TECHNICAL MEMORANDUM

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October 6, 2014

From: Grette Associates
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Re: Fisherman's Cove Working Waterfront; Eelgrass Survey
SGJJR Project Number: 50335.002

INTRODUCTION

As part of the development of the Fisherman's Cove Working Waterfront project, the Lummi Nation hired Grette Associates to conduct a delineation of eelgrass beds in the vicinity of the proposed development. Fisherman's Cove is located in Hale Passage, immediately south of Gooseberry Point. Existing development within Fisherman's Cove include three overwater structures (fuel dock, ferry terminal, and fixed pier) and a concrete boat launch. This development is limited to the northern portion of Fisherman's Cove. The remainder of Fisherman's Cove contains numerous mooring buoys. The proposed Fisherman's Cove Working Waterfront project would result in improvements to the existing fixed pier, realignment of the existing ferry terminal, and the removal and relocation of the existing fuel dock and boat launch. In addition, the proposed project would result in dredging of the nearshore and the installation of new working docks, a protective jetty, new launch ramp, and a floating harbor and attenuator. Due to the fact that this proposed project will occur within the intertidal and shallow sub-tidal environments and in an area where eelgrass is present, an eelgrass delineation is required. The delineation will assist in the design of the proposed project and will help minimize and estimate the potential impacts of the project on the eelgrass habitat. The remainder of this Technical Memorandum presents the methods and results of the eelgrass delineation.

SURVEY METHODS

In September 2011, Grette Associates biologists conducted a formal delineation of the eelgrass beds within the northern portion of Fisherman's Cove. A preliminary survey was completed in November 2010, in order to determine the presence and approximate location of the eelgrass beds, in order to develop the methodologies for the formal delineation. The portion of Fisherman's Cove surveyed for eelgrass encompassed the area where the proposed project may occur.

Eelgrass Delineation

Prior to the dive survey in November 2010, aerial photographs were reviewed to determine the presence of eelgrass within Fisherman's Cove. Based on the aerials, a large eelgrass bed was identified to the southeast of the existing piers and dock that extends well south of the proposed project location. Along the remainder of the shoreline (west of the existing fixed pier), where eelgrass was not observed on the aerial photographs, transects were established perpendicular to the OHWM in order to locate eelgrass. The transects were spaced 40 ft apart and extended from the OHWM south to a depth greater than -20 ft MLLW. Divers surveyed the transects and a buoy was dropped when eelgrass was observed for later surveying. Following the transect surveys, the edges of the existing eelgrass beds were delineated using a 2005 Trimble GeoXH Differential Global Positioning System (dGPS, horizontal accuracy ±1ft). SCUBA divers delineated the edge of each eelgrass bed by swimming along the eelgrass/non-eelgrass boundary, and placing weights attached to a surface buoy at intervals determined by the complexity of the edge (typical intervals were between 10 and 20 feet). In areas where the edge was complex, the distance between buoys was reduced to capture the complexity (to a maximum of 10-foot intervals). The boat driver and dive tender then positioned the survey skiff over the buoy, pulled the line tight (the diver held onto the anchor end of the line to keep it in place), and logged the position into the dGPS data logger. The locations of boundary points recorded in the dGPS data logger were downloaded into Trimble GPS Pathfinder Office 3.10 software and converted to incorporate into an AutoCAD file provided by SmithgroupJJR. The scale was maintained and the data plotted on the base map of Fisherman's Cove (Figure 1). This initial survey identified the location of eelgrass beds for the formal delineation that occurred in September 2011.

As stated above, the formal delineation of the eelgrass beds within the northern portion of Fisherman's Cove occurred in September 2011. The information collected in 2010 was used to identify the areas where turion densities would be collect (described below). Due to the fact that the initial survey occurred in November, the edge of the eelgrass bed was again delineated using the same process as described above. In addition, the areas previously identified as being devoid of eelgrass were again visually inspected.

The eelgrass delineation identified three (3) eelgrass beds within the northern portion of Fishermen's cove; eelgrass beds A, B, and C.

Eelgrass Densities

Eelgrass density data was collected along a total of forty (40) transects located within the three eelgrass beds. A total of six (6) transects were established within eelgrass bed A, twenty-six (26) transects within eelgrass bed B, and eight (8) transects in eelgrass bed C. The transects within eelgrass beds A and B ranged between 20 ft and 120 ft and extended through the entire eelgrass bed (oriented north/south). The transects within eelgrass bed C ranged between approximately 450 and 1,000 ft and were established within the portion of the larger eelgrass bed adjacent to the proposed project (oriented north/south). Transects were spaced approximately 20 ft apart. After the transects were established, turion counts were collected at even intervals along the transects and within the eelgrass beds. Turion counts were collected every 10 ft along the transect line within eelgrass bed A and every 20 ft within eelgrass beds B and C. Densities were sampled using a 0.25 m^2 quadrat. Divers also recorded macroalgae presence and substrate characteristics. Relative to the transect, turion density was measured by placing a 0.25 m^2 quadrat at the 2, 6, and 10 o'clock positions, relative to north. The number of turions within each quadrat position was

recorded, noting the general condition, approximate blade length, and presence of reproductive turions. Zero counts were included in the data collected and the three density counts (per quadrat) for each location were then averaged. These averages were then used to calculate an average density for the entire eelgrass bed. To calculate the total turion counts, these average densities were then extrapolated by multiplying average density by area (acres) of eelgrass.

SURVEY RESULTS

Existing substrates and currents within the proposed project area varied dramatically. The portion of Fisherman's Cove located west of the existing fuel dock consists of gravel/cobble from above the MHHW to a depth of approximately 0 to -2 ft MLLW, at which point finer sediments (sand and low levels of silt) are present. The survey indicated that there are three eelgrass beds located within the proposed project area. Eelgrass bed A is the smallest and is located to the east of the existing ferry terminal. Eelgrass bed B is a larger bed located west of the ferry terminal and south of the boat launch. Eelgrass bed B encircles the southern end of the fuel dock but no eelgrass is present below the dock. Eelgrass bed C is an extremely large eelgrass bed that extends well south of the proposed project area and covers the majority (between approximately 0 ft and -14 ft MLLW) of Fisherman's Cove.

Eelgrass bed A is approximately 4,355 sq ft and located between approximately -2 ft and -10 ft MLLW. The eelgrass turions appeared healthy and ranged in size between 4-6 ft long with approximately 20 percent epiphyte coverage. Overall eelgrass densities within the bed were low with an average turion density of approximately 12 per m^2. Turion densities within individual sample plots ranged from 0-14 turions per ¼ m^2 (0-56 per m^2). The coverage of eelgrass on the east side of the ferry dock appeared to be consistent in density and contained no visible bare areas without eelgrass (Figure 1). Based on the area and average density, there are approximately 4,855 eelgrass turions within eelgrass bed A. Within the eelgrass bed, the substrates consist primarily of sand with occasional shell hash and debris (metal, tires, etc.) in upper elevations and increased silt at lower elevations. Macroalgae consisted primarily of *Ulva lactuca* and *Saccharina latissima*, although the coverage was less than 20 percent for the entire bed. Macroalgae was only observed within approximately 36 percent of the survey locations with an average coverage less than 20 percent. Individual macroalgae coverage ranged from 10-40 percent. The western limit of this eelgrass is likely impacted by the regular high currents when the ferry approaches and departs from the ferry terminal. This disturbance, along with the finer substrates appears to have impacted the average turion densities and macroalgae coverage within the eelgrass bed.

Eelgrass bed B is much larger than eelgrass bed A and located west of the existing ferry terminal. Eelgrass bed B is approximately 0.64 acre (~27,900 sq ft) and is located laterally along the shoreline between approximately 0 and -15 ft MLLW. The eelgrass bed covers over 420 lineal feet of the shoreline and encircles the existing fuel dock with very little eelgrass extending below the existing dock. The northern edge of the eelgrass bed appears to be limited by the increase in substrates size (increase in gravels and cobble) and the use of the existing boat launch. The eastern extent appears to be limited by depths and the continual disturbance from the ferry terminal and the western extent appears to be limited by high flows around the point that have resulted in coarser substrates. The eelgrass turions appeared healthy and ranged in size between 4-6 ft long with approximately 20 percent epiphyte coverage. Overall eelgrass densities within the bed were moderate with an average turion density of approximately 25 per m^2. Turion

densities within individual sample plots ranged from 0-56 turions per ¼ m^2 (0-224 per m^2). Eelgrass coverage within this bed ranged from patchy to thick with many small areas devoid of eelgrass. The small bare areas still resulted in a large functioning eelgrass bed. Based on the area and average density, there are approximately 64,800 eelgrass turions within eelgrass bed B.

Substrates within the eelgrass bed B were dominated by sand in the upper elevations with increased silt at lower elevations. In areas where the eelgrass bed was patchy there was a larger amount of gravels and cobbles. Macroalgae was present in approximately 25 percent of the individual sample locations. Macroalgae consisted primarily of *Ulva lactuca* with a low level of *Saccharina latissima.* Macroalgae was primarily located within the western portion of the eelgrass bed where gravel and cobble are present and immediately waterward of the boat launch (primarily ulva within a depression). Macroalgae coverage within the plots averaged approximately 20 percent, with a range of 5-60 percent (within the 25 percent of the sample locations with macroalgae).

Eelgrass bed C is a large eelgrass bed located east of the existing fixed pier and extending to the south. This eelgrass bed is part of a wide eelgrass band that extends from approximately 0 ft to approximately -15 ft MLLW. The shoreline east of the existing fixed pier continues east for approximately 1,300 feet and then turns south (nearly 90 degrees). This stretch of shoreline contains extremely flat slopes (100H:1V) between 0 ft and -10 ft MLLW. The substrates within this flat sloped portion of the shoreline are dominated by sand and silt. The low energy, flat slopes, and fine substrates have resulted in optimal conditions for the colonization of eelgrass. As a result, almost the entire flat sloped area (with suitable depths) contains eelgrass. As stated above, the eelgrass bed is located between approximately 0 ft and -15 ft MLLW and is over 1,000 feet wide adjacent to the proposed project. The western extent of the bed is controlled by water depths, where the eelgrass ceases when there is a lack of sunlight. Eelgrass bed C continues south for more than a mile; however, the eelgrass bed was only delineated approximately 600 feet to the south of the proposed project area. The eelgrass present within eelgrass bed C was healthy (between 4-7 ft tall) and densities ranged from patchy to dense eelgrass coverage.

Following the delineation of the eelgrass bed C, transects were established parallel to the western edge of the bed. These transects were established to collect densities within the portion of the eelgrass bed where potential impacts from the proposed project may occur. Transects were oriented north/south and ranged between 445 ft to 1,400 ft and were located within approximately 250 ft of the western edge of the bed. Turion densities along the transects were divided into two distinct areas with greater densities in the shallower areas and decreasing densities below -12 ft MLLW. Average turion densities within 50 ft of the western edge were approximately 12 turions per m^2, while the remainder of the eelgrass bed (more than 50 ft east of the western edge) had an average density of approximately 26 turions per m^2. Overall, the average turion density within the western portion of eelgrass bed C (within 250 ft of the western edge) was approximately 19 turions per m^2. Turion densities within individual sample plots ranged from 0-80 turions per m^2, with the lowest densities observed at greater depths and within 50 ft of the western eelgrass edge. The majority of the proposed project would occur within the portion of the eelgrass bed with the lowest densities.

Macroalgae within the western portion of eelgrass bed C was low and present in less than 10 percent of the individual sample locations. Macroalgae consisted primarily of *Ulva lactuca* and *Saccharina latissima.* Macroalgae coverage within the plots averaged approximately 20 percent, with a range of 5-40 percent (within the 10 percent of the sample locations with macroalgae).

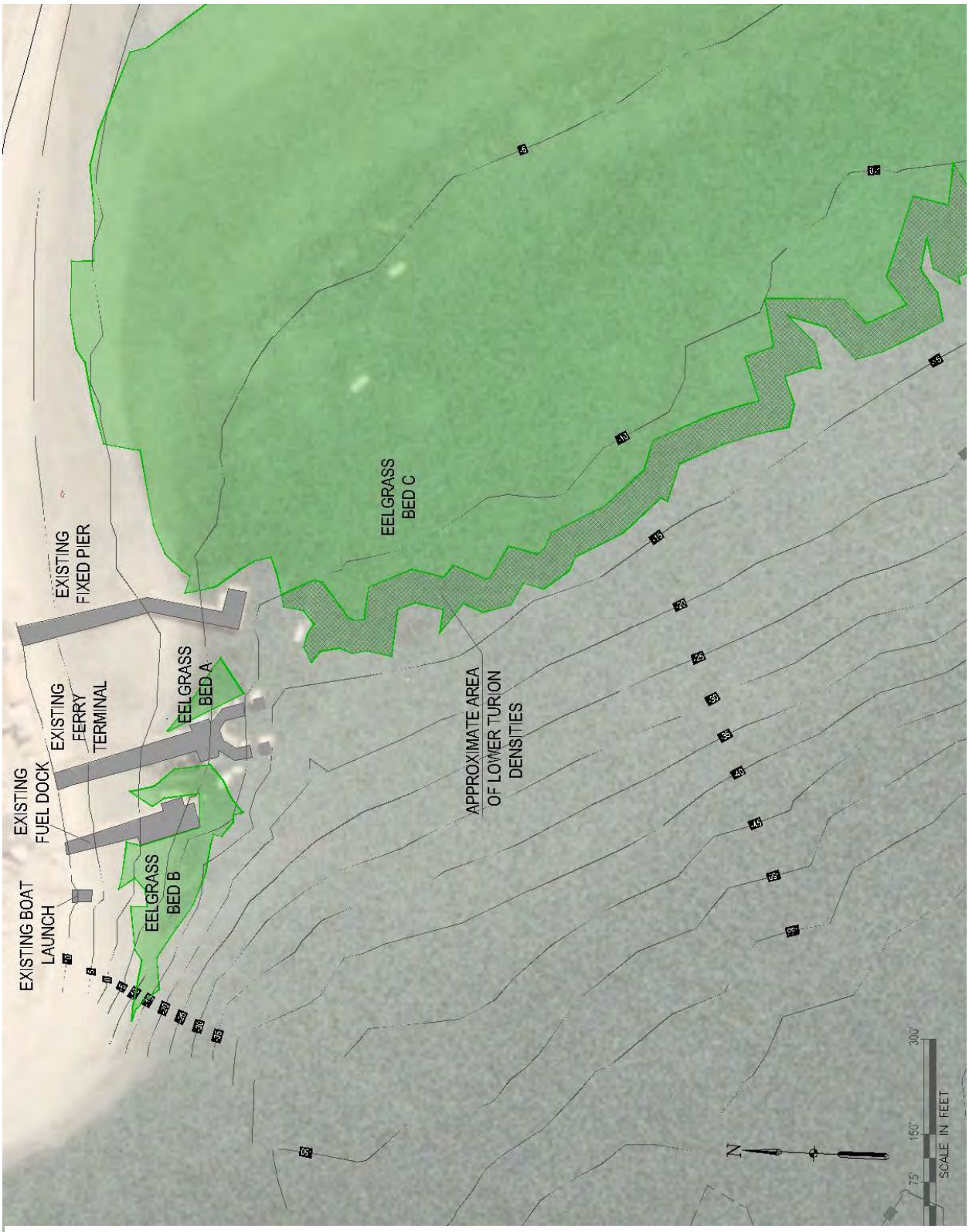

Figure 1. Eelgrass delineation in the northern portion of Fisherman's Cove.

POTENTIAL EELGRASS IMPACTS OF THE PROPOSED FISHERMAN'S COVE WORKING WATERFRONT

As part of this eelgrass delineation report, Grette Associates also estimated the potential impacts of the proposed Fisherman's Cove Working Waterfront project. The anticipated impacts associated with the project are based on designs dated October 1, 2014 and could change with any modification to this design. The proposed project would result in the direct removal of eelgrass and would also indirectly impact eelgrass by modifying the use of the area. The direct removal of eelgrass would result from the proposed dredging, realignment of the ferry terminal, and installation of new overwater structures (pier, dock, and ferry terminal). The impacts associated with the new overwater coverage would result from the installation of piling and the shading of the area directly beneath the structures. Indirect impacts associated with the proposed project are those impacts that will modify the existing use of the site and the environmental conditions. Modifications to the existing use include the use of the realigned ferry terminal, inner working harbor and increased use of the site by boats utilizing the new structures. In order to estimate the impacts of the ferry terminal realignment it was estimated that eelgrass within 100 ft of the new terminal may be impacted. The proposed dredging, breakwater, and attenuators has the potential to impact the existing eelgrass by altering the energy levels and currents adjacent to the new structures. For this report, it is anticipated that eelgrass within 25 ft of the new structures could potentially be impacted by shading and modified energy levels.

Based on the proposed design of the project (Figure 2), it is anticipated that the proposed project will result in impacts to all three eelgrass beds (Figure 2). The proposed project will impact approximately 0.67 acre of eelgrass habitat (29,080 sq ft) and approximately 45,112 eelgrass turions. The proposed project would eliminate all of eelgrass bed A (0.10 acre; 4,355 sq ft), which would result in the removal of 4,860 eelgrass turions based on the average turion density of 12 per m^2. Eelgrass bed B is approximately 0.64 acre (27,908 sq ft), of which approximately 0.24 acre (10,510 sq ft) will be eliminated. The removal of the 0.47 acre of eelgrass bed B would result in elimination of approximately 24,400 eelgrass turions (based on an average turion density of 25 per m^2). The proposed impacts to eelgrass bed C would result in the removal of approximately 0.33 acres (14,216 sq ft) along the western edge of the bed. Based on an average turion density of 12 turions per m^2 the proposed project would result in the removal of 15,852 eelgrass turions. The average density of 12 turions per m^2 was used due to the fact that all of the anticipated impact will occur in the portion of eelgrass with lower densities (within approximately 50 ft of the western edge).

The proposed impacts to eelgrass beds will require compensatory mitigation to replace the loss of functions and values. Based on experience from recent projects, it is anticipated that the proposed compensatory mitigation would require a 2:1 mitigation ratio for both eelgrass area and number of turions. This ratio is required to provide additional mitigation for the temporal lag in eelgrass habitat functions and values and for the uncertainty of success of the mitigation. Compensatory mitigation for the project would require the construction of approximately 1.34 acres of habitat that is optimal for eelgrass colonization and the presence of approximately 90,224 eelgrass turions. The approximately 90,000 turions would be required at the end of a long term monitoring program, which typically lasts 10 years.

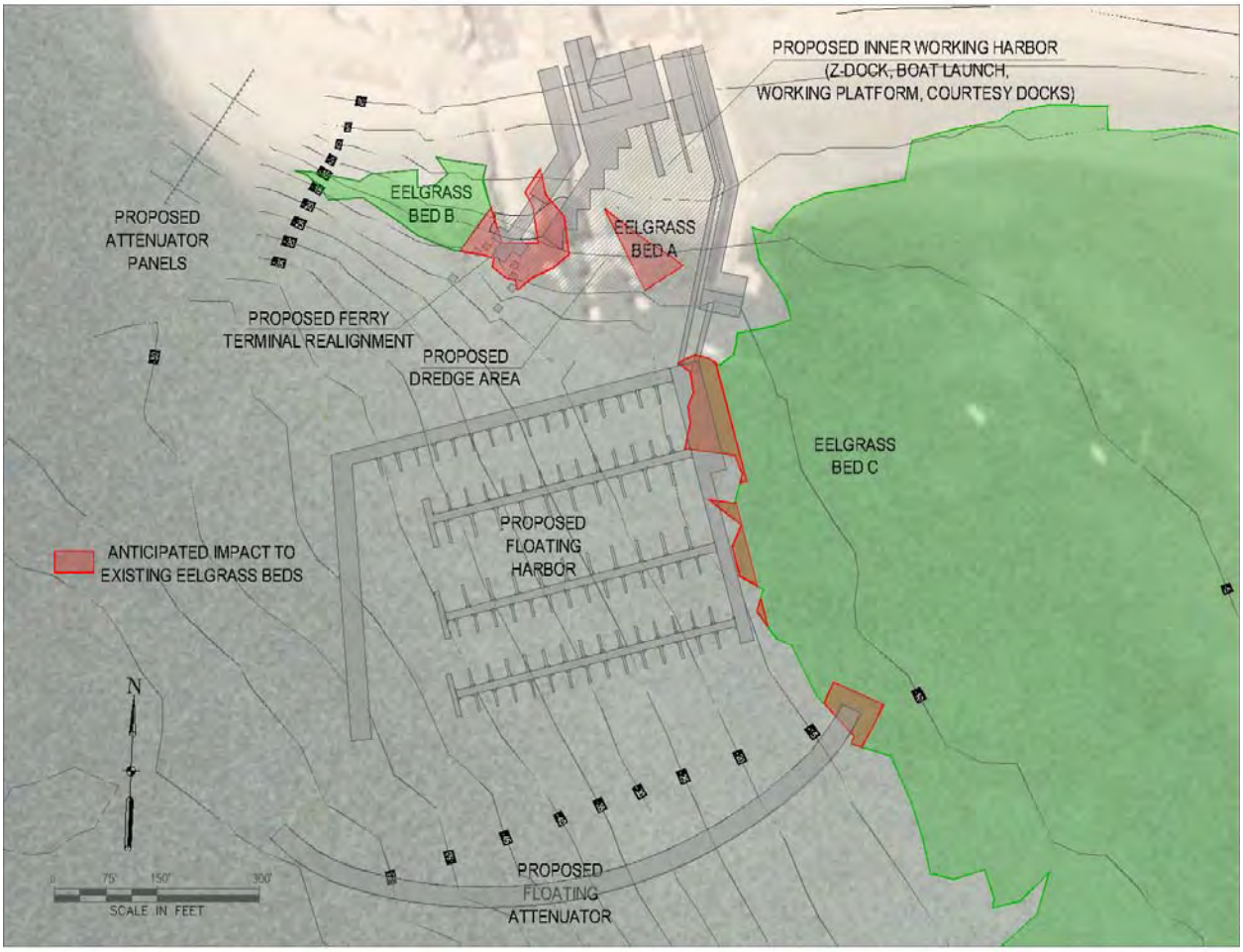

Figure 2. Anticipated impacts to existing eelgrass within the Northern Portion of Fisherman's Cove as part of the Fisherman's Cove Working Waterfront Project (dated October 1, 2014).

Since there is currently no mitigation bank or in lieu fee program for impacts to eelgrass the proposed project would be required to construct eelgrass habitat. This would entail the identification of sites that are currently devoid of eelgrass that could be modified to provide optimal eelgrass habitat. Grette Associates reviewed recent aerial photographs and conducted a site visit of the shoreline to the north of Fisherman's Cove on the Lummi reservation. This survey was focused on determining if there were potential mitigation opportunities north of Fisherman's Cove. Mitigation opportunities were defined as areas along the shoreline that are currently devoid of eelgrass that could be modified to provide optimal habitat for eelgrass colonization. Modifications to the existing shoreline would likely entail either dredging or the placement of suitable substrates on the shoreline and the planting of eelgrass turions. As part of the design of a mitigation site, the area will require surveying and modeling to ensure that the placement of finer substrates would be stable and not result in additional impacts to the adjacent areas. At this time, no specific mitigation site location has been identified; however, the shoreline north of Fisherman's Cove should be able to provide sufficient room for the mitigation. No specific location for the mitigation site has been selected based on the fact that the project design was not finalized at the time of the investigation. Because of this the actual impacts to eelgrass can't be determined and the overall mitigation need can't be finalized. In addition,

further development of a mitigation action will occur with further coordination with the permitting agencies.

The proposed project will likely require mitigation for the modification of intertidal and shallow subtidal habitat outside of the impacts to the existing eelgrass beds. These additional impacts would be associated with the installation of the boat launch, dredging of the Inner Working Harbor, and the increase in overwater coverage (specifically above -10 ft MLLW). Mitigation for the new overwater coverage will be required for the change in overwater coverage (existing versus proposed). The overall impacts associated with these project elements are often mitigated for at a 1:1 mitigation ratio; however, it is too early to determine potential mitigation opportunities. There is a lot more flexibility with these mitigation opportunities for these project elements. This flexibility makes the mitigation for these elements easier and cheaper to develop and complete, versus the eelgrass mitigation. These will be developed, as needed, during the finalization of the design and through coordination and negotiation with the permitting agencies.