BOULEVARD/CORNWALL OVERWATER PEDESTERIAN WALKWAY REVISED MITIGATION REPORT

Prepared for

City of Bellingham Parks and Recreation Department

Prepared by

Anchor QEA, LLC

1605 Cornwall Avenue

Bellingham, Washington 98225

October 2010

BOULEVARD/CORNWALL OVERWATER PEDESTRIAN WALKWAY

REVISED MITIGATION REPORT

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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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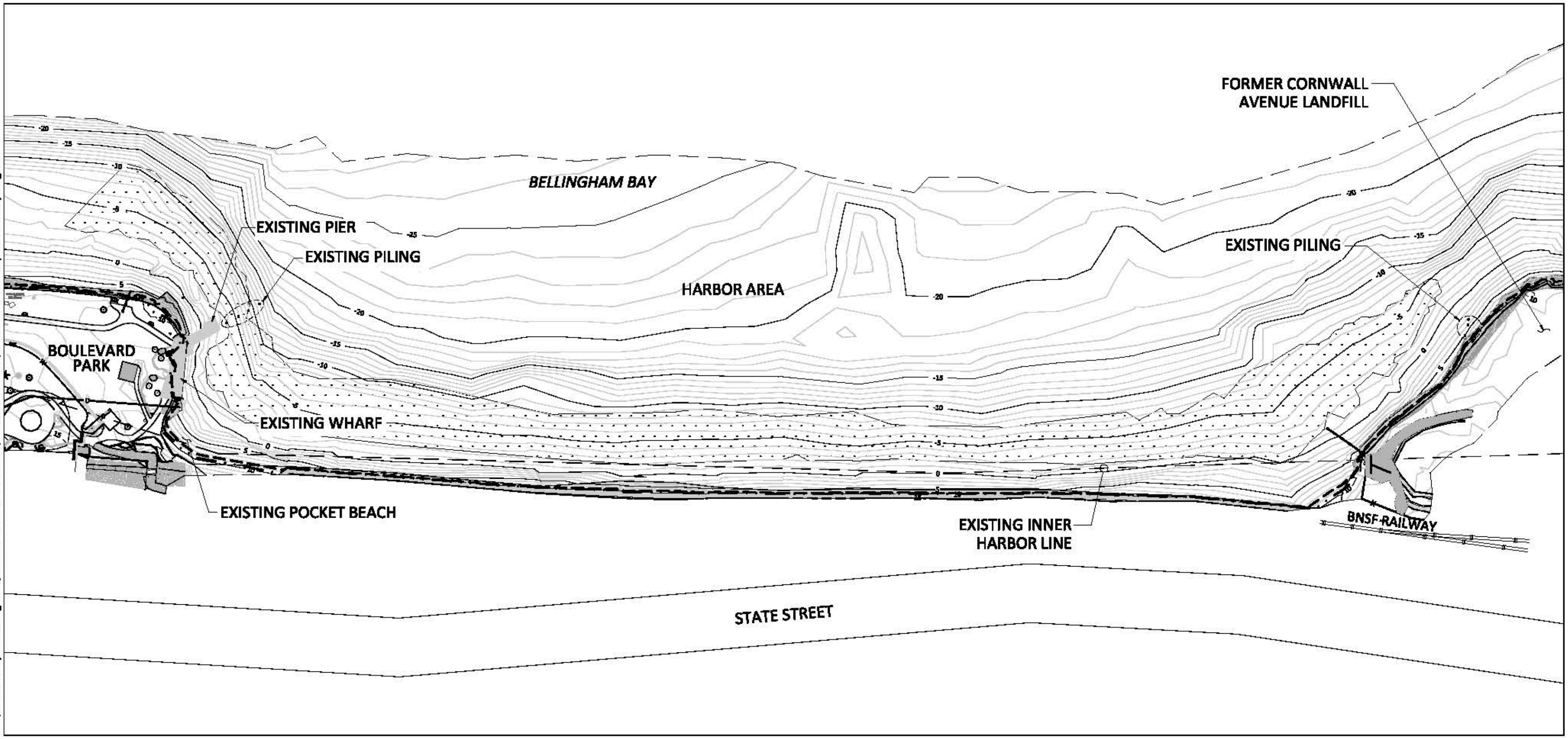
Scale in Miles

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



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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

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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, 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.

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. 1,705 square feet of grating will be integrated into the deck surface, including the three spans located closest to the Boulevard Park terminus and six 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

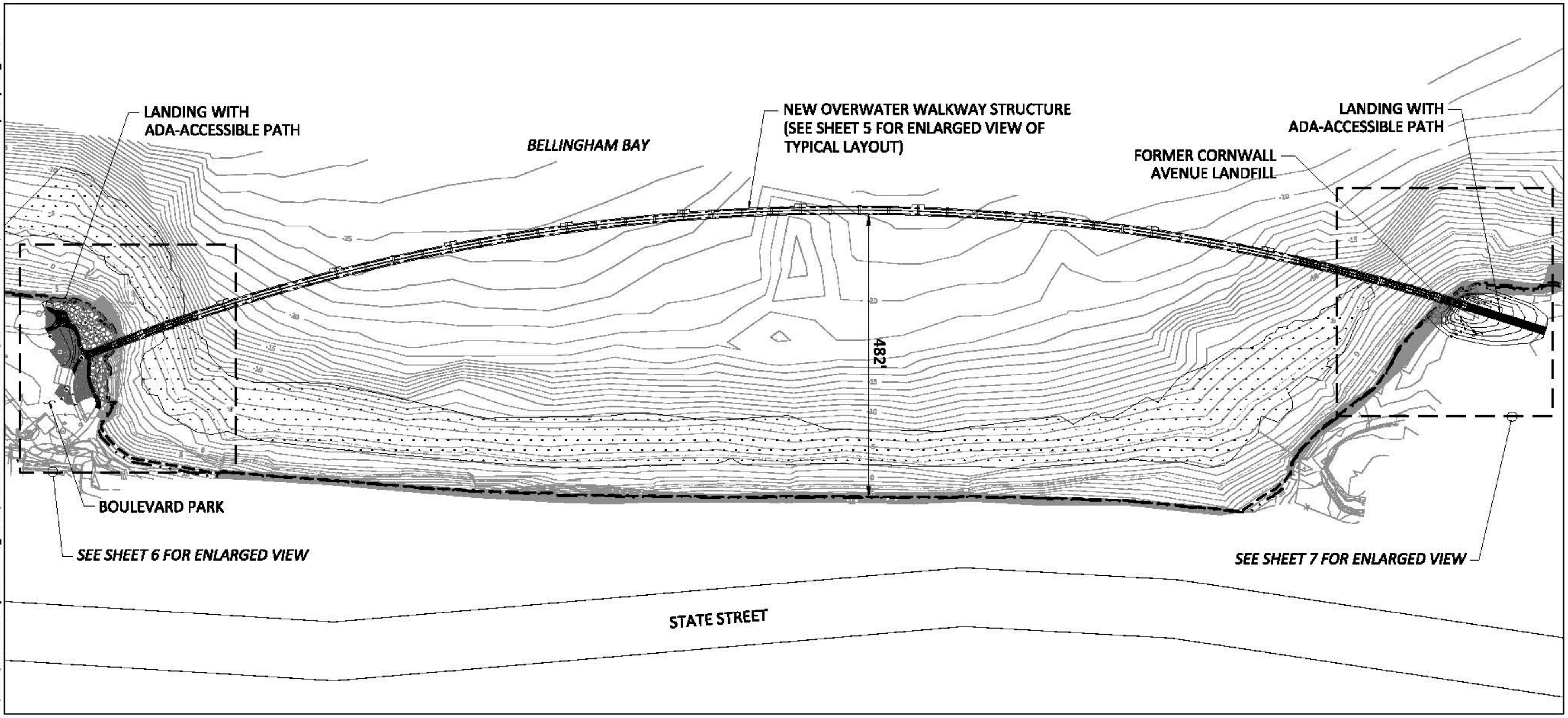
Landings for the overwater walkway will be developed at both Boulevard Park and the former Cornwall Avenue Landfill site (see Figure 4). On the Boulevard Park end, an existing timber wharf and timber pier will be demolished. Additionally, four existing creosote-treated timber piles located in the embayment 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.



LEGEND:

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

0 260
Scale in Feet

Oct 25, 2010 11:16am heriksen

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

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

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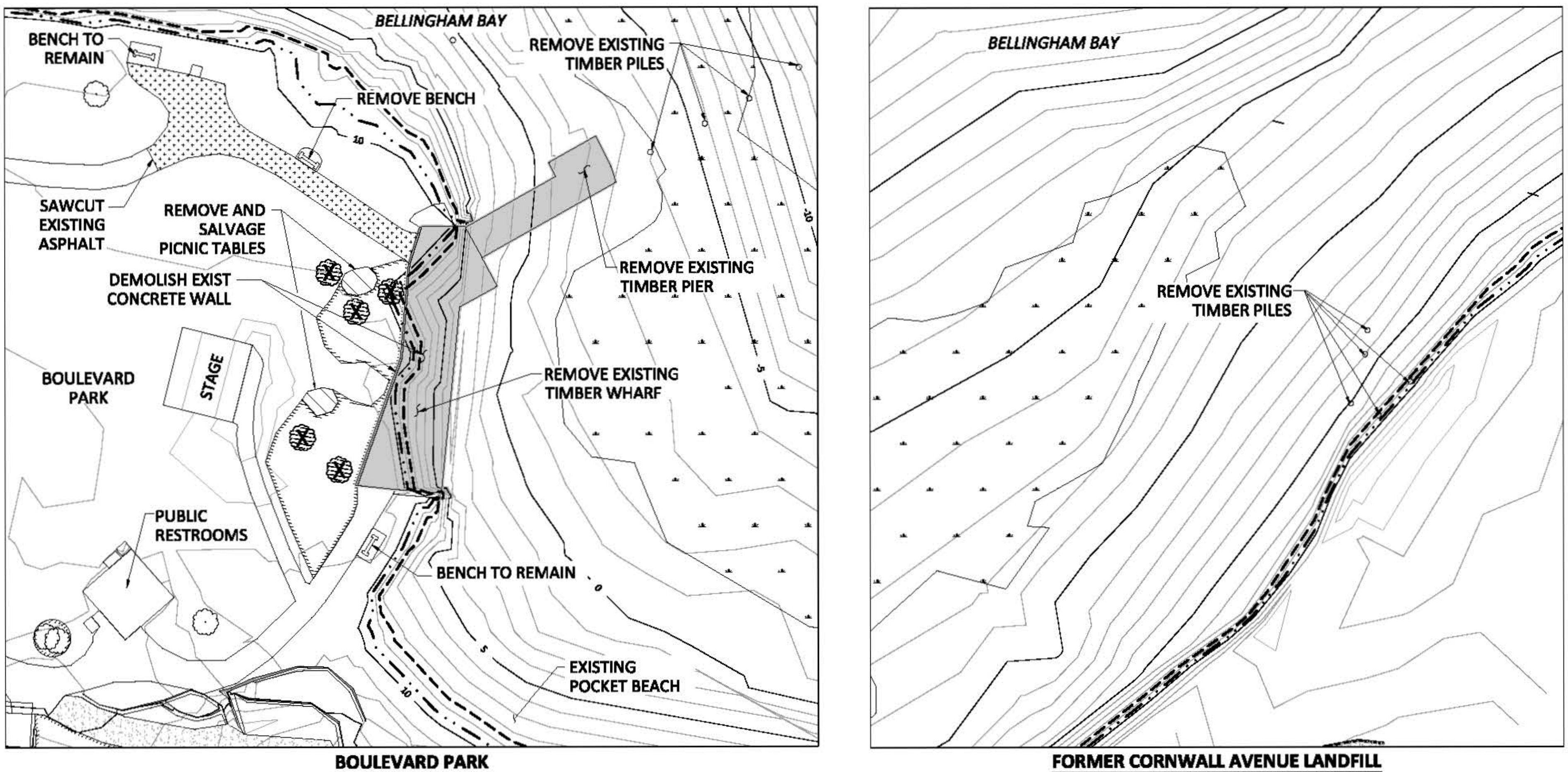

LEGEND:

- 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)

0 60
SCALE IN FEET

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

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

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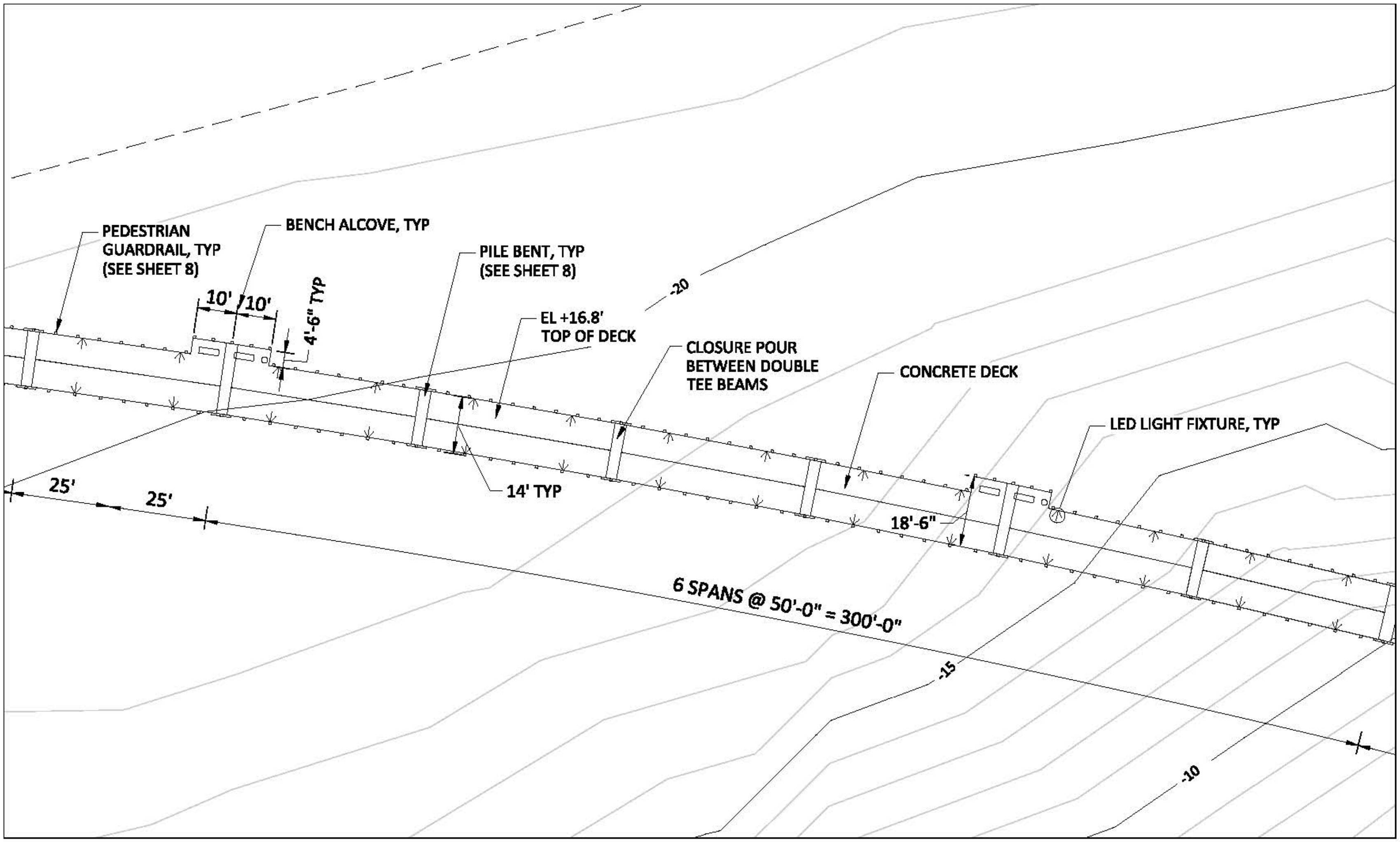

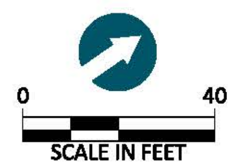

SOURCE: Drawing by Berger/ABAM dated 3/2010.

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

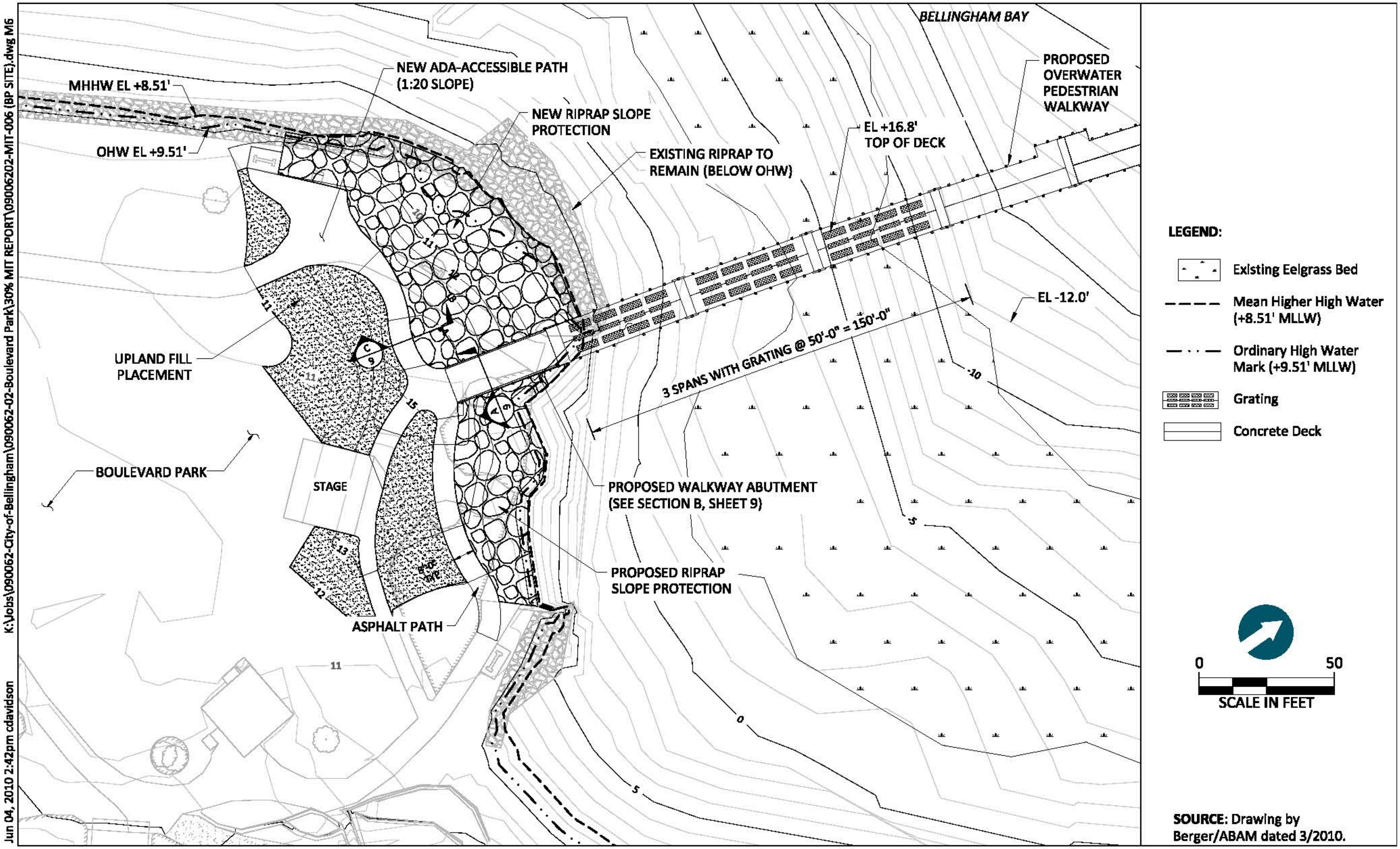

Figure 6
Boulevard Park Enlarged Site Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

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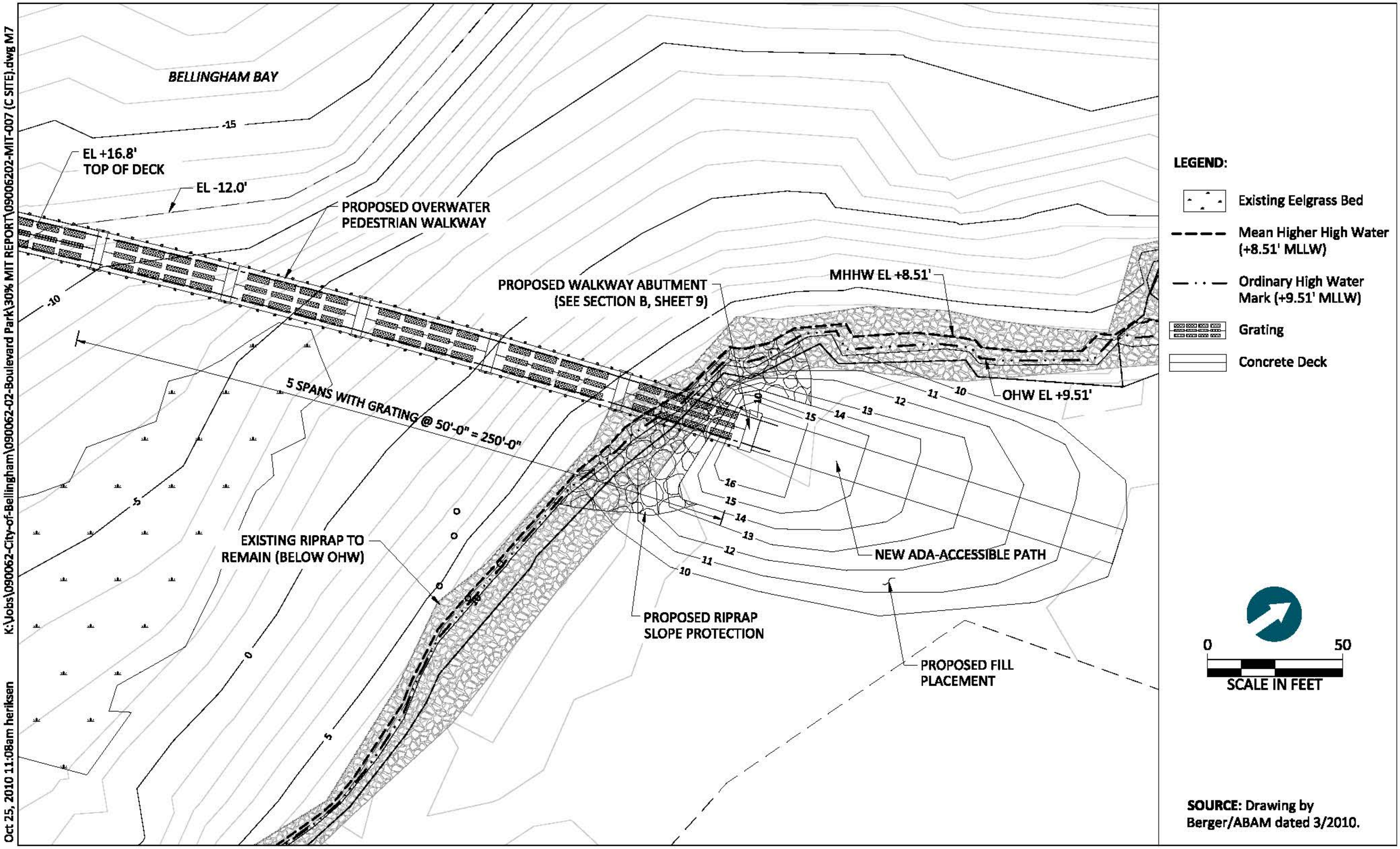

Figure 7
Former Cornwall Avenue Landfill Englared Site Plan
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

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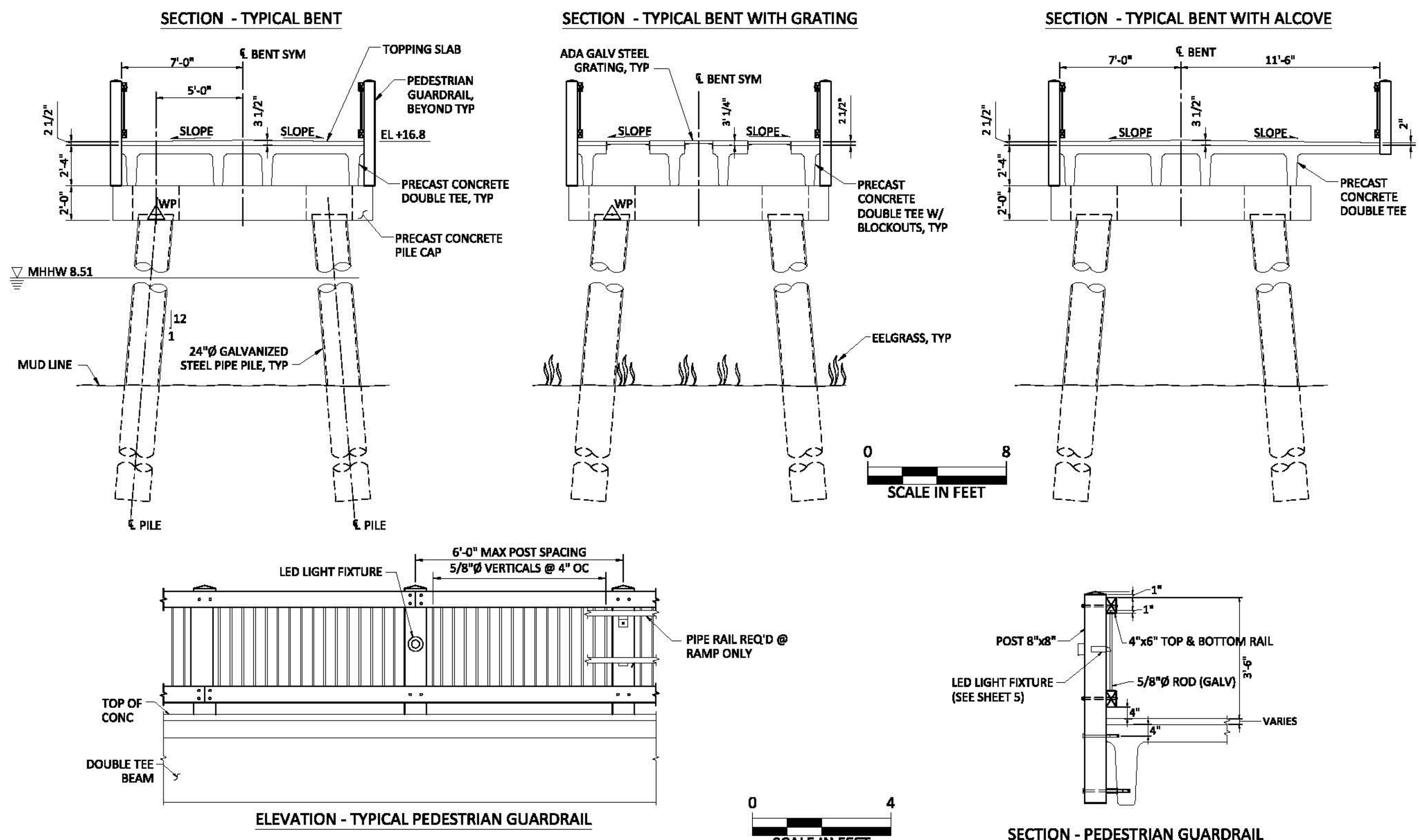

SOURCE: Drawing by Berger/ABAM dated 3/2010.

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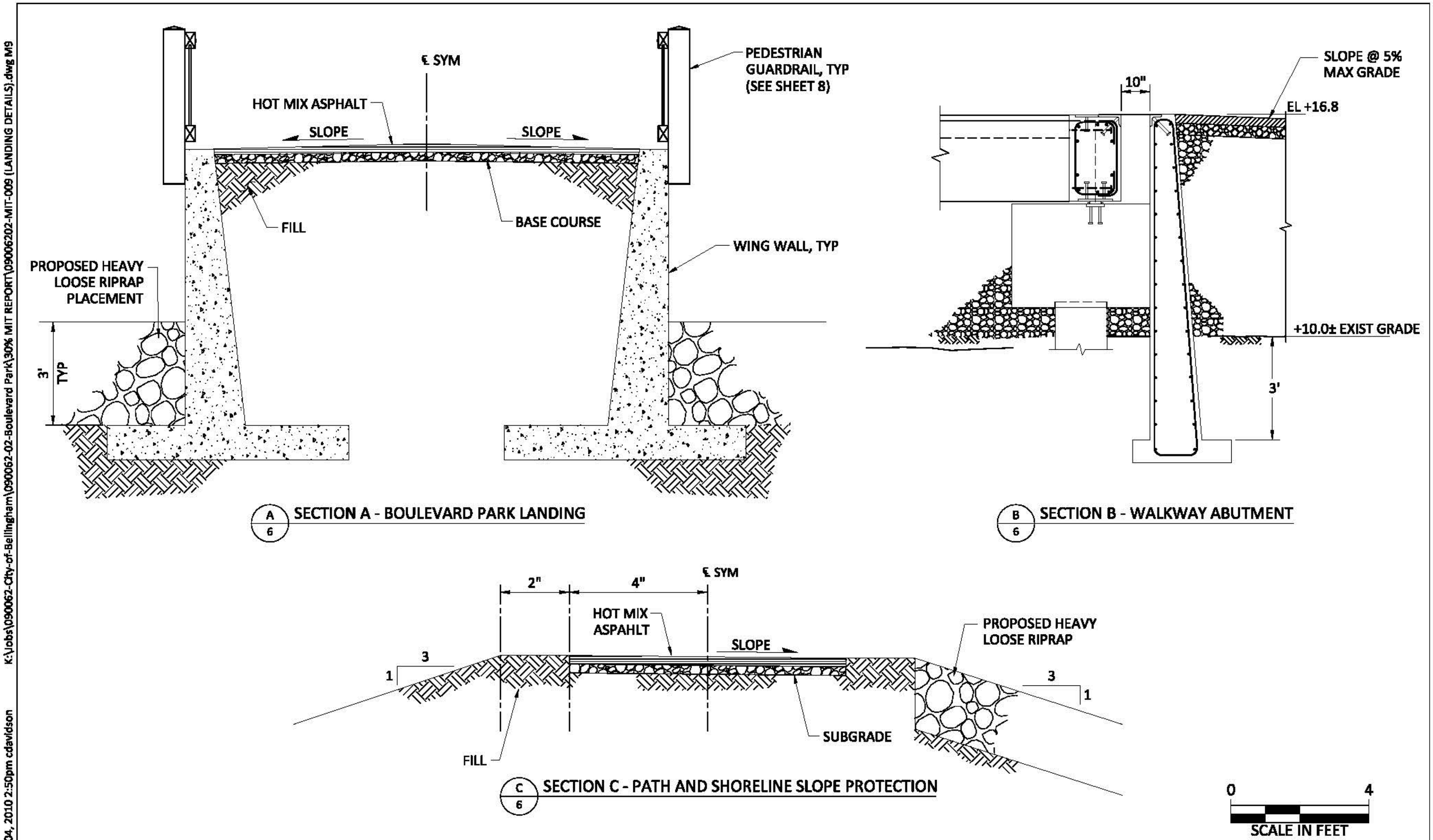
Figure 8
Typical Pile Bent Details
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway



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.

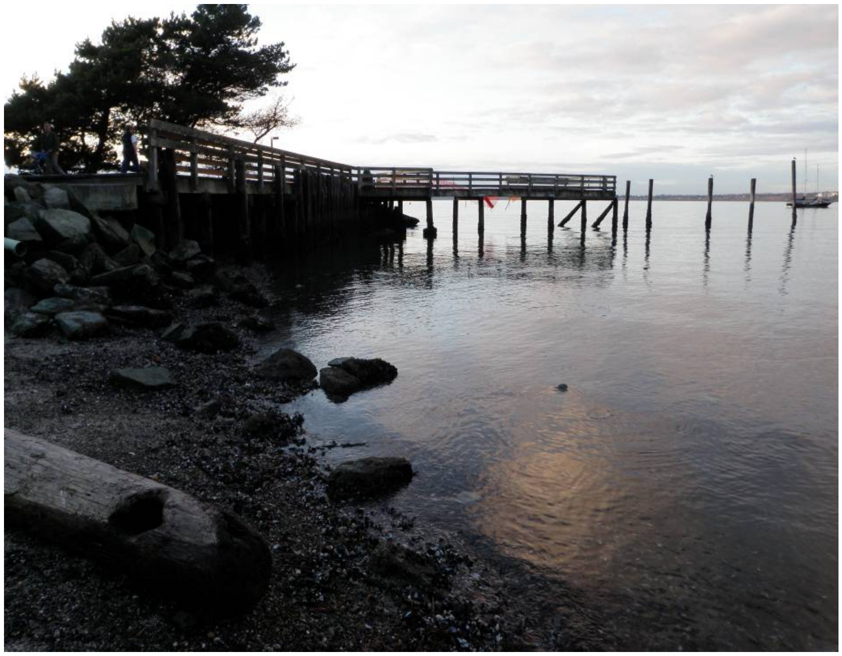


Photo 1 – Profile view of the existing pier at Boulevard Park from the adjacent pocket beach located at the northeast corner of Boulevard Park (facing west)

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.

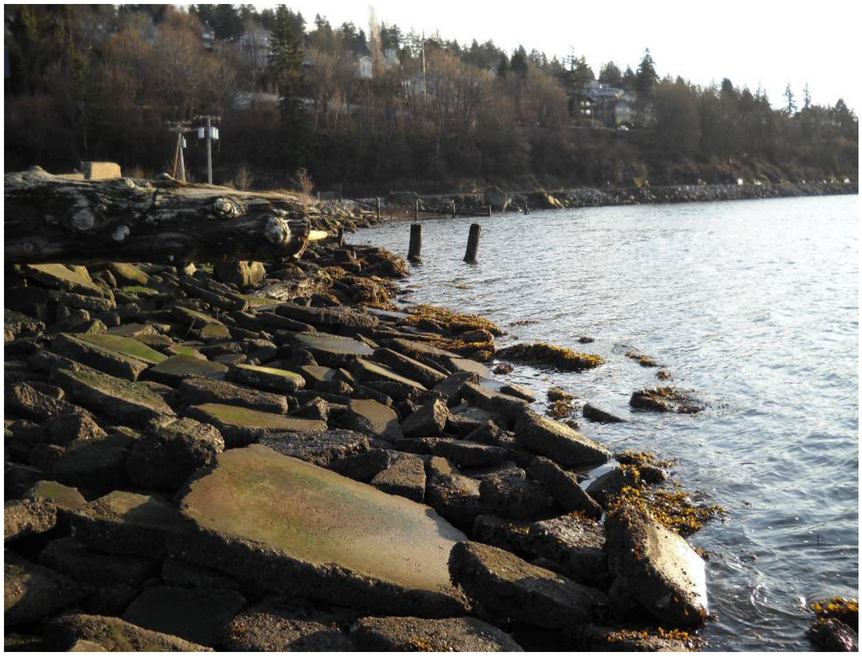


Photo 3 – View of the former Cornwall Avenue Landfill site where the north abutment of the proposed overwater walkway will land (facing southeast)

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 2008). 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. An eelgrass survey was conducted in 2008 (Grette Associates 2009) to determine the extent of the existing eelgrass bed. Subsequently, the location of the proposed structure was modified to avoid shading existing eelgrass. In addition, light transmitting grating was incorporated into the decking surface of the proposed structure between elevations 8.5 feet MHHW and -12 feet MLLW to minimize shading impacts on eelgrass. 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.

Potential mitigation opportunities to compensate for impacts to existing eelgrass beds include the recovery of eelgrass on the Boulevard Park side where the existing timber pier will be removed, and in areas where the derelict pilings will be removed. Another potential opportunity may be to remove rubble and debris in the intertidal zone on the Cornwall Avenue Landfill side within the elevation bands of -1.7 and -10 feet MLLW. This would provide the necessary substrate and area suitable for eelgrass reestablishment.

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	1,705 (1,193 open area)	4,203
Total	-3,339	5,396	1,705 (1,193 open area)	864

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 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 WDFW in-water work window for the Project is from September 1 to February 14 and the USACE in-water work window is from July 16 to October 14. Therefore, the expected overall allowable work window for construction of the project is September 1 to October 14.

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 6 summarizes the design goals, design criteria, and final performance standards associated with the proposed mitigation approach.

Table 6
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. Compensate for any lost eelgrass area at a 1:1 ratio.	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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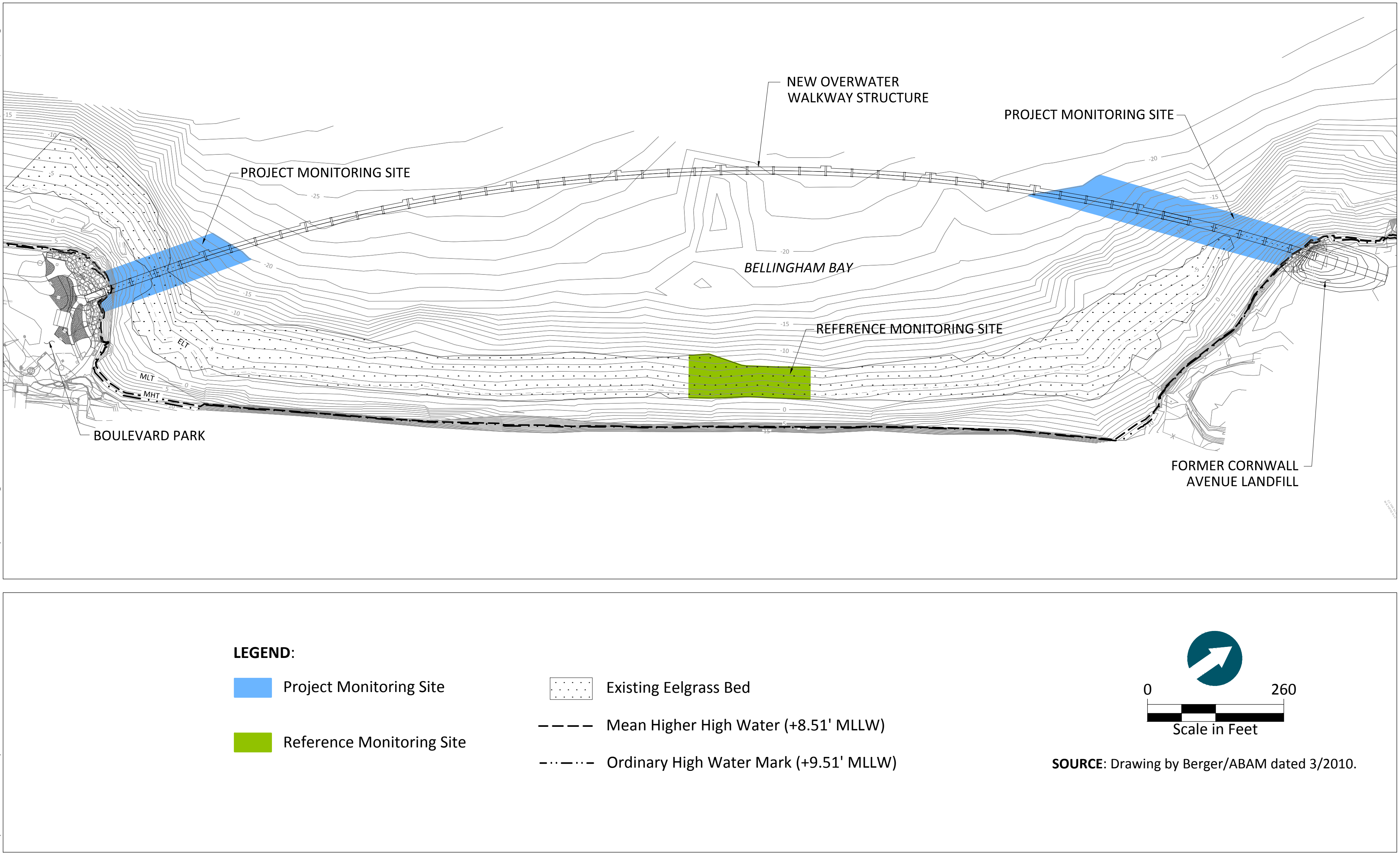
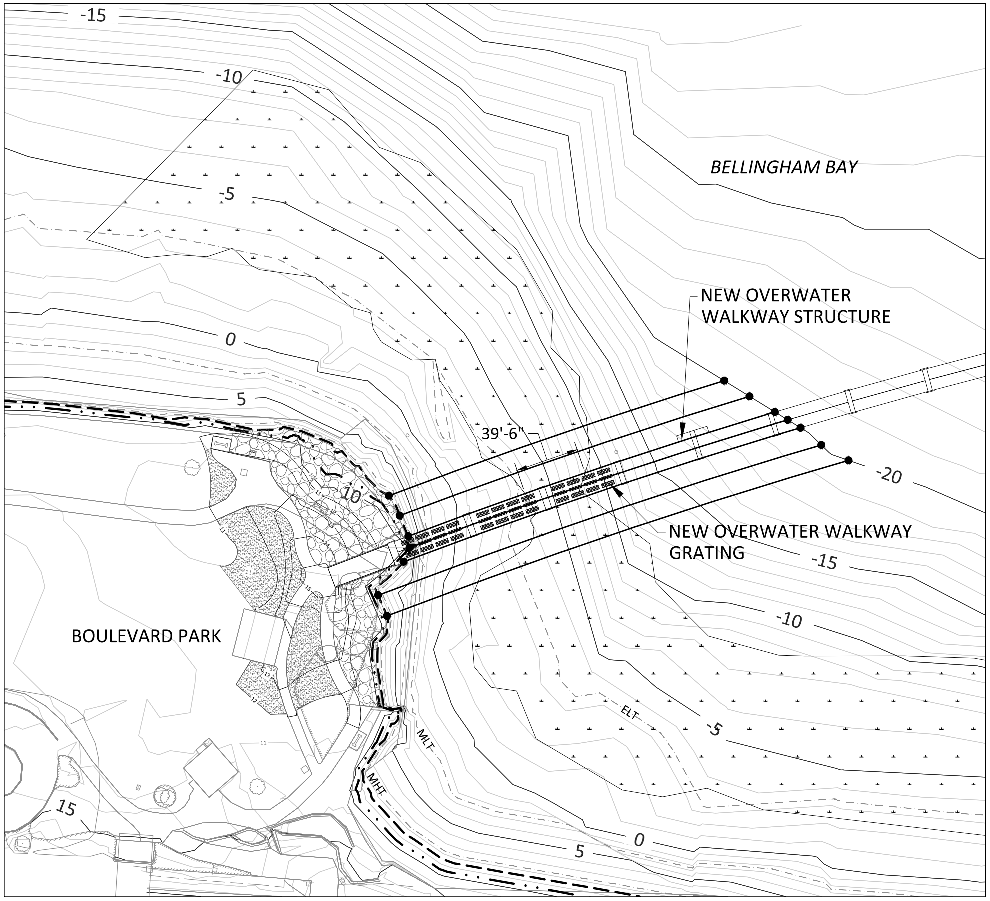
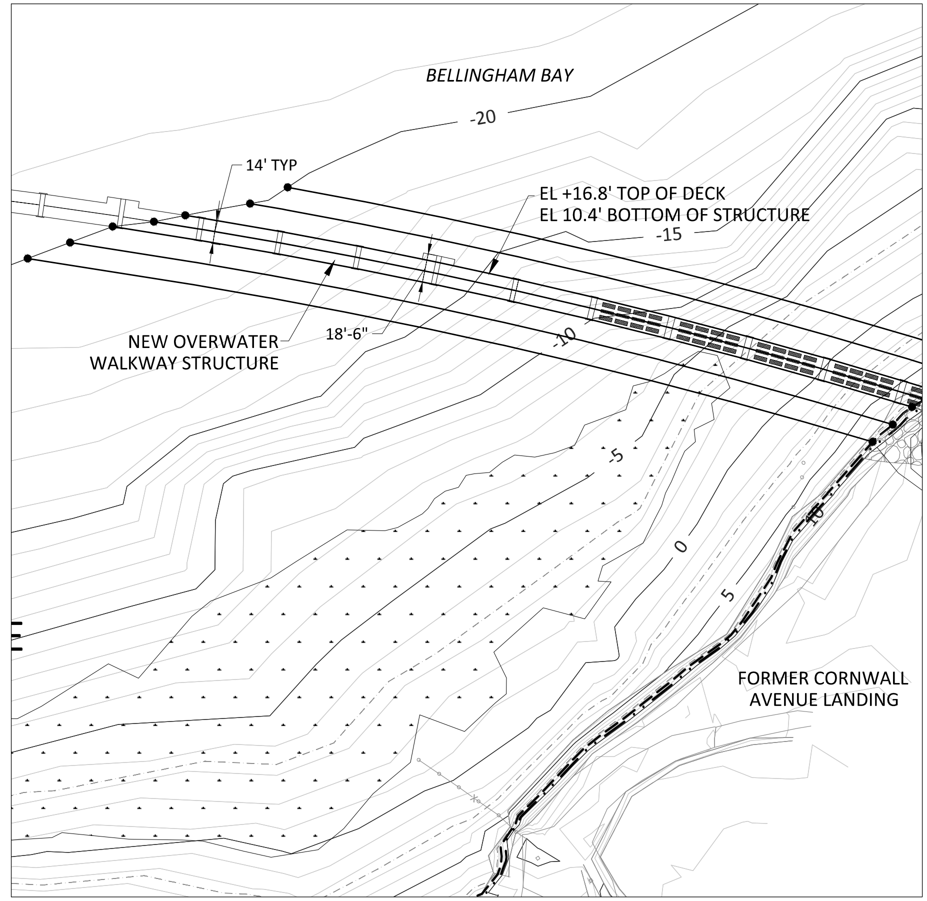


Figure 10
Monitoring Areas
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

ANCHOR QEA



BOULEVARD PARK



FORMER CORNWALL AVENUE LANDFILL

LEGEND:

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

0 120
Scale in Feet

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

Figure 10A
Transect Layout
Mitigation Report
Boulevard/Cornwall Overwater Pedestrian Walkway

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 and adjacent to the proposed structure (Project site) and comparing it to monitoring results from a nearby reference eelgrass patch (reference site). The reference site will provide data to compare to Project site data to inform whether any observed eelgrass changes in the Project site may be related to regional inter-annual trends in eelgrass rather than Project impacts. Reference site monitoring will occur within the Project's embayment and within the same eelgrass bed, outside of the overwater walkway's shadow. The locations of the Project site and reference site are shown on Figure 10.

6.2.1 Methodology

Sampling methods will follow WDFW's *Eelgrass/Macroalgae Habitat Interim Survey Guidelines* (WDFW Guidelines; WDFW 2008) and the *Washington DNR Aquatic Vegetation Preliminary Survey Guidelines* (WDNR Guidelines) for both the Project site and reference site (WDFW 2008). Monitoring of the Project site will include pre and post-construction sampling efforts to evaluate potential shading impacts from the proposed overwater walkway on eelgrass. Eelgrass monitoring will include a pre-construction baseline survey, and post construction monitoring in years 3 and 5. Samples will be taken along both portions of the walkway (i.e., the Cornwall Avenue Landfill side and the Boulevard Park side) that cross through suitable depths for eelgrass (Project Monitoring Site, Figure 10). The potential shading impact areas are assumed to extend as far as two times the width (equal to 28 feet) of the walkway.

6.2.1.1 Pre-construction (Baseline) Survey and Establishment of Monitoring Sites

A pre-construction eelgrass survey will be conducted to establish baseline eelgrass distribution. The outcome of this survey will be used to determine the monitoring approach, in consultation with WDFW, for post-construction year 3 and year 5 evaluations of Project impacts to existing eelgrass beds. Monitoring transects will be established running parallel to the proposed structure alignment. One transect will be located along the center of the structure, two along the edges of the structure (i.e., transects are located 7 feet to either side of the center transect), and two on either side of the structure extending to 14 feet and to 28 feet from the outside edge of the proposed structure (see Figures 10 and 10A). Transects will extend from the upper intertidal zone to approximately -12 feet MLLW.

6.2.1.1.1 Cornwall Avenue Landfill Side

Existing survey data (Grette Associates 2009) indicate that the proposed walkway was designed to not cross over any of the eelgrass bed shown in the Grette Associates survey. Despite that data, the pre-construction survey described above purposely includes survey transects in areas shown by Grette Associates to not have eelgrass in order to confirm the baseline distribution in the potential area shaded by the walkway and to provide additional information on other macroalgae species. The results of the pre-construction survey in the Project site will be used to determine the appropriate reference site sampling approach as shown in Table 7).

Table 7
Sampling Approach in Project Site on Cornwall Avenue Landfill Side and Reference Site

Pre-Construction Survey Eelgrass Distribution on Cornwall Avenue Landfill Side	Reference Site Sampling
If there is a large enough eelgrass bed in the Project site survey area to meet WDFW (2008) statistical power requirements through quadrat subsampling, then quadrat subsampling per WDFW guidelines will be conducted.	Quadrat subsampling per WDFW (2008) will be conducted in the reference site. Survey transects will be established along the same orientation to the shoreline as in the Project site (i.e., not perpendicular to the shoreline because the proposed walkway is not perpendicular to the shoreline).
If there is a large enough eelgrass bed in the Project site survey area to meet WDFW (2008) statistical power requirements through quadrat subsampling, then a full census of eelgrass shoots will be conducted in the survey area.	A full census of eelgrass shoots in an equal area in the reference site will be conducted. The reference site survey area will be of the same shape and be in the same depth contours as the eelgrass found in the Project site survey.

6.2.1.1.2 Boulevard Park Side

Existing survey data indicate that the proposed walkway alignment crosses over an existing eelgrass bed in this location. Based on Grette Associates (2009) data, there will be enough eelgrass in the impact monitoring area to conduct quadrat subsampling survey per WDFW guidelines.

6.2.1.2 Post-Construction Sampling

Post-construction year 3 and year 5 eelgrass monitoring activities will be determined based on the pre-construction survey results and in consultation with the WDFW Area Habitat Biologist. An initial expectation is that the pre-construction survey approach (i.e., quadrat subsampling or full census of shoots) will be repeated in post-construction surveys. One aspect of the post-construction monitoring approach to be discussed with WDFW will be whether the Cornwall Avenue Landfill side survey area can be reduced if only a small portion of an eelgrass bed (such as documented in Grette Associates 2009) is found in the pre-construction survey.

6.2.2 Data Analysis

Data analysis will follow the WDFW and WDNR Guidelines (WDFW 2008; WDNR n.d.). 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 Reporting

Pre- and post-construction monitoring data that are collected will be summarized in report format in accordance with the WDFW Guidelines and the WDNR Guidelines. The reports will be submitted to the City, USFWS, WDNR, and NMFS within 90 days following the monitoring activities.

6.2.4 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
				Pre-Construction Eelgrass Density ÷ Post-Construction Eelgrass Density < 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 8).
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.

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.

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