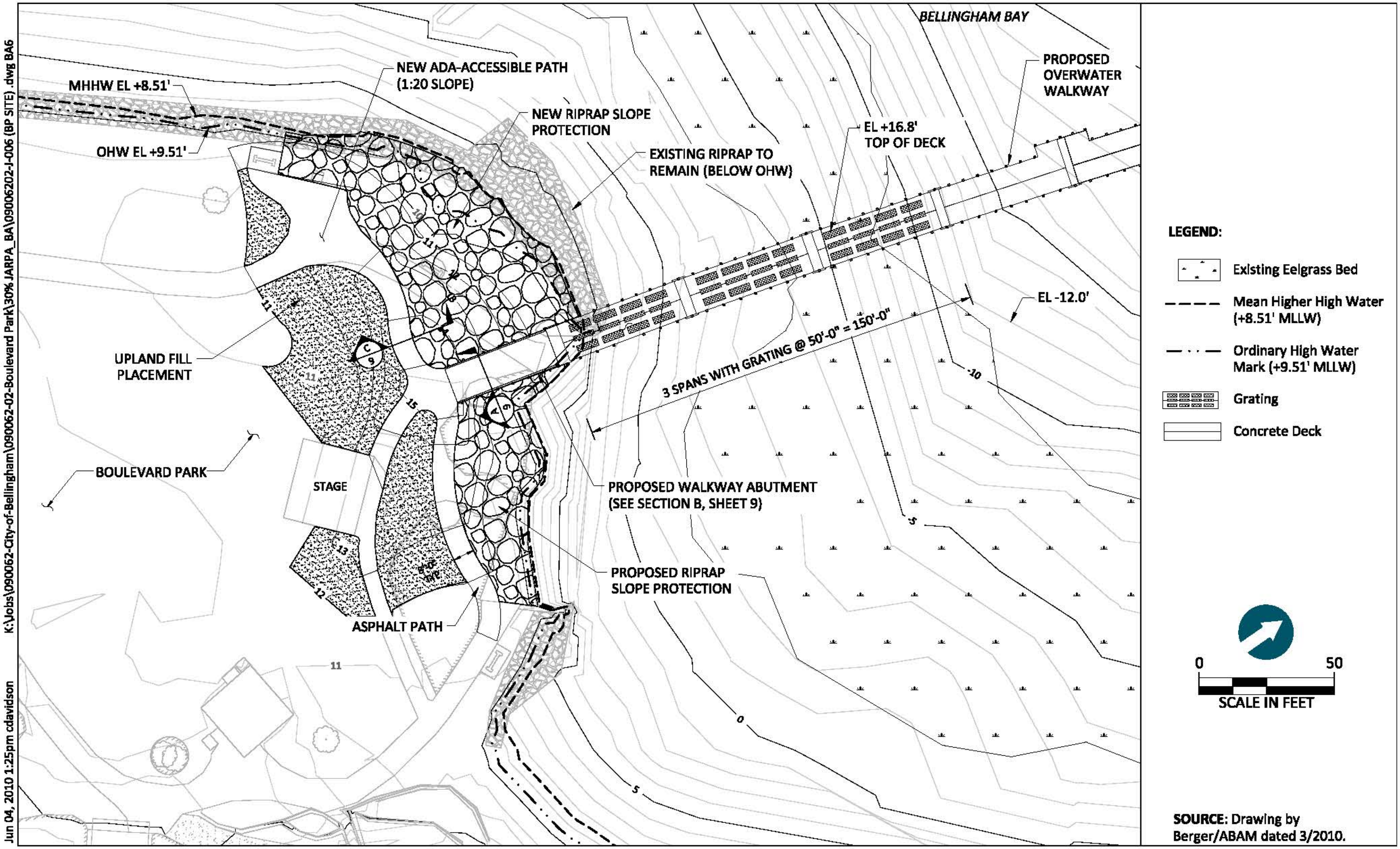
Figure 4
Demolition Plan
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 5
Overwater Walkway Typical Layout Plan (Enlarged)
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway



SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 6
Boulevard Park Enlarged Site Plan
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

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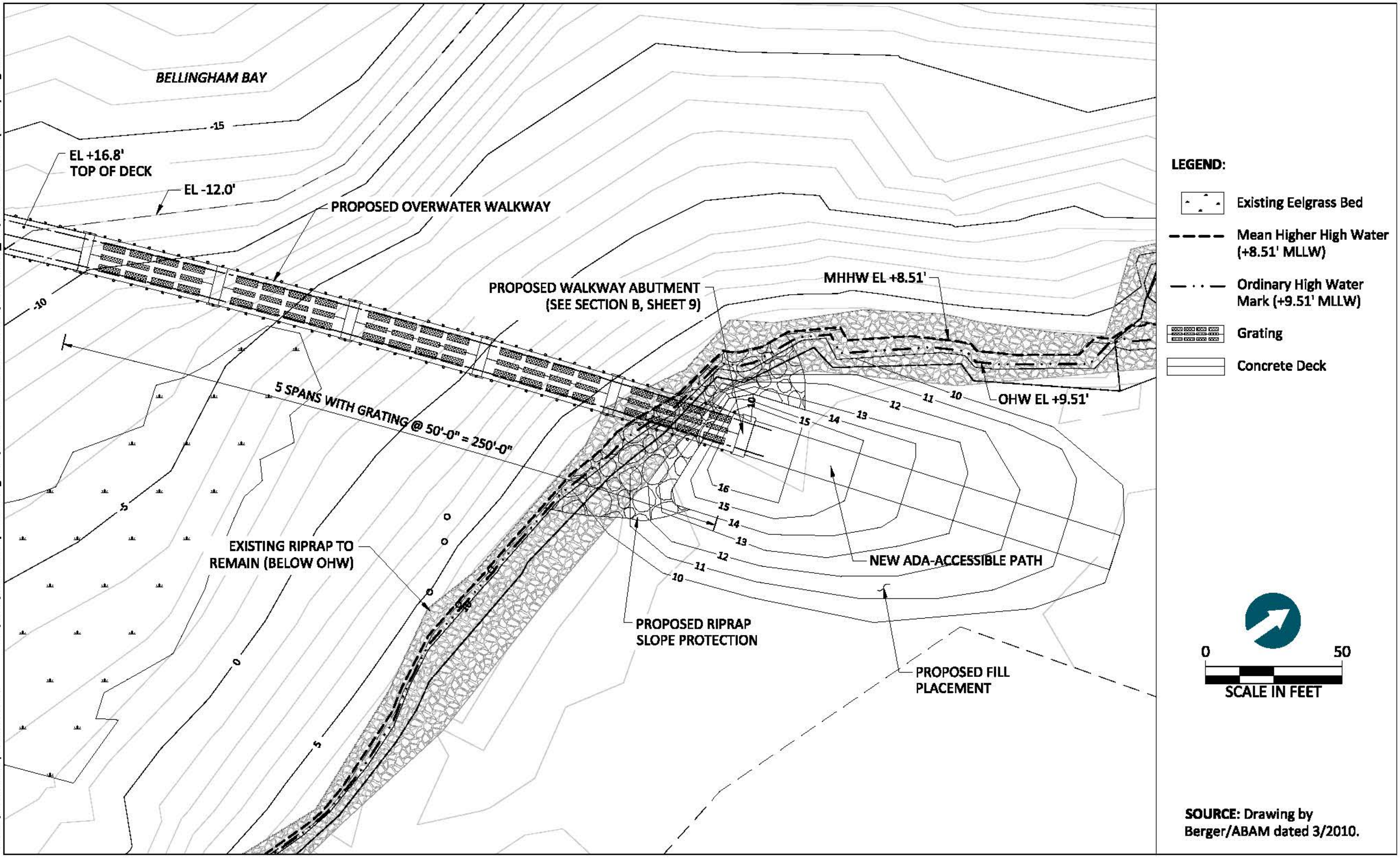

Figure 7
Former Cornwall Avenue Landfill Englared Site Plan
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

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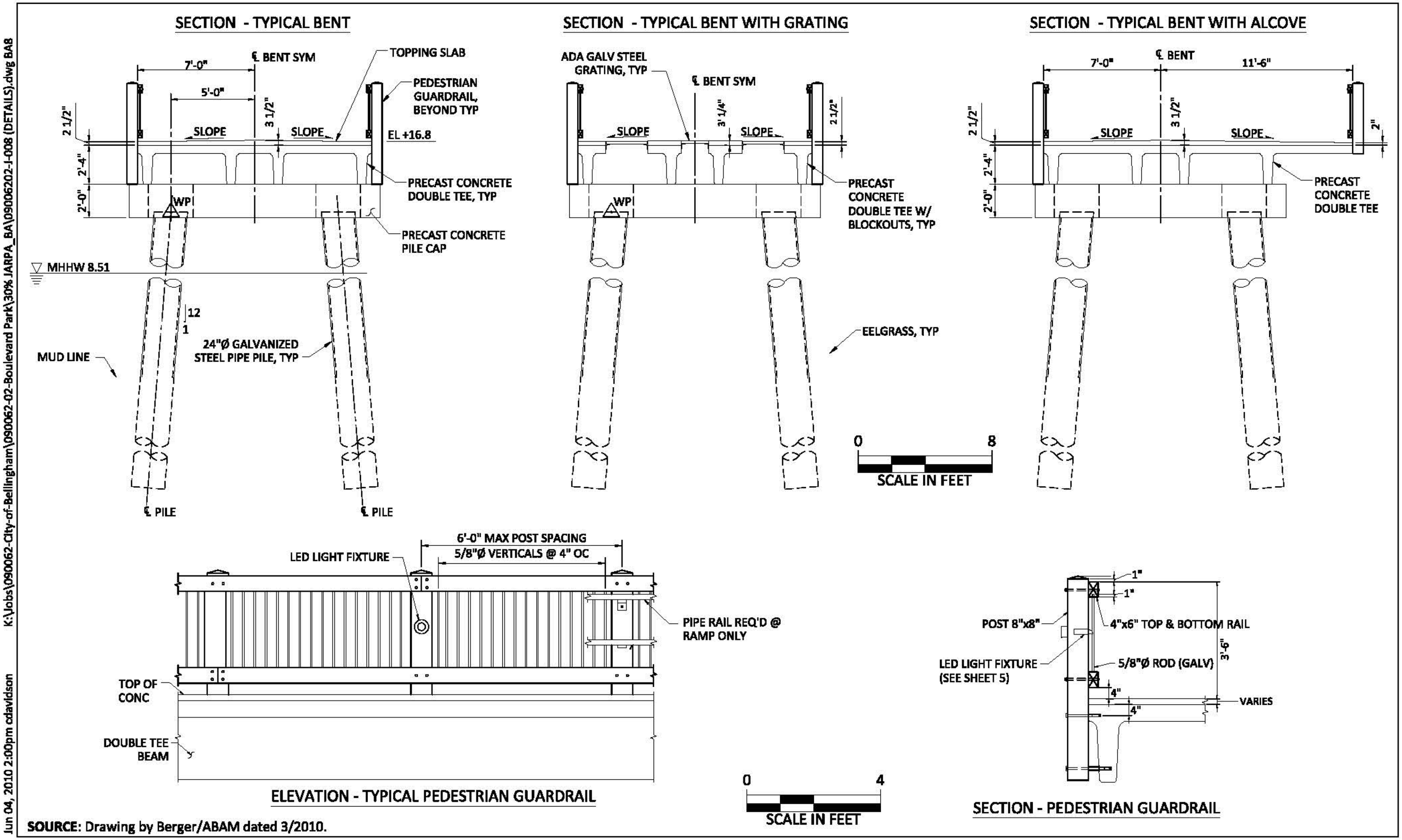

SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 8
Typical Pile Bent Details
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

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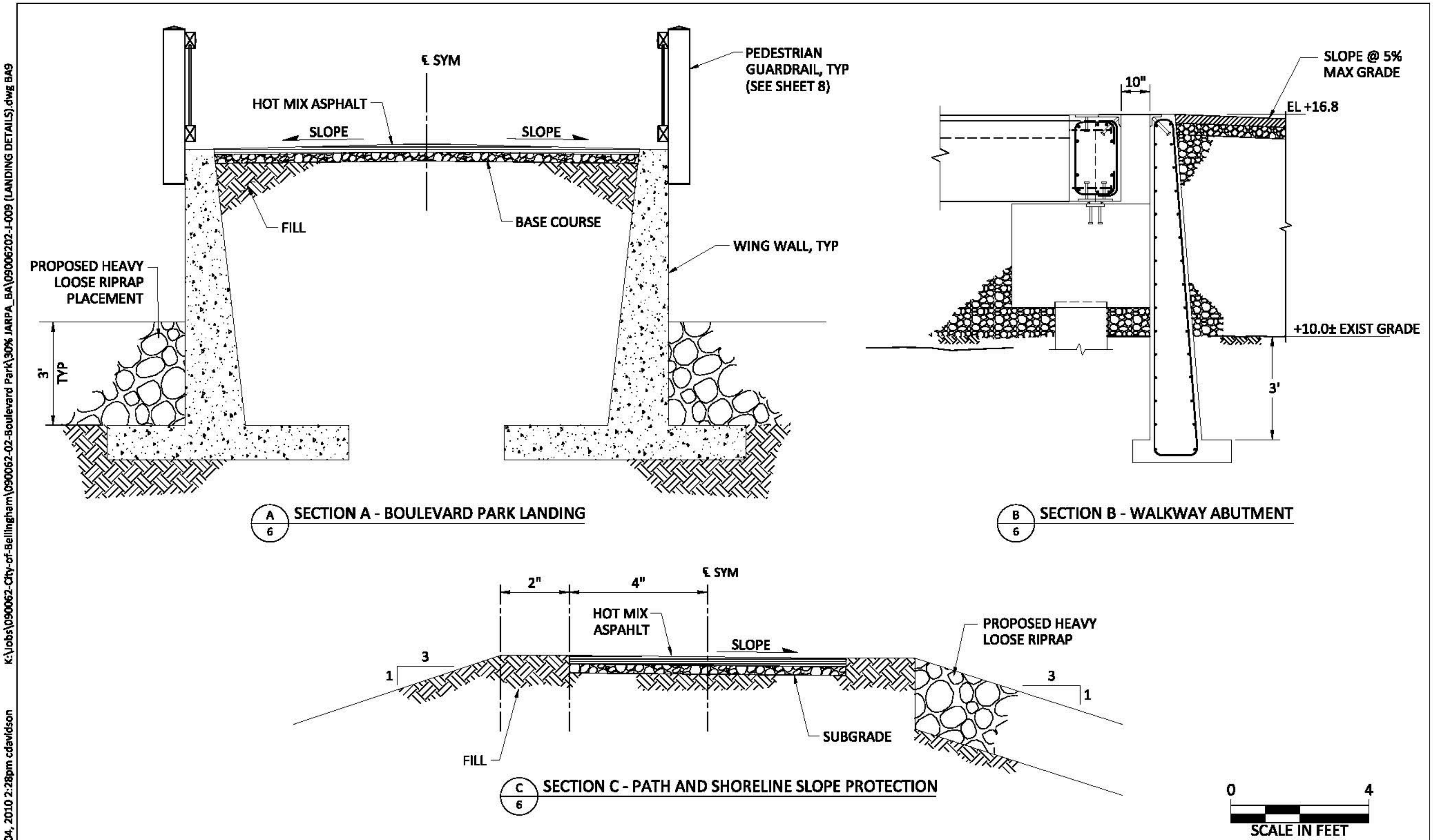

SOURCE: Drawing by Berger/ABAM dated 3/2010.

Figure 9
Landing and Abutment Details
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

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2.4 Environmental Considerations

2.4.1 Eelgrass Beds

Grette Associates conducted an underwater eelgrass survey within the embayment and mapped the extent of existing eelgrass beds. This survey occurred June 3 through June 5, 2008 (Grette Associates 2009), and employed a modified version of the Washington Department of Fish and Wildlife (WDFW) Intermediate Eelgrass/Macroalgae survey methods, modified to meet the needs of the Project and approved by WDFW (WDFW 2007). The results of the survey (Grette Associates 2009) showed that eelgrass is present along the entire embayment between Boulevard Park and the former Cornwall Avenue Landfill site. In general, eelgrass begins at an upper elevation of approximately -1.7 to -2.0 feet MLLW and extends waterward to approximately -8 to -10 feet MLLW. At the Boulevard Park landing, eelgrass density is lowest and the eelgrass band is narrowest at the existing pier. At the former Cornwall Avenue Landfill site, eelgrass density is generally similar along the entire shoreline area.

In addition, macroalgae was consistently found landward of the eelgrass bed surveyed. Fucus and Ulva were present on most transects, and sparse Laminaria was observed further waterward on some transects (Grette Associates 2009).

2.4.2 Historic and Cultural Resources

A cultural and historical resources report entitled *An Archeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham Washington* was prepared for the Project by Wessen & Associates, Inc. (2010). This report will be submitted to the Federal Highways Administration (FHWA) for review, approval, and submission to the Department of Archaeology and Historic Preservation (DAHP). The final documentation from FWHA and DAHP will be provided to the U.S. Army Corps of Engineers (USACE) when received.

2.4.3 Mitigation

The proposed mitigation for the Project includes removing an existing timber pier and wharf at the north end of Boulevard Park and nine additional creosote-treated timber piles in the embayment. The pier is supported by eight steel H-piles (each 8 inches square) and the wharf is supported by approximately 87 creosote-treated piles, all of which will be removed. The wharf is supported on the southern (landward) end by an existing concrete wall that may also be removed, depending on the nature and level of contamination behind the wall. Further evaluation of sediment quality behind the wall will be conducted in the summer of 2010.

Four creosote-treated, 12-inch-diameter timber piles located immediately north of the existing pier at Boulevard Park and five creosote-treated, 12-inch-diameter timber piles immediately offshore of the southwest corner of the former Cornwall Avenue Landfill site will be removed.

The removal of the pier, wharf, and piles will result in a significant reduction of overwater cover. In addition, approximately 30% of the spans of the proposed structure located above nearshore areas (-12 feet MLLW or higher) will be grated: the three spans closest to the Boulevard Park landing and the five spans closest to the former Cornwall Avenue Landfill site landing. The grating will be sized to provide 70% light transmission. Table 2 summarizes the anticipated changes in overwater cover resulting from the Project.

Table 2

Summary of Changes in Overwater Cover/Shading in the Intertidal Zone

Project Component	Removal of Existing Overwater Cover [1]	Total New Overwater Cover [1]	New Overwater Grated Areas [1, 3]	Net Change in Overwater Shading [1, 2]
Existing wharf, piles, and pier to be removed	-3,332	0	0	-3,332
Existing isolated piles (nine total) to be removed [4]	-7	0	0	-7
Proposed overwater walkway structure	0	5,396	1,515 (1,060.5 open area)	4,335.5
Total	-3,339	5,396	1,515 (1,060.5 open area)	996.5

Table Notes:
1. All areas are in square feet
2. Changes in overwater cover are only detailed for intertidal areas where the seafloor elevations range between -12 feet MLLW and +8.5 feet MLLW (MHHW)

3. New overwater grated areas were calculated based on quantities and specifications provided by Berger ABAM (approximately 30% grating—for areas described under item 2 above—with 70% openings)
4. Pile square footage is approximate and based on outside dimensions of the piles

Other avoidance and minimization measures are built into the Project design to minimize impacts to nearshore habitat (e.g., the widened deck portions will be located over areas with seafloor depths of -12 feet MLLW or lower). In addition, the preliminary overwater walkway design was modified based on discussions with WDFW (Williams, pers. comm. 2010) to ensure that the overwater walkway crosses over the narrowest area of eelgrass near the Boulevard Park landing (at the approximate location of the existing pier) and avoids crossing over the eelgrass areas near the former Cornwall Avenue Landfill site landing to minimize new macroalgae shading impacts from the overwater walkway (see Figures 5 and 6).

2.5 MTCA Remedial Actions Associated with the Overwater Walkway

The overwater walkway is located within the boundaries of three Model Toxics Control Act (MTCA) sites that are regulated by the Washington State Department of Ecology (Ecology): the Boulevard Park (also known as the South State Street Manufactured Gas Plant [MGP] Site), Cornwall Avenue Landfill, and Whatcom Waterway sites. The Boulevard Park site is undergoing investigation under an Ecology Agreed Order (AO) for soil and groundwater contamination related to the former South State Street MGP. The Cornwall Avenue Landfill site is undergoing investigation under an Ecology AO for contamination associated with a former municipal landfill. The landings of the overwater walkway will fall within the boundaries of the Boulevard Park and Cornwall Avenue Landfill MTCA sites. The overwater walkway structure will cross over aquatic lands that are within the natural recovery area of the Whatcom Waterway site, which is undergoing cleanup and long-term monitoring consistent with the Whatcom Waterway Consent Decree. The Boulevard/Cornwall Overwater Pedestrian Walkway Project and the various MTCA projects are coordinated by the City. The landings for the walkway have been designed not to interfere with any future proposed restoration actions at the Boulevard Park and Cornwall Avenue Landfill MTCA sites.

To accommodate the construction of the overwater walkway landings, one or more MTCA interim remedial actions may need to occur to avoid delaying the implementation of the

Project. Any needed remedial activities will be coordinated through, and approved by, Ecology.

2.6 Construction Methods

The proposed improvements will likely be constructed as described in Sections 2.6.1 and 2.6.2.

2.6.1 Removal of Existing Structures

The existing wharf and pier (including the eight steel H-piles) at the north end of Boulevard Park, and the isolated timber piles at the former Cornwall Avenue Landfill site will be removed by a derrick barge or land-based conventional crane (see Figure 4 for the demolition plan).

Best management practices (BMPs; see Section 3.5) as identified by the USACE Dredged Materials Management Office (DMMO) and the WDNR Puget Sound Initiative will be employed during removal of the piles. Timber piles will be removed in whole, wherever possible, by pulling. Removal of whole piles is the preferred method, because it will ensure the removal of the creosote preservative adhering to the piles. During removal, if a pile were to break above the mudline, an attempt will be made to pull the remainder of the pile to minimize disturbance of sediments. All creosote-treated wood that is removed will be disposed of in accordance with Washington State's Dangerous Waste Regulations (WAC 173-303) and Excluded Categories of Waste (WAC 173-303-071). All waste and debris generated by the Project will be collected and removed to a legally permitted waste disposal or recycling site.

2.6.2 Installation of New Structures

2.6.2.1 Upland Work

Upland work (above ordinary high water [OHW] and MHHW) will be performed using standard heavy construction equipment. Construction areas will be secured with temporary fencing to prohibit public access during construction. BMPs will be implemented to prevent sediment and other deleterious materials from entering waters of the United States (see Section 3.5).

2.6.2.2 In- and Overwater Work

Piles will be driven using a vibratory hammer from a derrick barge or land-based crane, which consists of pairs of a spring-isolated hammer head and a set of hydraulic pile clamps. This process begins by placing a choker around the pile and lifting it into vertical position with the crane. The pile is then lowered into position and set in place at the mudline. The pile is held steady while the vibratory hammer installs the pile to 5 feet above the required tip elevation. To ensure load-bearing capacity, the pile will be driven with an impact hammer for the remaining distance. Four of the piles need to be anchored to the bedrock to support the design loads.

Duration of vibratory pile driving time depends on the substrate conditions. Once the pile is set in place, pile installation with a vibratory hammer can take less than 15 minutes under steady substrate conditions, to more than an hour under difficult substrate conditions (such as glacial till and bedrock, or exceptionally loose material in which the pile repeatedly moves out of position). The Project location is not expected to have difficult conditions. During the construction period, 96 piles will be driven, four of which are located above MHHW. Based on this information, a conservative estimate of pile driving time could extend to approximately 30 to 60 hours of pile driving.

The bottom part of the precast concrete pile caps and deck panels will be set in place by a barge-mounted or land-based crane and secured in place. The concrete for the cast-in-place top part of the pile caps will be delivered and placed by barge. The concrete finish slab will be applied once the deck panels are in place. Concrete for the finish slab will be applied from either land or a barge. BMPs will be implemented to ensure that no uncured concrete comes into contact with surface waters. Pedestrian guardrails, lighting, and viewing benches will be installed after the finish slab has cured.

2.7 Construction Timing and Schedule

The entire Project, including demolition and construction, is expected to take approximately 42 to 46 weeks to complete. In-water work is expected to take approximately 14 weeks to complete. However, the duration and total period of in-water work would be affected by several factors, including the type of construction equipment and procedures selected by the contractor, and the sequencing of work elements. If it is necessary to perform certain work at night during a low tide, appropriate City, Whatcom County, and any other necessary approvals would be obtained. Approximate durations for various construction activities are listed in Table 3.

Table 3
Approximate In-Water Activity Durations

Project Element	Approximate Duration
Remove isolated timber piles	1 day
Remove timber wharf and pier	2 days
Install landings	2 weeks
Install walkway	40 weeks

In-water work will occur according to the allowable USACE and WDFW work windows for Bellingham Bay and/or in accordance with the requirements and conditions of the Hydraulic Project Approval (HPA) issued by WDFW and appropriate concurrence recommendations identified by the federal agencies during ESA consultation. The expected in-water work window for the Project is from July 16 to January 21, in the years in which construction will occur. Table 4 details the in-water work windows for the Project.

Table 4
In-water Work Windows

Species	Month												Approved Work Windows by Species
	J	F	M	A	M	J	J	A	S	O	N	D	
Salmon													July 2 to March 2
Bull Trout													July 16 to February 15
Herring													June 15 to January 21
Sand Lance													March 2 to October 14
Surf Smelt													N/A[1]

Note:
1 Surf smelt spawning occurs year-round.

2.8 Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). This area is the geographic extent of the physical, chemical, and biological effects resulting from the Project, including direct and indirect effects, and effects of interrelated and interdependent activities. The Project activity that will have the most far-reaching extent of effects is noise due to pile driving. The Action Area boundary is thus set as the limits of these noise effects.

The loudest underwater noise in the Project is expected to be impact hammer pile driving. Underwater noise from impact driving of the 24-inch steel piling proposed in the Project is expected to reach levels of approximately 189 dB_{RMS}[1] and 212 dB_{PEAK} (Laughlin 2005). A bubble curtain or other sound attenuation device capable of at least a 10 dB reduction in underwater sound pressure level will be used during pile installation for the Project, which is expected to lower the anticipated peak sound pressure level at the point of impact to 179 dB_{RMS} and 202 dB_{PEAK}. This sound pressure is expected to attenuate at a rate of 4.5 dB per doubling distance according to the practical spreading model used by USFWS and NMFS

[1] dB_{RMS} is the square root of the mean square of a single impulse pressure event.

(Davidson 2004 and Thomsen et al. 2006, *as cited in* WSDOT 2010). Sound pressure will also attenuate more rapidly in shallow water (Rogers and Cox 1988).

The in-water portion of the Action Area will be defined by those areas where in-water noise from impact pile driving will be noticeable above background levels. For fish, NMFS recognizes 150 dB_{RMS} as the behavioral effects threshold and 206 dB_{PEAK} as the injury threshold for all sizes of fish (WSDOT 2009; FHWG 2008; both in Appendix B). For cetaceans and pinnipeds, the disturbance threshold is recognized as 160 dB_{RMS}, with an injury threshold of 180 to 190 dB_{RMS} (WSDOT 2009). For marbled murrelets, the recognized underwater disturbance threshold is 150 dB_{RMS} and the injury threshold is 180 dB_{PEAK}. Based on this information, the most conservative in-water noise threshold used to set the Action Area for the Project is 150 dB_{RMS}.

Daytime ambient in-water noise levels in Puget Sound are typically around 135 dB_{RMS} (MacGillivray et al. 2007). Using the accepted practical spreading model for underwater noise transmission as described in Davidson (2004) and Thomsen et al. (2006, *as cited in* WSDOT 2010), sound pressure levels will decrease to the lowest noise threshold used to set the Action Area (150 $dB_{RMS.}$) at approximately 2.5 miles and to background levels of 135 dB_{RMS} within approximately 25.7 miles[2]. In-water sound attenuates more rapidly in shallow water (Popper et al. 2006), and is expected to attenuate in shallow subtidal areas near the Action Area before reaching the shoreline of the surrounding landmasses that contain Bellingham Bay. Therefore, the in-water portion of the Action Area extends approximately 4.5 miles to the west and approximately 6 miles southwest from the Project shore (Figure 10).

We are not aware of any airborne noise data available for the Project area. However, typical ambient in-air noise conditions are expected to be similar to the levels emitted in an urban residential area. Noise levels in a typical urban residential area are approximately 65 dBA

[2] Practical Spreading Model: R1 = (10^ (TL/TLC))(R2) where R1 = distance from source; TL = transmission loss in dB between expected dB and threshold dB; TLC = transmission loss constant (bubble curtain dB attenuation + sound attenuation); and R2 = distance from source of initial sound measurement. For the limit of potential disturbance, R1 = (10^([189-150]/15))(10) = 3,981 meters or 2.5 miles for the limit of potential disturbance. For the limit of ambient noise levels, R1 = (10^([189-135]/15))(10) = 39,810 meters or 25.7 miles. Practical spreading model calculator available at: http://www.wsdot.wa.gov/NR/rdonlyres/1C4DD9F8-681F-49DC-ACAF-ABD307DAEAD2/0/BA_NMFSpileDrivCalcs.xls .

(decibels on A-weighted scale[3]; Cavanaugh and Tocci 1998 *cited in* WSDOT 2010). Therefore, a conservative value of 65 dB for background airborne noise levels is used for this analysis.

The airborne portion of the Action Area is defined as those areas where in-air noise from pile driving will be elevated above background levels. In the proposed Project, impact pile driving will be the loudest activity, expected to generate noise of up to 110 dBA (measured at 50 feet from the source) (WSDOT 2010). This sound is expected to attenuate at a rate of 6 dB per doubling of distance according to the standard reduction for point source in-air noise at hard-site (paved) conditions (WSDOT 2010). The recognized in-air noise disturbance threshold for marbled murrelets is 70 dB_{RMS} (USDOI 2006) and for sea lions is 100 dB_{RMS} (WSDOT 2009). Therefore, the most conservative in-air noise threshold that will be used to set the Action Area for the Project is 65 dB_{RMS}. Sound levels will decrease to this level at approximately 1.2 miles from the Project. The sound is expected to attenuate more rapidly east of the Action Area due to the elevation changes and the vegetation and structures present on Sehome Hill, east of the Project.

Based on the information presented in this section, in-air noise is expected to extend approximately 1.2 miles and in-water noise is expected to extend approximately 6 miles from the Project. Figure 10 shows the Action Area, including the in-air and in-water portions.

[3] For sound pressure in air, the reference amplitude is usually 20 micro-Pascal (μPa). One Pascal is the pressure resulting from a force of one newton exerted over an area of 1 square meter. Sound measured on an A-weighted scale is in reference to 20 μPa in this document.

LEGEND:

Approximate Boundary of In-Water Portion of Action Area

Approximate Boundary of Land/Air-Based Portion of Action Area

0 2
Scale in Miles

SOURCE: Aerial from Google Earth Pro, 2010.

K:\Jobs\090062-City-of-Bellingham\090062-02-Boulevard Park\30% JARPA_BA\09006202-BA-010 (ACTION).dwg BA10

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Figure 10
Action Area
Biological Assessment
Boulevard/Cornwall Overwater Pedestrian Walkway

ANCHOR QEA

3 PROJECT EFFECTS SUMMARY AND MEASURES TO REDUCE EFFECTS

This section provides a summary of Project effects within the Action Area (defined in Section 2.8), as well as those measures that will be used to reduce or eliminate impacts. This BA considers direct and indirect effects on listed or proposed species, suitable habitat, critical habitat, and food resources, as well as effects of interrelated and interdependent actions.

3.1 Potential Direct Project Effects

Potential direct Project effects within the Action Area are listed below and discussed in the context of listed species in Chapter 5:

- Short-term in-water and in-air noise effects due to construction activities
- Short-term turbidity and water quality effects associated with construction activities
- Installation of new permanent in-water and overwater structures
- Permanent beneficial effects from removal of existing in-water and overwater structures

3.2 Potential Indirect Project Effects

Potential indirect Project effects within the Action Area are listed below and discussed in the context of listed species in Chapter 5:

- Temporary substrate disturbance due to construction activities

3.3 Effects of Interrelated/Interdependent Actions

"Interrelated Actions" means the Project is part of a larger action, depends on a larger action for its justification, or requires additional actions for its completion. The Project has the interrelated actions of one or more MTCA interim remedial actions that may need to occur to avoid delaying the implementation of the Project. These MTCA actions will be separately permitted. The Project has no interdependent actions, meaning there are no actions that depend on the Project actions for justification.

3.4 Impact Avoidance and Minimization Measures

Impact avoidance and minimization measures are Project design elements that avoid and/or minimize the potential for adverse environmental effects. These measures are as follows:

- No piles treated with pentachlorophenol will be used.
- Piles will be installed with a vibratory hammer where practicable to minimize impacts to the aquatic environment.

3.5 Best Management Practices

BMPs are construction work methods that are generally accepted to avoid and/or minimize the potential for adverse environmental effects. BMPs to be implemented for the Project include the following:

- All applicable permits for the Project will be obtained prior to construction of the overwater walkway. All work will be performed according to the requirements and conditions of these permits.
- In-water work (not including mobilization) will occur during the USACE approved work window, or an approved extension of the work window for Bellingham Bay. The work window for listed/protected salmonids, bull trout, and forage fish is July 16 to January 21.
- Construction of the proposed Project will comply with water quality requirements imposed by Ecology (Chapter 173-201A WAC), which specify a mixing zone beyond which water quality standards cannot be exceeded. Compliance with Ecology's standards is intended to ensure that fish and aquatic life are protected to the extent feasible and practical.
- The contractor will be responsible for the preparation and implementation of a Spill Prevention, Control, and Countermeasures (SPCC) plan to be used for the duration of the Project. The plan will be submitted to the project engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
    - The SPCC plan will identify construction planning elements and recognize potential spill sources at the site. The plan will outline responsive actions in the event of a spill or release, and will identify notification and reporting procedures.

The plan will also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.

- The SPCC plan will outline which measures the contractor will take to prevent the release or spread of hazardous materials, either found on site or encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to, gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."
- The contractor will maintain at the job site the applicable equipment and material designated in the SPCC plan.

- The contractor will be required to ensure that fresh concrete will not come into contact with marine waters before it is set.
- Excess or waste materials will not be disposed of or abandoned waterward of OHW or allowed to enter waters of the State.
- Barges will not be allowed to ground out during construction.
- No petroleum products, fresh cement, lime or concrete, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
- The contractor will be required to retrieve any floating debris generated during construction using a skiff and a net. Debris will be disposed of at an appropriate upland facility.
- Erosion control measures will be addressed in a Temporary Erosion and Sediment Control (TESC) plan prepared by the contractor and adhered to during construction activities.
- Demolition and construction materials will not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.
- When practical, work will occur when tides are low enough to prevent incidental contact of material with marine waters during restoration and construction activities, including demolition and grading.
- The Project will comply with guidance developed by NMFS for monitoring and/or attenuating sound pressures generated during steel pile driving. This will likely include use of a bubble curtain during impact pile driving of steel piles.
- The removal of the creosote-treated piles shall be consistent with conditions issued as

part of the Derelict Creosote Pile Removal Project HPA, issued to the WDNR Northwest Region (Control Number 106389 – 3, Issued August 08, 2007).

- The contractor will be advised that eelgrass beds are protected under both state and federal laws. The contractor will adhere to the following restrictions during the life of the contract. The contractor will not perform any of the following:
  - Place derrick spuds or anchors in the areas designated as "eelgrass"; or allow any chains or wires passing over the eelgrass areas to contact the eelgrass at any tidal stage
  - Shade the same area of the eelgrass beds for a period of time greater than 3 consecutive days during the growing season from March until August
  - Conduct activities that may cause scouring of sediments within the eelgrass beds or result in sediments transferring out of or into the eelgrass beds

3.6 Conservation Measures

Conservation Measures are measures taken to directly contribute to the recovery of a listed species. These measures include the impact avoidance and minimization measures and BMPs discussed in Sections 3.4 and 3.5. In-water work timing will occur according to recommended work windows, which are July 16 through January 21 for the Action Area. Moreover, all work will be performed according to the concurrence recommendations identified by the federal agencies during ESA consultation.

4 ENVIRONMENTAL BASELINE IN ACTION AREA

The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed federal projects in the Action Area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation process (50 CFR 402.02). The baseline is described in terms of the habitat features and processes necessary to support life stages of the subject ESA species that may occur within the Action Area.

4.1 Physical Indicators in the Action Area

4.1.1 Substrate and Slope

The substrate and slope within the Project Action Area have been extensively modified due to dredging, shoreline armament, and fill activities to support historic log storage and various industrial activities. The substrate slopes gently toward Bellingham Bay from the embayment between Boulevard Park and the former Cornwall Avenue Landfill site to the Whatcom Waterway navigation channel. A geotechnical study was conducted in October 2009 for the Project and results depict substrate below -20 MLLW as primarily composed of sand, soft clay, and silt. Substrate along the shoreline of the Action Area waterward of the riprap at each landing site primarily consists of gravel, cobble, sand, and shell fragments (Photo 5).

Photo 5
Typical substrate along the shoreline of the Action Area. Photo taken from the north end of Boulevard Park.

4.1.2 Flows and Currents

The Strait of Juan de Fuca and the Queen Charlotte Strait are inlets from the Pacific Ocean from which saltwater currents enter north Puget Sound. These currents are diverted by the San Juan Islands and are mostly dissipated by the time water reaches Bellingham Bay. Flows and currents within the Project Action Area are primarily influenced by freshwater inputs coming from the Nooksack River to the northwest of the Action Area and its associated tributaries such as Whatcom Creek and Squalicum Creek to the north, and Padden Creek to the south.

4.1.3 Salt/Freshwater Mixing

The Project Action Area is located within the Puget Sound Central Watershed and is part of Water Resource Inventory Area (WRIA) 1, also known as the Nooksack Basin (Smith 2002). Bellingham Bay consists of Puget Sound saltwater that is refreshed by currents and tidal flushing. Bellingham Bay contains direct freshwater input from the Nooksack River and its associated tributaries, as noted above.

4.2 Chemical Indicators

4.2.1 Water Quality

Whatcom Creek and Squalicum Creek to the north, and Padden Creek to the south, are on the Ecology Polluted Waters/303(d) List under Category 5. Whatcom Creek is listed for dissolved oxygen, fecal coliform, and high temperature; Squalicum Creek is listed for fecal coliform; and Padden Creek is listed for fecal coliform and dissolved oxygen. Additionally, portions of Bellingham Bay within the Action Area are listed for dissolved oxygen. A Category 5 listing means that "water quality standards have been violated for one or more pollutants, and there is no Total Maximum Daily Load (TMDL) or pollution control plan" (Ecology 2008).

4.2.2 Sediment Quality

Currently, three cleanup sites exist in the vicinity of the proposed Project, including Boulevard Park itself (South State Street MGP Site), the Cornwall Avenue Landfill site, and the Whatcom Waterway site (as described in Section 2.5). While not located in the Action Area, sediments located adjacent to the southern shoreline of Boulevard Park are listed on the Ecology Polluted Sediments/303(d) List for low and high molecular weight polycyclic aromatic hydrocarbons (PAHs) under Category 5. A Category 5 listing includes "sediments for which at least one characteristic or designated use is impaired, as evidenced by failure to attain the applicable water quality standard for one or more pollutants" (Ecology 2008). The majority of the Action Area contains sediments listed under Category 4A. A Category 4A listing includes "sediments where the data show that a characteristic use is impaired by a pollutant, but a TMDL addressing that impairment has already been developed and been approved by the US EPA."

4.3 Biological Conditions

4.3.1 Upland Vegetation

Upland vegetation is limited by development and riprap along the shorelines of both Boulevard Park and the former Cornwall Avenue Landfill site. Boulevard Park upland vegetation consists primarily of maintained grasses and shrubs with some evergreen trees

(Photo 6), whereas the former Cornwall Avenue Landfill site includes mostly non-native and invasive species of grasses and shrubs (Photo 7).

Photo 6
View of Boulevard Park upland area approaching the existing dock, facing north

Photo 7

View of the former Cornwall Avenue Landfill site shoreline, facing northwest

4.3.2 Eelgrass and Macroalgae

The intertidal and shallow subtidal areas surrounding Bellingham Bay provide habitat for several species of macroalgae including *Enteromorpha spp.*, *Porphyra spp.*, red algae (*Gracilariopsis*), brown kelp (*Laminaria*), and green sea lettuce (*Ulva sp.*), and beds of native eelgrass (*Zostera marina*). The beds of eelgrass extend across the embayment between Boulevard Park and the former Cornwall Avenue Landfill site. In general, eelgrass begins at an upper elevation of approximately -1.7 to -2.0 feet MLLW and extends waterward to approximately -8 to -10 feet MLLW (Grette Associates 2009).

4.3.3 Marine Mammals and Fish

The Bellingham Bay nearshore provides habitat for a variety of marine mammals and fish species. Non-ESA-listed marine mammals that could occur within the Action Area include harbor seal (*Phoca vitulina*), harbor porpoise (*Phocoena phocoena*), and California sea lion (*Salophus californianus*). WDFW Priority Habitats and Species (PHS) information documents two priority harbor seal haulout sites located in the Action Area (WDFW 2008).

Some of the fish species found in the intertidal zone of Puget Sound include clingfish (*Gobiesocidae*), sculpins (*Cottidae*), greenlings and lingcods (*Hexagrammidae*), pricklebacks (*Stichaidae*), gunnels (*Pholididae*), and sand lance (*Ammodytes hexapterus*). Fish commonly found in nearshore subtidal areas include greenlings and lingcod, rockfish (*Sebastes*), dogfish (*Squalidae*), sculpins, surf perch (*Embiotocidae*), pricklebacks, and wolf fishes (*Anarhichadidae*). Offshore, typical fish species include anchovy (*Engraulidiae*), herring (*Clupeidea*), mackerel and tuna (*Scombridae*), cow sharks (*Hexanchidae*), big skate (*Raja binoculata*), English dogfish (*Pleuronectes vetulus*), and spiny dogfish (*Squalus acanthias*). Both juvenile and adult salmonids could occur in the Action Area.

4.3.4 Forage Fish

Larval, juvenile, and adult Pacific herring, surf smelt (*Hypomesus pretiosus*), and Pacific sand lance are important forage fish for juvenile, sub-adult, and adult salmonids (Healey 1991). Pacific herring have demersal, or adhesive, eggs that are typically deposited throughout intertidal and shallow subtidal beds of native eelgrass and red algae, and likely on brown kelp and green sea lettuce. In Washington, herring spawning typically occurs between 0 and -10 feet MLLW. There is no documented herring spawning or potential in the Project footprint, but it does occur near Portage Island across Bellingham Bay as part of the Samish Bay/Portage Bay stock, approximately 5.5 miles west of the Project (Stick 2009; WDFW 2008). The majority of spawning activity in recent years has been observed in Portage Bay. Spawning activity typically occurs from early February to late March (Stick 2009). Some of this stock's spawning grounds overlap with those of the later spawning Cherry Point stock on the east side of Hale Passage. The Samish/Portage stock is the only north Puget Sound stock classified as healthy as of 2008 (Stick 2009).

Surf smelt spawning occurs year round on high intertidal beaches of sand and gravel (MRC 2010) and is typically located between MHHW and +7 MLLW. Pacific sand lance are known to spawn along beaches with fine sediment composition from MHHW to +5 MLLW; spawning occurs from mid-November through February. The WDFW PHS maps (2008) show that the project area is located in a priority Estuarine Zone. There is no surf smelt or sand lance spawning documented in the Project footprint, but it is documented in three areas within the Action Area: south of the Project, on the north side of Bellingham Bay, and along

Portage Island and in Portage Bay (WDFW 2000b). WDFW's SalmonScape network (WDFW 2000b) also notes approximately 300 feet of potential spawning habitat at the Boulevard Park end of the Action Area.

5 SPECIES EFFECTS ANALYSIS AND DETERMINATIONS

This section summarizes the regulatory basis for the effects determinations reached for the Project, and provides the effects analysis and determination for each listed species and critical habitat.

5.1 Regulatory Basis for ESA Effects Determinations

The effects determination is the conclusion of the analysis of potential direct or indirect effects of the proposed activity on listed or proposed species and/or designated or proposed critical habitat. Regulatory guidance from the Final Section 7 Consultation Handbook (USFWS and NMFS 1998) was used to make the effects determinations for the proposed activity, as described below.

For listed species and designated critical habitat, the range of conclusions that could result from the effects analysis for the effects determination include:

- **No effect** – the appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat.
- **May affect, is not likely to adversely affect** – the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur.
- **May affect, is likely to adversely affect** – the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial (see definition of "may affect, is not likely to adversely affect").

For listed species, a key factor in making an effects determination and distinguishing between a significant and insignificant effect is determining if the effect would be significant enough to cause a take. "Take," as defined by the ESA, includes such activities that harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct [ESA §3(19)]. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering; harass is further defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering (50 CFR §17.3).

If the Services determine that a project will adversely modify designated critical habitat, the project warrants an adverse modification call by the Services, and the project cannot proceed without modifications in accordance with a reasonable and prudent alternative or permission from the Endangered Species Committee[4].

5.2 Direct and Indirect Effects to Fish

Potential direct and indirect effects to listed fish and their food resources resulting from the Project include the following:

- Short-term in-water and in-air noise effects due to construction activities
- Short-term turbidity and other water quality effects associated with construction activities
- Short- and long-term impacts to prey resources from localized substrate disturbance
- Long-term effects from installation of new permanent in-water and overwater structures
- Permanent beneficial effect of removing existing in-water and overwater structures

5.2.1 Short-term Noise Effects

In-water noise conditions in part of the Action Area will be elevated from ambient conditions during construction due to use of mechanical equipment in the upland and over water, and due to in-water pile driving and removal, with impact pile driving expected to produce the loudest in-water sound pressures. These conditions have the potential to disturb

[4] A committee composed of seven government officials including the secretary of the interior, which is authorized to overrule the actions or decisions of the Services in order to grant relief from actions taken under the ESA.

fish migrating and feeding nearby on a short-term basis. As stated previously in Section 2.8, 150 dB_{RMS} is the currently recognized in-water behavioral effects threshold for fish, and 206 dB_{PEAK} is considered to be the injury threshold. Project in-water noise due to impact pile driving activities is expected to extend to 179 dB_{RMS} or 202 dB_{PEAK} with the use of a bubble curtain during impact pile driving, which is above the 150 dB_{RMS} behavioral effects threshold but below the 206 dB_{PEAK} injury threshold. Analysis of this noise information (Section 2.8) has determined that sound pressure levels from impact pile driving will decrease to the disturbance threshold at approximately 6 miles from the impact pile driving activity. Therefore, fish that may be present within this radius could be exposed to behavioral effects levels of in-water noise, but not injurious levels. Fish that may be present outside the 6-mile radius will not be exposed to disturbance levels of in-water noise associated with impact pile driving.

With regard to vibratory pile driving, empirical data on in-water noise is limited for the pile size and type to be used in this Project (24-inch steel piles). We are only aware of one study that has measured in-water noise for vibratory pile driving of these piles. WSDOT measured in-water sound at Friday Harbor Ferry Terminal during vibratory pile driving of 24-inch steel piles at 177 dB_{RMS} and 180 dB_{PEAK} (measured at 10 meters from the pile). For reference, the WSDOT manual for BA preparers (2010) also notes that vibratory driving sound pressures have been shown to be 10 to 20 dB lower than impact driving steel piles of similar diameter (CalTrans 2003 personal communication, *cited in* WSDOT 2010). Using this estimation, the difference between the expected impact hammer noise and expected vibratory hammer noise is 12 dB_{RMS} to 32 dB_{PEAK}, indicating that the Friday Harbor sound levels are a reasonable expectation for in-water vibratory hammer noise in this Project. The expected levels of 177 dB_{RMS} and 180 dB_{PEAK} levels are comparable to the expected impact hammer sound levels (with bubble curtain) to be expected in the Project. Thus, noise effects from this source will be expected to occur within a similar radius around the Project.

The elevated noise conditions discussed above will be limited to the construction period, associated with pile driving activities. As noted in Section 2.6.2.2, the duration of pile driving could extend to a conservative estimate of 30 to 60 hours of pile driving noise. Thus, based on the estimated pile driving time period and the noise and distance information presented above, it is concluded that in-water noise will not be elevated to injurious levels to fish, but that in-water noise could have behavioral effects to fish that may occur within 4.5 miles from pile driving activity. These effects can therefore not be discounted for those fish that may be present in that area during pile driving.

The Project will adhere to in-water work windows for the protection of salmonids and potentially spawning forage fish. Certain ESA-listed species are either highly unlikely to be present during in-water work, or would be unlikely to be present in the Action Area (see Sections 5.3 through 5.14 for species-specific discussions). Therefore, noise effects are considered insignificant or discountable for these species.

5.2.2 Short-term Water Quality Effects

Water quality effects considered for fish include turbidity and potential construction spills.

Turbidity

Temporary and localized turbidity may occur during pile driving and removal of piling and existing in-water structures. Turbidity effects are expected to be localized to the area near the construction activity, and will comply with WAC 173-201A-210(1). These standards were set to be protective of marine surface waters, including all indigenous fish and non-fish aquatic species. The extent of turbidity effects is expected to extend no further than approximately 150 feet from the point of construction.

The U.S. Environmental Protection Agency (EPA) indicates that turbidity is localized around piling to about a 25-foot radius during pile installation. Very little data exists regarding sediment plumes and turbidity caused by pile removal. Roni and Weitkamp (1996) monitored water quality parameters during a pier replacement project in Manchester, Washington. The study measured water quality before, during, and after pile removal, dredging, and pile replacement. Construction activities occurred from mid-February 1991 to March 1993. The study found that construction activity at the site had "little or no effect on DO (dissolved oxygen), water temperature, and salinity." Turbidity (measured in nephelometric turbidity unit [NTU]) at all depths nearest the construction activity was typically less than 1 NTU higher than stations farther from the construction area throughout construction. Only during dredging in 1991 did turbidity exceed background levels by more than 1 NTU.

In September 2004, water quality monitoring conducted at the Friday Harbor Ferry Terminal during three pile removal events of creosote-treated structures showed turbidity levels did not exceed 1 NTU over background conditions and were generally less than 0.5 NTU over background levels (as cited in WSF et al. 2009). In October 2005, water quality monitoring conducted at the Eagle Harbor Maintenance Facility during four pile removal events of creosote and steel piles showed turbidity levels did not exceed 0.2 NTU over background levels (as cited in WSF et al. 2009).

A number of studies have investigated the potential effects of turbidity on salmonids, mostly associated with dredging projects. These studies have found that there are several mechanisms of effect, including direct mortality, gill tissue damage, physiological stress, and behavioral changes. Study highlights are as follows: direct mortality occurred above 6,000 mg/L (Stober et al. 1981; Salo et al. 1980; LeGore and DesVoigne 1973), gill tissue damage occurred at levels above 3,143 mg/L (Servizi and Martens 1992), physiological stress occurred at approximately 2,000 mg/L (Redding et al. 1987), and behavioral (feeding activity) changes occurred at 2,000 to 3,000 mg/L (Redding et al. 1987).

Based on the above information on turbidity and pile construction, turbidity in the Project is not expected to range near these levels that cause adverse effects. In addition, any turbidity will only occur during times of in-water construction and will be reduced during times of no construction activity. Work will also occur during the approved in-water work window for the area. Based on this information, turbidity effects will be insignificant in the short- and long-term, and not at a level where take would occur.

Construction Spills

There is a chance that other short-term water quality effects could occur related to fuel or contaminant spills; however, BMPs and other measures will be in place to minimize the potential for these to occur and to minimize the effect to fish if they do occur (see Sections 3.4 through 3.6). These effects are therefore expected to be insignificant.

5.2.3 Prey Resource Effects

Some listed or proposed listed fish, particularly salmonids, consume forage fish as prey. Forage fish occur in Bellingham Bay, as described in Section 4.3.4. Surf smelt and sand lance spawn in small substrates in the intertidal zone and herring spawn on eelgrass plants occurring in the intertidal and subtidal zones. As discussed in Section 4.3.2, the intertidal and shallow subtidal areas around the Project contain eelgrass beds, but herring spawning is not expected there (Stick 2009). The WDFW PHS maps (2008) show that the project area is located in a priority Estuarine Zone. There is no surf smelt or sand lance spawning documented in the Project footprint, but it is documented in three areas within the Action Area: south of the Project, on the north side of Bellingham Bay, and along Portage Island and in Portage Bay (WDFW 2000b). WDFW's SalmonScape network (WDFW 2000b) also notes approximately 300 feet of potential spawning habitat at the Boulevard Park end of the Action Area.

Short-term Effects

Effects to these forage fish from water quality or substrate disturbance are expected to be insignificant. Water quality effects from the Project are expected to be insignificant, as discussed in Section 5.2.2. Piling installation activities that will cause substrate disturbance include placement of spuds for barge placement, which will temporarily disturb existing benthic and epibenthic organisms; however, the footprint of these activities is small relative to the available areas for benthic and epibenthic community colonization in the area. In addition, these communities would be expected to rapidly recolonize after the construction disturbance. Therefore, effects to fish prey resources via disturbance of the epibenthic prey community are expected to be insignificant.

As previously noted, forage fish spawning is not expected in the Project footprint but does occur in the Action Area and greater Bellingham Bay. Noise-producing work will occur during the approved in-water work window when spawning fish are not expected to be present in those areas. In the Action Area, temporary and short-term behavioral effects to non-spawning forage fish could occur within the 2.5-mile radius of behavioral effects where sound will be elevated above the 150 dB_{RMS} behavioral effects threshold. However, given the variety of foraging areas and prey species available in the area, behavioral effects on forage fish during pile driving are not expected to be significant for fish that may eventually prey on these forage fish.

Long-term Effects
The Project will not appreciably alter a large quantity of existing eelgrass relative to the extensive eelgrass beds present in the area. The Project footprint is small relative to the size of these existing beds. Also, minimal shading of eelgrass beds beyond existing conditions is proposed as part of the Project because the overwater walkway portions that are located over eelgrass beds will be grated to provide light penetration to the substrate below. Approximately 30% of the surface of these nearshore spans will be grated. The grating proposed will allow 70% light transmission. Mitigation will be performed to address eelgrass impacts in accordance with permit conditions applied to the Project. These permits will be acquired in coordination with WDFW, USACE, and other applicable agencies. Based on this information, long-term substrate conditions for potential forage fish use are not expected to be significantly different from existing conditions and effects to fish via disturbance of forage fish communities are expected to be insignificant.

There are no long-term sound effects expected as a result of the Project. Regarding long-term effects, noted researchers Drs. Arthur Popper and Mardi Hastings, who specialize in in-water sound effects on fish, have recently published work stating that nothing is known about the long-term effects of exposure to sound on forage fish or about the effects of cumulative exposure to loud sounds (Popper and Hastings 2009a and 2009b).

5.2.4 Long-term Effects due to New In-water and Overwater Structures

The proposed in-water and overwater structures in the Action Area will create physical presence in the marine nearshore where listed fish species occur. Physical presence elements that may impact fish include the overwater structure itself as well as the piling installed. Nightingale and Simenstad (2001) summarized the literature for overwater structure issues in marine areas, and for structures of the type proposed in this Project; they identified the associated habitat impact mechanisms of reduced light levels, altered ambient light patterns, and altered substrate characteristics.

Light Conditions

Light transmission in nearshore areas is important to fish, particularly salmonids, which require lighted conditions for migrating, feeding, and prey production in nearshore areas (Nightingale and Simenstad 2001). There is currently no light transmission through the existing pier and wharf. As shown in Table 2, the removal of the existing structure will remove 3,339 square feet of existing shading and the walkway spans nearest the shore (-12 feet MLLW and less) will provide 70% light transmission through the grated portions of the structure, resulting in 4,335.5 square feet of new shading, for a total of new overwater cover in intertidal areas of 996.5 square feet (approximately 10 feet by 10 feet). As previously noted, approximately 30% of the walkway spans closest to the termini of the proposed overwater walkway will be grated and will allow this 70% light transmission. Night lighting has been designed to be directed away from the water's surface.

In the scientific literature, shading from overwater structures has been associated with altered fish behavior. Studies in the Puget Sound region have suggested that overwater light limitations could result in the following behavioral changes: 1) migration delays due to disorientation; 2) loss of schooling in refugia due to fish school dispersal under light-limited conditions; and 3) increased size-selective predation risk due to changes in migratory routes to deeper waters to avoid light changes (Nightingale and Simenstad 2001).

The area of new overwater coverage and increase in night lighting in the nearshore of the Project is small relative to the available habitat in the Action Area, and the design of the structure has incorporated high light transmission elements in the nearshore in order to minimize impacts to light conditions. Therefore, it is concluded that long-term light limitations will not occur in the nearshore to the extent that fish migrating or feeding in the Action Area will experience significant behavioral effects.

Substrate Characteristics

The structure of the piles will create a permanent physical presence in the nearshore of the Action Area. The presence of piles may eventually alter adjacent substrates due to increased shellhash deposition from piling communities and changes to substrate bathymetry (Penttila 1990a; Shreffler 1999). Native benthic communities typically associated with local substrates may be replaced by those associated with shell hash substrates. Should this change occur near the piles in the Project, this area is small relative to the available habitat in the Action Area, and would not be expected to change foraging conditions for fish to the extent that prey resources or overall habitat quality would be significantly impacted. Therefore, effects to substrate are expected to be insignificant.

5.2.5 Long-term Beneficial Effects from Removal of Existing In-water and Overwater Structures

Removal of existing in-water and overwater structures will result in a beneficial effect to fish and their habitats in the Action Area. The removal of a total of 96 creosote-treated piles and associated overwater structures will remove the risk of contamination from this source to the nearshore. Creosote is a common wood preservative used to treat marine structures, such as docks and piles. Treated wood leaches PAHs and other creosote compounds into the surrounding water and sediment. Over time, these compounds can accumulate in marine sediments and degrade habitat.

5.3 Chinook Salmon (*Oncorhynchus tshawytscha*)

Puget Sound Chinook salmon were listed as threatened on August 2, 1999 (64 FR 14308).

5.3.1 Species Information and Presence in the Action Area

The Puget Sound ESU of Chinook salmon includes all naturally spawned populations from rivers and streams flowing into Puget Sound, including the Strait of Juan de Fuca from the Elwha River eastward, and rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington, as well as 26 artificial propagation programs.

The Nooksack River, which is located approximately 4 miles northwest of the Project, carries early-timed (spring) and late-timed (fall) stocks of Chinook salmon. Three additional Chinook salmon-bearing streams are located in the vicinity of the Action Area, including Squalicum Creek and Whatcom Creek approximately 1 and 1.5 miles (respectively) to the northwest and Padden Creek approximately 1 mile to the south (WDFW 2008). These streams all carry fall stocks. Adult Chinook salmon use much of Puget Sound during their migration to and from the open ocean and their upriver spawning grounds. Adults are opportunistic pelagic feeders and their diets consist of smaller forage fish such as herring, surf smelt, and sand lance as well as squid, larval crabs, and pelagic amphipods.

Peak river entry for spring Chinook adults is May to June and for fall Chinook is August and September (NNR et al. 2005). Juvenile outmigration generally occurs as early as December and January, peaks in May, and continues through June and July (Sjolseth et al. 1968; PI Engineering and Anchor 1999; NNR et al. 2005).

A study by Ballenger (1996) captured wild subyearling Chinook infrequently in Bellingham Bay during beach seining efforts in September and October of 1995. Ballenger (1996) captured two juvenile Chinook in 14 sets in September, while no juvenile Chinook were captured between October and December. Rice (2004) sampled by surface townet for juvenile Chinook on six monthly sampling trips at six sampling sites in Bellingham Bay from May through October 2003. Juvenile Chinook were present in townet catches during all sampling trips except the October trip, which was cut short due to weather. At the sampling site located just offshore of Whatcom Creek, no juvenile Chinook were caught in May, 18 fish were caught in July, 22 in August, and 4 in October. The Lummi Nation has unpublished data from research wherein Chinook have been captured in the nearshore area of Boulevard Park, but no further details are available at this time (Kruse, pers. comm. 2010).

Based on the above information, adult Chinook could be present in the offshore waters near the Project mainly in the summer and fall (outside of the work window) prior to their upriver migration, but are not expected in the nearshore. Juvenile Chinook salmon would be expected to use the nearshore areas of the Action Area as they migrate out of their natal streams and rivers, and past sampling indicates that they could be present in the Action Area outside the work window.

5.3.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects on fish in Section 5.2, the effect determination is that this project **may affect, and is likely to adversely affect Puget Sound Chinook salmon.**

The "may affect" determination is appropriate for these reasons:

- Short-term water quality effects to listed Chinook and their forage fish will be discountable or insignificant.
- Short-term effects to Chinook via disturbance of the forage fish and epibenthic prey community are expected to be insignificant and/or discountable.
- Long-term effects to substrate characteristics are not expected to change foraging conditions for Chinook to the extent that the overall quality of prey resources would be significantly impacted.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place during construction to further reduce effects on listed Chinook salmon.
- Removal of existing in-water and overwater structures will result in a long-term beneficial effect to Chinook salmon and their habitats in the Action Area.

The "likely to adversely affect" call is appropriate for these reasons:

- Information reviewed for this BA indicates that listed Chinook could be present in the Action Area inside the in-water work window. Thus, elevated noise levels during construction will occur with the risk that fish that are present could experience effects that are not discountable or insignificant.

The basis for this conclusion, within the context of the Section 7 regulations listed above, is that effect determinations for listed species are made at the individual level, and in-water work would occur with the risk that juvenile Chinook that are present could experience behavioral effects from noise that are not discountable or insignificant. Noise effects may cause impairment or disruption of normal behavioral patterns, with a comparable risk of impact to listed fish that may be present. Thus, a "may affect, likely to adversely affect" determination is appropriate.

5.3.3 Designated Critical Habitat

The *Final Rules Designating Critical Habitat for 12 Evolutionarily Significant Units (ESUs) of Pacific Salmon and Steelhead in Washington, Oregon, and Idaho* were published on September 2, 2005 (50 CFR Part 226), and became effective on January 2, 2006. This designation includes the Puget Sound ESU of Chinook salmon, which is currently listed as threatened under the ESA.

Critical habitat is designated for areas containing the physical and biological habitat features, or primary constituent elements (PCEs) essential for the conservation of the species or that require special management considerations. PCEs include sites that are essential to supporting one or more life stages of the ESU and that contain physical or biological features essential to the conservation of the ESU. Specific sites and features designated for Puget Sound Chinook salmon include the following:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning incubation and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes supporting growth and maturation.

In setting critical habitat designations, the conservation value of each habitat area was considered in the context of the productivity, spatial distribution, and diversity of habitats across the range of five geographical regions of correlated risk. Critical habitat was designated on the basis of the physical and biological habitat requirements of Puget Sound Chinook salmon, consistent with the PCEs identified for Pacific salmon and steelhead, as described above. The inshore extent of this critical habitat is defined by the line of MHHW. The offshore extent of critical habitat for marine nearshore areas is to the depth of -33 feet relative to MLLW (average of all the lower low water heights of the two daily tidal levels), an area that generally coincides with the maximum depth of the photic zone in Puget Sound.

Critical Habitat Presence in the Action Area

Designated critical habitat in the Action Area includes Puget Sound marine areas. The habitat within the Action Area provides PCEs 5 and 6: nearshore and offshore marine areas. Based on the environmental baseline information presented in Section 4, nearshore critical habitat is functioning properly. Aquatic nearshore habitat contains substrates, eelgrass, and macroalgae that support epibenthic invertebrate colonization. Offshore marine critical habitat contains the waters of Puget Sound, which, as described in Section 4.2.1, are generally functioning in the Action Area.

Critical Habitat Effects Analysis and Determination

Based on the guidance and definitions provided above and the previously discussed Project effects on fish in Section 5.2, the effect determination for critical habitat is that this project **may affect, but is not likely to adversely affect, designated critical habitat for Puget Sound Chinook salmon.**

The “may affect, not likely to adversely affect” determination is appropriate for these reasons:

- Noise and water quality effects to the water column within Chinook critical habitat during construction will be short-term and limited to the construction period.
- Short-term effects to Chinook critical habitat via physical disturbance of the forage fish and epibenthic prey community during construction (e.g., pile driving or removal) are expected to be insignificant and/or discountable.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place to further reduce effects during construction on Chinook critical habitat.

- Long-term effects to substrate characteristics are not expected to change foraging conditions for Chinook to the extent that the overall quality of prey resources in Chinook critical habitat would be significantly impacted.
- Long-term light limitations in nearshore critical habitat are not expected to result in significant behavioral effects to Chinook or result in significant degradation of critical habitat.
- Removal of existing in-water and overwater structures and creosote-treated piling will result in a long-term beneficial effect to Chinook and their habitats in the Action Area.

The basis for this conclusion is that the likelihood of the potential effects to critical habitat can be discounted and/or their extent can be labeled as insignificant.

5.4 Steelhead (*Oncorhynchus mykiss*)

Puget Sound steelhead were listed as threatened on May 11, 2007 (72 FR 26722).

5.4.1 Species Information and Presence in the Action Area

The Puget Sound DPS of steelhead includes all naturally spawned anadromous winter-run and summer-run populations, in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks.

In addition to the Nooksack River, three steelhead-bearing streams are located in the vicinity of the Action Area including Squalicum Creek and Whatcom Creek approximately 1 and 1.5 miles (respectively) to the northwest and Padden Creek approximately 1 mile to the south (WDFW 2008).

Puget Sound steelhead exhibit two life history types (winter run and summer run) that are defined based on the timing of adult returns to their natal spawning streams and by their degree of sexual development at the time they enter freshwater (NMFS 2005). The Puget Sound DPS, including the Nooksack River population, is primarily composed of winter steelhead stocks, but also includes several small stocks of summer steelhead occupying limited habitat. The three creeks noted above all carry winter stocks. Winter run, or ocean-maturing, steelhead enter freshwater between November and April at an advanced stage of maturation and spawn shortly thereafter, usually from March through June. Summer run, or stream-maturing, steelhead enter freshwater in a sexually immature condition, usually between May and October. These summer run steelhead remain in freshwater for several months before reaching maturity and spawning between January and April. Juvenile steelhead outmigrate from freshwater between mid-March and early June. Juvenile steelhead enter marine waters at a much larger size and have a higher rate of survival than other salmonid species. The majority of steelhead smolts appear to migrate directly to the open ocean and do not rear extensively in the estuarine or coastal environments (Burgner et al. 1992).

Unlike other species of Pacific salmonids, some steelhead do not die after spawning and are capable of repeat spawning. Only a small percentage of steelhead (an average of 8% overall among West Coast populations [Busby et al. 1996]) return to the spawning grounds for more than 1 year. Those steelhead that survive after spawning (mostly females) will outmigrate to the marine environment. These fish are capable of moving offshore in marine waters very soon after migrating from the river. Repeat spawners may return after 1 or 2 more years at sea.

Recent sampling in the Puget Sound nearshore supports the general life history model that juvenile steelhead use of the nearshore is very limited. Available data from townet sampling (deeper nearshore) and beach seine sampling (shallow nearshore) efforts around Puget Sound have reported the capture of few steelhead. In townet sampling in North and South Puget Sound, NMFS captured a total of 18 steelhead (Rice unpublished data). The total sampling effort was not available, but the mean steelhead catch ranged from 0 to 0.2 per net in North Puget Sound and 0.1 to 0.8 per net in South Puget Sound.

Beach seine sampling in Bellingham Bay (North Puget Sound) also captured few steelhead (Lummi Nation unpublished data). The Bellingham Bay research reported the capture of two juvenile steelhead salmon in 336 sets between February 14 and December 1, 2003. The steelhead were captured in the eastern portion of Bellingham Bay.

This information, coupled with information on general steelhead life history and river populations in the vicinity, suggests that juvenile steelhead presence would be extremely rare in the Action Area. Adult steelhead could be present at any time of year, but would likely only be present in offshore waters, and not in the shallow water near the Project.

5.4.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects on fish in Section 5.2, the effect determination is that this project **may affect, but is not likely to adversely affect Puget Sound steelhead.**

The "may affect, not likely to adversely affect" call is appropriate for these reasons:

- Juvenile steelhead are expected to be extremely rare in the Action Area and are unlikely to be present at any time of year. Adult steelhead are highly unlikely to occur in the Action Area. In addition, in-water work will occur during the approved in-water work window for the area when steelhead are even less likely to be present.
- Short-term water quality effects will be discountable or insignificant.
- Short-term effects to steelhead via disturbance of the forage fish and epibenthic prey community are expected to be insignificant and/or discountable.
- Removal of existing in-water and overwater structures will result in a long-term beneficial effect to habitat for any steelhead that may occur in the Action Area.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place during construction to further reduce effects on any steelhead that may occur in the Action Area.

The basis for this conclusion is that the likelihood of the potential effects can be discounted and/or their extent can be labeled as insignificant.

5.4.3 Critical Habitat

Critical habitat has not been proposed or designated for Puget Sound steelhead, but NMFS reports that it is "under development"[5]. Should critical habitat be proposed or designated in

[5] As noted here: http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/Index.cfm

the future prior to Project initiation or completion, Project effects would be evaluated at that time.

5.5 Green Sturgeon (*Acipenser medirostris*)

The southern DPS of green sturgeon was listed as threatened on April 7, 2006 (71FR 17757).

5.5.1 Species Information and Presence in the Action Area

Green sturgeon are anadromous, and when not spawning, spend the majority of their lives in oceanic waters, bays, and estuaries. The southern DPS of green sturgeon spawns in the Sacramento River (Adams et al. 2002); are found along the west coasts of Mexico, the United States, and Canada; and are found in all marine areas of Washington (Wydoski and Whitney 2003). They are known to enter Washington estuaries during summer when estuary water temperatures are more than 2°C warmer than adjacent coastal water (Moser and Lindley 2007). Early life-history stages reside in freshwater, with adults returning to freshwater to spawn. Spawning is believed to occur every 2 to 5 years (Moyle 2002). Adults typically migrate into freshwater beginning in late February; spawning occurs from March to July, with peak activity from April to June (Moyle et al. 1995). Juvenile green sturgeon spend 1 to 4 years in fresh and estuarine waters before dispersal to saltwater (Beamesderfer and Webb 2002). They disperse widely in the ocean after their out-migration from freshwater (Moyle et al. 1992). Diet information for adult green sturgeon is sparse, but indicates that benthic invertebrates, including shrimp, mollusks, amphipods, and small fish, are key food sources (Moyle et al. 1992).

Observations of green sturgeon in the Puget Sound region are much less common compared to coastal estuaries in Washington such as the Columbia River estuary, Grays Harbor, and Willapa Bay. Although two confirmed Southern DPS fish were detected in Puget Sound in 2006, the extent to which Southern DPS green sturgeon use Puget Sound remains uncertain and very few green sturgeon have been observed there (USDOC 2009; DeLacy et al. 1972; Miller and Borton 1980). In addition, Puget Sound does not appear to be part of the coastal migratory corridor that Southern DPS green sturgeon use to reach overwintering grounds north of Vancouver Island (pers. comm. with Steve Lindley, NMFS, and Mary Moser, NMFS, February 24–25, 2008, *as cited in* USDOC 2009). There are no green sturgeon concentrations or spawning areas in Puget Sound. Therefore, the presence of green sturgeon in the Action Area is considered extremely unlikely.

5.5.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA above and the distribution information, the effect determination is that this project **will have no effect on Southern DPS green sturgeon.** The "no effect" determination is appropriate because the presence of green sturgeon in the Action Area and the chance of potential Project effects to these animals is so unlikely as to be considered no effect.

5.5.3 Designated Critical Habitat

On October 9, 2009, NMFS designated critical habitat for the Southern DPS of green sturgeon (50 CFR Part 226), which is currently listed as threatened under the ESA. However, Puget Sound was excluded from this critical habitat designation, and therefore, there is no critical habitat in the Action Area.

5.6 Pacific Eulachon (*Thaleichthys pacificus*)

The Southern DPS of Pacific eulachon was listed as threatened on March 18, 2010 (75 FR 13012).

5.6.1 Species Information and Presence in the Action Area

Pacific eulachon, or "Columbia River smelt" (Penttila 2007) range from northern California to Alaska and the Bering Sea. In Washington, most eulachon are found in the Columbia River basin; Washington rivers outside the Columbia Basin where eulachon have been known to spawn include the coastal rivers: Bear, Naselle, Nemah, Wynoochee, Quinault, and Queets Rivers (Wydoski and Whitney 2003; WDFW and ODFW 2001). Eulachon are infrequently located farther south in Puget Sound (Wydoski and Whitney 2003; Penttila 2009). They are not found in the Nooksack River, contrary to erroneous reports found in some documents (FR 2010; Penttila, pers comm. 2010).

Eulachon are planktivorous. Larvae and juveniles consume phytoplankton, zooplankton, ostracods, worm larvae, and eulachon larvae, while juveniles and adults consume euphausiids, copepods, and other planktonic organisms (WDFW and ODFW 2001).

Eulachon migrate from saltwater into coastal streams to spawn. Usually, adults only migrate a short distance up coastal streams to spawn, and all fish die soon after spawning. After spawning, larvae move to saltwater, rearing for 3 or 4 years, and then return to spawn. Further details of their use of saltwater habitats are unknown.

Based on this information, eulachon are not expected in the Action Area.

5.6.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA above and the distribution information, the effect determination is that this project **will have no effect on the Southern DPS of Pacific eulachon.** The "no effect" determination is appropriate because the presence of Pacific eulachon in the Action Area and the chance of potential Project effects to these animals is so unlikely as to be considered no effect.

5.6.3 Critical Habitat

Critical habitat has not been proposed for the Southern DPS of Pacific eulachon. If critical habitat for these fish is either proposed or designated in the future, the potential effects to critical habitat would need to be evaluated once critical habitat is defined and the PCEs are described for this species.

5.7 Bocaccio (*Sebastes paucispinus*)

The Georgia Basin DPS of bocaccio (rockfish) was listed as endangered on April 28, 2010 (75 FR 22276).

5.7.1 Species Information and Presence in the Action Area

Bocaccio are large Pacific coast rockfish that are found from Baja California to Alaska, most commonly between Oregon and northern Baja California. In Puget Sound, most bocaccio are found south of the Tacoma Narrows and have always been rare in North Puget Sound (Drake et al. 2008, *as cited in* USDOC 2009). In the Strait of Georgia, bocaccio have been documented in some inlets, but records are occasional and the distribution of bocaccio in inshore waters is not well understood (COSEWIC 2002).

Bocaccio are live-bearers, and larvae are found in surface waters, distributed over a wide area extending far offshore (Moser 1996). Larval and juvenile bocaccio feed on zooplankton, while adults eat epibenthic invertebrates and small fishes, including other species of rockfish (Eschmeyer et al. 1983).

Bocaccio are most commonly found between 160 and 820 feet in depth, but may be found as deep as 1,560 feet (Feder et al. 1974; Love et al. 2002). Juveniles and subadults are more common than adults in shallower water, and bocaccio are known to school in nearshore waters as juveniles (McCall and He 2002). Adults are generally associated with rocky areas and outcrops, but some are also frequently found in areas lacking hard substrate (USDOC 2009).

Based on the geographical range information presented above, bocaccio would be rare in the Action Area, but could occur there. If present, adults could occur in the deeper waters of the Action Area and juvenile bocaccio could occur in shallower waters of the Action Area.

5.7.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA, species distribution information, previously discussed Project effects on fish in Section 5.2, and the rationale given for juvenile Chinook salmon in Section 5.3.2, it is concluded that this project **may affect, and is likely to adversely affect the Georgia Basin DPS of bocaccio**. Effect determinations for listed species are made at the individual level, and in-water work would occur with the risk that bocaccio that are present could experience behavioral effects from noise that are not discountable or insignificant. Thus, a "may affect, likely to adversely affect" determination is appropriate.

5.7.3 Critical Habitat

Critical habitat has not been proposed for Georgia Basin bocaccio. If critical habitat for these fish is either proposed or designated in the future, the potential effects to critical habitat would need to be evaluated once critical habitat is defined and the PCEs are described for this species.

5.8 Yelloweye Rockfish (*Sebastes ruberrimus*)

The Georgia Basin DPS of yelloweye rockfish was listed as threatened on April 28, 2010 (75 FR 22276).

5.8.1 Species Information and Presence in the Action Area

Yelloweye rockfish are very large Pacific coast fish that are found from northern Baja California to the Aleutian Islands, Alaska, but are most common from central California northward to the Gulf of Alaska (Eschmeyer et al. 1983). In Puget Sound, yelloweye rockfish are more frequently observed in North Puget Sound than in South Puget Sound (Miller and Borton 1980), likely due to the larger amount of rocky habitat in North Puget Sound.

Similar to other rockfish, yelloweye rockfish are live-bearers, and larvae are found in surface waters (Moser 1996). Also similar to bocaccio, juvenile yelloweye rockfish feed on zooplankton and adults eat epibenthic invertebrates and small fishes (Eschmeyer et al. 1983; Love et al. 2002).

Yelloweye rockfish occur in waters 80 to 1,560 feet deep (Orr et al. 2000), but are most commonly found between 300 to 590 feet in depth (Love et al. 2002). They are typically associated with high relief zones with crevices and complex rock habitats (Love et al. 1991; Richards 1986).

Based on the depth and substrate preferences presented above, it would be highly unlikely that adult yelloweye rockfish would occur in the Action Area. Juvenile yelloweye rockfish could be present in shallower waters of the Action Area.

5.8.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA, species distribution information, previously discussed Project effects on fish in Section 5.2, and the rationale given for juvenile Chinook salmon in Section 5.3.2, it is concluded that this project **may affect, and is likely to adversely affect the Georgia Basin DPS of yelloweye rockfish**. Effect determinations for listed species are made at the individual level, and in-water work would occur with the risk that yelloweye rockfish that are present could experience behavioral effects from noise that are not discountable or insignificant. Thus, a "may affect, likely to adversely affect" determination is appropriate.

5.8.3 Critical Habitat

Critical habitat has not been proposed for Georgia Basin yelloweye rockfish. If critical habitat for these fish is either proposed or designated in the future, the potential effects to critical habitat would need to be evaluated once critical habitat is defined and the PCEs are described for this species.

5.9 Canary Rockfish (*Sebastes pinninger*)

The Georgia Basin DPS of canary rockfish was listed as threatened on April 28, 2010 (75 FR 22276).

5.9.1 Species Information and Presence in the Action Area

Canary rockfish are large Pacific coast fish that are distributed from Baja California to the Gulf of Alaska (Boehlert 1980; Mecklenburg et al. 2002). These fish are most common off the coast of central Oregon (Richardson and Laroche 1979). They were once common in the greater Puget Sound area (Holmberg et al. 1967), but are now rare.

Similar to other rockfish, canary rockfish are live-bearers, and larvae are found in surface waters over a wide area (Moser 1996). Also, similar to bocaccio, juvenile canary rockfish feed on zooplankton and adults eat epibenthic invertebrates and small fishes (Eschmeyer et al. 1983; Love et al. 2002).

Canary rockfish most commonly inhabit waters 160 to 820 feet deep (Orr et al. 2000), but may be found up to 1,400 feet in depth (Boehlert 1980).

Based on the depth and abundance information presented above, canary rockfish would be rare in the Action Area, but could occur there. If present, adults could occur in the deeper waters of the Action Area and juvenile canary rockfish could occur in shallower waters of the Action Area.

5.9.2 Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA, species distribution information, previously discussed Project effects on fish in Section 5.2, and the rationale given for juvenile Chinook salmon in Section 5.3.2, it is concluded that this project **may affect, and is likely to adversely affect the Georgia Basin DPS of canary rockfish**. Effect determinations for listed species are made at the individual level, and in-water work would occur with the risk that canary rockfish that are present could experience behavioral effects from noise that are not discountable or insignificant. Thus, a "may affect, likely to adversely affect" determination is appropriate.

5.9.3 Critical Habitat

Critical habitat has not been proposed for Georgia Basin canary rockfish. If critical habitat for these fish is either proposed or designated in the future, the potential effects to critical habitat would need to be evaluated once critical habitat is defined and the PCEs are described for this species.

5.10 Southern Resident Killer Whale (*Orcinus orca*)

On November 15, 2005, NMFS listed the Southern Resident DPS of killer whale (also known as orca whales) as endangered under the ESA (Federal Register 70, No. 222, 69903).

5.10.1 Species Information and Presence in the Action Area

The Southern Resident killer whale group has been established as a DPS and a stock under the Marine Mammal Protection Act of 1972; this group contains the pods, or groups, of J pod, K pod, and L pod, and was estimated to include approximately 85 individuals in 2009 (Center for Whale Research 2009).

The geographic distribution of Southern Resident killer whales year-round is in the coastal waters off Oregon, Washington, Vancouver Island, and off the coast of central California and the Queen Charlotte Islands (Center for Biological Diversity 2001). In the summer, Southern Residents are typically found in the Georgia Strait, Strait of Juan de Fuca, and the outer coastal waters of the continental shelf. In the fall, the J pod migrates into Puget Sound, while the rest of the population makes extended trips through the Strait of Juan de Fuca. In the winter, the K and L pods retreat from inland waters and are seldom detected in the core areas until late spring. The J pod generally remains in inland waterways throughout the winter, with most of their activity in Puget Sound. Other winter movements and range of Southern Residents are not well understood.

Killer whales use the entire water column, including regular access to the ocean surface to breathe and rest (Bateson 1974; Herman 1991). They remain underwater 95% of the time, with 60 to 70% of their time spent between the surface and a depth of 20 meters, while diving regularly to depths of more than 200 meters (Baird 1994; Baird et al. 1998). Southern Residents spend less than 5% of their time between depths of 60 and 250 meters (Center for Biological Diversity 2001). Time-depth recorder tagging studies of Southern Residents have documented that whales regularly dive to greater than 150 meters, but that there is a trend toward a greater frequency of shallower dives in recent years (Baird and Hanson 2004).

Southern Resident killer whales primarily feed on salmon (Balcomb et al. 1980; Bigg et al. 1987). Chinook salmon dominate their diet, making up 78% of identified prey. Chum salmon (11%) are also a significant prey source, especially in autumn. Other species eaten include coho salmon (5%), steelhead (2%), sockeye salmon (1%), and non-salmonids such as herring and rockfish (3% combined) (several sources *cited in* NMFS 2008a).

The Whale Museum in Friday Harbor, Washington, provides the most up-to-date verified scientific information on killer whale sightings in Puget Sound (Osborne 2009). The museum keeps a database of verified sightings by location "quads." The Project in-water Action Area includes quads 200 through 206. Since the inception of the database in 1990, there have been 41 recorded orca sightings, with a majority of the sightings located approximately 4 miles to the southwest in quads 200 and 205 (Whale Museum 2009). Orcas are not frequently spotted in Bellingham Bay due to the shallow tideflats that typify the marine environment. Based on their known distribution and this information, killer whales could conceivably occur in the Action Area; however, they would be highly unlikely to be there.

5.10.2 Direct and Indirect Effects to Species

Effects on killer whales were considered based on risk factors listed in the killer whale recovery plan (NMFS 2008a). Potential Project effects include temporary effects on killer whales' food supply (primarily salmon), noise effects, and water quality.

Prey Resources

Effects to salmon (discussed earlier in this BA in Section 5.2) include noise, potential turbidity, and prey item disturbance. Larger Chinook, the killer whales' favored food source (78% of diet; NMFS 2008a), are unlikely to be present in the Action Area during construction. Other salmonids only form a small proportion of killer whale diets: steelhead, coho, and sockeye form 2, 5, and 1% of typical killer whale diets, respectively (NMFS 2008a). Rockfish and Pacific herring could be present near the Project, but also comprise a small percent of typical killer whale diets (3% combined; NMFS 2008a). Effects to killer whales via effects to prey resources are expected to be insignificant or discountable for the following reasons: killer whales are highly unlikely to be present in the Action Area; very few killer whale prey items are expected to be present; and those prey items that may be present comprise a small overall proportion of killer whale diets.

Noise Effects

In-water noise conditions in part of the Action Area will be elevated from ambient conditions during construction due to use of mechanical equipment in the upland and overwater, and in-water pile driving and removal, with impact pile driving expected to produce the loudest in-water sound pressures. In-water noise conditions have the potential to disturb killer whales that may be present in this area. For cetaceans, NMFS currently recognizes an underwater noise disturbance threshold for impact pile driving activities of 160

dB_{RMS}, and an in-water injury threshold of 180 dB_{RMS} (WSDOT 2009; FHWG 2008). As discussed in Section 2.8, Project in-water noise is expected to extend to 179 dB_{RMS} or 202 dB_{PEAK} with the use of a bubble curtain during impact pile driving, which is above the 160 dB_{RMS} disturbance threshold but below the 180 dB_{RMS} injury threshold. It is estimated that in-water sound pressures from impact pile driving will decrease to the disturbance threshold of 160 dB_{RMS} approximately 0.5 miles from the Project[6]. Killer whales that may be present within this 0.5-mile in-water distance during construction could be exposed to disturbance levels of noise. However, as discussed in Section 5.10.1, distribution information for killer whales indicates it is highly unlikely that killer whales would be present within this zone or the Action Area as a whole during construction. Therefore, it is concluded that the likelihood of noise impacts to killer whales are so small that they can be considered discountable.

With regard to vibratory pile driving, NMFS is currently in the process of revising its noise thresholds for behavioral harassment (as defined in 50 CFR 216.3[7]) of marine mammals for non-pulse noise such as that produced from vibratory pile driving (75 FR 11130-11131); based on discussions with agency personnel, the new threshold is anticipated to be 120 dB. As discussed in Section 2.8 of this document, in-water non-pulse noise from vibratory hammers in the Project is estimated at approximately 177 dB_{RMS} and 180 dB_{PEAK}, and ambient in-water noise in the Action Area is expected to extend to approximately 135 dB_{RMS}. Thus, non-pulse noise from vibratory hammers is anticipated to be above the ambient level in the area. However, as discussed above, distribution information for killer whales indicates it is highly unlikely that killer whales would be present within the Action Area as a whole during construction. Therefore, it is concluded that the likelihood of non-pulse noise impacts to killer whales is so small that it can be considered discountable.

Water Quality

There is a chance that other short-term water quality effects could occur related to fuel or contaminant spills; however, BMPs and other measures will be in place to minimize the

[6] For the limit of disturbance, $R_1 = (10^{([189-160]/15)})(10)$ = 858 meters or 0.5 mile.

[7] Level B Harassment means any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild. Read more: http://cfr.vlex.com/vid/216-3-definitions-19895003#ixzz0l7k4K6cL

potential for these to occur and to minimize the effect if they do occur. These effects are therefore expected to be insignificant.

5.10.3 Effects Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects, the effect determination is that this project **may affect, but is not likely to adversely affect Southern Resident killer whales.**

The "may affect, not likely to adversely affect" determination is appropriate for these reasons:

- Historical whale sighting records suggest that it is highly unlikely that Southern Resident killer whales would be present in or near the Action Area.
- Effects to killer whales via disturbance of prey species can be considered insignificant.
- Short- and long-term effects to killer whales due to noise can be considered discountable.
- Water quality effects are expected to be insignificant.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place to further reduce effects on listed killer whales.

The basis for this conclusion is that the likelihood of the potential effects can be discounted and/or their extent can be labeled as insignificant.

5.10.4 Designated Critical Habitat

On November 29, 2006, NMFS published final rules for designating critical habitat for the Southern Resident killer whale DPS. Critical habitat includes the Summer Core Area in Haro Strait and waters around the San Juan Islands, Puget Sound, and the Strait of Juan de Fuca, which comprise approximately 2,560 square miles of marine habitat. Extremely shallow waters of Puget Sound (shallower than -20 feet MLLW) are not considered to be within the geographical area occupied by the species and are therefore not included in the critical habitat designation (71 F 229, 69068).

Critical habitat is designated for areas containing the physical and biological habitat features, or PCEs, essential for the conservation of the species or that require special management considerations. PCEs include sites that are essential to supporting one or more life stages of the DPS and that contain physical or biological features essential to the conservation of the DPS. Specific sites and features designated for Southern Resident killer whale DPS include the following:

1. Water quality to support growth and development
2. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth
3. Passage conditions to allow for migration, resting, and foraging

Critical Habitat Presence in the Action Area

The Action Area lies within the Puget Sound area of killer whale critical habitat, and provides all three of the above PCEs. Construction of the proposed Project will occur in water depths extending from the shoreline to -25 feet MLLW, which overlaps slightly with areas designated as critical habitat.

Critical Habitat Effects Analysis and Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects, the effect determination for critical habitat is that this project **may affect, but is not likely to adversely affect Southern Resident DPS killer whale critical habitat.**

The "may affect, not likely to adversely affect" determination is appropriate for these reasons:

- Historical whale sighting records suggest that it is highly unlikely that Southern Resident killer whales would be present in or near the Action Area.
- Effects to killer whale critical habitat via disturbance of prey species can be considered insignificant.
- Short- and long-term effects to killer whale critical habitat due to noise can be considered discountable.
- Water quality effects to critical habitat are expected to be insignificant.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place to further reduce effects on listed killer whales.
- The overwater walkway will be located in an embayment with water depths extending from the shoreline to -25 feet MLLW, which is within killer whale critical

habitat; however, there are no known records of killer whales using the Project embayment, and killer whales are not typically found in Bellingham Bay due to the shallow tideflats that typify the marine environment in this area.

The basis for this conclusion is that potential Project effects may occur ("may affect"), but are not expected to jeopardize the continued existence of the Southern Resident DPS or result in the destruction or adverse modification of critical habitat ("not likely to adversely affect"), for the reasons listed above.

5.11 Humpback Whale (*Megaptera novaeangliae*)

On June 2, 1970, NMFS listed the humpback whale as endangered under the ESA (35 FR 8491 8498).

5.11.1 Species Information and Presence in the Action Area

Humpback whales are typically sighted off the outer coast of central California and southeastern Alaska (NMFS 1991). Several humpback whale sightings are reported in central and south Puget Sound annually, but this use is usually short-term; major humpback whale breeding, feeding, and migration areas are in Mexican and Hawaiian waters, Alaska, and the Washington coast (Calambokidis et al. 1996). Due to their scarcity, humpbacks have not been systematically surveyed in Puget Sound; therefore, there does not exist a scientific data set with which to document their return to inland waters of the Georgia Basin (Falcone et al. 2005). However, Falcone et al. (2005) report that volunteer sighting networks such as the Orca Network[8] allow individuals to report whale activity visible to humans. Falcone et al. (2005) state that most reports of humpback whales were made by naturalists aboard whale watching vessels and can be considered reliable in terms of species identification. Inexperienced observers, particularly those that are shore-based, are most likely to misidentify a humpback as a gray whale, which are common in some areas during the late spring. In this case, the number of humpbacks reported might actually be an underestimate. Therefore, in the absence of systematic surveys, the Orca Network is the best available information for recent humpback whale sightings.

[8] http://www.orcanetwork.org/sightings/archives.html

Humpback whales forage either at or below the water surface. Humpback whales feed on benthic and pelagic organisms including euphausiids, copepods, and other crustacean zooplankton; small schooling fish such as sand lance and herring; and salmonids, pollock, capelin, and some cephalopod mollusks (Perry et al. 1999; Frost and Lowry 1981). Simenstad et al. (1979) listed four species of euphausiids and four species of small schooling fish found in stomachs of humpback whales taken in the eastern North Pacific Ocean.

In 2008 and 2009, humpbacks were sighted via the Orca Network at various locations in North Puget Sound and the San Juan Island archipelago (Orca Network 2010). The closest of these (Deception Pass) is approximately 20 miles by water from Bellingham Bay. In general, sightings of whales in North Puget Sound and the archipelago are on the west side of Whidbey and Guemes Islands.

5.11.2 Direct and Indirect Effects to Species

Effects on humpback whales from the Project were considered based on risk factors discussed in the humpback whale recovery plan (NMFS 1991). Potential Project effects include those relating to noise, water quality, and prey species. Effects based on in-water noise were discussed in Section 5.10, related to killer whales, and would be expected to also be insignificant for humpback whales since the noise thresholds are the same for all cetaceans (WSDOT 2009) and humpback whales would be even less likely to be near the overwater walkway during construction. Likewise, effects due to water quality would be expected to be similarly insignificant.

In addition to the discountability and insignificance of these effects, historical whale sighting records and humpback whale life history suggest that it is extremely unlikely that humpback whales would be present in or near the Action Area. Therefore, these effects are even less likely to occur and may be considered as no effect.

5.11.3 Effects Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects, the effect determination is that this project **will have no effect on humpback whales.** The “no effect” determination is appropriate because the presence of humpback whales in the Action Area and the chance of potential Project effects to humpback whales is so unlikely as to be considered no effect.

5.11.4 Critical Habitat

No critical habitat has been designated for humpback whales.

5.12 Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions were listed as threatened on April 10, 1990 (62 Fed Reg 30772-30723).

5.12.1 Species Information and Presence in the Action Area

Steller sea lions feed in open water habitat from nearshore areas to the edge of the continental shelf (WDW 1993). Diet studies conducted over the past 15 years show that Steller sea lions eat a variety of fishes and invertebrates; demersal and off-bottom schooling fishes predominate (Jones 1981; Pitcher 1981), while harbor seals and other pinnipeds are occasionally eaten (Pitcher and Fay 1982). Principal prey identified in stomachs and scats collected in British Columbia included hake, herring, octopus, Pacific cod, rockfish, and salmon (Olesiuk et al. 1990). Rockfish and hake are consistently important components of Steller sea lions' diets (WDW 1993).

Adult Steller sea lions congregate at rookeries on the outer coast for pupping and breeding from late May to early June (Gisiner 1985). Rookeries are usually located on beaches of relatively remote islands, often in areas exposed to wind and waves, where access by humans and other mammalian predators is difficult (WDW 1993).

Steller sea lions occur year-round in Washington waters, but do not breed in Washington (NMFS 1992). Their numbers in Washington decline during summer months, which corresponds to the breeding season at Oregon and British Columbia rookeries. No Steller sea lion haulout sites are located within the vicinity of the Project or in the Action Area (WDFW 2000a). Common haulouts in the region are the Sucia Island in the San Juan archipelago and Race Rocks off Vancouver Island (WDFW 2000a), approximately 18 miles and 55 miles overwater, respectively, from Bellingham Bay.

5.12.2 Direct and Indirect Effects to Species

Effects on Steller sea lion from the Project were considered based on risk factors discussed in the Steller sea lion recovery plan (NMFS 2008b). Potential Project effects include those relating to noise, water quality, and prey species. The recovery plan notes that short-term noise effects include sea lions hauled out on land re-entering the water and long-term noise effects include potential abandonment of haulout areas (NMFS 2008b).

Short-and long-term in-water noise effects were discussed in Section 5.10, related to killer whales, and would be expected to also be insignificant for Steller sea lions since the noise disturbance thresholds are the same for pinnipeds as for cetaceans (160 dB_{RMS}; WSDOT 2009) and Steller sea lions would be similarly unlikely to be in the Action Area or vicinity during construction. Short-term in-air noise is expected to extend to 110 dBA, and based on the airborne noise calculating method used in Section 2.5 of this document, would decrease to the 100 dB_{RMS} in-air noise disturbance threshold for sea lions within approximately 150 feet. Long-term in-air noise effects are not expected because there are no haulout areas identified in or near the Action Area. Effects due to water quality would be expected to be insignificant, as for killer whales and other aquatic species considered in this BA.

In addition to the discountability and insignificance of these effects, historical Steller sea lion sighting records and life history suggest that it is extremely unlikely that Steller sea lions would be present in or near the Action Area. Therefore, effects of the Project on Steller sea lions are considered even less likely to occur and may be considered no effect.

5.12.3 Effects Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects, the effect determination is that this project **will have no effect on Steller sea lions.** The "no effect" determination is appropriate because the presence of Steller sea lions in the Action Area and the chance of potential Project effects impacting Steller sea lions is so unlikely as to be considered no effect.

5.12.4 Designated Critical Habitat

No critical habitat has been designated for Steller sea lion in Washington. Critical habitat is associated with breeding and haulout areas in Alaska, California, and Oregon.

5.13 Bull Trout (*Salvelinus confluentus*)

Bull trout were listed as threatened on November 1, 1999 (64 FR 58910).

5.13.1 Species Information and Presence in the Action Area

The Coastal-Puget Sound DPS of bull trout includes all Pacific Coast drainages within the State of Washington, including Puget Sound. Stocks in the vicinity of the Project include Upper and Lower Skagit stocks (WDFW 2000b).

Bull trout were originally classified with Dolly Varden (*Salvelinus malma*) under a single scientific name. In 1991, the American Fisheries Society (AFS) supported the decision to separate them into two distinct species. Information on the distribution and life history of each species is not distinct because the species are biologically similar (Bonar et al. 1997). Thus, the two are often counted as the same in surveys, as in those discussed below. Typical bull trout timing for spawning is from August through November (McPhail and Murray 1979; Pratt 1992). Resident and juvenile bull trout prey on invertebrates and small fish, and adult migratory bull trout primarily eat fish.

In northern Puget Sound, bull trout occur in the Nooksack, Skagit, Stillaguamish, and Snohomish basins. Sub-adult and adult bull trout feed mostly on fish in marine/estuarine areas of northern Puget Sound (e.g., smelt, herring, and juvenile salmonids).

The WRIA 1 salmonid Recovery Plan notes that outmigrating juvenile bull trout have been caught in the lower Nooksack River smolt trap from early April to late August (NNR et al. 2005). Outmigrants have been caught in the lower mainstem Nooksack River from early April through mid-July and would be expected in nearshore marine areas in and near Bellingham Bay (Ballenger 2000). Adults in the Nooksack population spawn from August to October (NNR et al. 2005) and would be expected in offshore areas prior to their spawning migration. However, adults would not be expected in the Action Area of the Project.

5.13.2 Direct and Indirect Effects to Species

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects on fish in Section 5.2, the effect determination is that this project **may affect, but is not likely to adversely affect the Coastal-Puget Sound DPS of bull trout.**

The "may affect, not likely to adversely affect" determination is appropriate for these reasons:

- In-water work will occur during the approved in-water work window for the area when bull trout are not likely to be present.
- Short-term water quality effects to listed bull trout and their forage fish will be discountable or insignificant.
- Short-term effects to bull trout via disturbance of the forage fish and epibenthic prey community are expected to be insignificant and/or discountable.
- Long-term effects to substrate characteristics are not expected to change foraging conditions for bull trout to the extent that the overall quality of prey resources would be significantly impacted.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place during construction to further reduce effects on listed bull trout that may occur in the Action Area.
- Long-term light limitations in the nearshore are not expected to result in significant behavioral effects to bull trout.
- Removal of existing in-water and overwater structures will result in a long-term beneficial effect to bull trout that may occur in the Action Area.

The basis for this conclusion is that the likelihood of the potential effects can be discounted and/or their extent can be labeled as insignificant.

5.13.3 Designated Critical Habitat

On September 26, 2005, the Final Rule was published designating critical habitat for the Coastal-Puget Sound DPS of bull trout (70 Fed. Reg. 56212), and the rule became effective on October 26, 2005 (50 CFR Part 17). On January 13, 2010, USFWS proposed to revise its 2005 designation. This proposal involved inclusion of various areas not included in the initial designation and exclusion of certain other areas that were included. None of these changes affect critical habitat in the Action Area. The proposal also involved inclusion of an additional PCE (#9, below) dealing with competitors and predators on bull trout.

Critical habitat designates areas that contain the physical and biological habitat features (called PCEs) essential for the conservation of a threatened or endangered species and that may require special management considerations. For an area to be included as critical habitat, it has to provide one or more of the following functions for bull trout:

1. Spawning, rearing, foraging, or overwintering habitat to support essential existing local populations.
2. Movement corridors necessary for maintaining essential migratory life history forms.
3. Suitable habitat that is considered essential for recovering existing local populations that have declined or that need to be re-established to achieve recovery.

Areas providing one or more of these functions and at least one of the following nine PCEs are designated as critical habitat:

1. Water temperatures ranging from 36 to 59° F (2 to 15° C), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade (such as that provided by riparian habitat), and local groundwater influence.
2. Complex aquatic environments with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.
3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.25 inches (0.63 centimeters) in diameter and minimal substrate embeddedness are characteristic of these conditions.
4. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull

trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.

5. Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.
6. Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
7. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
8. Sufficient water quantity and quality such that normal reproduction, growth, and survival are not inhibited.
9. Few or no nonnative predatory (e.g., lake trout, walleye) or competitive (e.g., brown trout) species present.

The inshore extent of critical habitat is defined by the line of MHHW. The offshore extent of critical habitat for marine nearshore areas is to the depth of -33 feet relative to MLLW (average of all the lower low water heights of the two daily tidal levels), an area that generally coincides with the maximum depth of the photic zone in Puget Sound.

Critical Habitat Presence in the Action Area

The Action Area lies within Critical Habitat Unit #2, Puget Sound. The PCEs provided by the area are 1, 2, 6, 7, and 8: water temperature, complex aquatic environments, migratory habitats, abundant food base, and water quality and quantity.

Based on the environmental baseline information presented in Section 4, nearshore bull trout critical habitat is functioning properly. Aquatic nearshore habitat contains substrates, eelgrass, and macroalgae that support epibenthic invertebrate colonization. Offshore marine critical habitat contains the waters of Puget Sound, which are generally fully functioning in the Action Area.

Critical Habitat Effects Analysis and Determination

Based on the guidance and definitions provided above and the previously discussed Project effects in Section 5.2, the effect determination for critical habitat is that this project **may affect, but is not likely to adversely affect, designated critical habitat for Coastal-Puget Sound bull trout.**

The "may affect, not likely to adversely affect" determination is appropriate for these reasons:

- The Project will adhere to in-water work windows and noise and water quality effects to bull trout critical habitat during construction will be discountable or insignificant.
- Short-term effects to bull trout critical habitat via disturbance of the forage fish and epibenthic prey community are expected to be insignificant and/or discountable.
- Avoidance and minimization measures, Conservation Measures, and BMPs will be in place to further reduce effects during construction for bull trout critical habitat.
- Long-term effects to substrate characteristics are not expected to change foraging conditions for bull trout to the extent that the overall quality of prey resources in bull trout critical habitat would be significantly impacted.
- Long-term light limitations in nearshore critical habitat are not expected to result in significant behavioral effects to bull trout.
- Removal of existing in-water and overwater structures will result in a long-term beneficial effect to bull trout and their habitats in the Action Area.

The basis for this conclusion is that the likelihood of the potential effects to critical habitat can be discounted and/or their extent can be labeled as insignificant.

5.14 Marbled Murrelet (*Brachyramphus marmoratus*)

The marbled murrelet was listed as threatened on October 1, 1992.

5.14.1 Species Information and Presence in the Action Area

Marbled murrelets are small seabirds that occur along the north Pacific coast. Murrelet nesting habitat exists in the Olympic and Cascade Mountains to the west and east of the Action Area, respectively (75 Fed Reg 50929); murrelets typically use habitats close to their nesting areas (Falxa and Huff 2008; USFS 2006). The nesting habits of the marbled murrelet are not well known. In contrast to most other *Alcidae* species, the marbled murrelet nest primarily in older coastal coniferous forests (Nelson 1997 *cited in* Raphael et al. 2002). Nests have been located up to 33 miles inland from saltwater, and up to 47 miles inland from freshwater lakes (WDW 1991). The nesting period is between April 1 and September 15, with peak activity occurring between July and August when adults are increasing foraging trips to feed their young.

Field observations of murrelets in Puget Sound have suggested that foraging distribution is linked to tidal patterns that increase prey availability for the birds (Speich and Wahl 1995). Murrelets forage year-round in waters generally less than 90 feet deep and are most frequently within 1,500 feet of protected shoreline waters. They typically feed on forage fish, small crustaceans, and invertebrates. High use areas for foraging murrelets include upwelling areas, mouths of bays, over underwater sills, tidal rips, narrow passages between islands, shallow banks, and kelp beds.

Marbled murrelets have been documented throughout the year in several parts of northeastern Puget Sound, including the waters of the San Juan Island complex, Whidbey Island, and near the mainland of Washington. The marbled murrelet population in this subregion begins to increase in late July through fall and winter. This has been attributed to a shift of birds immigrating from British Columbia as well as birds from the more exposed Strait of Juan de Fuca to the more protected eastern bays of Puget Sound and the San Juan archipelago (Campbell et al. 1990; Speich and Wahl 1995).

Recent marbled murrelet distribution information indicates that they could occur in the vicinity of the Project, but are unlikely to occur in the Action Area itself. WDFW PHS information for the Project location does not indicate murrelet presence in the Action Area (WDFW 2008). WDFW winter aerial surveys (on and off transect, and 2 minute grid cells) from 1993 to 2004 showed the presence of marbled murrelets area in the grid cell between Eliza Island and Fairhaven to the south with animals estimated at less than 2 birds per square kilometer (WDFW 2004a and 2004b). Based on this information and the information presented above on murrelet habitat use of marine areas, marbled murrelet use of the Action Area could involve occasional use of the area while foraging, but would be considered to be rare.

5.14.2 Direct and Indirect Effects to Species

Potential direct and indirect effects to marbled murrelets resulting from the Project include temporary in-air and in-water noise effects attributable to construction.

In-water and in-air noise conditions in part of the Action Area will be elevated from ambient conditions during construction, due to use of mechanical equipment in the upland and over water, and in-water pile driving and removal, with impact pile driving expected to produce the loudest in-water sound pressures. These noise conditions have the potential to disturb marbled murrelets that may be present nearby. The currently recognized in-air noise disturbance threshold for marbled murrelets is 70 dBA (USDOI 2006) and the in-air injury threshold is 92 dBA (WSDOT 2009). Project airborne noise is expected to extend to 110 dBA, which is above both the 70 dBA disturbance threshold and the 92 dBA injury threshold. Use of noise analysis methods described in Section 2.8 of this document results in an estimate of in-air sound levels decreasing to the injury threshold of 92 dBA at approximately 400 feet from the Project and to the disturbance threshold of 70 dBA at approximately 1.2 miles from the Project.

The underwater disturbance threshold is 150 dB_{RMS} and the in-water injury threshold is 180 dB_{PEAK} (WSDOT 2009). Project in-water noise is expected to extend to 170 dB_{RMS} or 180 dB_{PEAK} with the use of a bubble curtain during impact pile driving, which is above the 150 dB_{RMS} disturbance threshold but below the 180 dB_{PEAK} injury threshold. In-water sound pressures will decrease to the disturbance threshold of 150 dB_{RMS} at approximately 0.1 miles from the Project[9].

Based on this information, foraging marbled murrelets that could be present within this 1.2-mile airborne radius area or the 2.5-mile in-water radius from pile driving activities could be exposed to disturbance levels of noise, which would not be considered insignificant. However, based on previously discussed information on murrelet use of the area, the likelihood of murrelets being present in the Action Area is so low that this noise disturbance can be considered discountable.

[9] For the limit of disturbance, $R_1 = (10^{(189-150)/15)})(10)$ = 3,981 meters or 2.5 miles.

5.14.3 Effects Determination

Based on the guidance and definitions provided within the context of ESA above and the previously discussed Project effects, the effect determination is that this project **may affect, but is not likely to adversely affect marbled murrelets.**

This determination is appropriate because individual marbled murrelets could conceivably be present in the Action Area, but the likelihood of their presence is so low that effects discussed above can be considered discountable. The basis for this conclusion is the effects are extremely unlikely to occur (discountable).

5.14.4 Designated Critical Habitat

The USFWS designated critical habitat for the marbled murrelet in 1996. There is no critical habitat designated in the Action Area; critical habitat for marbled murrelets includes only federal lands designated as late successional reserves of old growth forests (61 FR 26255). The nearest murrelet critical habitat is approximately 25 miles east in the Cascade Mountains. Therefore, it is determined that the project will have **no effect on designated critical habitat for marbled murrelet.**

6 REFERENCES

Adams, P.B., C.B. Grimes, S.T. Lindley, and M.L. Moser, 2002. Status Review for North American Green Sturgeon, Acipenser medirostris. National Marine Fisheries Service. http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/greensturgeon.pdf

Ballenger, D., 1996. 1995 Lummi Shore beach seine study. Lummi Natural Resources Department, Report No. 96-2. Bellingham, Washington.

Ballenger, D., 2000. Pacific States Marine Fisheries Commission. *In litt.* Unpublished data of Lummi Nation Fisheries Department's beach seine surveys of Bellingham Bay, Lummi Bay, and Cherry Point in 1994 and 1995.

Baird, R.W., 1994. Foraging behaviour and ecology of transient killer whales. Ph.D. thesis, Simon Fraser University, Burnaby, B.C.

Baird, R.W., L.M. Dill, and M.B. Hanson, 1998. Diving Behavior of Killer Whales. Abstract of a paper presented at the World Marine Mammal Conference, Monaco, January, 1998.

Baird, R. W., and M. B. Hanson, 2004. A progress report on diving behavior of Southern Resident killer whales. Contract report under Order No. AB133F-03-SE-1070. (Available from M. B. Hanson, NWFSC, 2725 Montlake Blvd. East, Seattle, WA 98112.)

Balcomb, K.C., J.R. Boran, R.W. Osborne, and N.J. Haenel, 1980. Observations of Killer Whales (Orcinus orca) in Greater Puget Sound, State of Washington, NTISPB80-224728, U.S. Dept. of Commerce, Springfield, VA.

Bateson, G., 1974. Observations of a Cetacean Community. In: J. McIntyre (Ed.), Mind in the Waters, New York, Charles Scribner's Sons, Sierra Club Books, 146-165.

Beamesderfer, R.C.P. and M.A.H. Webb, 2002. Green sturgeon status review information. S.P. Cramer and Associates, Gresham, Oregon, U.S.

Bigg, M.A., G.M. Ellis, J.K.B. Ford, and K.C. Balcomb, 1987. Killer whales: a study of their identification, genealogy, and natural history in British Columbia and Washington State. Phantom Press, Nanaimo, B.C.

Boehlert, G. W., 1980. Size composition, age composition and growth of the canary rockfish, Sebastes pinniger, and the splitnose rockfish, Sebastes diploproa, from the 1977 rockfish survey. U.S. National Marine Fisheries Service Marine Fisheries Review 42(3-4): 57-63.

Bonar, S.A., M.Diverns, and B. Bolding, 1997. Methods for sampling the distribution and abundance of bull trout/Dolly Varden. Washington Department of Fish and Wildlife, Inland Fisheries Investigations, Resources Assessment Division, Report No. RAD97-05. Olympia, Washington.

Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito, 1992. Distribution and origins of steelhead trout (Oncorhynchus mykiss) in offshore waters of the North Pacific Ocean. International North Pacific Fisheries Commission, Bulletin 51. 91 pp.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino, 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS – NWFSC-27. 261 pp.

Calambokidis, J., G.H. Steiger, J.R. Evenson, K.R. Flynn, K.C. Balcomb, D.E. Claridge, P. Bloedel, J.M. Straley, C.S. Baker, O. von Ziegesar, M.E. Dahlheim, J.M. Waite, J.D. Darling, G. Ellis, and G.A. Green, 1996. Interchange and isolation of humpback whales off California and other North Pacific feeding grounds, Marine Mammal Science, 12:215-226.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall, 1990. The birds of British Columbia. Vol. 2. R. BC. Mus., Can. Wild. Serv., Victoria, B.C., Canada.

Cavanaugh, W.J. and G.C. Tocci, 1998. Environmental Noise, the Invisible Pollutant. Environmental Excellence in South Carolina, Vol. 1. No. 1, Fall 1998. USC Institute of Public Affairs. Available at: http://www.cavtocci.com/portfolio/publications/EnvironmentalNoise.pdf

Center for Biological Diversity, 2001. Petition to list the southern resident killer whale (Orcinus orca) as an endangered species under the Endangered Species Act. Center for Biological Diversity, Berkeley, CA.

Center for Whale Research, 2009. Update on the Southern Resident Killer Whale Population 2009. Available at: http://www.whaleresearch.com/research.html Friday Harbor, Washington.

COB (City of Bellingham), 2009. *Final Draft Shoreline Master Program*. Prepared by the City of Bellingham Planning Commission on June 2009.

COB, 2008. *Waterfront Connections Plan*. Prepared for Mayor Dan Pike of the COB. September 2008.

COB Parks (City of Bellingham Parks and Recreation Department), 2008. *Parks, Recreation and Open Space Plan*. Updated and amended 2008.

COB Parks, 2002. *Parks, Recreation and Open Space Plan*. Drafted by the COB for the COB Comprehensive Plan. 2002.

COB and POB (City of Bellingham and Port of Bellingham), 2006. *New Whatcom Preliminary Draft Framework Plan 2016*. Summary and map presented by the COB and POB. September 25, 2006.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada), 2002. Assessment and Status Report on the Bocaccio, Sebastes paucispinus, in Canada.

Davidson, M., 2004. Transmission loss. Pages lecture structure obtained from website in IOM. Studies, editor. University of Plymouth, Drake Circus, Plymouth, Devon, UK.

DeLacy, A.C., B. S. Miller, and S. F. Borton, 1972. Checklist of Puget Sound Fishes. Wash. Sea Grant, Div. Mar. Res., Univ. Wash., Seattle, 43 p.

Ecology (Washington State Department of Ecology), 2008. 2008 Washington State Water Quality Assessment. Available at: http://www.ecy.wa.gov/Programs/wq/303d/2008/index.html. Accessed on April 20, 2010.

Emmett, R.L., S.A. Hinton, S.L. Stone, and M.E. Monaco, 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries, Volume II: Species life history summaries. ELMR Rep. No. 8 NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 pp.

Eschmeyer, W.N., E.S. Herald and H. Hammann, 1983. A field guide to Pacific coast fishes of North America. Houghton Mifflin Company, Boston, U.S.A. 336 p.

Falcone, E., J. Calambokidis, G. Steiger, M. Malleson, J. Ford, 2005. Humpback whales in the Puget Sound/Georgia Strait Region. Proceedings of the 2005 Puget Sound Georgia Basin Research Conference.

Falxa and Huf, 2008. *Marbled Murrelet Effectiveness Monitoring Northwest Forest Plan: 2004-2007 Summary Report*. Prepared for the Northwest Forest Plan Interagency Regional Monitoring Program. September 2008.

Feder, H.M., C.H. Turner, and C. Limbaugh, 1974. Observations on fishes associated with kelp beds in southern California. Calif. Dep. Fish Game Fish Bull. 160. 144 pp.

FR (Federal Register), 2010. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of Eulachon. Federal Register, Vol 75, No. 52, Thursday, March 18, 2010.

FHWG (Fisheries Hydroacoustic Working Group), 2008. Memorandum from NOAA's Fisheries Northwest and Southwest Regions, U.S. Fish and Wildlife Service Regions 1 and 8, California/Washington/Oregon Departments of Transportation, California Department of Fish and Game, and U.S. Federal Highway Administration to Applicable Agency Staff re: Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities. June 12, 2008.

Frost, K.J. and LF Lowry, 1981. Foods and trophic relationships of cetaceans in the Bering Sea pp. 825-836 In: Hood, D.W., and Calder, J.A (eds.). The eastern Bering Sea Shelf: Oceanographv and Resources. Vol 2. Seattle, University of Washington Press.

Gisiner, R.C., 1985. Male territorial and reproductive behavior in Steller sea lion. Eumetopias jubatus. Ph.D. Thesis, U. California, Santa Cruz. 145pp.

Grette Associates LLC, 2009. Boulevard Park Overwater Walkway Eelgrass Habitat Memorandum. Prepared for Reid Middleton, Inc. on May 7, 2008 and revised on February 15, 2009.

Healey, M.C., 1991. Life history of Chinook salmon (Oncorhynchus tshawytscha). Pages 311-393 in C. Groot and L. Margolis (eds) Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, British Columbia.

Herman, L.M., 1991. What the Dolphin Knows, or Might Know, in its Natural World. In: K.W. Pryor and L.S. Norris (Eds.), Dolphin Societies: Discoveries and Puzzles, Berkeley, University of California Press, pp. 349-363.

Holmberg EK, Day D, Pasquale N, and Pattie B., 1967. Research report on the Washington trawl fishery 1962–1964. State of Washington Department of Fisheries Research Division. 62 p.

Jones, R.E., 1981. Food habits of smaller marine mammals from northern California. Proc. Nat. Acad. Sci. 42:409-433.

Kruse, Donald., 2010. Personal communication between Donald Kruse of Lummi Nation Natural Resources and Ali Wick of Anchor QEA, LLC. April 15, 2010.

Laughlin, J., 2005. *Underwater Sound Levels Associated with Pile Driving at the Bainbridge Island Ferry Terminal Preservation Project*. Washington State Department of Transportation. November 2005.

LeGore, R.S., and D.M. Des Voigne, 1973. Absence of acute effects on threespine sticklebacks (*Gasterosteus aculeatus*) and coho salmon (*Onchorynchus kisutch*) exposed to resuspended harbor sediment contamination. Journal of the Fisheries Research Board of Canada 30(8): 1240-1242.

Love, M. S., M. H. Carr, & L. J. Haldorson, 1991. The ecology of' substrate-associated juveniles of the genus Sebastes, Environ, Bio!. Fishes 30:225-243.

Love, M.S., Yoklavich, M. and Thorsteinson, L., 2002. The Rockfishes of the Northeast Pacific. University of California Press, Berkeley, California.

MacGillivray, A., E. Ziegler, and J. Laughlin, 2007. Underwater acoustic measurements from Washington State Ferries 2006 Mukilteo Ferry Terminal Test Pile Project. Technical report prepared by JASCO Research, LTD for Washington State Ferries and Washington State Department of Transportation. 27 pp.

McCall and He, 2002. Status Review of the Southern Stock of Bocaccio (Sebastes paucispinus). Santa Cruz Laboratory, Southwest Fisheries Science Center. National Marine Fisheries Service, Santa Cruz, CA. Available at: http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/bocaccio.pdf

McPhail, J. D. and C. B. Murray, 1979. The Early Life-history and Ecology of Dolly Varden (Salvelinus malma) in the upper Arrow Lakes. University of British Columbia, Department of Zoology and Institute of Animal Resources, Vancouver, B.C.

Mecklenburg, C. W., T. A. Mecklenburg, and L. K. Thorsteinson, 2002. Fishes of Alaska. American Fisheries Society, Bethesda, Maryland.

Miller, B.S. and S. F. Borton, 1980. Geographical distribution of Puget Sound fishes: maps and data source sheets. 3 Volumes. Wash. Sea Grant Prog. and Wash. State Dept. Ecol.

Moser, H.G., 1996. Scorpaenidae: scorpionfishes and rockfishes. p. 733-795. In H.G. Moser (ed.) The early stages of fishes in the California Current Region. California Cooperative Oceanic Fisheries Investigations (CalCOFI) Atlas No. 33. 1505 p.

Moser, M. and S. Lindley, 2007. Use of Washington estuaries by subadult and adult green sturgeon. Environmental Biology of Fishes. Doi 10.1007/s10641-006-9028-1.

Moyle, P.B., 2002. Inland fishes of California. University of California Press, Berkeley, CA. 502 pp.

Moyle, P.B., P.J. Foley, and R.M. Yoshiyama, 1992. Status of green sturgeon, Acipenser medirostris, in California. Final Report submitted to National Marine Fisheries Service. 11 p. University of California, Davis, CA 95616.

Moyle, P.B., R.M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake, 1995. Fish Species of Special Concern in California. Second edition. Final report to CA Department of Fish and Game, contract 2128IF.

MRC (Whatcom County Marine Resources Committee), 2010. Marine Life in Whatcom County: Surf Smelt (Hypomesus pretiousus) Fact Sheet http://www.whatcom-mrc.whatcomcounty.org/Fact_Sheets/surf_smelt.htm Accessed on March 2, 2010.

Nightengale, B.J. and C.A. Simenstad, 2001. Overwater Structures: Marine issues. White paper prepared for Wash. Depts. of Fish and Wildlife, Ecology and Transportation. University of Washington, Seattle, Washington. 13 l pp.

NMFS (National Marine Fisheries Service), 2010. NMFS Northwest Regional Office website, available at: http://www.nwr.noaa.gov. Relevant pages included in Appendix A.

NMFS, 2008a. Recovery Plan for Southern Resident Killer Whales (Orcinus orca). National Marine Fisheries Service, Northwest Region, Seattle, Washington. 251 pp.

NMFS, 2008b. Recovery Plan for the Steller Sea Lion. Eastern and Western Distinct Population Segments (Eumetopias jubatus). Revision. March 2008. Original version: December 1992. Available at: http://www.nmfs.noaa.gov/pr/pdfs/recovery/stellersealion.pdf

NMFS, 2005. Status review update for Puget Sound Steelhead. Prepared by the 2005 Puget Sound Steelhead Biological Review Team, National Marine Fisheries Service, Northwest Fisheries Science Center. July 26, 2005. 112 pp

NMFS, 1992. Report to Congress on Washington State Marine Mammals. U.S. Department of Commerce, Silver Springs, Maryland. 39 pp.

NMFS, 1991. Final Recovery Plan for the Humpback Whale. Megapter novaeangliae. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Office of Protected Resources.

NNR (Nooksack Natural Resources), Lummi Natural Resources, and Whatcom County Public Works, 2005. Water Resource Inventory Area 1 (WRIA 1) Salmonid Recovery Plan. Developed in consultation with the cities of WRIA 1 and Washington Department of Fish and Wildlife. Available at: http://whatcomsalmon.whatcomcounty.org/action-processes-recoveryplan.html

Olesiuk, P.E., M.A. Biggs, G.M. Ellis, S.J. Crockford, and R.J. Wigen, 1990. An assessment of the feeding habits of harbor seals (Phoca vitulina) in the Strait of Georgia, British Columbia, based on scat analysis. Can. Tech. Rep. Fish. and Aquat. Sci. No. 1730.

Orca Network, 2010. Orca Network Sightings Archives. Available at: http://www.orcanetwork.org/sightings/archives.html. Updated daily. Accessed on January 28, 2010.

Orr, J. W., M. A. Brown, and D. C. Baker, 2000. Guide to rockfishes (Scorpaenidae) of the genera Sebastes, Sebastolobus, and Adelosebastes of the northeast Pacific Ocean. 2d ed. NOAA Tech. Memo., NMFS-AFSC-117, Seattle, WA.

Osborne, R., 2009. Personal communication between Dr. Richard Osborne of the Whale Museum and Ali Wick of Anchor QEA. October 23, 2009.

Penttila, D., 2007. Marine Forage Fishes in Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-03. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington.

Penttila, D., 2009. Personal communication between Ali Wick of Anchor QEA and Dan Penttila, Forage Fish Biologist at Washington Department of Fish and Wildlife. August 7, 2009.

Penttila, D., 2010. Personal communication between Ali Wick of Anchor QEA and Dan Penttila, Forage Fish Biologist at Washington Department of Fish and Wildlife. March 29, 2010.

Penttila, D. and D. Doty, 1990. Progress Report. Results of 1989 Eelgrass Shading Studies in Puget Sound. Washington Department of Fisheries, Marine Fish Habitat Investigations Division. Summary available at: http://depts.washington.edu/newwsdot/pentdot.html

Perry, S.L, D.P. DeMaster, and G.K. Silber, 1999. Special Issue: The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1).

PI Engineering and Anchor (Pacific International Engineering and Anchor Environmental, L.L.C.), 1999. Bellingham Bay Demonstration Pilot: Final Habitat Restoration Documentation Report. Prepared for the Bellingham Bay Demonstration Pilot Work Group. February 15, 1999. Bellingham, Washington.

Pitcher, K.W., 1981. Prey of Steller sea lion, Eumetopias jubatus, in the Gulf of Alaska. U.S. Nat. Mar. Fish. Serv. Fish. Bull. 79(3):467-472.

Pitcher, K.W. and F.H. Fay, 1982. Feeding by Steller sea lions on harbor seals. Mar. Fish. Rev. 63:70-71.

Popper, A. N., and M. C. Hastings, 2009a. The effects of anthropogenic sources of sound on fishes. J. Fish Biol. 75:455-489.

Popper, A. N., and M. C. Hastings, 2009b. The effects of human-generated sound on fish. Integrative Zool., 4:43-52.

Popper, A.N., T.J. Carlson, A. D. Hawkins, B. L. Southall, and R. L. Gentry, 2006. Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper. May

15, 2006. Available at: http://www.wsdot.wa.gov/NR/rdonlyres/84A6313A-9297-42C9-BFA6-750A691E1DB3/0/BA_PileDrivingInterimCriteria.pdf

Pratt, K.L., 1992. A review of bull trout life history. In: Howell, P.J.; Buchanan, D.B., eds. Proceedings of the Gearhart Mountain bull trout workshop.; 1992 August; Gearhart Mountain, OR. Corvallis, OR: Oregon Chapter of the American Fisheries Society: 5-9.

Raphael, Martin G., Diane Evans Mack, and Brian A. Cooper, 2002. *Landscape-Scale Relationships between Abundance of Marbled Murrelets and Distribution of Nesting Habitats*. Published by the University of California Press in The Condor; Vol. 104, No. 2, pp. 331-342. May 2002.

Redding, M. J., C.B. Schreck., and F.H. Everest, 1987. Physiological effects on coho salmon and steelhead of exposure to suspended solids. Trans. of the Am. Fish. Soc. 116:737-744.

Reyff, J.A., P. Donavan, and C.R. Greene Jr., 2003. Underwater Sound Levels Associated with Seismic Retrofit Construction of the Richmond-San Rafael Bridge. Produced by Illingworth & Rodkin, Inc., and Greeneridge Sciences under contract to the California Department of Transportation.

Rice, C., 2004. 2003 Bellingham Bay Juvenile Chinook Townetting Project, Field Sampling and Data Summary. Watershed Program, Northwest Fisheries Science Center. NOAA/NMFS, Seattle, Washington.

Richards, L. J., 1986. Depth and habitat distributions of three species of rockfish (Sebastes) in British Columbia: observations from the submersible Pisces IV. Env. Biol. Fish. 17:13-21

Richardson, A.L. and Laroche, W.A., 1979. Development and occurrence of larvae and juveniles of the rockfishes Sebastes crameri, Sebasted pinniger, and Sebastes helvomaculatus (Famly Scorpaenidae) off Oregon. Fish. Bull. 77, 1-41.

Rogers, P. H. and Cox (a.k.a. Hastings), M., 1988. "Underwater Sound as a Biological Stimulus." In Sensory Biology of Aquatic Animals, edited by J. Atema, R. R. Fay, A. N. Popper, and W. N. Tavolga. Springer-Verlag, New York, pp. 131-149.

Roni, P.R and L.A. Weitkamp, 1996. Environmental monitoring of the Manchester naval fuel pier replacement, Puget Sound, Washington, 1991-1994. Report for the Department of the Navy and the Coastal Zone and Estuarine Studies Division, Northwest Fisheries Science Center, National Marine Fisheries Service, January 1996.

Salo, E.O, N.J. Bax, T.E. Prinslow, C.J. Whitmus, B.P. Snyder, and C.A. Simenstad, 1980. The effects of construction of naval facilities on the outmigration of juvenile salmonids from Hood Canal, Washington. FRI-UW-8006. University of Washington College of Fisheries, Fisheries Research Institute. April 1980.

Servizi, J.A., and D.W. Martens, 1992. Sublethal responses of coho salmon (Oncorhynchus kisutch) to suspended sediments. Can. J. Fish. Aquat. Sci. 49:1389-1395.

Shreffler, D. K., and W. M. Gardiner, 1999. Preliminary findings of diving and light surveys. In Simenstad, C. A., B. J. Nightengale, R. M. Thom, and D. K. Shreffler (eds.) 1999. Impacts of ferry terminals on juvenile salmon migrating along Puget Sound shorelines. Phase I: Synthesis of State of Knowledge. Washington State Transportation Center, Univ. of Wash. WA-RD 472.1. 116 pp. plus appendices.

Simenstad, C.A., B.S. Miller, J.N. Cross, K.L. Fresh, S.N. Steinfort, and J.C. Fegley, 1979. Nearshore fish and macroinvertebrate assemblages along the Strait of Juan de Fuca, including food habits of nearshore fish. NOAA Tech. Memo. ERL-MESA-20. U.S. Department of Commerce. Boulder, Colorado. 144pp.

Sjolseth, D.E., E.O. Salo, R.A. Bishop, and W.G. Williams, 1968. Studies of Juvenile Salmon in the Nooksack River System and Bellingham Bay. Final Report. FRI/University of Washington, Seattle, WA.

Smith, Carol J., 2002. *Salmon and Steelhead Habitat Limiting Factors in WRIA 1, the Nooksack Basin*. Prepared for the Washington State Conservation Commission. July 2002.

Speich, S.M. and T.R. Wahl, 1995. Marbled Murrelet Populations of Washington – Marine Habitat Preferences and Variability of Occurrence. USDA Forest Service Gen. Tech. Rep. PSW-152. 1995.

Stick, K.C. and A. Lindquist, 2009. *2008 Washington State Herring Stock Status Report*. Prepared for the WDFW Fish Program Fish Management Division. November 2009.

Stober, Q.J., B.D. Ross, C.L Melby, P.A. Dimmel, T.H. Jagielo, and E.O. Salo, 1981. Effects of Suspended Sediment on Coho and Chinook Salmon in the Toutle and Cowlitz Rivers. FRI-UW-8124. University of Washington College of Fisheries, Fisheries Research Institute. November 1981.

Thomsen, F.K, Ludemann, R..Kafemann, and W. Piper, 2006. Effects of offshore wind farm noise on marine mammals and fish. Cowrie, Ltd., Hamburg, Germany.

Thorson, P. and Reyff, J.A., 2004. San Francisco – Oakland Bay Bridge East Span Seismic Safety Project. Marine Mammal and Acoustic Monitoring for the Eastbound Structure. EA 012023. 04-SF-80 KP 12.2/KP 14.3

USDOC (U.S. Department of Commerce), 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon: Final Rule. October 9, 2009. Available at: http://www.nmfs.noaa.gov/pr/pdfs/fr/fr74-52300.pdf

USDOI (U.S. Department of Interior), 2006. Memorandum: Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California. U.S. Fish and Wildlife Service (USFWS). Arcata Fish and Wildlife Office. July 31, 2006.

USFS (U.S. Forest Service), 2006. Status and Trends of Populations and Nesting Habitat for the Marbled Murrelet. General Technical Report PNW-GTR-650. June 2006

USFWS (U.S. Fish and Wildlife Service), 2007. *Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in Whatcom County*. Prepared by USFWS Western Washington Fish and Wildlife Office; revised November 1, 2007.

USFWS and NMFS (U.S. Fish and Wildlife Service and National Marine Fisheries Service), 1998. Endangered Species Consultation Handbook. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. March 1998. Final.

Vagle, S., 2003. On the Impact of Underwater Pile Driving Noise on Marine Life. Canada DFO, Institute of Ocean Sciences, Ocean Science and Productivity Division.

WDFW (Washington Department of Fish and Wildlife), 2008. Priority Habitats and Species (PHS) Map in the Vicinity of T25R02E Section 26. August 19, 2008.

WDFW, 2007. Eelgrass/Macro Algae Habitat Survey Guidelines.

WDFW, 2004a. Washington Department of Fish and Wildlife. Marbled Murrelet Density (2 minute grid cells). Winter 1993 – 2004 Aerial Surveys. 1993 – 2004.

WDFW, 2004b. Washington Department of Fish and Wildlife. Web page. www.access.wa.gov.

WDFW, 2000a. *Atlas of Seal and Sea Lion Haulout Sites in Washington*. Prepared by the WDFW Wildlife Science Division. February 2000.

WDFW, 2000b. Salmonscape Interactive mapper – Salmon presence; forage fish spawning habitat. Available at: http://wdfw.wa.gov/mapping/salmonscape/. Accessed on April 30, 2010.WDFW and ODFW (Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife), 2001. Washington and Oregon Eulachon Management Plan. November 2001. Available at: http://wdfw.wa.gov/fish/creel/smelt/wa-ore_eulachonmgmt.pdf

WDW (Washington Department of Wildlife), 1993. Status of the Steller (northern) sea lion (Eumetopias jubatus) in Washington. Draft unpubl. rept. WDW, Olympia, Washington.

WDW, 1991. Management Recommendations for Washington's Priority Species. Washington Department of Wildlife, Wildlife Management, Fish Management, and Habitat Management Divisions. May 1991.

Wessen & Associates, Inc., 2010. *An Archeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham Washington.* April 2010.

WFG (Waterfront Futures Group), 2004. *Waterfront Vision and Framework Plan: Connecting Bellingham with the Bay*. Drafted by the WFG. December 2004.

Whale Museum, 2009. ORCAS database of killer whale sightings, records from 1990 – 2008. Provided to Anchor QEA by Dr. Richard Osborne, Whale Museum, Friday Harbor, WA on August 17, 2009.

Williams, Brian, personal communication. 2010. Meeting between Louis Klusmeyer of Berger ABAM, Brian Williams of WDFW, and Paul Schlenger and Derek Koellmann of Anchor QEA, LLC. February 5, 2010.

Willson, M.F., Armstrong, R.H., Hermans, M.C., and K. Koski, 2006. Eulachon: A review of biology and an annotated bibliography. Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, Juneau, AK. 243 pp.

WSDOT (Washington State Department of Transportation), 2010. Biological Assessment Preparation for Transportation Projects - Advanced Training Manual. February 2010.

WSDOT, 2009. Marine Mammal, Fish, and Marbled Murrelet Injury and Disturbance Thresholds for Marine Construction Activity. Available at: http://www.wsdot.wa.gov/NR/rdonlyres/216F21DA-A91B-43F2-8423-CD42885EE0EC/0/BA_MarineNoiseThrshlds.pdf .

WSF et al. (Washington State Ferries, Anchor QEA, LLC, and Axis Environmental, LLC), 2009. Reference Biological Assessment, Washington State Ferries Capital, Repair, and Maintenance Projects. June 2009.

Wydoski, R.S. and R.L. Whitney, 2003. Inland fishes of Washington. University of Washington Press, Seattle, Washington.

APPENDIX A
NMFS AND USFWS SPECIES LISTS

OPR Home | About OPR | Species | Permits | Laws & Policies | Programs | Education | Publications

Species

- **Marine Mammals**
  - Cetaceans
  - Pinnipeds
- **Marine Turtles**
- **Marine & Anadromous Fish**
- **Marine Invertebrates & Plants**
- **Species of Concern**
- **Threatened & Endangered Species**
  - Critical Habitat Maps

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Marine and Anadromous Fish

Overview

NOAA's National Marine Fisheries Service (NMFS) has jurisdiction over most marine and anadromous fish listed under the Endangered Species Act (ESA). Marine fish spend their entire life in salt water. Anadromous fish are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn.

Status of Fish Species

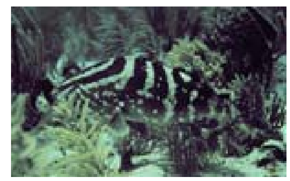
The majority of fish listed as endangered or threatened under the ESA are Pacific salmonids, though the Gulf of Maine Atlantic salmon, U.S. populations of smalltooth sawfish, shortnose sturgeon, and totoaba are also protected under the ESA. Other fish of interest are species of concern or candidate species.

If different populations of a fish species have been listed under the ESA as "distinct population segment (DPS)" or "evolutionarily significant unit (ESU)", some DPSs or ESUs may be threatened and others endangered.

(E = "endangered"; T = "threatened"; P = "proposed"; C = "candidate"; S = "species of concern"; F = "foreign")

Species	Status
Alabama shad (*Alosa alabamae*)	S
alewife (*Alosa pseudoharengus*)	S
Atlantic halibut (*Hippoglossus hippoglossus*)	S
Atlantic salmon (*Salmo salar*)	
○ Gulf of Maine	E
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	C/S
Atlantic wolffish (*Anarhichas lupus*)	S
barndoor skate (*Dipturus laevis*)	S
blueback herring (*Alosa aestivalis*)	S
bocaccio (*Sebastes paucispinis*)	
○ Georgia Basin	P-E
○ Southern	S


Humphead Wrasse
(Cheilinus undulatus)
Photo: Brian Zgliczynski, NOAA


Nassau grouper
(Epinephelus striatus)
Photo: Stephania Bolden, NOAA


Sockeye Salmon
(Oncorhynchus nerka)
Photo: Travis Nelson, Washington Dept. of Fish & Wildlife


Chinook Salmon
(Oncorhynchus tshawytscha)
Photo: NOAA

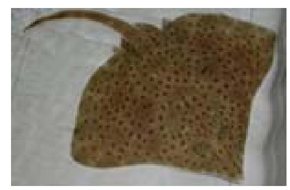

Chum Salmon
(Oncorhynchus keta)
Photo: NOAA

- bumphead parrotfish (*Bolbometopon muricatum)* — S
- canary rockfish (*Sebastes pinniger)*
  - Georgia Basin — P-T
- Chinook salmon (*Oncorhynchus tshawytscha*)
  - California coastal — T
  - Central Valley spring-run — T
  - Lower Columbia River — T
  - Upper Columbia River spring-run — E
  - Puget Sound — T
  - Sacramento River winter-run — E
  - Snake River fall-run — T
  - Snake River spring/summer-run — T
  - Upper Willamette River — T
  - Central Valley, fall and late fall run — S
- chum salmon (*Oncorhynchus keta*)
  - Columbia River — T
  - Hood Canal summer-run — T
- coho salmon (*Oncorhynchus kisutch*)
  - Central California coast — E
    - *original listing -* — T
  - Lower Columbia River — T
  - Oregon coast — T
  - Southern Oregon & Northern California coasts — T
  - Puget Sound/Strait of Georgia — S
- cowcod (*Sebastes levis)* — S
- cusk (*Brosme brosme)* — C/S
- dusky shark (*Carcharhinus obscurus)* — S
- green sturgeon (*Acipenser medirostris)*
  - southern — T
- Gulf sturgeon (*Acipenser oxyrinchus desotoi*) — T

Coho Salmon
(Oncorhynchus kisutch)
Photo: NOAA

Steelhead Trout
(Oncorhynchus mykiss)
Photo: NOAA's Monterey Bay National Marine Sanctuary

Smalltooth Sawfish
(Pristis pectinata)
Photo: Florida Fish and Wildlife Conservation Commission



Barndoor Skate
(Dipturus laevis)
Photo: NOAA

Bocaccio
(Sebastes paucispinis)
Photo: NOAA

Cowcod
(Sebastes levis)
Photo: NMFS Southwest Fisheries Science Center

Cusk
(Brosme brosme)
Photo: NMFS Northeast Region

humphead wrasse *(Cheilinus undulatus)*	S
key silverside *(Menidia conchorum)*	S
largetooth sawfish *(Pristis perotteti)*	C/S
mangrove rivulus *(Rivulus marmoratus)*	S
Nassau grouper *(Epinephelus striatus)*	S
night shark *(Carcharinus signatus)*	S
opossum pipefish *(Microphis brachyurus lineatus)*	S
Pacific eulachon (smelt) *(Thaleichthys pacificus)*	P-T
Pacific herring *(Clupea pallasii)*	C
Pacific hake *(Merluccius productus)*	S
porbeagle shark *(Lamna nasus)*	S
rainbow smelt *(Osmerus mordax)*	S
saltmarsh topminnow *(Fundulus jenkinsi)*	S
sand tiger shark *(Carcharias taurus)*	S
shortnose sturgeon (*Acipenser brevirostrum*)	E
smalltooth sawfish (*Pristis pectinata*)	
○ U.S. portion of range	E
sockeye salmon (*Oncorhynchus nerka*)	
○ Ozette Lake	T
○ Snake River	E
speckled hind *(Epinephelus drummondhayi)*	S
steelhead trout *(Oncorhynchus mykiss)*	
○ Puget Sound	T
○ Central California coast	T
○ Snake River Basin	T
○ Upper Columbia River	E
○ Southern California	E

Sand Tiger Shark
(Carcharias taurus)
Photo: NOAA's National Ocean Service

○ Middle Columbia River	T
○ Lower Columbia River	T
○ Upper Willamette River	T
○ Northern California	T
○ South-Central California coast	T
○ California Central Valley	T
○ Oregon Coast	S
■ striped croaker *(Bairdiella sanctaeluciae)*	S
■ thorny skate *Amblyraja radiata*	S
■ totoaba (*Totoaba macdonaldi*)	E (F)
■ Warsaw grouper *(Epinephelus nigritus)*	S
■ white marlin *(Tetrapturus albidus)*	S
■ yelloweye rockfish *(Sebastes ruberrimus)*	
○ Georgia Basin	P-T

For information on other fish managed by NOAA Fisheries, such as commercial, recreational, and subsistence fisheries, visit the site of the Office of Sustainable Fisheries.

More Information
Critical Habitat for Pacific Salmon
Essential Fish Habitat
NMFS Office of Sustainable Fisheries
Pacific salmon - NMFS Northwest Region
Pacific Salmon Publications - NMFS Northwest Region

Page Title: ESA MM List

URL: http://www.nwr.noaa.gov/Marine-Mammals/ESA-MM-List.cfmhttp://www.nwr.noaa.gov/Marine-Mammals/ESA-MM-List.cfm

ESA-Listed Marine Mammals

Under the jurisdiction of NOAA Fisheries Service that may occur:

off Washington & Oregon

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Blue Whale (E), *Balaenoptera musculus*
- Fin Whale (E), *Balaenoptera physalus*
- Sei Whale (E), *Balaenoptera borealis*
- Sperm Whale (E), *Physeter macrocephalus*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

in Puget Sound

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

(E) = Endangered
(T) = Threatened

Page last updated: 2009-05-27 15:17:43

Endangered Species Act Status of West Coast Salmon & Steelhead

(Updated July 1, 2009)

Species[1]			*Current Endangered Species Act Listing Status*[2]	*ESA Listing Actions Under Review*
Sockeye Salmon (*Oncorhynchus nerka*)	1	Snake River	***Endangered***	
	2	Ozette Lake	***Threatened***	
	3	Baker River	*Not Warranted*	
	4	Okanogan River	*Not Warranted*	
	5	Lake Wenatchee	*Not Warranted*	
	6	Quinalt Lake	*Not Warranted*	
	7	Lake Pleasant	*Not Warranted*	
Chinook Salmon (*O. tshawytscha*)	8	Sacramento River Winter-run	***Endangered***	
	9	Upper Columbia River Spring-run	***Endangered***	
	10	Snake River Spring/Summer-run	***Threatened***	
	11	Snake River Fall-run	***Threatened***	
	12	Puget Sound	***Threatened***	
	13	Lower Columbia River	***Threatened***	
	14	Upper Willamette River	***Threatened***	
	15	Central Valley Spring-run	***Threatened***	
	16	California Coastal	***Threatened***	
	17	Central Valley Fall and Late Fall-run	***Species of Concern***	
	18	Upper Klamath-Trinity Rivers	*Not Warranted*	
	19	Oregon Coast	*Not Warranted*	
	20	Washington Coast	*Not Warranted*	
	21	Middle Columbia River spring-run	*Not Warranted*	
	22	Upper Columbia River summer/fall-run	*Not Warranted*	
	23	Southern Oregon and Northern California Coast	*Not Warranted*	
	24	Deschutes River summer/fall-run	*Not Warranted*	
Coho Salmon (*O. kisutch*)	25	Central California Coast	***Endangered***	
	26	Southern Oregon/Northern California	***Threatened***	
	27	Lower Columbia River	***Threatened***	• Critical habitat
	28	Oregon Coast	***Threatened***	
	29	Southwest Washington	*Undetermined*	
	30	Puget Sound/Strait of Georgia	***Species of Concern***	
	31	Olympic Peninsula	*Not Warranted*	
Chum Salmon (*O. keta*)	32	Hood Canal Summer-run	***Threatened***	
	33	Columbia River	***Threatened***	
	34	Puget Sound/Strait of Georgia	*Not Warranted*	
	35	Pacific Coast	*Not Warranted*	
Steelhead (*O. mykiss)*	36	Southern California	***Endangered***	
	37	Upper Columbia River	***Threatened***	
	38	Central California Coast	***Threatened***	
	39	South Central California Coast	***Threatened***	
	40	Snake River Basin	***Threatened***	
	41	Lower Columbia River	***Threatened***	
	42	California Central Valley	***Threatened***	
	43	Upper Willamette River	***Threatened***	
	44	Middle Columbia River	***Threatened***	
	45	Northern California	***Threatened***	
	46	Oregon Coast	***Species of Concern***	
	47	Southwest Washington	*Not Warranted*	
	48	Olympic Peninsula	*Not Warranted*	
	49	Puget Sound	***Threatened***	• Critical habitat
	50	Klamath Mountains Province	*Not Warranted*	
Pink Salmon (*O. gorbuscha)*	51	Even-year	*Not Warranted*	
	52	Odd-year	*Not Warranted*	

1 The ESA defines a "species" to include any distinct population segment of any species of vertebrate fish or wildlife. For Pacific salmon, NOAA Fisheries Service considers an evolutionarily significant unit, or "ESU," a "species" under the ESA. For Pacific steelhead, NOAA Fisheries Service has delineated distinct population segments (DPSs) for consideration as "species" under the ESA.

Page Title: ESA Turtle List

URL: http://www.nwr.noaa.gov/Other-Marine-Species/ESA-Turtle-List.cfmhttp://www.nwr.noaa.gov/Other-Marine-Species/ESA-Turtle-List.cfm

ESA-Listed Marine Turtles

Under the jurisdiction of NOAA Fisheries Service that may occur off Washington & Oregon:

- Leatherback Sea Turtle (E), *Dermochelys coriacea*
- Loggerhead Sea Turtle (T), *Caretta caretta*
- Green Sea Turtle (E), *Chelonia mydas*
- Olive Ridley Sea Turtle (E), *Lepidochelys olivacea*

Sightings and strandings of these animals are very rare, and there are no breeding beaches in the Northwest Region.

(E) = Endangered
(T) = Threatened

Jan. 5, 2010: NOAA's Fisheries Service proposed to revise and expand critical habitat for the leatherback turtle under the Endangered Species Act. Additional information about this proposal can be found in the links below and at the website of the NOAA Fisheries' Office of Protected Resources.

- *News Release* *(PDF 73KB)*
- *Federal Register Notice* *(PDF 712KB)*

Page last updated: 2010-01-05 08:15:42

Page Title: ESA Other List

URL: http://www.nwr.noaa.gov/Other-Marine-Species/ESA-Other-List.cfmhttp://www.nwr.noaa.gov/Other-Marine-Species/ESA-Other-List.cfm

Other ESA-Listed Species

Under the jurisdiction of NOAA Fisheries Service that may occur off Washington & Oregon:

- Southern distinct population segment, or DPS, of north American green sturgeon (T), (*Acipenser medirostris*), listed in the NOAA Fisheries Service Southwest Region

Page last updated: 2009-03-03 10:53:48

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN

IN WHATCOM COUNTY

AS PREPARED BY

THE U.S. FISH AND WILDLIFE SERVICE

WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (*Salvelinus confluentus*)

Canada lynx (*Lynx canadensis*)

Gray wolf (*Canis lupus*)

Grizzly bear (*Ursus arctos = U. a. horribilis*)

Marbled murrelet (*Brachyramphus marmoratus*)

Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout

Critical habitat for the marbled murrelet

Critical habitat for the northern spotted owl

PROPOSED

Dolly Varden (*Salvelinus malma*) due to similarity of appearance

CANDIDATE

Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)

Pacific lamprey (*Lampetra tridentata*)

Pacific Townsend=s big-eared bat (*Corynorhinus townsendii townsendii*)

Peregrine falcon (*Falco peregrinus*)

River lamprey (*Lampetra ayresi*)

Tailed frog (*Ascaphus truei*)

Western gray squirrel (*Sciurus griseus griseus*)

Botrychium ascendens (triangular-lobed moonwort)

Cimicifuga elata (tall bugbane)

APPENDIX B
INTERAGENCY CRITERIA MEMO AND MARINE NOISE INJURY AND DISTURBANCE THRESHOLDS

NOAA's Fisheries Northwest and Southwest Regions	U.S. Fish and Wildlife Service Regions 1 & 8	California/Washington/ Oregon Departments of Transportation	California Department of Fish and Game	U.S. Federal Highway Administration

MEMORANDUM

June 12, 2008

From: Fisheries Hydroacoustic Working Group

Subject: Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities

To: Applicable Agency Staff

The signatory agencies, identified below, have agreed in principle to use the attached Interim Criteria for Injury to Fish from Pile Driving Activities. The agreement was concluded at a meeting in Vancouver, Washington on June 10-11, 2008 with key technical and policy staff from the Federal Highway Administration, NOAA Fisheries, U.S. Fish and Wildlife Service, the Departments of Transportation from California, Oregon, and Washington; and national experts on sound propagation activities that affect fish and wildlife species of concern. The agreed upon criteria identify sound pressure levels of 206 dB peak and 187 dB accumulated sound exposure level(SEL) for all listed fish except those that are less than 2 grams. In that case, the criteria for the accumulated SEL will be 183 dB.

These criteria will apply to all new projects beginning no later than 60 days from the date of this memorandum. During the interim 60 day period, the Transportation Agencies will work with the Services to identify projects currently in the consultation process and reach agreement on which criteria will be used to assess project effects.

The agencies agree to review the science periodically and revise the threshold and cumulative levels as needed to reflect current information. Behavioral impacts to fish and impacts to marine mammals are not addressed in this agreement. Sub-injurious effects will continue to be discussed in future meetings.

The respective agencies also agree to develop appropriate training for staff on these revised criteria, as well as a process to review and possibly refine the criteria, when appropriate.

For questions or concerns about the revised criteria, we recommend staff contact their agency environmental coordinator or agency expert on pile driving issues.

Federal Highway Administration*

*FHWA supports the use of these interim criteria in the states signing this agreement in principle. FHWA leaves the schedule for implementation to the discretion of the state DOTs in cooperation with their respective FHWA Division Offices and the Services.

NOAA Fisheries – NWR

NOAA Fisheries – SWR

US Fish and Wildlife Service Region 1

US Fish and Wildlife Service Region 8

California Department of Transportation

California Department of Fish and Game

Oregon Department of Transportation

Washington State Department of Transportation

Washington State
Department of
Transportation

Marine Mammal, Fish, and Marbled Murrelet Injury and Disturbance Thresholds for Marine Construction Activity

Functional Hearing Group	Airborne Noise Thresholds	Underwater Noise Thresholds	
	In air Sound Pressure Level (RMS)	Impact Pile Driving Disturbance Threshold	Injury Threshold
Cetaceans	NA	160 dB RMS	180 dB RMS****
Pinnipeds	Disturbance: 90 dB RMS (un-weighted) for harbor seals, and 100 dB RMS (un-weighted) for sea lions and all other pinnipeds (re: 20 μPa^2sec)**	160 dB RMS	190 dB RMS****
Fish ≥ 2 grams	NA	Behavior effects threshold 150 dB RMS***	187 dB Cumulative SEL★★
Fish < 2 grams	NA		183 dB Cumulative SEL★★
Fish all sizes	NA		Peak 206 dB
Foraging marbled murrelets★★★	Injury: 92 dBA*	150dB RMS★	180 dB peak

***** Noise levels measured in air are typically used to assess impacts on humans and thus are weighted (A-weighting) to reduce the contribution of low and high frequencies and correspond to how humans hear. Noise levels measured underwater are not weighted and thus measure the unaltered frequency range of interest, which may extend below and above the audible range of many organisms.

****** Personal communication (email) on March 11, 2009 with Jaclyn Daly, Fisheries Biologist, National Marine Fisheries Service, Office of Protected Resources, 1315 East-West Hwy, Rm 3525, Silver Spring, MD 20910. This is the in air SPL at which pinniped haulout disturbance has been documented.

******* Hastings 2002, as cited in BA Manual

RMS - Root-mean-square: For pile driving, this is the square root of the mean square of a single pile driving impulse pressure event.

******** Source: Southal et al. 2007; 71 FR 3260 Jan. 20, 2006

★Although listed as a disturbance threshold, the USFWS considers this to be a noise disturbance threshold guideline, not criteria, for foraging marbled murrelets and for underwater exposure only.

★★Source: Memorandum on the Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities (available: http://www.wsdot.wa.gov/Environment/Biology/BA#Noise)

Potentially useful websites for calculating underwater noise distance to thresholds: Greeneridge calculator: http://www.greeneridge.com/radii.html (data inputs: Range = 10 [if source level, range = 1], B = 15, C = 0.003 for marine mammals, C = 0 for fish); Online math calculator: http://www.easycalculation.com/statistics/root-mean-square.php

(yellow shading)	For pile driving, these are the thresholds that NMFS has determined would result in Level A Harassment (injury) and Level B Harassment (disturbance) to marine mammals, as described in 70 FR 1871, 71 FR 3260, and 73 FR 41318.

APPENDIX C
ESSENTIAL FISH HABITAT CONSULTATION

ESSENTIAL FISH HABITAT CONSULTATION

This document was prepared as a resource document for concurrent Essential Fish Habitat (EFH) consultation with National Marine Fisheries Service (NMFS) for compliance with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the 1996 Sustainable Fisheries Act (SFA). EFH is defined by the Magnuson-Stevens Act in 50 Code of Federal Regulations (CFR) 600.905-930 as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

The waters of Puget Sound, including the Action Area, are designated as EFH for the three EFH composite groups of groundfish, coastal pelagic fish, and Pacific salmon (NMFS 1998; PFMC 1998a, 1998b, and 1999). The Pacific salmon composite includes Chinook, coho, and pink salmon (PFMC 1999).

EFH and life history stages for these fish are listed in Table C-1.

Table C-1
Species of Fishes and Life-History Stages with Designated EFH in Puget Sound

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Groundfish Species					
Arrowtooth flounder	X	X	X		
Big skate	X	X	X		X
Black rockfish	X		X		
Bocaccio			?	X	
Brown rockfish	X	?	?	X	
Butter sole	X	X	X		
Cabezon	X	X	X	?	X
California skate	X				
Canary rockfish	?	?	X		
China rockfish	X		X		
Copper rockfish	X		X	?	
Curlfin sole	X				
Darkblotched rockfish	X		X		
Dover sole	X	X	X		

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
English sole	X	X	X	X	X
Flathead sole	X	X	X		
Greenstriped rockfish					
Kelp greenling	X	X	X	X	X
Lingcod			X	X	
Pacific cod	X	X	X	X	X
Pacific Ocean perch	X		X		
Pacific sanddab				X	X
Pacific whiting (Hake)			X		
Petrale sole	X		X		
Quillback rockfish	X		X	?	
Ratfish	X				
Redbanded rockfish	X				
Redstripe rockfish	?				
Rex sole	X				?
Rock sole	X	X	X		
Rosethorn rockfish	X		X		
Rosy rockfish	?				
Rougheye rockfish	X		?		
Sablefish			X		
Sand sole	X	X	X		
Sharpchin rockfish	X		?		
Shortspine thornyhead	X		X		
Spiny dogfish	X		X		X
Splitnose rockfish	X		X		
Starry flounder	X	X	X	X	X
Stripetail rockfish	X				
Tiger rockfish	X		X		
Vermilion rockfish	X	?	X		
Yelloweye rockfish	X				
Pacific Salmon Species					
Chinook salmon	X		X		
Coho salmon	X		X		
Puget Sound pink salmon	X		X		

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Coastal Pelagic Species					
Northern anchovy	X	X	X	X	X
Pacific sardine	X				
Pacific mackerel	X				
Market squid	X				
Northern anchovy	X	X	X	X	X

Note:
? = uncertain, but attribute may apply to this life stage

Analysis of Effects on EFH

The assessment of potential impacts from the proposed Project to the species' EFH is based on information in the documents listed in the reference section (NMFS 1998; PFMC 1998a, 1998b, 1999). The specific elements of the Project that could impact salmonid species EFH, and the impact mechanisms and Conservation Measures that avoid and minimize impacts, are identified in Table C-2.

Table C-2

Affected EFH by Project Element and Proposed Conservation Measures

Project Element	Affected EFH	Impact Discussion	Applicable Conservation Measures
Mechanical equipment use, and pile driving and removal	Water column and airborne noise	Temporary in-water and in-air noise effects will occur during construction. Pile driving activity can have effects to fish that may be present in the area during construction. All elevated in-water noise will occur during the approved in-water work window to avoid effects to certain ESA-listed fish that may be present in the Action Area during construction. Other fish may be present during this time, but EFH will not be adversely affected.	All BMPs, avoidance and minimization measures, and Conservation Measures discussed in Sections 3.4 through 3.6 of the BA will be applied, including adherence to in-water work windows as stipulated in the BA. In addition, all applicable permits for the Project will be obtained, and all work will be performed according to the requirements and conditions of these permits. Also, the contractor will furnish, install, and operate a bubble curtain system that will attenuate underwater sounds and pressures. The bubble curtain will be designed to achieve a minimum of 10 dB reduction in sound pressure.
	Water column water quality	Turbidity and other spill- or contaminant-related water quality effects could occur associated with pile construction. However, construction effects are expected to be localized and short-term and avoidance and minimization measures, Conservation Measures, and BMPs will be in place to reduce construction-related effects. Therefore, short- and long-term water quality effects to EFH are expected to be minimal.	All BMPs, avoidance and minimization measures, and Conservation measures discussed in Sections 3.4 through 3.6 of the BA will be applied, including adherence to in-water work windows as stipulated in the BA. In addition, all applicable permits for the Project will be obtained, and all work will be performed according to the requirements and conditions of these permits. State water quality standards as defined in WAC 173.201A will be met. Construction will comply with these water quality standards or with water quality restrictions that may be set for the Project.
	Substrate	Short-term substrate disturbances may occur related to piling construction. Construction effects are expected to be localized to the pile locations and short-term and avoidance and minimization	All BMPs, avoidance and minimization measures, and Conservation Measures discussed in Sections 3.4 through 3.6 of the BA will be applied. In addition, all applicable permits for the Project will be obtained, and all work will be performed according to the requirements and conditions of these permits.

Project Element	Affected EFH	Impact Discussion	Applicable Conservation Measures
		measures, Conservation Measures, and BMPs will be in place to reduce construction-related effects. The footprint of these activities is also small relative to the available areas for benthic and epibenthic community colonization in the area. In addition, benthic and epibenthic communities would be expected to rapidly recolonize after the disturbance. Effects to forage fish are expected to be insignificant or discountable. Based on this information, effects to EFH via disturbance of the prey community are not expected to be significant. Mitigation will be performed to address eelgrass impacts in accordance with permit conditions applied to the Project.	Eelgrass beds occur in the area where work is proposed. The contractor will be advised that eelgrass beds are protected under both state and federal laws. The contractor will adhere to the following restrictions during the life of the contract. The contractor will *not* perform any of the following: • Place derrick spuds or anchors in the areas designated as "eelgrass" • Shade the eelgrass beds for a period of time greater than 3 consecutive days during the growing season from March until August • Conduct activities that may cause scouring of sediments within the eelgrass beds or result in sediments transferring out of or into the eelgrass beds
New in-water and overwater structures	Water column	Reduced light levels and altered ambient light patterns will occur with the installation of the new overwater structure. Fish behavioral changes in EFH may include: 1) migration delays; 2) loss of schooling in refuge; and 3) increased size-selective predation risk. Though the area of new overwater coverage and increase in night lighting for the Project is small relative to the available habitat in the Action Area, and the design of the structure has incorporated light transmission	Light transmission has been incorporated into the Project design (see Section 2.3.1 of the attached BA). Night lighting has been designed to be directed away from the water's surface.

Project Element	Affected EFH	Impact Discussion	Applicable Conservation Measures
		elements in order to reduce impacts to light conditions, long-term light limitations will occur in nearshore EFH. However, these effects are not expected to significantly impede fish movement or prey resources to the extent that quality or quantity of EFH is reduced.	
	Substrate	The structure of the piles will create a permanent physical presence in the nearshore of the Action Area. The presence of piles may eventually alter adjacent substrates due to increased shellhash deposition from piling communities and changes to substrate bathymetry. However, these changes are not expected to alter foraging conditions for fish to the extent that prey resources or overall EFH quality would be significantly impacted.	None for this effect.
Removal of existing in-water and overwater structures	Water column Substrate	The removal of a total of 96 creosote-treated piles and associated overwater structures will remove the risk of contamination from this source to the nearshore waters and substrates.	Removal of these structures will result in a beneficial effect to EFH.

EFH Assessment and Determination of Effect

An adverse effect is defined as "any impact that reduces quality and/or quantity of EFH…[and] may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions." (50 CFR CH. VI. Subpart J; 600.810). Potential impacts from the proposed Project on groundfish, coastal pelagic, and Pacific salmonid EFH are shown in Table C-2.

Based on this information and the above definition, the project **will not adversely affect EFH for salmonid, groundfish, and coastal pelagic species.** This conclusion is appropriate because the Project will result in short-term increases in noise, turbidity, and substrate disturbance and long-term light limitations in nearshore fish habitat; however, these effects are not expected to significantly impede fish movement or prey resources to the extent that quality or quantity of EFH is reduced. In addition, permanent removal of existing creosote-treated in-water and overwater structures will result in a beneficial effect to EFH. Table C-2 lists the Conservation Measures that will help to avoid or minimize impacts to EFH for EFH composite species.

References

NMFS (National Marine Fisheries Service), 1998. Essential Fish Habitat West Coast Groundfish Appendix. NMFS, Seattle, Washington.

PFMC (Pacific Fishery Management Council), 1998a. The Pacific Coast Groundfish Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon.

PFMC, 1998b. Coastal Pelagics Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon.

PFMC, 1999. Appendix A. Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon.