MARINE BIOLOGY BASELINE INVENTORY

Gateway Pacific Terminal

Whatcom County, Washington

Prepared for:

Pacific International Terminals, Inc.
1131 SW Klickitat Way
Seattle, Washington 98134

Prepared by:

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway North
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June 15, 2012

Project No. 0-915-15338-C

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PREFACE

Pacific International Terminals, Inc. (Pacific International Terminals), proposes to develop the Gateway Pacific Terminal (the "Terminal"), a multimodal terminal for transfer of dry bulk commodities, at Cherry Point in Whatcom County, Washington. Construction and operation of the Terminal and associated facilities require the approval of local, state, and federal agencies. Agency decision makers are to be informed of the potential environmental effects of the proposed project by preparation of an Environmental Impact Statement (EIS). The EIS will be prepared under guidelines of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) by a lead federal agency and lead state agency or agencies working in cooperation.

This report is one of several technical reports prepared on behalf of Pacific International Terminals that provide scientific technical information about the existing conditions of the proposed project area and in some cases the projected effects of project operations. It is provided to the lead federal, state, and local agencies for their use in preparation of a Draft EIS. Several of the technical reports have also been prepared to support specific project permit applications submitted to local, state, and federal agencies, or as part of the consultation process with resource agencies and affected Indian nations.

A more detailed description of the proposed Terminal, including a complete list of proposed commodities and the phasing plan, is provided in the *Revised Gateway Pacific Terminal Project Information Document* (Pacific International Terminals 2012).

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1.0 INTRODUCTION

AMEC Environment & Infrastructure, Inc. (AMEC), prepared this report to provide baseline information on the marine biological community in the vicinity of the proposed Gateway Pacific Terminal (the Terminal) in Whatcom County, Washington. The proposed Terminal project is located approximately 18 miles northwest of the City of Bellingham, 5 miles west of the City of Ferndale, and 17 miles south of the United States – Canada Border (Figure 1). A more detailed description of the proposed Terminal, including a complete list of proposed commodities and the phasing plan, is provided in the revised *Gateway Pacific Terminal Project Information Document* (Pacific International Terminals, Inc. 2011, Revised 2012).

Several marine biological inventories have been conducted in the study area over the past 15 years. Additional field investigations were conducted in summer 2011 to supplement those previous studies. The field investigations completed in summer 2011 were conducted based on a plan for *Marine Biology Baseline Monitoring* (Baseline Monitoring Plan) (AMEC Earth & Environmental 2011a), which was distributed on July 14, 2011, to the Multi-agency Permitting (MAP) Team administered by the State of Washington Governor's Office of Regulatory Assistance (ORA) to coordinate the permitting process. The Baseline Monitoring Plan reflects revisions suggested by the MAP Team on a draft plan distributed on May 20, 2011.

1.1 PURPOSE OF THIS REPORT

The purpose of this report is to provide baseline information about the marine biological community at the Pacific International Terminals, Inc. (Pacific International Terminals), property, in support of project environmental documentation and permit applications. Specifically, this report documents the results of field investigations conducted in summer 2011 following protocols detailed in the Baseline Monitoring Plan (AMEC Earth & Environmental 2011a), which was developed following the guidelines of the regulatory agencies as described in Section 1.2.

The results presented in this document may be used to evaluate potential effects of the proposed Terminal on marine species, but this report does not attempt to identify or discuss such potential effects. Rather this report characterizes the distribution and abundance of:

- Submerged marine vegetation;
- Epibenthic invertebrates;
- Intertidal clams;
- Geoduck clams;
- Benthic invertebrates;

- Rockfish habitat; and
- Forage fish, as represented by surf smelt spawning within the study area.

This report summarizes data collected during field investigations conducted in summer 2011. Where data from earlier studies are available, the results of the 2011 field studies are discussed in relation to results from those earlier investigations.

Further details and background on the purposes of the field investigations and the study design are presented on the Baseline Monitoring Plan (AMEC Earth & Environmental 2011a).

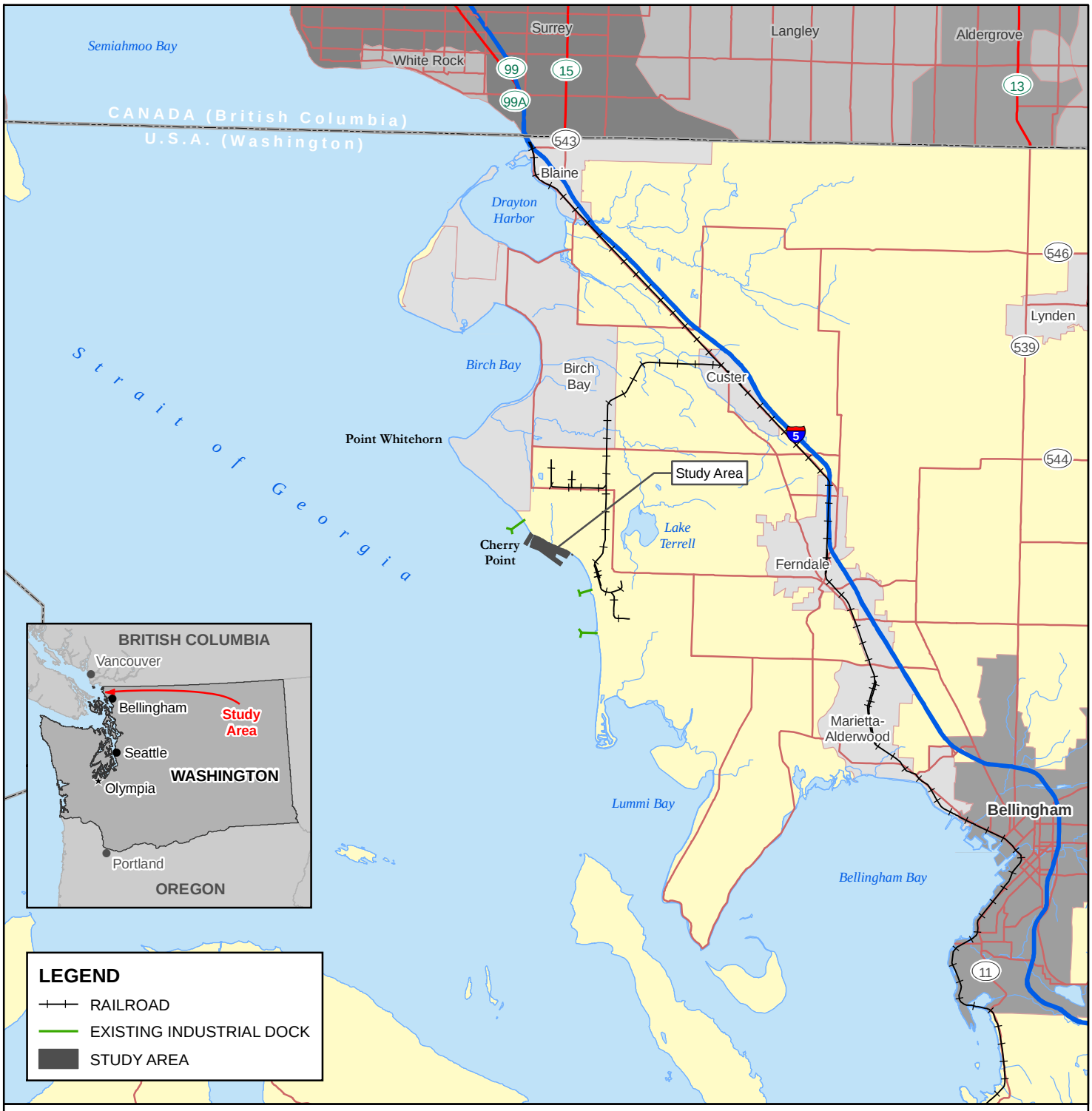
1.2 REGULATORY BASIS

As indicated above, the Baseline Monitoring Plan (AMEC Earth & Environmental 2011a) was developed to address specific regulatory and legal requirements as detailed in this section.

In 1997, Pacific International Terminals received a Shoreline Substantial Development Permit (SDP) (SHS92-0020) and Major Development Permit (MDP92-0003) from Whatcom County to construct and operate the Gateway Pacific Terminal. Several parties, including the Washington State Department of Ecology (Ecology), Washington Department of Fish Wildlife (WDFW), and a coalition of five environmental groups represented by the Washington Environmental Council, appealed the permit to the State Shoreline Hearings Board on the basis that potential environmental impacts from the project were not satisfactorily addressed or mitigated. The appeal led to a settlement agreement among all of the parties executed in 1999 (Settlement Agreement 1999; Pacific International Terminals, SDP SHS 92-0020 and SHB Appeals Numbers 97-22 and 97-23), which provided a number of conditions to the shoreline permit, including some conditions directing evaluation of existing conditions of the marine environment in the project area.

In 2000, the Washington Department of Natural Resources (WDNR) established a State Aquatic Reserve at the Cherry Point reach. The *Cherry Point State Aquatic Reserve Management Plan* (ARMP) (WDNR 2010) emphasizes long-term protection of the aquatic resources within and directly adjacent to the reserve. The ARMP describes the Gateway Pacific Terminal as a proposed industrial use of the shoreline, and an allowable use for state-owned aquatic lands as long as the project meets the following conditions (WDNR 2010, page 52):

- Serves the objectives of the reserve,
- Meets all regulatory requirements, and
- Conforms to the terms and conditions of the 1999 Settlement Agreement.



AMEC 11810 North Creek Parkway N Bothell, WA 98011			CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.
PROJECT: GATEWAY PACIFIC TERMINAL		DWN BY: SD	DATUM: NAD83	DATE: APRIL 2012
TITLE: VICINITY MAP		CHK'D BY: MG	REV. NO.: -	PROJECT NO.: 091515338C-09-03
		PROJECTION: WA SP North, Ft.	SCALE: 1 inch=3 miles	FIGURE No.: FIGURE 1

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 1 - Vicinity Map.mxd

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Regulatory requirements include compliance with Section 7 of the Endangered Species Act (ESA; as amended in 1978, 1979, and 1982). To evaluate the effects of the proposed Terminal on marine species listed under the ESA, Pacific International Terminals will prepare a Biological Evaluation (BE).

As part of its project permit applications, Pacific International Terminals proposes the access trestle and wharf configuration shown in Figure 2. This configuration was evaluated in the 1996/1997 Environmental Impact Statement (EIS), and is the configuration for which the SDP was issued (the "Permitted Configuration"). A second configuration for the access trestle and wharf, which moves the wharf south of the Permitted Configuration, has been the focus of discussion in recent years (See Figure 3 for location). The area of this configuration was included in this study.

The wharf and a portion of the access trestle and would be constructed on property leased by Pacific International Terminals from the WDNR. The area that would be leased from WDNR for each configuration is shown on Figures 2 and 3, and the potential WDNR lease area for both alignments combined are shown on Figure 4.

1.3 STUDY AREA

The study area encompasses the WDNR lease area and reference areas for comparison, as shown in Figure 4.

For purposes of the field investigations conducted in summer 2011, the study area is further organized into four individual sub-areas:

- *Area A* is the combined locations of the permitted and alternative alignments for the Gateway Pacific Terminal wharf and trestle;
- *Area B* is a reference (background) area located northwest of Area A;
- *Area C* is a forage fish reference area located approximately 3,250 feet southeast of Area A; and
- *Area D* is an area between the two wharf alignments and the shoreline for which WDNR had specifically requested video surveys (see Figure 4).

The study area (Areas A, B, C, and D) includes intertidal, subtidal, and nearshore habitat conditions. It ranges from approximately the level of mean lower low water (MLLW) to -125 feet MLLW.

1.4 EXISTING INFORMATION

Other marine biological inventories have been conducted in the study area since 1996. These studies can be used in concert with the data presented in this report to evaluate trends over time in the marine biological community.

The following marine biology investigations were previously conducted in the study area and were included as appendices to the 1996 Draft EIS (Whatcom County 1996):

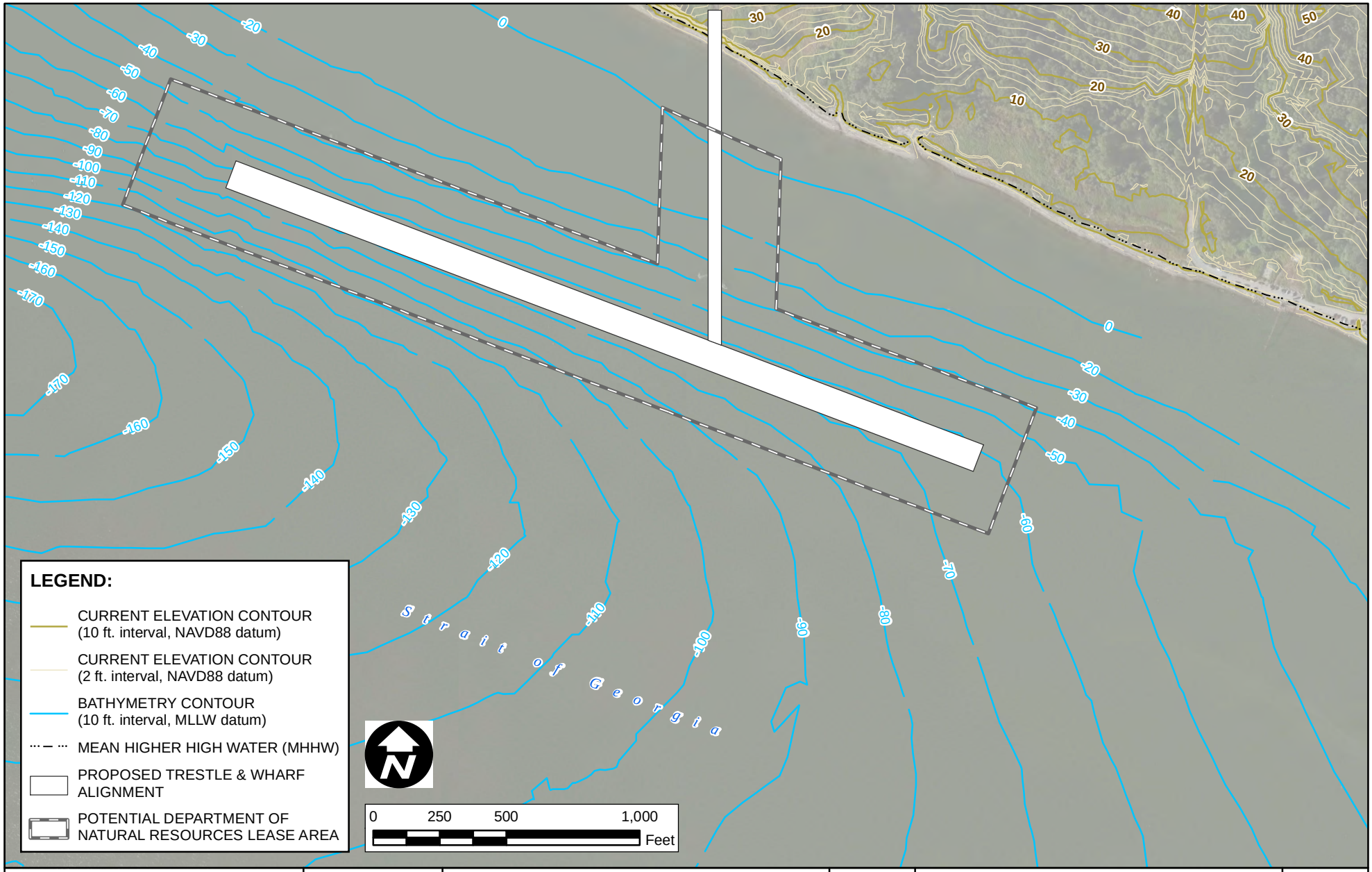
- Beach Processes at Cherry Point, Washington State (Westmar Consultants 1996);
- *Fisheries and Marine Resource Analyses* (Shapiro & Associates 1996), which presented results of macroalgae and eelgrass investigations and included a model to predict effects of shading on the marine environment.

A hardshell clam inventory was conducted in 1997 (Shapiro & Associates 1997).

Other marine biology inventories in the vicinity of the study have been conducted by the Whatcom County Marine Resources Committee (MRC) and others, and include the following:

- Clam Surveys conducted by the MRC in 2005 and 2009 (MRC 2005, 2009);
- Submerged aquatic vegetation conducted in 2004 (Fairbanks et al. 2005); and
- Periodic forage fish surveys (WDFW 2006, 2011a).

In addition, in 2001 the MRC published a compilation of data on the marine resources of Whatcom County that includes the study area (Anchor 2001). Much of the aforementioned information was summarized in the ARMP (WDNR 2010).



SOURCE: Proposed Trestle & Wharf Alignment, Bathymetry Contours: 154199-A100-42S01.dwg (Rev. J), Ausenco Sandwell, 12/24/2010.
Current Elevation Contours: 2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.
Mean Higher High Water (MHHW): 2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

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TITLE: PERMITTED ALIGNMENT

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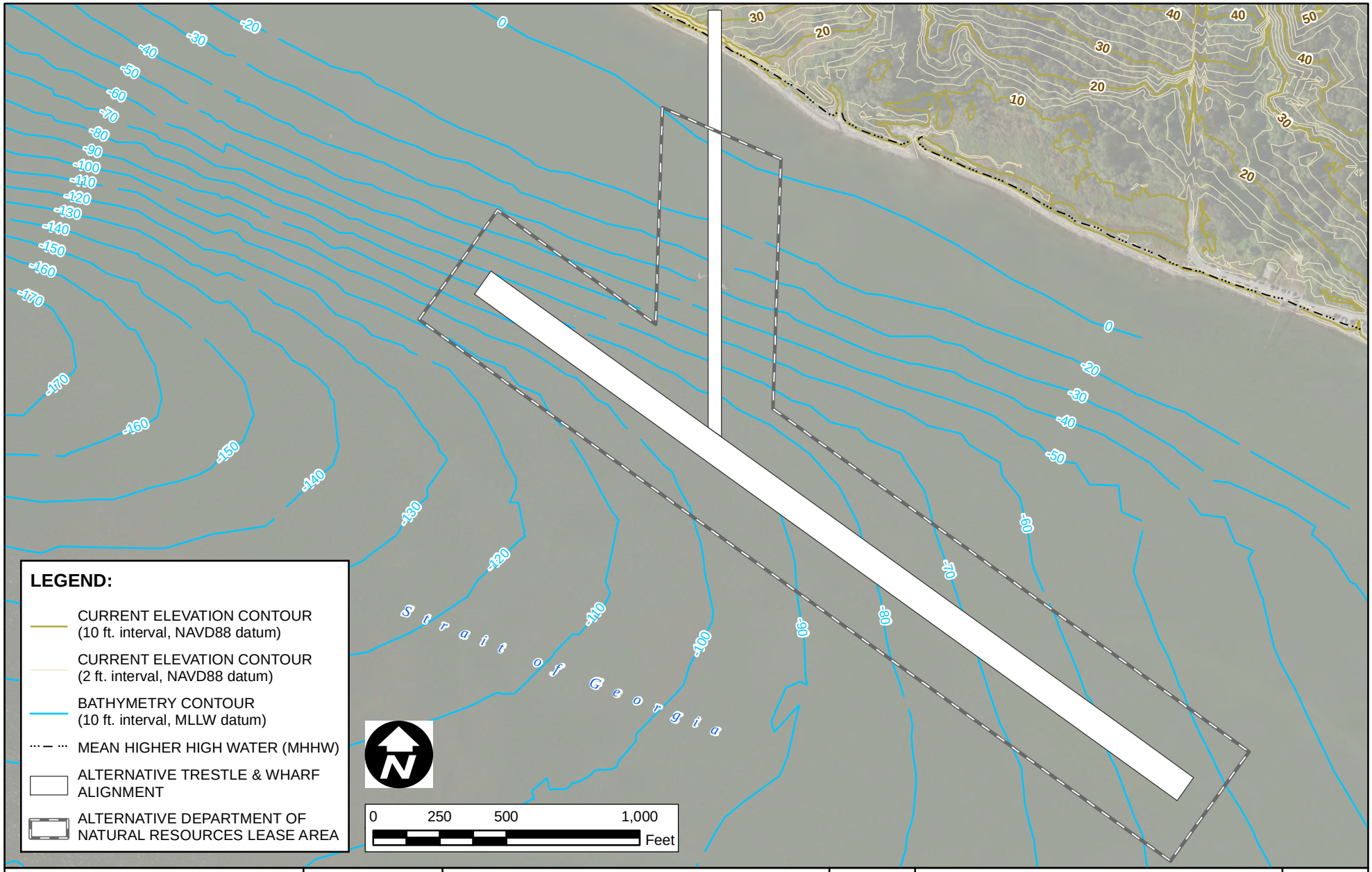

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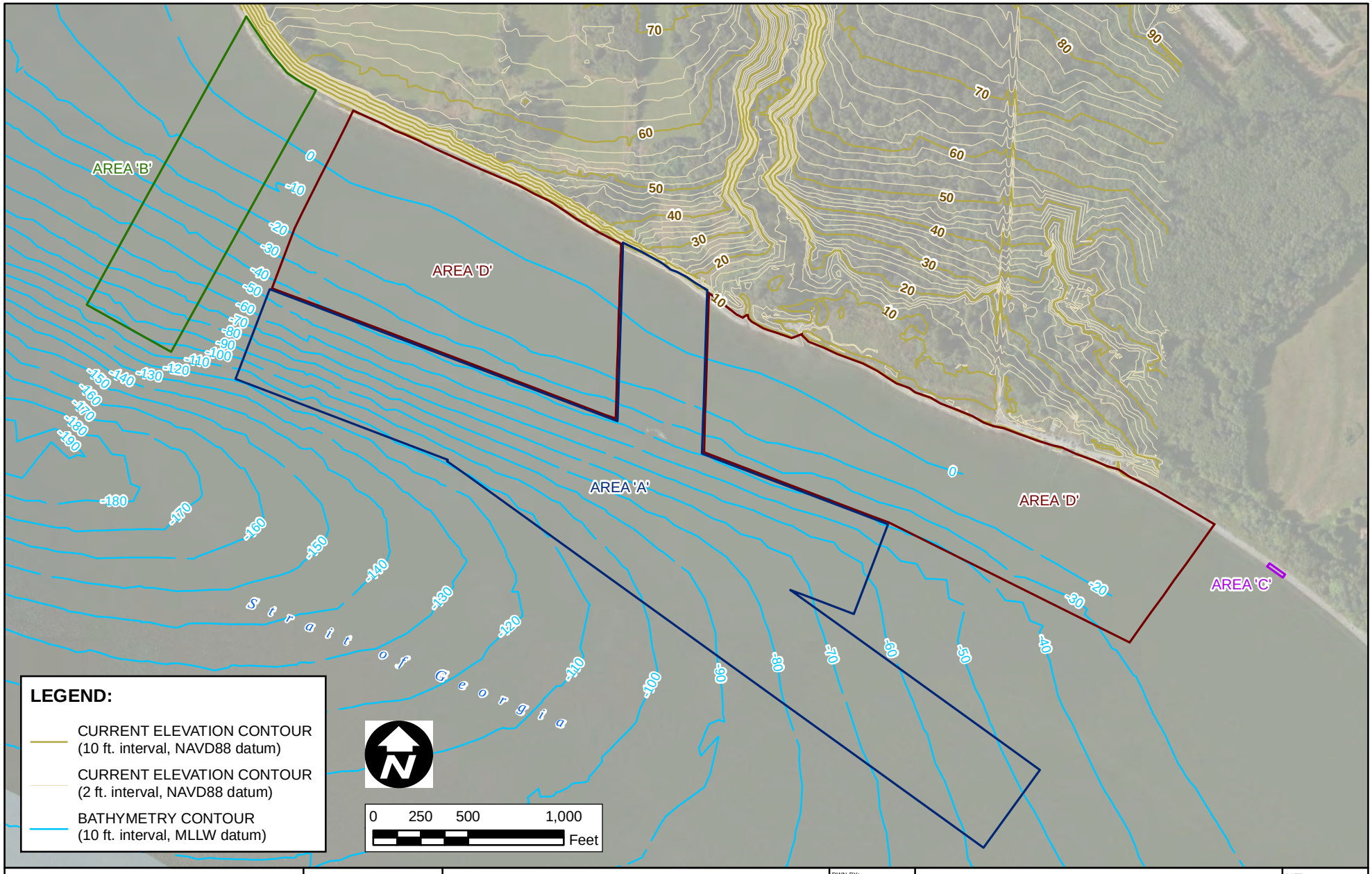

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Current Elevation Contours:
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PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: STUDY AREA

DATE: APRIL 2012
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FIGURE NO.: 4

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2.0 METHODS

Field investigations were conducted in summer 2011 following the methods described in the *Baseline Monitoring Plan* (AMEC Earth & Environmental 2011a). Field studies were conducted as described in the Baseline Monitoring Plan except as specified in this section. For the submerged marine vegetation and rockfish assessments, the investigations were conducted using a two-tiered approach, coupling a qualitative underwater video survey with subsequent quantitative investigations. The underwater video survey was conducted to characterize the bottom substrate to assess its potential to support rockfish populations, and to map the distribution of submerged marine vegetation (including macroalgae and eelgrass). The qualitative data were collected for archival purpose, and to provide a general overview of ecological conditions. Higher resolution data were collected using analytical techniques, including benthic grab sampling and diver surveys.

Quantitative surveys were conducted to obtain specific inventories of marine invertebrates, including (1) epibenthic invertebrates, (2) intertidal clams, (3) geoduck and horse clams, and (4) benthic infauna. In addition, forage fish surveys were conducted to determine whether surf smelt use the study area for spawning. Where discrepancies between underwater video survey and quantitative diver surveys were apparent, diver survey data provide the greater precision.

2.1 UNDERWATER VIDEO SURVEY

Underwater video surveys were conducted on June 1, and June 3 – 5, 2011, to obtain the following information:

- Qualitative data on bottom substrates to use in assessing the potential for supporting rockfish populations and
- Qualitative data for mapping submerged marine vegetation.

This section describes the study design, field methods, and data analysis completed for the underwater video surveys.

2.1.1 Study Design

The underwater video study was designed to characterize the bottom substrate and attached marine vegetation within the following portions of the Study Area:

- Area A (the two potential wharf alignments being considered for the Project and the trestle area extending from the shoreline to the wharf alignments);
- Area B (a reference area located northwest of Area A); and

- Area D (the area between the wharf alignments and the shoreline, which was added to the Study Area based on a request by WDNR) (Figure 5).

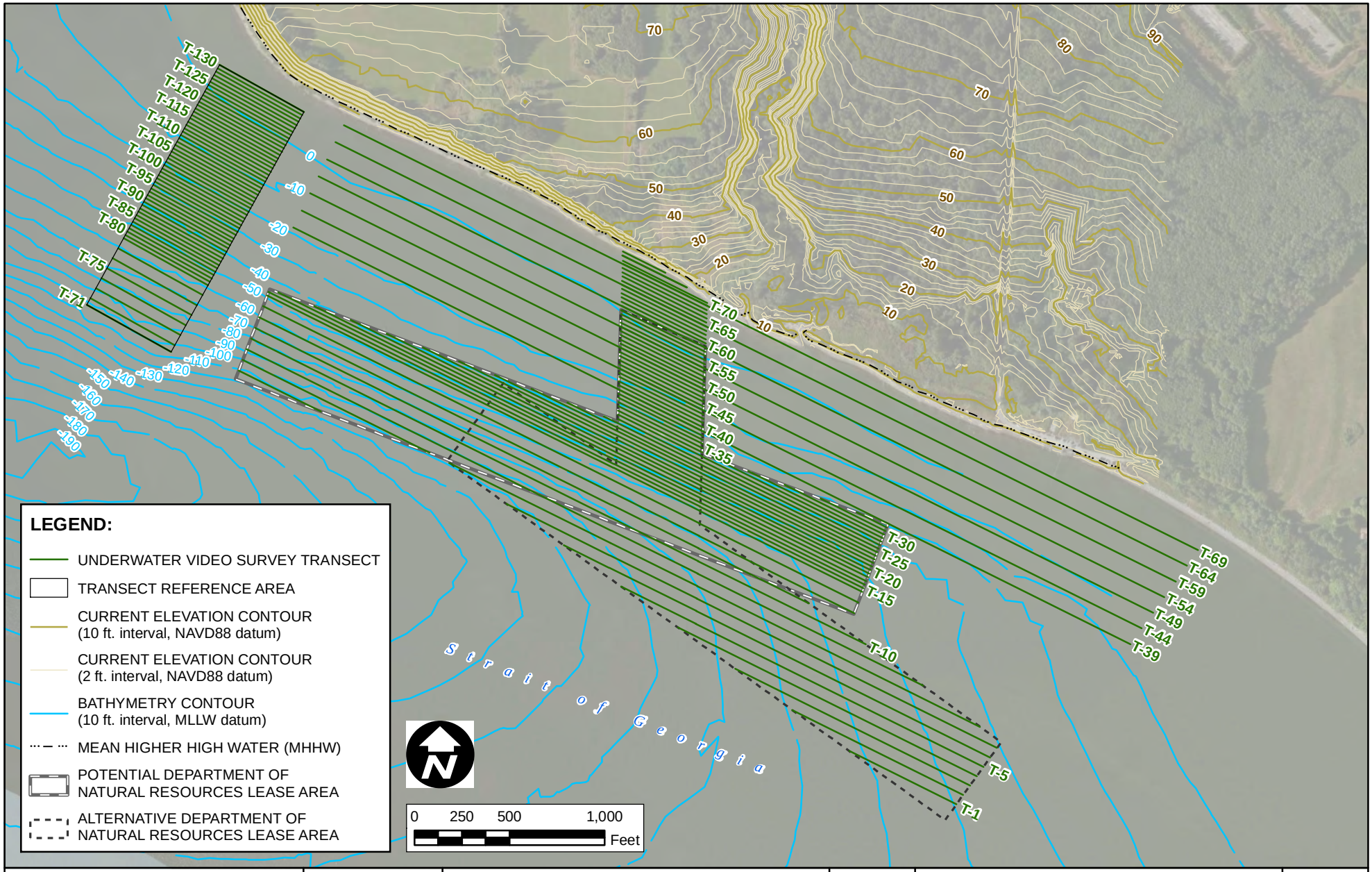
The study design consisted of 130 transects (see Figure 5):

- A total of 63 transects in Area A with a total length of 115,956 feet (22.0 miles);
- A total of 60 transects in Area B with a total length of 29,913 feet (5.7 miles); and
- A total of 7 transects in Area D with a total length of 31,341.2 linear feet (5.9 miles).

Continuous underwater video recordings were filmed along the pre-determined sample transects, oriented roughly parallel to the shoreline, and extending throughout the study area. The study design spaced transects at intervals of approximately 20 feet between the shoreline (defined as the shallowest depth possible to maneuver the video tow vessel, corresponding approximately to 0 feet MLLW) and water depths corresponding to approximately -60 feet MLLW. The intervals between transects were increased to approximately 60 feet in areas with water depths greater than -60 feet MLLW. This design allowed for greater video coverage in shallower areas where light levels may have greater potential to support growth of submerged marine vegetation.

In Area D between the shoreline and the alternative wharf alignments, underwater video was filmed along seven transects spaced approximately 100 feet apart. The underwater video in this area serves to document baseline conditions to evaluate the potential effects of the trestle and wharf structures on sediment transport, as requested by the WDNR (Figure 5).

The reference area (Area B) for the video survey was established to the northwest of Area A, extending from approximately 0 feet MLLW to approximately -125 feet MLLW. The length of each transect (500 feet) in Area B is similar to the length of transects completed in the trestle area, and the bathymetric gradient extending from the shoreline is similar to the bathymetric gradient surveyed in the trestle and wharf areas (Figure 5).



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DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 700 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: UNDERWATER VIDEO SURVEY TRANSECT LOCATIONS

DATE: APRIL 2012
PROJECT NO.: 091515338C-09-03
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FIGURE NO.: 5

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2.1.2 Field Investigation Methods

The proposed coordinates for the end points of each transect were entered into a differential global positioning system (DGPS), allowing the survey vessel to navigate the length of each transect. The track of the vessel as indicated by the DGPS was recorded and then mapped to show the actual video tracks surveyed. Underwater video was collected using a proprietary video survey system designed and built by AMEC staff. The system uses an Outland Technology, Inc., UWC-325, very-low-light, underwater color camera integrated with the DGPS and an onboard laptop computer. The underwater video was recorded digitally to the computer's hard drive to create a permanent record of the survey for later analysis. The video is displayed using NTSC (National Television System Committee) format, which delivers a frame rate of 30 frames per second using 525 lines per frame. The latitude and longitude coordinates, direction of travel, and time stamp data from the integrated DGPS/video system is superimposed onto each video image before it is recorded. The DGPS position is updated once per second.

A pair of red lasers mounted on the camera tow-fish project parallel light beams spaced 170 millimeters (mm) (6.75 inches) apart. The projected light beams are recorded by the video to provide a visual reference scale on the video images that allows the size of recorded objects to be estimated. The lasers also help operators know when the bottom is in sight under conditions of low visibility. At times, the bottom is nearly featureless, which makes viewing it difficult; if the two red dots from the lasers are visible then the camera operator knows that the bottom is in view. Appendix A presents photographs of the underwater video system along with representative video frames depicting observed marine biota. The resolution of individual video frames presented in Appendix A is substantially reduced from the resolution of the running video due to the way NTSC formatted video is processed and displayed.

The camera was lowered into the water column until the bottom was observed, then the vessel progressed slowly along each transect. The distance the camera is suspended above the bottom depends on the water clarity and lighting conditions. During this survey, high turbidity in the water column, particularly at shallower water depths, required the camera to be kept approximately 1 to 3 feet above the bottom. A scientist monitored the video screen throughout the entire survey transect, controlling camera depth to maintain a relatively constant distance above the substrate and prevent the camera from striking the bottom. An audio comment was made at the beginning and end of each transect.

A number of the proposed transects could not be surveyed:

- Transect 70 in Area A was located in water too shallow for the survey vessel to operate.

- The shallowest transects in Area B were located in shallow areas with poor visibility, where large boulders prevented safe deployment of the survey vessel (labeled “Area not Surveyed” in figures presenting the results).
- Portions of five transects in Area D were not recorded due to interruptions in digital recording.

Video recordings were successfully completed for a total of 26.1 miles of transects within Area A, Area B, and Area D; this coverage represents 77.7 percent of the video transects proposed in the *Baseline Monitoring Plan* (AMEC Earth & Environmental 2011a).

2.1.3 Data Analysis

A separate video file was created for each surveyed transect. Each video file was reviewed by a qualified marine biologist. For each 1 second of video, the marine biologist identified the following characteristics:

- The dominant marine vegetation;
- Identification (to genus, if possible) of epibenthic fauna; and
- Fish habitat characteristics, including substrate, relief, and complexity.

These data were compiled in a Microsoft Excel® spreadsheet that lists the observed features in conjunction with the transect location coordinates. Further details on the procedures and criteria used in scoring are provided in Section 2.2 for marine vegetation, Section 2.3 for epibenthic fauna, and Section 2.4 for rockfish habitat.

2.2 SUBMERGED MARINE VEGETATION (MACROALGAE)

Submerged marine vegetation was evaluated using a two-tiered approach, coupling a qualitative underwater video survey with subsequent quantitative investigations conducted by divers. Section 2.2.1 describes the methods used for the quantitative diver surveys. Section 2.2.2 presents the criteria used to categorize the underwater video surveys described in Section 2.1.

2.2.1 Diver Surveys

Diver surveys were conducted to inventory the distribution and abundance of macroalgae. Divers accessed sampling locations (described below) from shore. Intertidal sampling points (points above approximately 0 feet MLLW), were accessed from shore, and conducted during low tide, so no SCUBA was required for these stations.

The surveys followed methods prescribed in the Settlement Agreement (Pacific International Terminals, SDP SHS 92-0020 and SHB Appeals Numbers 97-22 and 97-23).

2.2.1.1 Field Investigation Methods

As prescribed in the Settlement Agreement, individual sampling stations consisted of quadrats covering an area of 0.25 square meter (2.7 square feet) established along transects oriented roughly perpendicular to the shoreline (or parallel to the proposed wharf alignment). The quadrats were spaced at 6-meter (20-foot) intervals along each transect, beginning at the upper intertidal fringe of the macroalgae bed (where *Ulva* and *Fucus* begin), and continuing perpendicular to the shoreline along the transect until macroalgae was no longer apparent and the substrate became consistently sand or mud. Transects ranged in length from 171 to 225 meters (560 to 740 feet) (Figure 6).

In Area A, five transects were established at 4.6-meter (15-foot) intervals, with the middle transect at the centerline of the proposed marine trestle. In addition, to establish a baseline for monitoring for prop-wash impacts associated with construction, two transects were established adjacent to the footprint of the proposed trestle: one placed 15.2 meters (50 feet) west-northwest of the edge of the trestle footprint, and the second placed 15.2 meters (50 feet) east-southeast from the edge of the trestle footprint.

In Area B, transects were placed similarly to Area A, with five transects spaced at 4.6-meter (15-foot) intervals. The centerline of Area B is approximately 607 meters (2,000) feet west-northwest of the centerline of the proposed trestle footprint.

At each sampling station along a transect, divers identified dominant macroalgae species to genus, with the exception of kelp species, which were identified to the species level. Overall percent cover for each quadrat was recorded, as well as holdfast counts for each kelp species encountered. Because macroalgae species distribution and abundance are typically correlated with substrate type (as described by Mumford [2007]), a description of substrate at each station was also recorded. Substrate types recorded included cobble, gravel, sand, silt, or combinations of each.

Due to the invasive nature of the non-native species *Sargassum muticum,* the width of the *Sargassum* band (where *Sargassum* was the dominant species) was recorded along each transect.

2.2.1.2 Data Analysis

Results from the quantitative surveys were analyzed to determine differences in species composition, distribution, and density between Area A and Area B. Data were consolidated and evaluated by elevation relative to MLLW. Average percent cover, holdfast counts, and densities were consolidated and summarized by elevation at intervals of 5 feet (+5 to MLLW, MLLW to -5 MLLW, -5 to -10 MLLW, etc.) for each transect and over all transects.

2.2.2 Underwater Video Surveys

As described previously, underwater video surveys were conducted to map submerged marine vegetation. Submerged marine vegetation was classified based on the categories defined in Table 1.

Table 1 Categories of Submerged Marine Vegetation

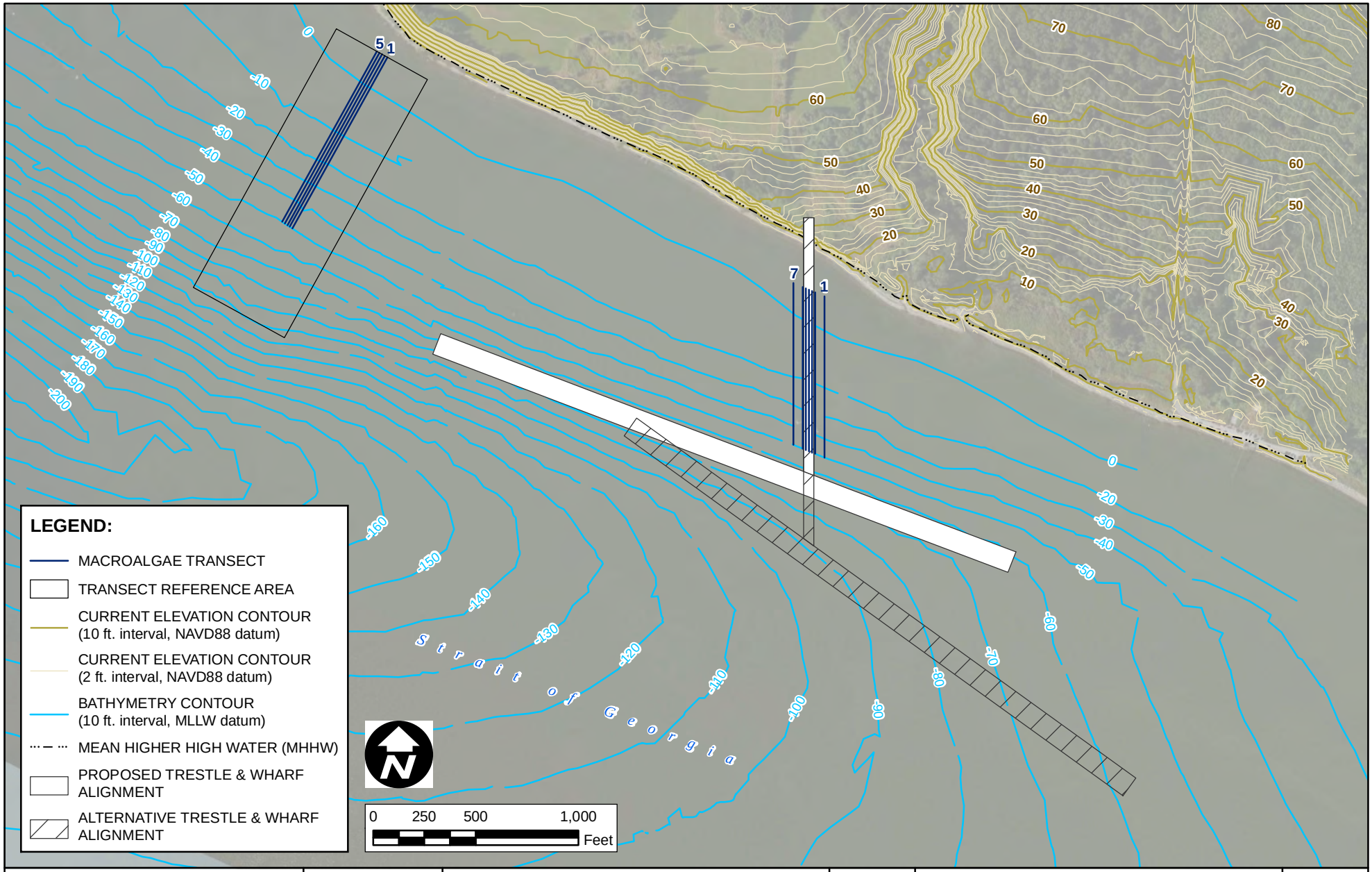
Category	Description
None	Percent cover by macroalgae less than approximately 10% (as estimated by photo frame).
Sparse macroalgae/colonial invertebrates	Mixed macroalgae and colonial invertebrates (primarily sea pens) with cover less than 20% (as estimated by photo frame).
Dense Laminariales	An understory canopy dominated by various species of Laminariales kelps. Other species in the canopy may include various red algae and intermittent bull kelp. These areas are referred to as the "macroalgae bed" later in the document.
Sargassum	Areas dominated (approximately 50% per video frame) by *Sargassum* macroalgae with intermittent red and/or other brown alga species.
Eelgrass	Any area where eelgrass was present (dominant or not).
Mixed	Areas not dominated by any of the above macroalgae groups, where eelgrass was absent. This category generally included Laminariales, foliose red algae, bull kelp, and/or *Ulva*. This category generally occurred at the fringe of the macroalgae bed.

2.3 MARINE INVERTEBRATES

Field investigations were conducted to obtain quantitative inventories of marine invertebrates, including (1) epibenthic invertebrates, (2) intertidal clams, (3) geoduck and horse clams, and (4) benthic infauna. This section describes the field and analytical methods used to perform these surveys.

2.3.1 Epibenthic Invertebrates

Macroscopic epibenthic invertebrates are large invertebrates that live on the surface of the seafloor. Macroscopic epibenthic invertebrates include crabs, sea stars, and sea anemones. Incidental observations of macroscopic epibenthic invertebrates, identified to genus or species, if possible, were noted on field data forms during the quantitative surveys of submerged marine vegetation and geoducks. Observations of epibenthic invertebrates were consolidated into lists of macroscopic epibenthic invertebrate species observed in the study area.



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TITLE: MACROALGAE TRANSECT LOCATIONS

DATE: APRIL 2012
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2.3.1.1 Intertidal Clams

An inventory of hardshell clams was conducted following the same methods employed during an earlier investigation in 1997 (Shapiro & Associates 1997). Sampling stations were established along two transects.

- One transect was oriented perpendicular to the shoreline along the centerline of the Area A.
- The second transect was oriented perpendicular to the shoreline and ran through the center of Area B.

Sampling stations were established along the transects at regular intervals corresponding to elevation changes of 1 foot from elevations of approximately +5 feet MLLW to -2 feet MLLW, where clams would be anticipated to occur (Figure 7). Sample stations consisted of 1-meter-square quadrats, excavated to a depth of approximately 0.3 meter (12 inches).

Clam surveys were conducted during low tide events on July 14 and August 8, 2011. Area A was sampled on July 14, 2011. In total, sampling in Area A was conducted at five stations (-2 feet MLLW, -1 foot MLLW, 0 feet MLLW, +1 foot MLLW, and +2 feet MLLW). Samples were not collected above elevation +2 feet MLLW due to the absence of suitable habitat in these areas.

Area B was sampled on August 8, 2011. Due to tidal constraints, the lowest elevation sampled at the reference site was -1 foot MLLW. No sample was collected from the reference site at elevation -2 feet MLLW. Similar to Area A, no samples were collected above elevation +2 feet MLLW due to the absence of suitable habitat.

For both areas, the location of the first sampling station along the transect was selected at random between elevation -1 foot MLLW and -2 feet MLLW. Subsequent stations were placed at 1-foot vertical intervals along the transect up to +2 feet MLLW, or where clams were no longer present. Elevations for the sample stations were identified using an auto level. Specifically, at a known elevation, a stadia rod was held at the waterline and used to measure the offset in elevation and calculate the reference height above MLLW. Once the reference height was known, the stadia rod was moved along a transect running perpendicular to the shore, and locations approximately 1 vertical foot apart were flagged for sampling.

At each sample station, 1-meter-square quadrats were excavated to a depth of approximately 0.3 meter (12 inches) using hand tools. The number and size (length of the shell, from anterior end to posterior end) of clams by species that were encountered in each station were recorded.

2.3.2 Geoduck and Horse Clams

Surveys were conducted along six transects and within a “show plot” to estimate the density of geoducks and horse clams within Area A and Area B.

2.3.2.1 Field Investigation Methods

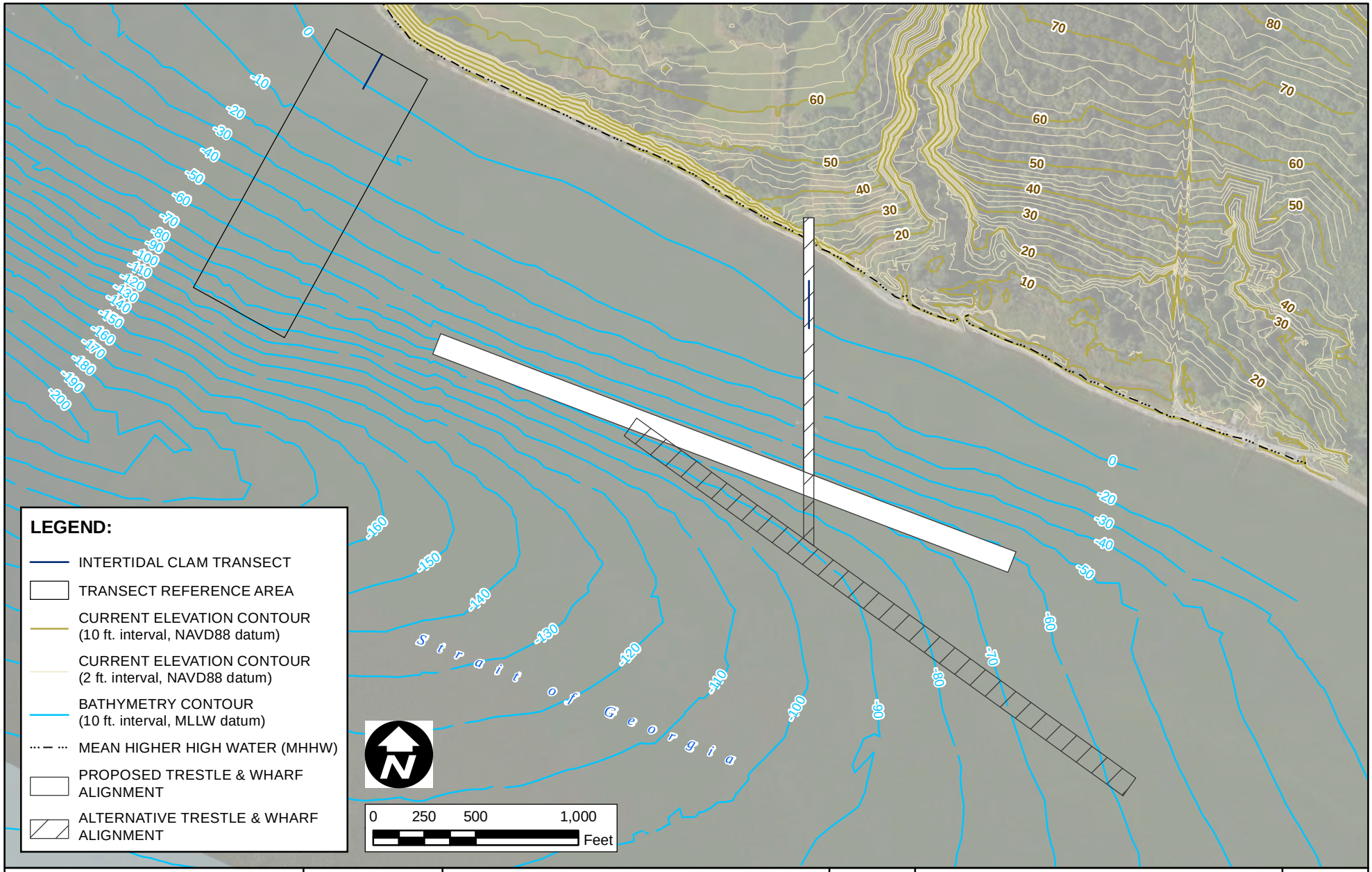
Following methodology developed by WDFW (Bradbury, et al. 2000), Geoduck (*Panopea abrupta)* survey transects were spaced approximately 305 meters (1,000 feet) apart and perpendicular to shore (Figure 8). The transects extended from elevations of -18 feet MLLW to -70 feet MLLW within the Study Area, as specified in the WDFW protocol. Divers counted and mapped geoducks identified along each transect.

Six transects were established within the study area—five transects in Area A, and one transect in Area B. The position of each transect was recorded using DGPS.

To further quantify the number of geoducks and horse clams within the study area, a “show plot” was established, and the data analyzed, following the methods of Bradbury et al. (2000). The show plot was a transect measuring 46 meters (150 feet) long by 2 meters (approximately 7 feet) wide. The show plot was used to provide a correction factor for geoduck and horse clam counts conducted within the test transects. Divers conducted an initial survey of the show plot, counting and flagging geoducks. The show plot was then resurveyed each day for 3 days, with the divers counting and flagging geoducks and horse clams that were not counted during previous surveys. On the third day, no new clams were identified.

The “show factor” (Bradbury, et al. 2000) was calculated as the ratio of the number of geoducks counted during the initial survey relative to the total number of geoducks present during the three-day survey. The show factor was applied to the survey counts in the test transects within Area A and Area B to adjust the survey results for geoducks that may not have been showing during the survey.

Throughout the geoduck transects and show plot areas, horse clams were also documented when observed.



SOURCE: Proposed Trestle & Wharf Alignment, Bathymetry Contours: 154199-A100-42S01.dwg (Rev. J), Ausenco Sandwell, 12/24/2010.
Current Elevation Contours: 2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.
Mean Higher High Water (MHHW): 2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

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AMEC
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Bothell, WA 98011

DWN BY: SD
CHK'D BY: MG
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 650 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: INTERTIDAL CLAM TRANSECT LOCATIONS

DATE: APRIL 2012
PROJECT NO.: 091515338C-09-03
REV. NO.: -
FIGURE NO.: 7

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 7 - Intertidal Clam Transect Locations.mxd

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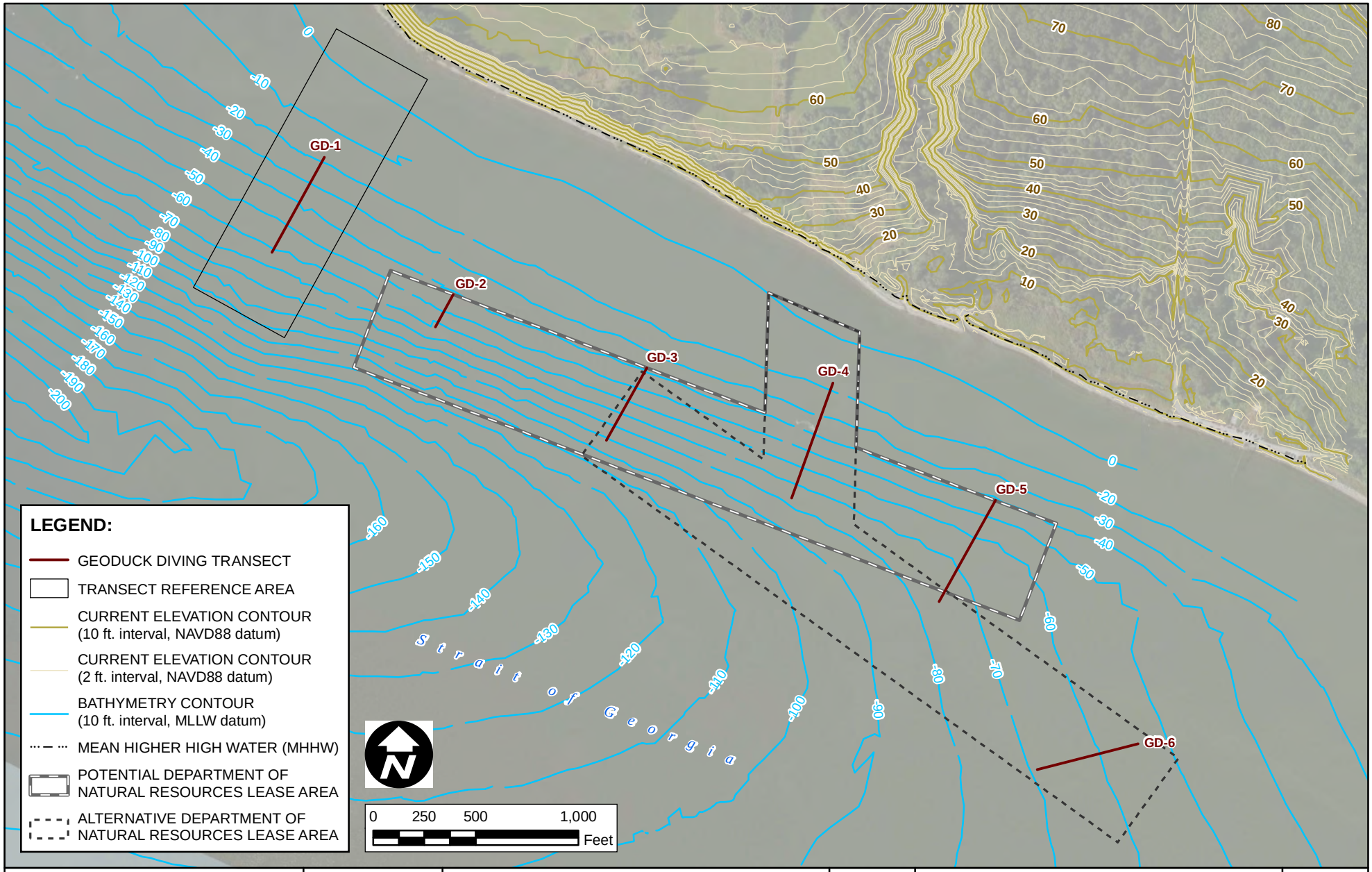

SOURCE: Bathymetry Contours:
154199-A100-42S01.dwg (Rev. J), Ausenco Sandwell, 12/24/2010.
Current Elevation Contours:
2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.
Mean Higher High Water (MHHW):
2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

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PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 650 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: GEODUCK TRANSECT LOCATIONS

DATE: APRIL 2012
PROJECT NO.: 091515338C-09-03
REV. NO.: -
FIGURE NO.: 8

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 8 - Geoduck Transect Locations.mxd

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2.3.2.2 Data Analysis

Geoduck density was calculated as the number of geoducks present per square foot of survey area. The total area sampled in each transect was calculated, and the number of geoducks identified within each transect was divided by the total area to calculate the number of geoducks per square foot. The show factor was then applied to the observed density to generate an estimated geoduck population and corrected geoduck density for each transect.

2.3.3 Benthic Infauna

Sediment samples for identification of benthic infauna were collected as part of a larger study to characterize offshore sediments (AMEC Earth & Environmental 2011b). Core samples for benthic infauna surveys were collected at six sample stations located in Area A ranging in elevation from -19 feet MLLW to -103 feet MLLW (Figure 9).

2.3.3.1 Field Investigation Methods

Benthic infauna were collected and characterized from six sample locations shown in Figure 9. The sampling stations were located using a DGPS, and samples were collected within approximately 6 feet of the proposed sampling locations specified in the work plan (AMEC Earth & Environmental 2011b). For the sampling station at the shallowest water depth (GJP-1), the five replicate sediment samples were collected using a hand-core sediment sampler (20 centimeters diameter by 10 centimeters deep). At all other sampling locations, samples were collected using a 0.2-square-meter, pneumatically powered, clamshell-style sediment sampler (Van Veen grab sampler) deployed from a boat. Five replicate grab samples were collected at each location. The upper 10 centimeters (cm) (4 inches) of sediment was sub sampled from each grab using a cookie cutter sampler with a diameter of 22 cm (0.038 square meters), which was pushed into the sediments within the Van Veen grab to a depth of 10 cm.

Benthic macroinvertebrate samples were processed in accordance with guidelines provided in Puget Sound Environmental Protocols (Tetra Tech 1987) and as described in the *Baseline Monitoring Plan* (AMEC Earth & Environmental 2011b). Sediment samples were sieved through a 1,000-micrometer (µm) stainless-steel mesh sieve, and the contents of the sieve were placed into sample jars. Benthic macroinvertebrate samples were first preserved in a 10 percent aqueous solution of borax-buffered formalin solution for no more than 1 week, after which time the buffered formalin solution was decanted from the samples and replaced with 95 percent denatured ethanol. Samples were sorted, and organisms were identified to the species level or the highest taxonomic level possible, by professional benthic invertebrate taxonomists.

2.3.3.2 Data Analysis

Each of the five replicate samples from each location was sorted and underwent taxonomic identification as a separate sample to allow statistical analyses of the results. The taxonomic data for each replicate sample at each sampling location are presented in Appendix B.

Descriptive indices of community structure were calculated for the benthic invertebrate data to discern patterns in species abundance and composition using statistical methods specified by Ecology (1998). The following metrics were calculated for replicate samples at each station:

1. Margalef's Index of species richness (*SR*): This index provides a measure of species richness (the number of different species of organisms present) that is roughly normalized for sample size without using more complex rarefaction techniques. *SR* varies from 0 for samples consisting of just a single species to a large number for samples containing many species:

   $$SR = (S - 1)/\ln N$$

   where:

   S is the raw number of different species present in a sample;

   N is the total number of individuals of all species.

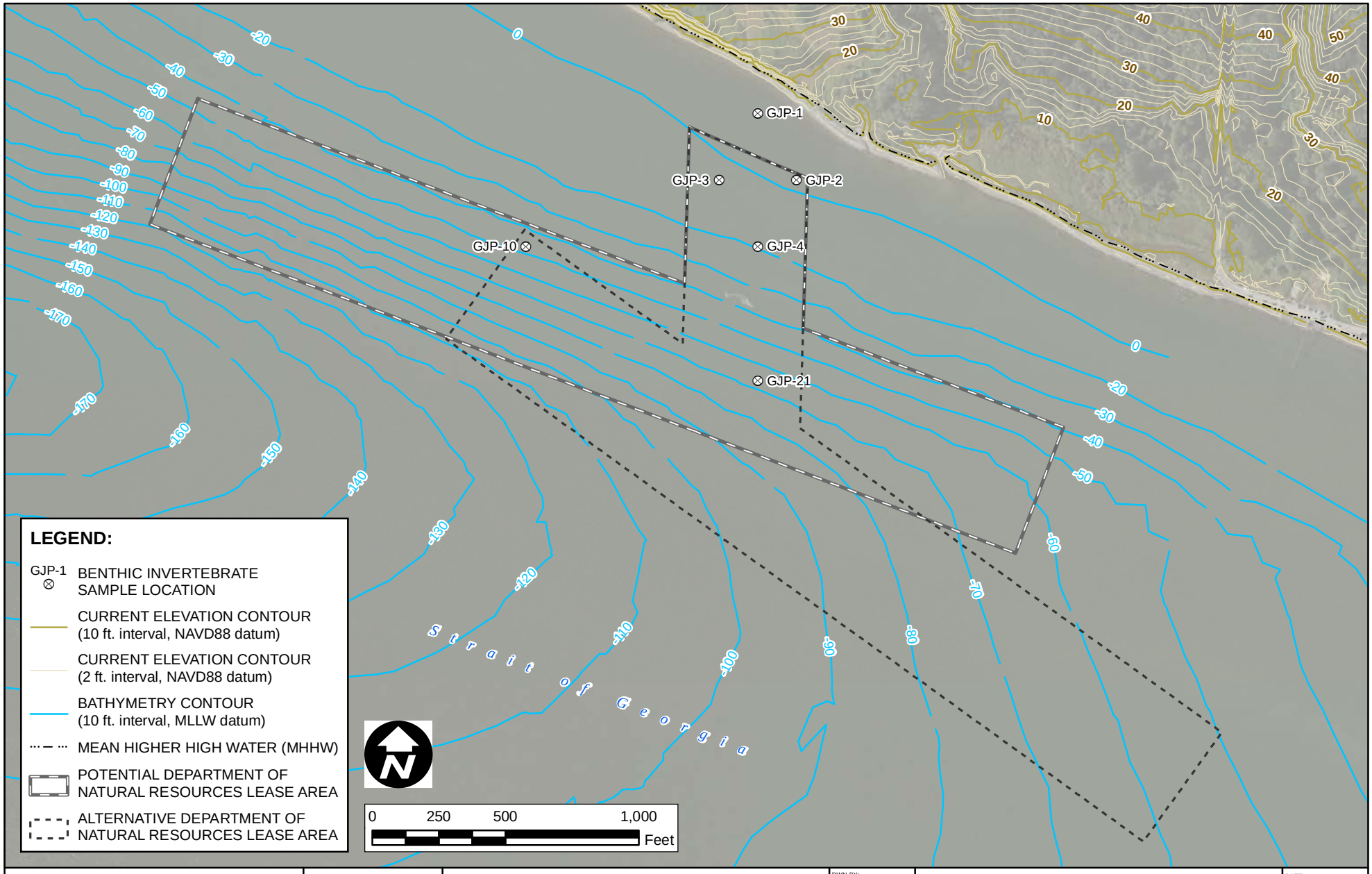
2. The Shannon-Wiener Diversity Index: This index provides a measure of diversity that is less biased by sample size than SR. The higher the Diversity index (H'), the greater the species diversity in the sample.

   $$H' = \sum_{i=1}^{S} p_i \ln p_i$$

   where:

   s is the total number of species observed; and

   p_i is the relative abundance of each species, calculated as the proportion of individuals of a given species relative to the total number of individuals in the sample.



SOURCE: Bathymetry Contours:
154199-A100-42S01.dwg (Rev. J), Ausenco Sandwell, 12/24/2010.
Current Elevation Contours:
2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.
Mean Higher High Water (MHHW):
2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

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DWN BY: SD
CHK'D BY: MG
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 500 feet

PROJECT: MARINE BIOLOGY BASELINE INVENTORY 2011

TITLE: BENTHIC INVERTEBRATE SAMPLE LOCATIONS

DATE: JANUARY 2012
PROJECT NO.: 091515338C-09-03
REV. NO.: -
FIGURE NO.: 9

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 9 - Benthic Invertebrate Sample Locations.mxd

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3. Evenness (*J'*): This index determines how evenly the proportions of taxa are distributed in a sample.

$$J' = H'/H'max$$

where:

H' is the Shannon-Wiener index as defined above and H'_{max} *is defined as,*

$$H'max = ln\, s$$

where s is the number of species observed.

4. Abundance (*A*): Is defined as the total number of organisms (*N*) per unit area (m^2) of substrate sampled.

$$A = N/area$$

5. Community Composition: This metric gives the percentage of the total number of individuals present that belong to the four dominant phyla in each sample. For example, in a sample represented by six phyla (A, B, C, D, E, and F) in which 30 percent of the organisms are in Phylum A, 25 percent in Phylum B, 20 percent in Phylum C, 15 percent in Phylum D, and the remainder in the remaining two phyla, the community composition metric for the four dominant phyla would be 90 percent.

2.4 FISH

Surveys were conducted to determine whether forage fish and rockfish are likely to be present in the study area. Rather than conduct surveys of rockfish, studies were conducted to evaluate rockfish habitat, and therefore, the potential for rockfish species to occur within the study area. The focus of the forage fish investigation was to determine whether surf smelt spawn within the study area.

2.4.1 Rockfish Habitat

The underwater video survey data were used to assess the habitat quality of Area A and Area B for rockfish. The video surveys of the study area were evaluated to characterize the physical habitat attributes (substrate, vertical relief, and habitat complexity) that have been related to the abundance of rockfish in Puget Sound following the methods of Pacunski and Palsson (2001).

Three species of Puget Sound rockfish (yelloweye [*Sebastes ruberrimus]*, canary [*S. pinniger*], and bocaccio [*S. paucispinis*]) are protected under the Endangered Species Act (ESA). Adults of these species are found most commonly at depths between 160 feet and 820 feet (50 to 250 meters), but

may be found at depths up to 1,560 feet (475 meters) (National Marine Fisheries Service [NMFS] 2009. Adults generally move into deeper water as they increase in size and age, but usually exhibit strong site fidelity to rocky bottoms and outcrops. Juveniles and subadults may be more common than adults in shallower water, and are associated with rocky reefs, kelp canopies, and artificial structures, such as marine wharfs, piers, and oil platforms (NMFS 2005). In the inland waters of Puget Sound, adult rockfish communities have been divided into categories based on their preferred depth range: intertidal, nearshore (subtidal to about 100 feet), shallow shelf (100 to 300 feet), deep shelf (330 to 660 feet), and slope (> 660 feet) (Love et al. 2002).

Measures of habitat quality vary among different studies, but different studies have demonstrated good correlation over meso-scale areas between the abundance of rockfish and physical habitat characteristics of bottom topography, substrate, and other physical features (e.g., habitat complexity) (Pacunski and Palsson 2001).

2.4.1.1 Field Investigation Methods

Subsurface characteristics were mapped along transects using an underwater video system as described in Section 2.1.

2.4.1.2 Data Analysis

The video for each transect was analyzed and the substrate types along the transects were recorded. Three habitat variables were mapped following methods described by Pacunski and Palsson (2001) as shown in Table 2. These habitat variables consisted of substrate type, vertical relief, and habitat complexity (Table 2). Each habitat variable was scored qualitatively as described in Table 2, with the following exceptions:

- The “high and “wall” scoring of Pacunski and Palsson under vertical relief were combined into a single score of “high”; and
- The “simple” and “low” scores of Pacunski and Palsson under habitat complexity were combined into a single score of “low.”

Following video processing, the three habitat variables (substrate, vertical relief, and habitat complexity) observed along each transect were mapped in a geographic information system (GIS) using the transect GPS coordinates recorded for each habitat variable. Habitat maps were produced for each habitat variable depicting the scoring of transects in the reference and study areas. A frequency matrix table was prepared summarizing the observed habitat variable scores to provide a qualitative estimate of the value of rockfish habitat in the reference and study areas. The results are presented in Section 3.3.1.

Table 2 Habitat Variables Used in Fish and Wildlife Bottom Fish (including rockfish) Video Surveys

Variable	Score	Description
Substrate	Rock	Hardpan (clay, sandstone), bedrock, boulder
	Coarse grain	Large to medium gravel, cobble, shell hash
	Fine grain	Fine gravel, sand, silt
Vertical Relief	None	Flat or rolling substrate with vertical relief up to 0.5 meter
	Low	Vertical relief from 0.5 meter (1.6 feet) to 2 meters (6.6 feet)
	High	Vertical relief greater than 2 meters, slope less than 45 degrees
	Wall	Vertical relief greater than 2 meters, slope greater than or equal to 45 degrees
Habitat Complexity	Simple	Smooth surfaces, no crevices
	Low	Some irregularity, few crevices (<25 percent of area)
	Medium	Moderate irregularity, ~20-50% of habitat with crevices
	High	Highly irregular, many crevices (>50% of area with crevices)

Source: Taken from Pacunski and Palsson 2001.

2.4.2 Forage Fish

Forage fish are defined as fish that provide prey for predatory fish and other marine wildlife. In Puget Sound, commonly occurring forage fish include Pacific herring *(Clupea pallasii*), surf smelt *(Hypomesus pretiosus),* and Pacific sand lance *(Ammodytes hexapterus).*

The focus of this investigation was to determine whether surf smelt use the study area, specifically Area A, for spawning.

Pacific herring distribution and abundance have been monitored annually by WDFW, and reported in the annual Washington State herring stock status reports (e.g., Stick and Lindquist 2008), and thus were not included in this baseline investigation.

Surveys for spawning Pacific sand lance were not included in this investigation because previous investigations have not identified suitable sand lance habitat, and sand lance spawning has not been observed within the study area (WDFW 2006, 2012).

2.4.2.1 Field Investigation Methods

To determine whether surf smelt use Area A for spawning, samples of beach substrate were collected and assessed for the presence of surf smelt eggs. The beach substrate samples were collected from both Area A and Area C, where surf smelt have been known to spawn (WDFW 2012), during each sampling event. According to WDFW Priority Habitat and Species (PHS) data, surf smelt spawning

events have been recorded along the shoreline approximately 3,250 feet east-southeast of the centerline of Area A, in what is called Area C in this study (Figure 4).

Sampling was planned to coincide with historic peak spawning events in the vicinity. Previous data indicate that surf smelt spawning at the control site (Area C) peaks during the first three weeks of July (Williams 2011). Therefore, sampling was conducted in the Study Area on a weekly basis during the first three weeks of July. An additional sample was collected August 8, 2011. Surf smelt surveys were conducted following standard WDFW protocols (Moulton and Penttila 2006). Suitable spawning areas in the study area were investigated, where potential spawning areas are described as areas with a mixture of sand and small gravel substrate, usually with fine shell fragments mixed in, at elevations of +7 feet MLLW to +9 feet MLLW (as summarized in Penttila 2007).

Whereas the WDFW protocol prescribes sampling +7 to +9 feet MLLW, in Area A, suitable substrate for surf smelt spawn was not available at that elevation. Alternatively, somewhat suitable substrate was identified at a higher tidal elevation (elevation of approximately +11 feet MLLW, estimated based on the water line and known tidal elevation) near the extreme high tide line, which is where samples were collected. One sample was collected from Area A during each of the four field investigations.

At the control site (Area C), two samples were collected during each of the four field investigations because the band of suitable spawning substrate was so expansive. One sample was collected at the lower end of the elevation range of suitable substrate, and one sample was collected at the upper end of the elevation range of suitable substrate.

Each sample consisted of four scoops of gravel evenly spaced along a 100-foot stretch of beach. Samples were condensed in the field by washing the potentially occurring eggs from the sand and discarding the barren sediment. Because the eggs are lighter than sand and gravel, they move upward during the washing process, allowing them to be skimmed from the surface of the material. The skimmed material was preserved with Stockard's solution for processing in the laboratory.

2.4.2.2 Laboratory Analysis

Final separation of any eggs from the sand was performed using a dissecting microscope. Laboratory analysis was completed under a dissecting microscope at 10-20 times magnification. Eggs were counted by species (sand lance or surf smelt), and the counts entered into a lab data form.

3.0 RESULTS

This section presents the results of the marine baseline studies described in Section 2.0. Photographs taken during the investigation are provided in Appendix C.

3.1 SUBMERGED MARINE VEGETATION (MACROALGAE)

Submerged marine vegetation was assessed using a two-tiered approach, coupling a qualitative underwater video survey with subsequent quantitative surveys conducted by divers. The quantitative diver survey provided estimates of overall cover and identified macroalgae to the species level, where possible. The diver surveys provide more precise data, at a higher resolution, than the underwater video surveys. The underwater video surveys covered more area and went to greater depths, showing periodic tufts of macroalgae and beds of colonial invertebrates.

3.1.1 Macroalgae Video Surveys

As indicated in Section 2.1, underwater video surveys were conducted along transects to provide a qualitative assessment of the composition and distribution of marine vegetation. A map of the actual video tracks followed during the field investigation is provided in Figure 10.

As described in Section 2.1.2, a number of the proposed transects could not be surveyed. Specifically, the shallowest proposed transect throughout the Study Area was not surveyed because the water was too shallow to allow the research vessel to tow the video. Similarly, approximately 17 transects within Area B were not surveyed due to shallow water in an area of poor visibility with large, randomly situated boulders (labeled as “Area not Surveyed” in Figure 10). However, because this boulder hazard area is within the photic zone, where macroalgae is occurs, data were collected during quantitative macroalgae surveys (described in the next section).

The results of the macroalgae video mapping are shown in Figure 11, including the approximate distribution of Laminariales kelp, mixed kelp, *Sargassum,* a small patch of eelgrass, and areas of sparse vegetation and colonial invertebrates. In general, macroalgae extends from approximately 0 feet MLLW to a maximum depth corresponding to elevation of -20 feet MLLW in Area A, and to a depth of -30 feet MLLW in Area B.

As described previously, the *macroalgae bed* is defined as the area with an understory canopy dominated by various species of Laminariales kelps. Other species in the macroalgae bed may include various red algae and intermittent bull kelp. The macroalgae bed in Area B was more densely covered by an understory canopy of Laminariales alga species than was the bed in Area A.

In general, the majority of the macroalgae bed was dominated by a mixed community with an understory canopy of Laminariales species, foliose red alga species, and the green alga, *Ulva* sp. At depths below -20 feet MLLW, areas labeled as sparse macroalgae/colonial invertebrates represent beds of tube worms.

Figure 11 also shows the extent of *Sargassum* throughout the study area.

A small patch of eelgrass was observed in shallow water southeast of Gulf Road. Based on the video mapping, the area of eelgrass is estimated to be less than approximately 100 square feet.

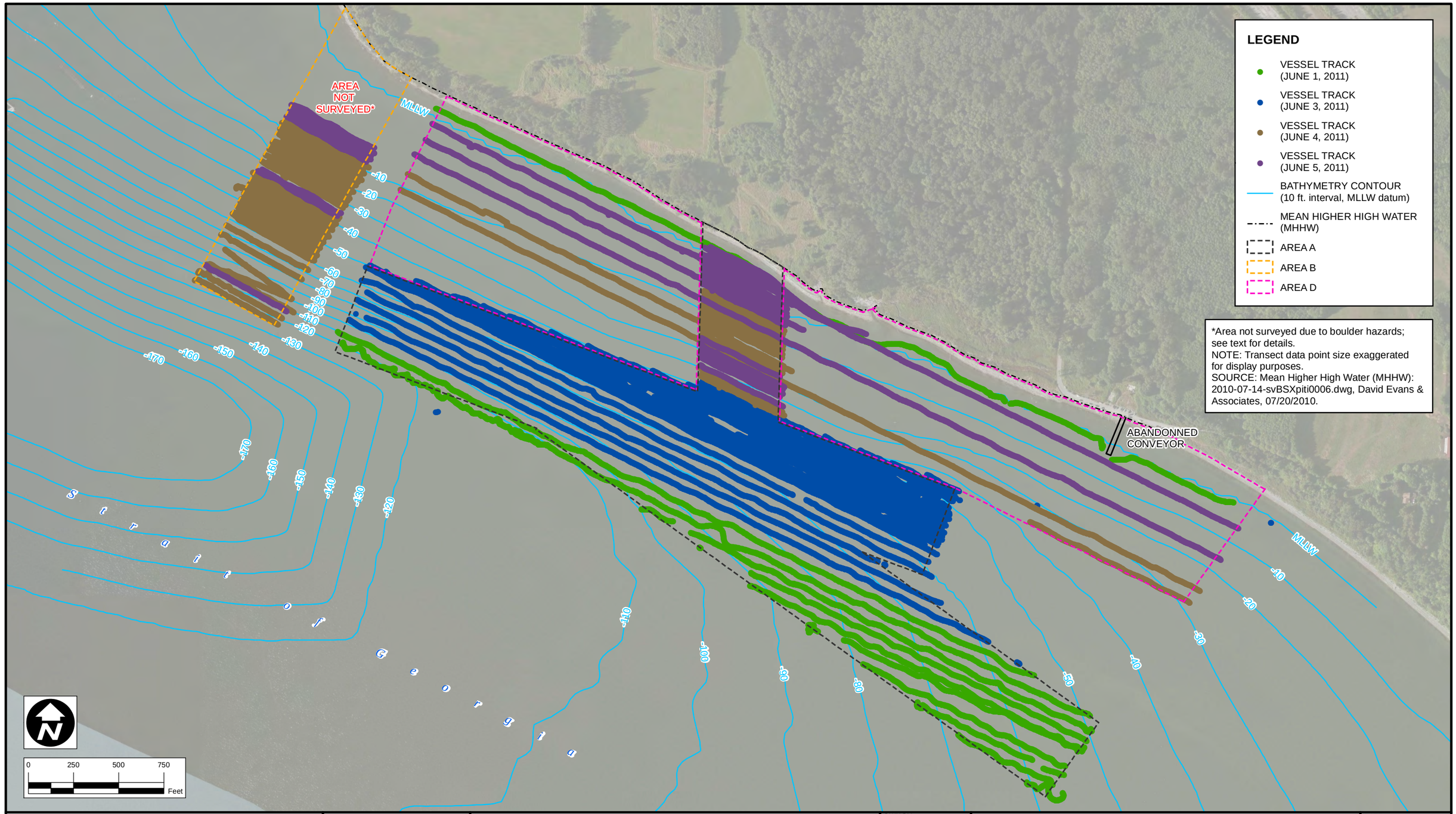
3.1.2 Quantitative Macroalgae Surveys

This section presents the results of the diver surveys for Area A and Area B.

3.1.2.1 Area A

As described in Section 2.2.1, diver surveys were conducted along seven transects to further characterize the macroalgae community in Area A. Five transects (Transects 2 through 6) were established within the footprint of the trestle alignment to establish baseline conditions for monitoring the effects of shading on the macroalgae community. The outer two transects (Transects 1 and 7) were implemented to understand baseline conditions for monitoring the effects of prop wash that may occur in the future during terminal construction. In general, observations at the outer transects were consistent with observations along the five inner transects, so the results presented below are representative of all transects jointly. Raw data for each of the transects surveyed are included in Appendix D.

Dominant macroalgae identified throughout Area A include one genus of green algae (*Ulva* sp.*)*, 12 genus of red algae (*Mazzaella* sp.*, Mastocarpus* sp.*, Fauchea* sp.*, Odonthalia* sp.*, Gracilaria* sp., *Porphyra* sp.*, Rhodomela* sp., *Gracilariopsis* sp.*, Neorhodomela* sp.*, Polysiphonia* sp.*, Plocamium* sp.*,* and *Pterosiphonia* sp.), and six species of brown algae (*Fucus* sp., *Desmarestia ligulata, Sargassum muticum*) including three species of kelp (*Laminaria saccharhina, Costaria costata*, and *Nereocystis luetkeana*)*.*



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DWN BY:	SD
CHK'D BY:	MG
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: UNDERWATER VIDEO TRACKS

DATE:	APRIL 2012
PROJECT NO.:	091515338C-09-03
REV. NO.:	-
FIGURE NO.:	FIGURE 10

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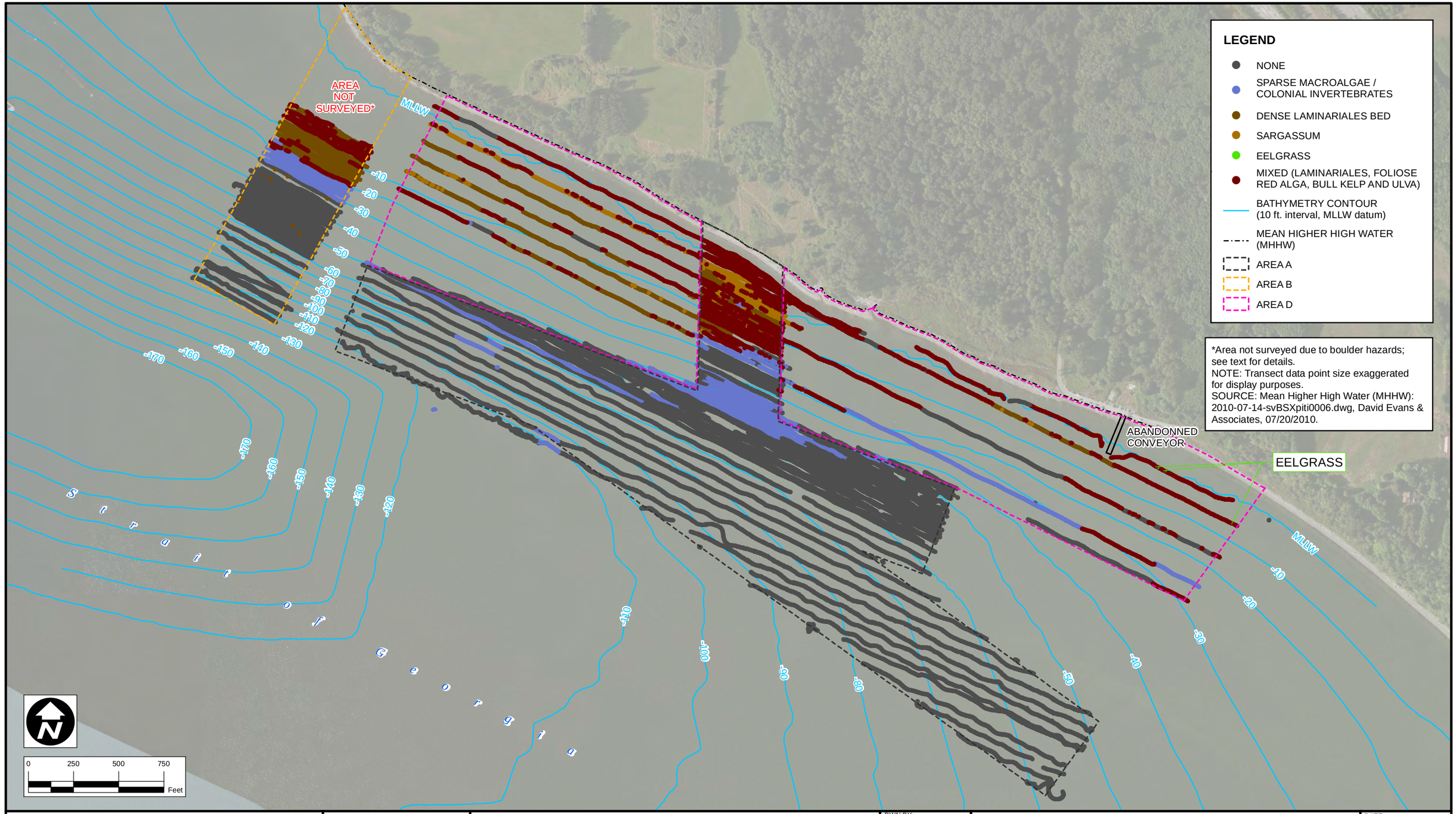

LEGEND

- NONE
- SPARSE MACROALGAE / COLONIAL INVERTEBRATES
- DENSE LAMINARIALES BED
- SARGASSUM
- EELGRASS
- MIXED (LAMINARIALES, FOLIOSE RED ALGA, BULL KELP AND ULVA)
- BATHYMETRY CONTOUR (10 ft. interval, MLLW datum)
- MEAN HIGHER HIGH WATER (MHHW)
- AREA A
- AREA B
- AREA D

*Area not surveyed due to boulder hazards; see text for details.
NOTE: Transect data point size exaggerated for display purposes.
SOURCE: Mean Higher High Water (MHHW): 2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

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DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: SUBMERGED MARINE VEGETATION MAP BASED ON VIDEO SURVEYS

DATE:	APRIL 2012
PROJECT NO.:	091515338C-09-03
REV. NO.:	-
FIGURE NO.:	FIGURE 11

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 11 - Submerged Marine Vegetation Map.mxd

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Table 3 summarizes the distribution by elevation of marine macroalgae species observed in Area A during the diver surveys. Marine macroalgae distribution typically varies with water depth (available light) and substrate type (Mumford 2007). Results of the diver surveys were consistent with this general trend. In the upper intertidal zone (+5 feet MLLW to 0 feet MLLW), the dominant genuses included *Fucus* and *Ulva.* A band from approximately -1 foot MLLW to -4 feet MLLW was dominated by the invasive macroalgae *Sargassum muticum,* interspersed with *Fucus* at the higher elevation end of the band and *Laminaria* at the lower elevation end of the band. Various red algae were interspersed throughout the *Sargassum* to depths up to -10 feet MLLW. *Sargassum* was present in diver transects to a depth of -10 feet MLLW, although underwater video surveys show isolated *Sargassum* occurring up to -15 feet MLLW.

A relatively dense macroalgae bed dominated by *Laminaria saccharhina* extended from approximately -3 feet MLLW to approximately -13 feet MLLW, with *Nereocystis luetkeana*, *Costaria costata*, and various red alga species interspersed. *Laminaria, Nereocystis,* and *Desmarestia ligulata* continued to a depth of -20 feet MLLW, with one stipe of *Nereocystis* observed as deep as -20.5 feet MLLW.

From -15 feet MLLW to -20 feet MLLW, macroalgae were generally sparse. Percent cover decreased from approximately 100 percent cover above -15 feet MLLW to less than 20 percent cover below -13 feet MLLW, with no macroalgae present at most sample points below -20 feet MLLW. Where present, the macroalgae community between -15 to -20 feet MLLW was dominated by *Laminaria* with some *Nereocystis,* and the brown alga *Desmarestia ligulata* prevalent at nearly all transects in deeper water. Below -20 feet MLLW, *Nereocystis* was present in the middle transects.

The highest density of macroalgae in terms of highest percent cover and greatest number of macroalgae holdfast counts occurred between 0 feet MLLW and -15 feet MLLW (Appendix D; Figure 12). Table 4 shows average percent cover and kelp total holdfast counts over various depth ranges observed.

Table 3 Summary of Macroalgae Species Distribution by Elevation in Area A

Most Common Species (Dominant)	Elevation (feet MLLW) [a]					
	+5 to 0	0 to -5	-5 to -10	-10 to -15	-15 to -20	-20 to -25
Ulva						
Fine thallus red algae[b]						
Mazzaella spp.						
Mastocarpus spp.						
Fauchea spp.						
Odonthalia spp.						
Rhodomela spp.						
Porphyra spp.						
Gracilaria spp.						
Gracilariopsis spp.						
Fucus spp.						
Sargassum muticum						
Laminaria saccharhina						
Costaria costata						
Nereocystis luetkeana						
Desmarestia ligulata						

a. Color coded blocks in the table represent presence of specific species green, red, and brown alga phyla at specified depth intervals.

b. Genuses include: *Neorhodomela*, *Polysiphonia*, *Plocamium,* and *Pterosiphonia.*

Table 4. Macroalgae Percent Cover and Kelp Holdfast Counts by Elevation in Area A

Elevation Range (feet MLLW)	Number of Quadrats Sampled	Average Cover (%)	Kelp Total Holdfast Counts (all transects)
Above 0	26	26	0
0 to -5	86	87	226
-5 to -10	40	90	59
-10 to -15	33	59	101
-15 to -20	30	10	15
-20 to -25	14	<5	1

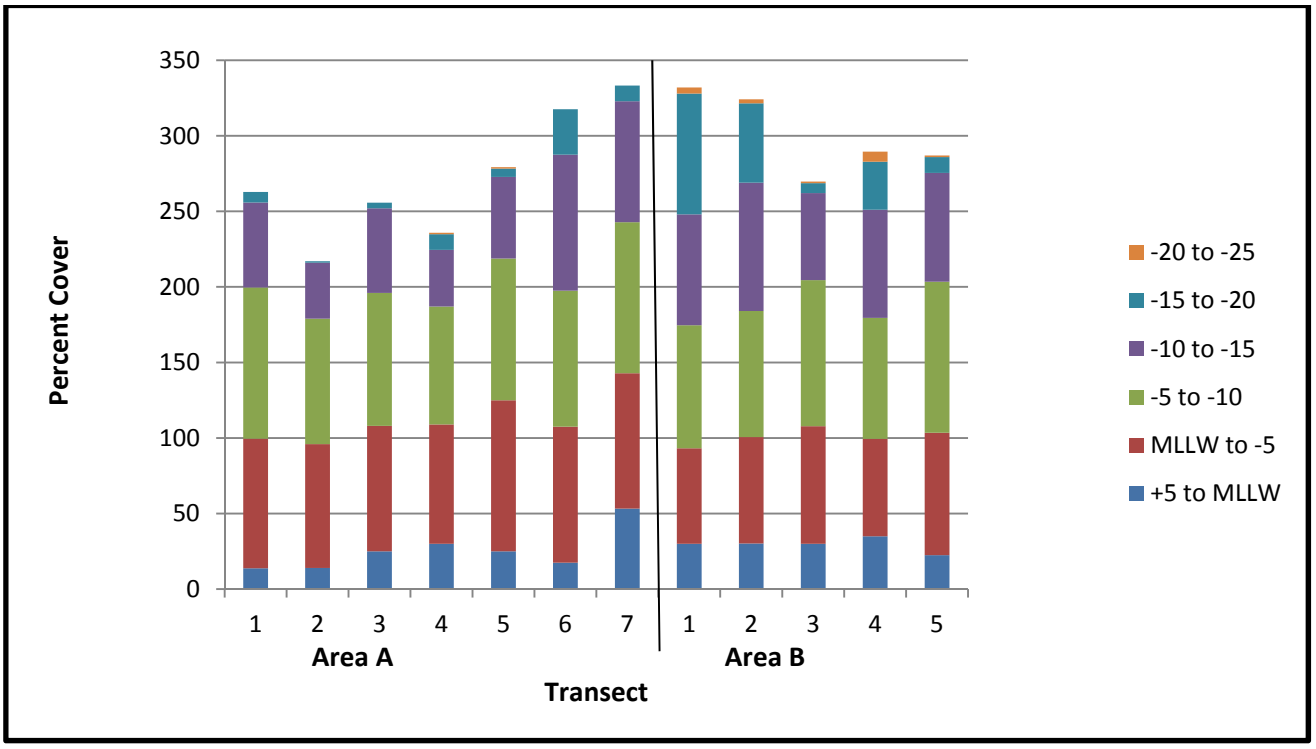

Figure 12 Macroalgae Percent Cover for Each Transect Investigated, by Elevation

Total cover exceeds 100 percent because it is additive for each elevation sampled.

Table 5 shows the presence of substrate type relative to water depth. Multiple samples were taken within each depth range, so it is possible for multiple substrate types to be reported for each depth, such as the MLLW to -5 MLLW depth range. Below 0 feet MLLW, the substrate composition transitioned from a predominantly cobble bottom, to a mixed-cobble substrate with sand and gravels present. Below -15 feet MLLW, the substrate transitioned to soft bottom with mixed sand, and with silt present below -20 feet MLLW. Macroalgae species distribution and diversity were generally associated with substrate composition. *Fucus* and *Ulva* were observed on the medium- to large-sized cobbles in the intertidal zone, while kelp species (*Laminaria* and *Nereocystis*) were observed attached to cobbles located between 0 feet MLLW and -15 feet MLLW.

In general, *Fucus* and *Ulva* were found attached to medium to large sized cobbles in the intertidal zone, while kelp species (*Laminaria* and *Nereocystis*) were found attached to subtidal cobbles between 0 feet MLLW and -15 feet MLLW

Table 5 Substrate Composition by Depth in Area A as Recorded by Divers during Vegetation Surveys. Shaded boxes indicate substrate type is present within the specified depth range.

	Elevation (feet relative to MLLW)					
Substrate	**+5 to 0**	**0 to -5**	**-5 to -10**	**-10 to -15**	**-15 to -20**	**-20 to -25**
Cobble						
Mixed cobble[1]						
Gravel						
Sand						
Mixed sand						
Silt						

a. Mixed cobble indicates areas where cobble is dominant, with either sand or gravel also present.

b. Mixed sand indicates areas dominated by sand, with some cobble, gravel, or silt mixed into the substrate.

3.1.2.2 Area B

Table 6 summarizes the distribution by elevation of macroalgae species identified during the diver surveys in Area B. The species composition and distribution were similar to Area A. Upper intertidal species included *Fucus* and *Ulva,* similar to Area A, although in Area B, *Mastocarpus* also extended into the upper intertidal zone and *Ulva* did not extend as deep (ending at -5 feet MLLW, compared to -15 feet MLLW in Area A). Below 0 feet MLLW, to -10 feet MLLW, the species composition in Area A and Area B were similar, although two species of red algae (*Porphyra* and *Gracilariopsis*) present in Area A were absent at these depths in Area B. Between -10 feet MLLW and -15 feet MLLW, the brown kelp *Agarum* was present in Area B, but not in Area A, whereas the red algae *Porphyra* and *Gracilariopsis,* and the kelp *Nereocystis* were present in Area A, but not in Area B. The community composition below -15 feet MLLW was similar in both areas, with the exception that *Laminaria* was observed in deeper water in Area B (to -23 feet MLLW in Area B as opposed to -18 MLLW in Area A).

Table 6 Summary of Macroalgae Species Distribution by Elevation in Area B. Shaded boxes indicate taxa is present within the specified depth range.

	Elevation (feet MLLW)[a]						
Dominant Species	**+5 to 0**	**0 to -5**	**-5 to -10**	**-10 to -15**	**-15 to -20**	**-20 to -25**	**-25 to -30**
Ulva							
Fine thallus red algae[b]							
Mazzaella spp.							
Mastocarpus spp.							
Fauchea spp.							
Gracilaria spp.							
Odonthalia spp.							
Porphyra spp.	Not present						
Gracilariopsis spp.	Not present						
Fucus spp.							
Sargassum muticum							
Laminaria saccharhina							
Costaria costata							
Agarum spp.							
Nereocystis luetkeana							
Desmarestia ligulata							

a Table is color coded to represent species from the green, red, and brown alga phyla.

b Species include *Odanthalia, Neorhodomela, Polysiphonia, Plocamium,* and *Pterosiphonia.*

Comparisons of the observations of macroalgae species distribution in Area A and Area B revealed the following:

- The intertidal green alga *Ulva* extended deeper in Area A than Area B.
- Overall species distribution and abundance were similar in Area A and Area B.
- In both Area A and Area B, the macroalgae density was greatest between 0 feet MLLW and -15 feet MLLW.
- The macroalgae bed dominated by *Laminaria* in Area B extended from -5 feet MLLW to approximately -20 feet MLLW, whereas *Laminaria* in Area A ended at approximately -13 feet MLLW.

Similar to Area A, in Area B the highest density of macroalgae in terms of percent cover occurred between 0 feet MLLW and -15 feet MLLW (Figure 12). Above MLLW the average percent cover was 23 percent, whereas between MLLW and -15 MLLW the average percent cover was 84 percent.

Between -15 and -20 MLLW, the average percent cover was 11 percent, between -20 and -25 the average percent cover was 1 percent, with no macroalgae occurring below -25 MLLW. Similarly, holdfast counts of kelp were of highest density between MLLW and -15 MLLW (slightly higher than Area A), with the average number of holdfasts per quadrat ranging from 2 to 3.3. A summary of average cover and total number of holdfasts counted by depth is provided in Table 7.

Table 7 Macroalgae Percent Cover and Kelp Holdfast Counts by Elevation in Area B

Elevation Range (feet MLLW)	Number of Quadrats Sampled	Average Cover (%)	Total Kelp Holdfast Counts (number for all transects)
Above 0	20	30	0
0 to -5	62	71	51
-5 to -10	28	88	61
-10 to -15	25	72	55
-15 to -20	18	36	53
-20 to -25	19	3	18

Charts providing a side-by-side comparison of the project site and reference site in terms of overall percent cover are shown below (Figure 12). Note that because percent cover was estimated for each species and due to the multidimensional nature of the sampling environment (rocks increasing the surface area and available substrate, overlapping vegetation, etc.), the sum of cover percentage exceeds 100 percent. The percent cover at each elevation and the total percent cover at each transect is provided (Figure 12). This shows that the greatest percent cover of macroalgae was between MLLW and -15 MLLW at all transects investigated.

Similar to Area A, macroalgae species distribution and diversity were generally associated with substrate type. *Fucus* and *Ulva* were found on the medium- to large-sized cobbles in the intertidal zone, while kelp species (*Laminaria* and *Nereocystis*) were found attached to subtidal cobbles from 0 feet MLLW to -15 feet MLLW. Below -15 feet MLLW, the cobble transitioned to soft bottom dominated by mixed sand, with silt dominant below -20 feet MLLW (Table 8). As mentioned previously, multiple samples were taken within each depth range, so it is possible for multiple substrate types to be reported for each depth, such as the MLLW to -5 MLLW depth range.

Table 8 Substrate Type by Depth in Area B as Recorded by Divers during Vegetation Surveys. Shaded boxes indicate substrate type is present within the specified depth range.

	Elevation (feet relative to MLLW)						
Substrate	**+5 to 0**	**0 to -5**	**-5 to -10**	**-10 to -15**	**-15 to -20**	**-20 to -25**	**-25 to -30**
Cobble							
Mixed cobble[a]							
Gravel							
Sand							
Mixed sand[b]							
Silt							

a Mixed cobble indicates areas where cobble is dominant, with either sand or gravel also present.

b Mixed sand indicates areas dominated by sand, with some cobble, gravel, or silt mixed into the substrate.

A less than 100-square-foot patch of eelgrass was identified during the quantitative investigation in Area B at a depth of approximately -2 feet MLLW. The patch was limited to a sandy area approximately 50 to 60 feet wide (see photos in Appendix C), but did not fall in any of the transects surveyed. The patch extends beyond Area B to the north and slightly to the south, but not all the way to Area A. These areas of relatively long, narrow sandy patches along the lower intertidal zone are common along the Cherry Point reach between Point Whitehorn and Gulf Road. Eelgrass generally grows in these areas between elevations of +1 foot MLLW to -5 feet MLLW. Eelgrass was not observed in Area A.

3.2 MARINE INVERTEBRATES

The results of the marine invertebrates sampling are presented below. The first, brief section includes a description of incidental observations of epibenthic invertebrates. The latter two sections include an analysis of intertidal clams, geoduck clams, and benthic infauna.

3.2.1 Epibenthic Invertebrates

Incidental observations of marine epibenthic invertebrates were recorded throughout the marine baseline investigation, specifically during the marine vegetation and the geoduck/horse clam surveys. Epibenthic invertebrate taxa observed throughout the study area during surveys for macroalgae and geoduck include species from the phyla Cnidaria, Arthropoda, Echinodermata, and Mollusca. Incidental observations included crabs, seastars, and nudibranchs. A complete list, with genus and species, is provided in Appendix E.

No non-native epibenthic invertebrates were identified during the investigation.

3.2.2 Intertidal Clams

A total of 280 individual clams were identified at nine sampling stations. During the investigation of Area A on July 14, 2011, 150 clams were identified and measured at five stations; during the investigation of Area B on August 8, 2011, 130 clams were identified and measured at four stations.

3.2.2.1 Area A

Clam species identified in Area A included 111 clams from the genus *Macoma* (macoma clams), 25 butter clams (*Saxidomus giganteus*), 9 Pacific littleneck clams (*Protothaca staminea*), 2 Manila clams (*Venerupis philippinarum*), and 3 horse clams (*Tresus nuttallii*). No common cockles or geoducks were observed in the stations or during incidental observations in the area.

The greatest numbers of clams were collected at the station situated at 0 feet MLLW, which was dominated by macoma clams, with butter clams and Pacific littleneck clams also present (Figure 13). Below 0 feet MLLW, macoma clams were clearly most abundant, whereas above 0 feet MLLW, the clams more evenly distributed between macoma clams, butter clams, and Pacific littleneck.

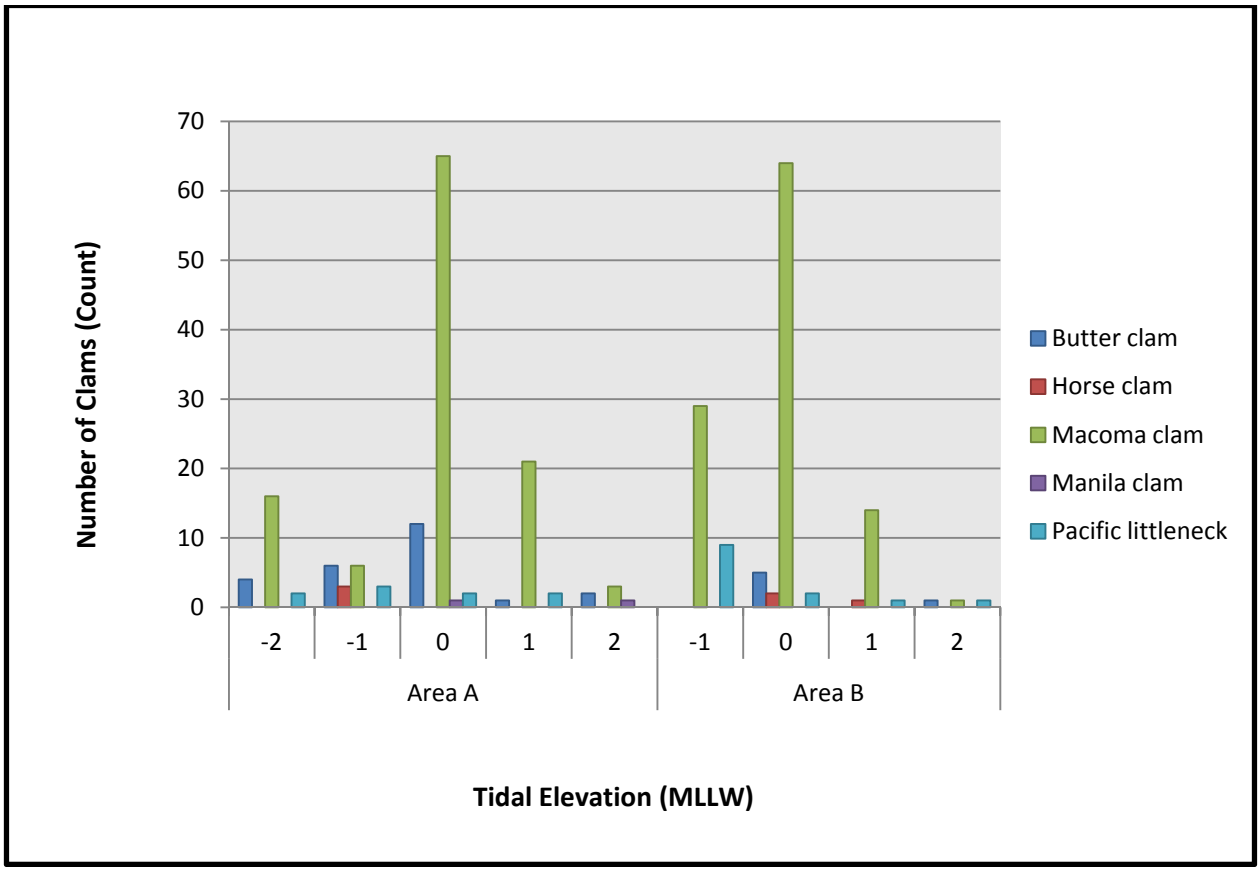

Figure 13 Comparison of Clams in Area A and Area B by Elevation

The greatest density of clams occurred at 0 feet MLLW at both locations.

The estimated population density along the transect in Area A was calculated for each species of clam identified. Assuming 1 square meter of sediment was sorted for each of the five sampling stations, a total area of 5 square meters (54 square feet) of substrate was investigated. The overall density was 31.6 clams per square meter (2.9 per square foot), consisting of 22.2 Macoma clams, 5 butter clams, 1.8 Pacific littleneck clams, 0.6 horse clams, and 0.4 Manila clams per square meter (0.09, 0.46, 0.17, 0.04 per square foot, respectively).

According to Washington State regulations, the harvestable size for species identified in the study area is 1.5 inches (38.1 mm). There is no minimum size for horse clams. The majority (87 percent) of clams identified were below the harvestable size limit. Most of the harvestable clams (15 total) were butter clams. Other harvestable species included one Pacific littleneck clam and three horse clams. Figure 14 provides a size frequency distribution for clams measured in Area A.

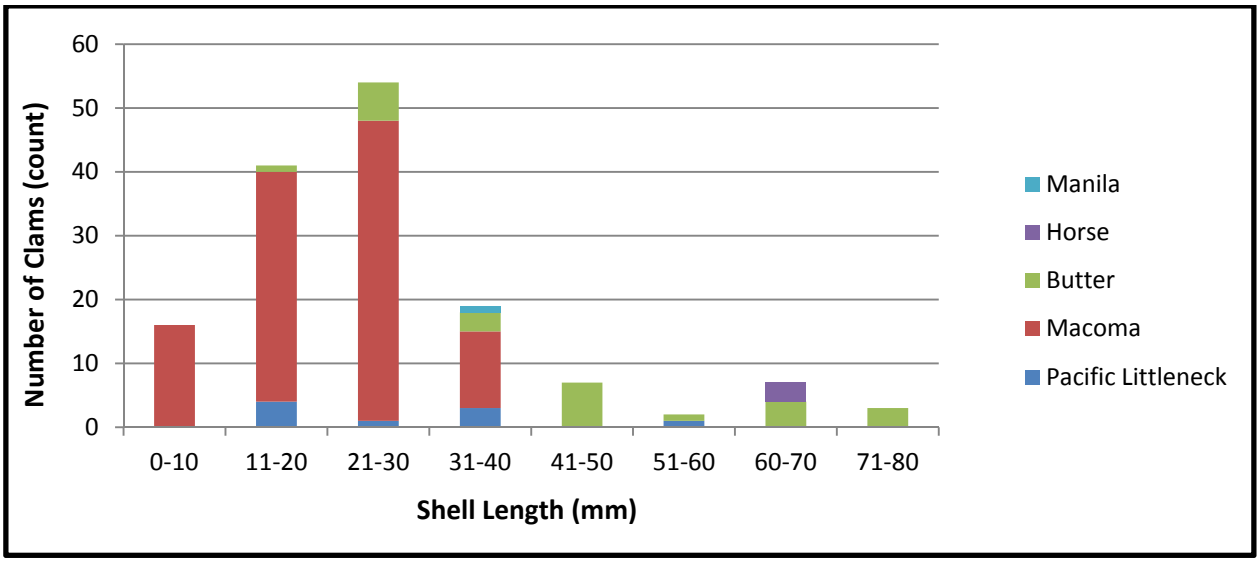

Figure 14 Size Frequency Distribution of Clams Sampled in Area A.

3.2.2.2 Area B

A total of 130 clams were identified and measured at four stations in Area B on August 8, 2011. Clam species identified in Area B included 108 macoma clams, 6 butter clams, 13 Pacific littleneck clams, and 3 horse clams. No common cockles or geoducks were observed in the stations or during incidental observations in the area.

Similar to the observations in Area A, the greatest numbers of clams were collected at the station situated at 0 feet MLLW, where macoma clams were most abundant, with butter clams, horse clams, and Pacific littleneck clams also present. Below 0 feet MLLW, Macoma clams were the most

abundant species, whereas above 0 feet MLLW, Macoma clams were abundant, but Pacific littleneck clams were more common (Figure 13).

The estimated density of clams along the transect in Area B was calculated for each species. Assuming 1 square meter of sediment was sorted for each of the four sampling stations, a total area of 4 square meters of substrate was investigated. The overall density measured along the transect was 32.5 clams per square meter (approximately the same as Area A), consisting of 27 Macoma clams, 1.5 butter clams, 3.25 Pacific littleneck clams, and 0.8 horse clams per square meter.

Similar to Area A, the majority (76 percent) of clams identified in Area B were below the legal size limit. However, in Area B, most of the harvestable clams (18 total) were Macoma clams, whereas in Area A most of the harvestable clams were butter clams. Other species within the harvestable size range at the reference site included Pacific littleneck clam (four total), butter clam (five total), and horse clam (three total). Figure 15 provides a size frequency distribution of clams measured in Area B.

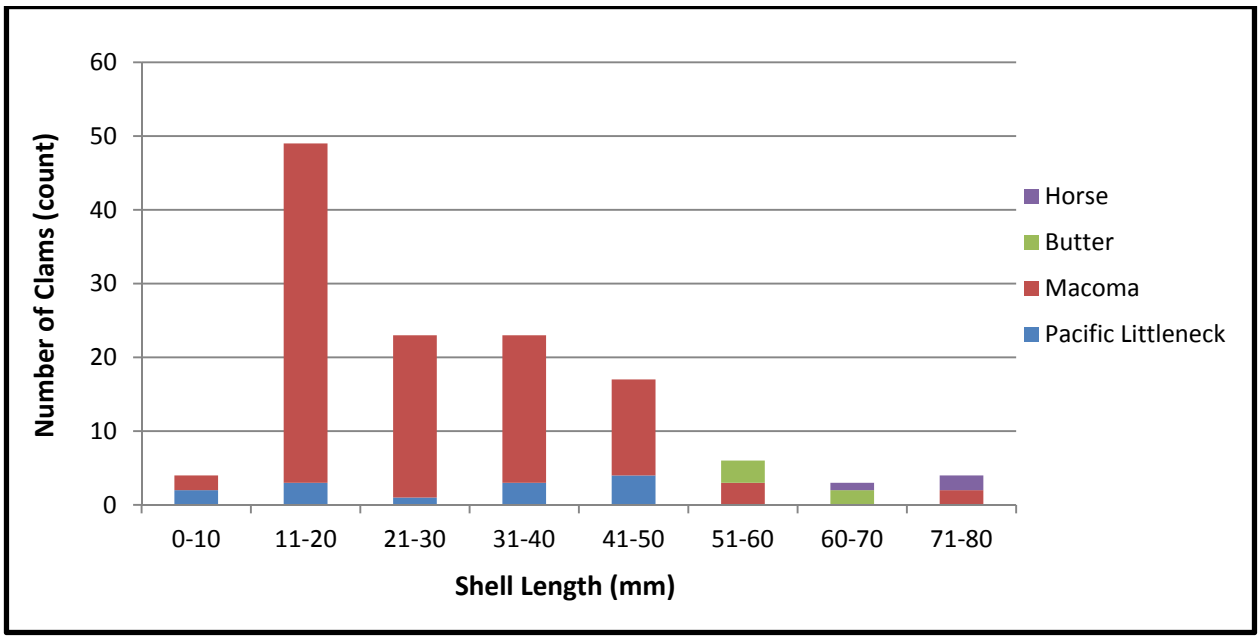

Figure 15 Size Frequency Distribution of Clams in Area B.

3.2.3 Geoduck and Horse Clams

The results of the quantitative geoduck survey show that geoduck clam densities are low throughout the study area. Five transects were situated within Area A and one transect was positioned in Area B. Only four horse clams were identified during the geoduck survey.

A total of 40 geoduck clams were counted over a sampling area of 16,290 square feet (1,513 square meters), representing an average density of 0.002 clam per square foot (0.0002 per square meter). A show factor of 0.67 was then applied to the geoduck counts within each transect to represent the number of siphons visible above the sediment as described in Section 2.3.3.1. The corrected number of siphons (corrected by applying the show factor) per transect was then used to calculate the geoduck population per transect, which was then translated to a density per transect. The show factor corrected average density over all the transects was calculated at 0.005 geoducks per square foot (0.0005 per square meter), slightly higher than the uncorrected density described above.

Summary data of geoduck density within each transect and the overall average per transect within the study area are provided in Table 9.

Table 9 Summary of Geoducks Sampled during the Field Investigation by Transect

Transect Number	GD-1	GD-2	GD-3	GD-4	GD-5	GD-6	Average Density
Begin Elevation (MLLW)	-70	-64	-72	-70	-71	-70	
End Elevation (MLLW)	-18	-40	-40	-18	-36	-46	
Survey Length (feet)	540	200	375	520	480	600	
Survey Area (square feet)	3,240	1,200	2,250	3,120	2,880	3,600	
Geoduck Observed	3	9	12	8	8	0	
Show Factor	0.670	0.670	0.670	0.670	0.670	0.670	
Estimated Geoduck Population	4.478	13.433	17.910	11.940	11.940	0.000	
Average Geoduck Density (per square foot)	**0.001**	**0.011**	**0.008**	**0.004**	**0.004**	**0.000**	**0.005**[a]
Overall Geoduck Density (per square foot)						**0.002**[b]	

a Average density per square foot calculated as the arithmetic average of the density among the six transects without correcting for the difference in survey area in each transect.

b Overall density per square foot calculated as total number of geoducks observed among the total area sampled.

3.2.4 Benthic Infauna

Benthic invertebrate samples were collected at six locations in the study area at elevations ranging from -19 feet MLLW to -103 feet MLLW.

Each of the five benthic macroinvertebrate samples from each location was sorted for taxonomic identification as a separate sample to allow statistical analyses of the results within each sample station. Community composition at each of the sample locations was calculated for the four predominant phyla, which were consistently the Annelida (e.g., polychaete worms), Arthropoda (e.g.,

crustaceans), Echinodermata (e.g., brittle stars), and Mollusca (e.g., bivalves and gastropods) across all sample locations. A statistical summary of taxonomic composition for these four predominant phyla at each sampling location is presented in Table 11.

Table 10 Benthic Macroinvertebrate Sample Location Sediment Characteristics

Station Identification	Station Depth (feet MLLW)	Sampling Date	Sediment Fines (Percent)	Sediment TOC (Percent)
GJP-4	-19	7/7/11	7.4	0.419
GJP-6	-35	7/7/11	19.8	0.686
GJP-10	-46	7/8/11	10.6	0.706
GJP-21	-68	7/7/11	41.6	1.19
GJP-37	-86	7/5/11	29.9	1.16
GJP-45	-103	7/8/11	34.9	1.16

Abbreviations

TOC: total organic carbon

Table 11 Community Composition Represented by the Four Dominant Phyla at Each Sample Location

Station	Annelida (%)	Arthropoda (%)	Echinodermata (%)	Mollusca (%)
GJP-4	13.3	2.0	2.2	80.5
GJP-6	13.0	6.7	13.2	42.3
GJP-10	8.4	1.5	9.5	78.2
GJP-21	9.7	8.0	7.5	76.4
GJP-37	11.5	8.5	13.1	66.1
GJP-45	5.7	5.3	7.7	81.1

Molluscs dominated the community composition at all sampling locations, whereas the relative dominance of the remaining three phyla varied from location to location (Table 11). Other representative phyla reported at the sampling locations consisted of the Cnidaria (e.g., jellyfish and corals), Nemertea (e.g., ribbon worms), Nematoda (e.g., roundworms), Phoronida (e.g., horseshoe worms), Platyhelminthes (e.g., flatworms), and Sipuncula (peanut worms).

Metrics were calculated for each location as described in Section 2.3.4.2. These are summarized in Table 12 and include the number of species, Margalef's index of species richness, the Shannon-Wiener diversity index, species evenness, and abundance (organism density).

Station GJP-4 had the greatest number of species, with a mean of 51 species per replicate sample (range of 49 to 54 species in the five replicates), while Station GJP-45 had the lowest number of species, with a mean of 20 species per replicate (range of 16 to 30 species in the five replicates). Due

to the high number of species at Station GJP-4, Margalef's index of species richness was greatest at Station GJP-4, with a mean of 7.64 (range of the five replicates between 7.32 and 7.94), and lowest at Station GJP-45, with a mean of 4.00 (range of the five replicates between 2.99 and 5.95). The remaining stations, arranged in order of descending magnitude of the number of species, where GJP-6 > GJP-37 > GJP-10 > GJP-21 (Table 12). Margalef's index followed the same general trend, but was slightly greater at GJP-21 than at GJP-10.

The Shannon-Wiener Index of species diversity was greatest at Station GJP-37, with a mean of 2.68 (range of the five replicates between 2.38 and 2.93), and lowest at Station -10, with a mean of 1.89 (range of the five replicates between 1.50 and 2.31). The remaining stations, arranged in order of descending magnitude of the Shannon-Wiener Index, were GJP-21 > GJP-6 > GJP-45 > GJP-4 (Table 12).

The species evenness index was greatest at Station GJP-37 with a mean evenness index of 0.82 (range of the five replicates between 0.79 and 0.86), while Station GJP-4 had the lowest mean evenness index of 0.51 (range of the five replicates between 0.45 and 0.59). The remaining stations, arranged in order of descending magnitude of species evenness, were GJP-21 > GJP-45 > GJP-6 > GJP-10 (Table 12).

Abundance, expressed as the number of individuals per square meter, was greatest at Station GJP-4, with a mean abundance of 18,921 (range of the five replicates between 16,211 and 22,079), while Station GJP-37 had the lowest mean abundance of 2,816 (range of the five replicates between 2,289 and 3,632). The remaining stations, arranged in order of descending magnitude of abundance, were GJP-6 > GJP-10 > GJP-45 > GJP-21 (Table 12).

Table 12 Number of Species, Species Richness, Species Diversity, Species Evenness, and Abundance of Benthic Invertebrate Samples

	Sample Locations					
Metric[a]	**GJP-4**	**GJP-6**	**GJP-10**	**GJP-21**	**GJP-37**	**GJP-45**
Number of Species						
Mean	51.2	44.0	24.6	24.2	26.6	20.4
Std. Dev.	1.9	5.5	8.0	6.5	6.31	5.7
Minimum	49.0	36.0	13.0	17.0	20.0	16.0
Maximum	54.0	50.0	35.0	34.0	34.0	30.0
Species Richness[b]						
Mean	7.64	7.19	4.47	4.93	5.48	4.00
Std. Dev.	0.26	0.75	1.19	0.95	1.22	1.15
Minimum	7.32	6.33	2.53	3.89	4.19	2.99

Table 12 Number of Species, Species Richness, Species Diversity, Species Evenness, and Abundance of Benthic Invertebrate Samples

	Sample Locations					
Metric[a]	**GJP-4**	**GJP-6**	**GJP-10**	**GJP-21**	**GJP-37**	**GJP-45**
Maximum	7.94	8.09	5.70	6.34	6.80	5.95
Diversity[c]						
Mean	1.99	2.48	1.89	2.50	2.68	2.10
Std. Dev.	0.21	0.16	0.34	0.18	0.23	0.32
Minimum	1.80	2.28	1.50	2.27	2.38	1.80
Maximum	2.28	2.67	2.31	2.72	2.93	2.55
Evenness						
Mean	0.51	0.66	0.60	0.79	0.82	0.70
Std. Dev.	0.06	0.02	0.06	0.02	0.03	0.05
Minimum	0.45	0.64	0.55	0.77	0.79	0.63
Maximum	0.59	0.68	0.69	0.81	0.86	0.76
Abundance[d]						
Mean	18,921	10,663	5,237	2,916	2,816	3,384
Std. Dev.	2,181	2,703	2,948	1,211	634	603
Minimum	16,211	6,605	3,026	1,605	2,289	2,395
Maximum	22,079	13,553	10,289	4,789	3,632	3,974

a Definitions and formulas of metrics are presented in Section 2.3.4.2.

b Margalef's index of species richness.

c Shannon-Wiener Index of species diversity.

d Number of organisms per square meter.

The dominant taxa for each sampling station are summarized in Table 13. Representative photographs of dominant taxa are provided in Appendix F.

Table 13 Dominant Benthic Invertebrate Taxa by Sample Station Replicate

Sample	Dominant Taxon	Percent of Total Individuals from All Species (%)
Station GJP-4		
GJP-4R1	*Nutricola lordi* & *Nutricola* spp.	62
GJP-4R2	*Nutricola lordi* & *Nutricola* spp.	60
GJP-4R3	*Nutricola lordi* & *Nutricola* spp.	60
GJP-4R4	*Nutricola lordi* & *Nutricola* spp.	63
GJP-4R5	*Nutricola lordi* & *Nutricola* spp.	53

Table 13 Dominant Benthic Invertebrate Taxa by Sample Station Replicate

Sample	Dominant Taxon	Percent of Total Individuals from All Species (%)
Station GJP-6		
GJP-6R1	*Rochefortia tumida*	27
GJP-6R2	*Nutricola lordi* & *Nutricola* spp.	23
GJP-6R3	*Rochefortia tumida*	37
GJP-6R4	*Nutricola lordi*	22
GJP-6R5	*Amphiodia urtica*	32
Station GJP-10		
GJP-10R1	*Nutricola lordi*	40
GJP-10R2	*Nutricola lordi*	31
GJP-10R3	*Nutricola lordi*	59
GJP-10R4	*Nutricola lordi*	59
GJP-10R5	*Nutricola lordi*	58
Station GJP-21		
GJP-21R1	*Nutricola lordi* & *Nutricola* spp.	20
GJP-21R2	*Ennucula tenuis*	27.928
GJP-21R3	*Nutricola lordi & Nutricola spp.*	27
GJP-21R4	*Nutricola lordi & Nutricola spp.*	27
GJP-21R5	*Nutricola lordi & Nutricola spp.*	24
Station GJP-37		
GJP-37R1	*Amphiodia urtica*	17
GJP-37R2	*Nutricola* sp.	20
GJP-37R3	*Nutricola lordi*	28
GJP-37R4	*Axinopsida serricata*	17
GJP-37R5	*Axinopsida serricata*	25
Station GJP-45		
GJP-45R1	*Acila castrensis*	44
GJP-45R2	*Acila castrensis*	54
GJP-45R3	*Acila castrensis*	30
GJP-45R4	*Acila castrensis*	30
GJP-45R5	*Nutricola lordi*	23

3.3 FISH

This section discusses the results of both underwater video surveys to assess rockfish habitat quality in the study area, as well as the results of forage fish spawning surveys for surf smelt and sand lance.

3.3.1 Rockfish Habitat

The results of the underwater videography survey of adult rockfish habitat are summarized in Figures 16, 17, and 18, which depict substrate type, habitat complexity, and vertical relief, respectively, along the visible portions of the survey transects throughout the study area. This section summarizes the results of the underwater survey of rockfish habitat throughout the study area, discussing each of the habitat variables: substrate type, vertical relief, and habitat complexity. The three habitat variables are discussed separately, and then discussed in combination to provide an overall scoring of the quality of adult rockfish habitat in the study area.

3.3.1.1 Area A

The majority of the substrate in Area A at depths greater than approximately -15 feet MLLW was classified as fine-grained with isolated patches of cobble/rock and some small areas of coarse-grained sediment (Figure 16). The majority of substrate in Area A landward of about -15 feet MLLW was classified as coarse-grained sediments with some isolated patches of cobble/rock. A narrow band of rock/cobble substrate extended along the shoreline throughout the entire reach of the study area at 0 feet MLLW (Figure 16).

Habitat complexity throughout the majority of Area A is scored as low (Figure 17), with narrow bands of medium-complexity habitat occurring at about -15 to -20 feet MLLW and between 0 feet MLLW and approximately -3 feet MLLW (Figure 17).

Vertical relief throughout almost the entire study area is scored as none (Figure 18).

A frequency matrix table summarizing the observed habitat variable scores is presented in Table 14 to provide a qualitative estimate of the value of rockfish habitat in Area A. Because practically no vertical relief is present throughout the entire study area, the frequency matrix table shows only the remaining two habitat variables (substrate and habitat complexity) that were scored.

As can be seen from Table 14, of the 121,060 feet (36,900 meters) of visible transect length within the study area, the combination of habitat complexity and substrate type resulted in a low rockfish habitat quality score over 109,470 feet (90.5 percent) of the visible transect length and medium rockfish habitat quality score for 11,589 feet (9.5 percent) of the visible transect length. The low quality of rockfish habitat within Area A is due primarily to the absence of vertical relief and the low habitat complexity.

AREA NOT SURVEYED*

MLLW

-10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170

Strait of Georgia

ABANDONNED CONVEYOR

LEGEND

- FINE GRAIN
- COARSE GRAIN
- ROCK/COBBLE
- BATHYMETRY CONTOUR (10 ft. interval, MLLW datum)
- MEAN HIGHER HIGH WATER (MHHW)
- AREA A
- AREA B
- AREA D

*Area not surveyed due to boulder hazards; see text for details.
NOTE: Transect data point size exaggerated for display purposes.
SOURCE: Mean Higher High Water (MHHW): 2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

N

0 250 500 750 Feet

Pacific International Terminals
A Cantix Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway N
Bothell, WA 98011

amec

DWN BY:	SD
CHK'D BY:	MG
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: UNDERWATER VIDEO MAP OF SUBSTRATE

DATE:	APRIL 2012
PROJECT NO.:	091515338C-09-03
REV. NO.:	-
FIGURE NO.:	FIGURE 16

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 16 - Underwater Video Map of Substrate.mxd

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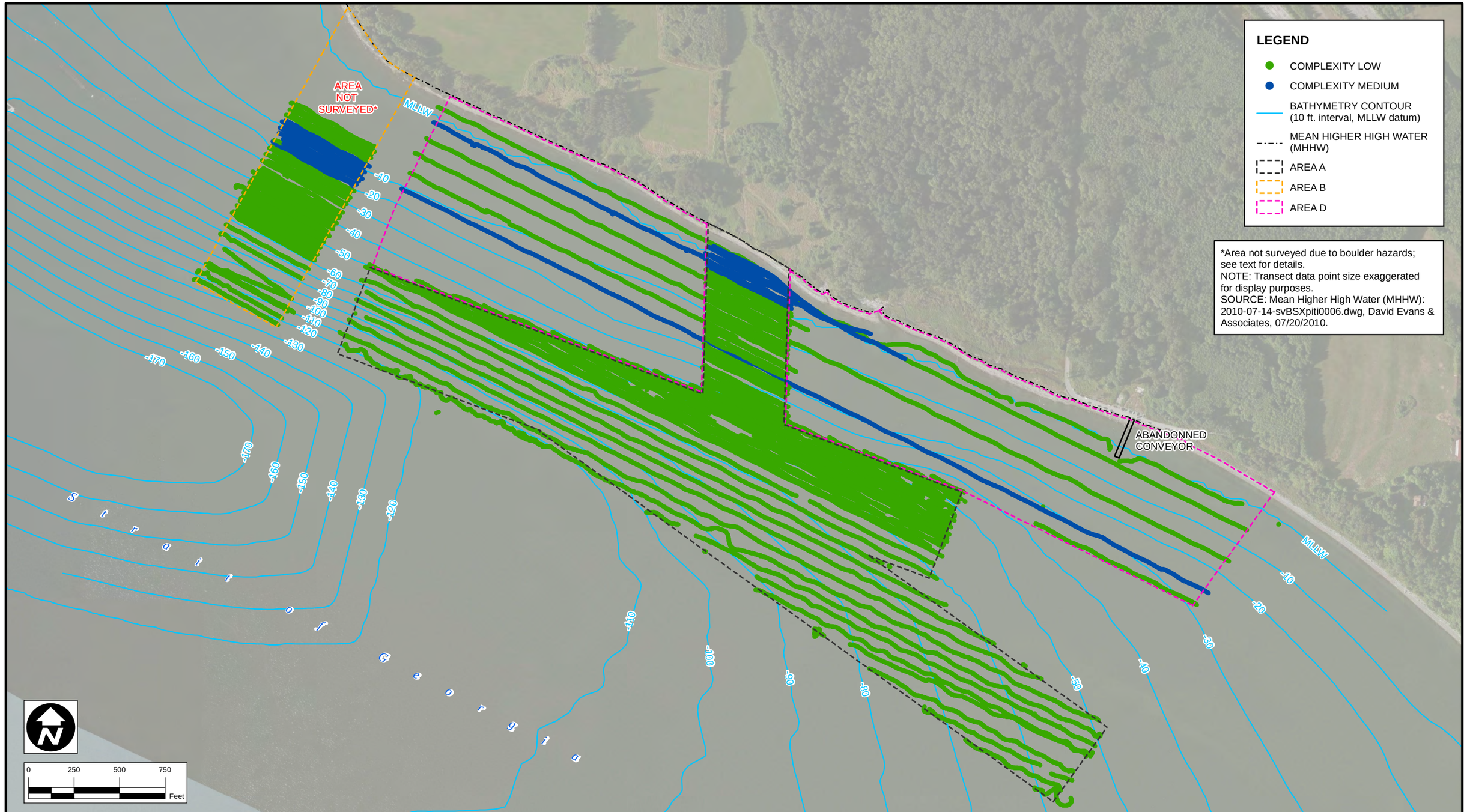

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CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway N
Bothell, WA 98011

DWN BY: SD
CHK'D BY: MG
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: UNDERWATER VIDEO MAP OF HABITAT COMPLEXITY

DATE: APRIL 2012
PROJECT NO.: 091515338C-09-03
REV. NO.: -
FIGURE NO.: FIGURE 17

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 17 - Underwater Video Map of Habitat Complexity.mxd

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AREA NOT SURVEYED*

MLLW

ABANDONNED CONVEYOR

Strait of Georgia

-10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170

LEGEND

- RELIEF - NONE
- RELIEF - LOW
- WALL
- BATHYMETRY CONTOUR (10 ft. interval, MLLW datum)
- MEAN HIGHER HIGH WATER (MHHW)
- AREA A
- AREA B
- AREA D

*Area not surveyed due to boulder hazards; see text for details.
NOTE: Transect data point size exaggerated for display purposes.
SOURCE: Mean Higher High Water (MHHW): 2010-07-14-svBSXpiti0006.dwg, David Evans & Associates, 07/20/2010.

N

0 250 500 750 Feet

Pacific International Terminals
A Cermix Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway N
Bothell, WA 98011

amec

DWN BY:	SD
CHK'D BY:	MG
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: UNDERWATER VIDEO MAP OF VERTICAL RELIEF

DATE:	APRIL 2012
PROJECT NO.:	091515338C-09-03
REV. NO.:	-
FIGURE NO.:	FIGURE 18

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-09-03 - Marine Biology Data Analysis\Underwater_Video_Survey\dwg\Revised\Figure 18 - Underwater Video Map of Vertical Relief.mxd

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Table 14 Rockfish Habitat Matrix in Area A Based on Habitat Complexity and Substrate Type

	Habitat Complexity					
Substrate Type	**Low**		**Medium**		**High**	
	Linear feet	Percent of total	Linear feet	Percent of total	Linear feet	Percent of total
Fine	83,847	69.3%	0	0.0%	0	0.0%
Coarse	20,466	16.9%	11,544	9.5%	0	0.0%
Cobble/Rock	5,157	4.3%	45	<0.1%	0	0.0%
Total[a]	109,470	90.5%	11,589	9.5%	0	0.0%

a Total visible transect length = 121,060 feet (22.9 miles).

3.3.1.2 Area B

Substrate in Area B shoreward of approximately -35 feet MLLW is dominated by coarse-grained material with some isolated patches of bedrock and cobble, while that at depths greater than -35 feet MLLW is dominated by fine-grained material with some isolated patches of bedrock and cobble (Figure 16). The band of coarse-grained material extends to much greater depth in Area B than the band of coarse-grained material in Area A, which transitioned to fine-grained substrate at approximately -15 feet MLLW. The shallowest margin of Area B could not be surveyed by towed video due to prolific boulder formations in shallow water, and therefore is not included in this habitat evaluation. The shallow water boulder area combined with a macroalgae community could potentially provide habitat to juvenile rockfish, but adult rockfish are generally limited to deeper water.

Habitat complexity in Area B consists of three distinct bands (Figure 17):

- A narrow band of low habitat complexity shoreward of -10 feet MLLW;
- A narrow band of medium habitat complexity between about -10 feet MLLW and -25 feet MLLW; and
- Low habitat complexity at depths greater than about -25 feet MLLW.

Vertical relief throughout Area B is scored as none (Figure 18).

A frequency matrix table summarizing the observed habitat variable scores is presented in Table 15 to provide a qualitative estimate of the value of rockfish habitat in Area B. Because no vertical relief was observed throughout the entire Area B, the frequency matrix table shows the remaining two habitat variables (substrate and habitat complexity) that were scored. As can be seen from Table 15, of the 22,581 feet of visible transect length within Area B, the combination of habitat complexity and substrate type resulted in low rockfish habitat quality score for 18,439 feet (81.7 percent) of the visible transect length, and medium rockfish habitat quality score for only 4,142 feet (18.3 percent) of the

visible transect length. The low quality of rockfish habitat within Area B is due primarily to the absence of vertical relief and the low habitat complexity.

Table 15 Rockfish Habitat Matrix in Area B Based on Habitat Complexity and Substrate Type

Substrate Type[a]	Habitat Complexity[c]			
	Low		Medium	
Fine	12,681	56.2%[b]	0	0
Coarse	5,724	25.3%	4,139	18.3%
Cobble/Rock	34	0.2%	3	<0.1%
Total	**18,439**	**81.7%**	**4,142**	**18.3%**

a Total visible transect length = 22,581 feet (4.3 miles).

b Percent shown is the percent of the visible transect length

c No area of high habitat complexity was recorded during the survey, therefore data for high complexity are omitted from the table.

3.3.2 Forage Fish

This section presents the results of field surveys of surf smelt spawning conducted in the study area during Summer 2011.

3.3.2.1 Area A

Habitat for spawning surf smelt and sand lance at the project site was low in quality and quantity, and higher in elevation than ideal for either surf smelt or sand lance. Substrate was characterized by medium-sized cobbles from 0 feet MLLW to the toe of slope, with the exception of a narrow band of gravel.

Four samples were collected during each of four separate field sampling events from the narrow band of gravel located along the drift algae line. No eggs were identified in the field, and laboratory analysis of the samples revealed no eggs in any of the samples.

Field data sheets from each of the field investigations are provided in Appendix G.

3.3.2.2 Area C

To validate the sampling results from the proposed project site (Area A), beach substrate samples were collected in Area C during periods of documented peak spawning activity (e-mail communication between Melinda Gray (AMEC) and Brian Williams (WDFW) June 17, 2011).

Samples were collected from Area C during the same tidal cycle as those collected from Area A. Similar to Area A, during field observations, no eggs were detected. However, one surf smelt egg was

detected during laboratory analysis in a sample collected on July 14, 2011, at the lower elevation transect.

4.0 DISCUSSION

This section provides an interpretation of the results of the current investigation relative to previous investigations, specifically the studies conducted in 1996 as part of the earlier EIS (Shapiro and Associates 1996) and other studies that have been conducted in the vicinity.

4.1 SUBMERGED MARINE VEGETATION (MACROALGAE)

As the Cherry Point Aquatic Reserve Management Plan states, macroalgae and eelgrass beds provide "food, habitat, and shelter for a variety of organisms including salmonids, forage fish, phytoplankton, zooplankton and macroinvertebrates" (WDNR 2010). Macroalgae is an important source of primary production, as well as a food source for a variety of grazing marine invertebrates (Nybakken 2001).

In general, the community composition of the macroalgae bed investigated in the study area is typical of a cobble substrate shoreline along the Washington Coast, the Strait of Juan de Fuca, the San Juan Archipelago, and the west coast of Whidbey Island, with species distribution dictated by substrate type and available light (Mumford 2007). Intertidal species must be adapted to daily tidal fluctuations, and include species such as *Ulva,* rockweed and various species of fine thallus red algae attached to hard substrate. Moving into deep water, other studies have shown that nearshore beds of non-floating kelp species (Laminariales, foliose red alga, etc.), are found along moderate wave energy shorelines within the intertidal and subtidal habitats where there is suitable hard substrate for growth (Mumford 2007). In deeper water, the floating kelp, *Nereocystis* may be found attached to hard substrates. Subtidal marine vegetation can only grow as deep as the sun light needed for photosynthesis can penetrate (called the photic zone), which appears to vary from -15 to -30 MLLW throughout the Study Area.

The baseline data collected in this study provides a reference point for monitoring temporal dynamics of the macroalgae community throughout the study area. Macroalgae diversity, abundance, and distribution are subject to change due to various natural and anthropogenic forces in the marine environment. Natural forces that may affect macroalgae distribution may include temperature, salinity, substrate, wave action, and major storm events (summarized in Dethier and Schoch 2000, Mumford 2007). Despite the natural variation that is expected in macroalgae communities studies have shown that replicate stretches of shoreline within an area tend to remain relatively similar to each other (Dethier and Schoch 2000), and that the abundance and location of floating kelp beds appear to be persistent over time periods as long as one hundred years (Mumford 2007). Hence, Area B and

Area A should theoretically remain relatively similar to each other without some external pressure on either site. As described in the results section, Area A and Area B, within the larger study area, should be suitable for evaluating changes that may occur over time, as long as surveys are conducted concurrently in both areas, at approximately the same time of year as the baseline study.

This study shows that the macroalgae communities throughout the study area are similar to those described in the study of the area conducted in 1993 (Shapiro 1996). In both surveys the intertidal was dominated by *Ulva* (the only green alga species identified in both surveys) and *Fucus*, with *Laminaria* species extending from approximately -5 MLLW to a depth of approximately -15 MLLW. In both surveys, the macroalgae community was most dense between -5 and -15 MLLW, with sparse coverage below -15 MLLW.

The invasive, *Sargassum muticum*, was identified in the 1993 study growing in a “dense” band beginning at “just below” MLLW and extending to approximately -5 MLLW. Subsequent underwater video surveys and aerial surveys of macroalgae in the Cherry Point vicinity have confirmed the presence and relative distribution (shallow subtidal) of *Sargassum* (Fairbanks et al. 2005; WDNR 1995). The WDNR mapped approximately 4% of the total submerged marine vegetation at Cherry Point as *Sargassum*, and the 2005 study (Fairbanks et al. 2005) mapped nearly 14% of the total submerged marine vegetation *Sargassum* (WDNR 1995). While the data between the two studies are not directly comparable, as different methods were used for each of the studies, it appears that *Sargassum* density may be increasing within the study area.

In general, kelp species composition (*Laminaria* and *Nereocystis*) and distribution were similar between the 1993 (Shapiro 1996) and the current survey. Both surveys identified only one species of kelp as most abundant (*Laminaria saccharina)*, with sparse presence of *Nereocystis* (only 6 holdfasts counted in 1996, and 2 in the current survey).

The general species composition and distribution of macroalgae appears relatively consistent over the years. The data collected in 1996 and 2011 are relatively similar in terms of species and depth composition. The two studies were conducted during similar seasons, therefore it is recommended that future studies conducted to evaluate long term changes be conducted In general, it is thought that seasonal differences in macroalgae distribution and abundance may be of greater significance than annual differences, with peak abundance and diversity occurring in the late summer and early fall (Mondragon and Mondragon 2003). Therefore, it is strongly recommended that any subsequent investigations to evaluate changes in the macroalgae community be conducted at the same time of year as the current study (early June).

4.2 MARINE INVERTEBRATES

This section provides an assessment of the data collected for marine invertebrates relative to other recent studies in the project vicinity. The section includes a discussion of data collected for incidental observations of epibenthic invertebrates, and quantitative surveys of intertidal clams, horse clams, and benthic infauna.

4.2.1 Epibenthic Invertebrates

Observations of epibenthic invertebrates were consistent with results of other studies in the area summarized in the *Cherry Point Aquatic Reserve Management Plan* (WDNR 2010). In general, the distribution and abundance of invertebrates depend on the substrate type. Barnacles, sea stars, anemones, and snails were observed, along the cobble shoreline, with shore crabs observed between the cobbles. Below the cobble shoreline, where the substrate was finer grained (sand and silt), Dungeness crabs, sunflower stars, sea pens, and tube worms were observed.

Among the epibenthic invertebrates identified, Dungeness crabs are most important for supporting a recreational and Tribal commercial harvest. Dungeness crabs are also important ecologically, as their pelagic larvae are preyed upon by fishes, including rockfish, salmon, and halibut (Brusca and Brusca 2003).

4.2.2 Intertidal Clams

Clams provide important ecological and recreational functions throughout Puget Sound and the Cherry Point reach. As reported by WDNR, shellfish beds function to improve nutrient cycling, stabilize substrates, enhance water quality, and provide food for other marine invertebrates, fish, and birds (WDNR 2010).

This study shows that the study area supports an intertidal clam population, but that the species composition and size distribution would not necessarily support a prolific commercial or recreational harvest. The clam species most frequently harvested in Puget Sound include butter clam, Manila clam, and native Pacific littleneck clam. These species constituted only 26 percent of the total clam specimens identified at the sample stations.

The greatest density of clams occurred between approximately -1 foot MLLW and +1 foot MLLW, with fewer clams below -2 feet MLLW or above +2 feet MLLW. The overall size range and species composition of clams sampled in the current study differed from the earlier study (Shapiro & Associates 1997). In 1997, the single most common species of clam was the eastern soft shell clam, *Mya arenaria,* which was not identified in the current study. Rather, during the current study, the clam fauna was dominated by various species of macoma clam. The findings in the present study are

consistent with results reported by the Whatcom County Marine Resources Committee (MRC 2005, 2009) for the Cherry Point area.

Shapiro & Associates (1997) evaluated the hardshell clam species (butter clam, Pacific littleneck clam, horse clam—none identified) separately, as these species are generally preferred species for recreational harvest. In the 1997 survey, the hardshell clam species combined to constitute 51 of the total number of clams identified (Shapiro & Associates 1997), whereas in the current study, the same species amounted to 39 of the clams identified in Area A, and 22 of the clams identified in Area B.

The species composition identified in the current study more closely resembles the results of studies conducted in 2005 and 2009 by the Whatcom County Marine Resources committee, with the Macoma clam representing the majority of the sample, followed by Pacific littleneck clam and butter clam.

4.2.3 Geoduck and Horse Clams

Subtidal geoduck and horse clams observed in the study area were minimal. The low density of geoduck (0.005 per square foot) and similarly low numbers of horse clams observed suggest that the study area does not provide good habitat for either species. For comparison, on commercially harvested geoduck tracts, densities average approximately 0.06 geoducks per square foot in the Strait of Juan de Fuca and approximately 0.11 geoducks per square foot in Hood Canal (WDNR 2008).

No prior studies of geoduck densities within the study area have been conducted to provide a baseline for evaluating changes over time.

4.2.4 Benthic Infauna

The investigation of benthic infauna conducted for the present study is meant to function as a baseline for further investigation. No prior data exist for evaluating changes that may have occurred in the benthic macroinvertebrate community over time.

Diversity indices make assumptions about the relative abundance of species in natural communities, and these indices are dependent on sampling size (total area sampled). In addition, the values may differ for communities at different stages in biotic succession, in different habitats or geographic areas, or at different times of the year. They also differ with different efforts in the level of taxonomic resolution. For all of these reasons, comparisons of diversity values between previous studies conducted in the vicinity of the Study Area by Ecology (1998) have been avoided.

Station GJP-4 had the highest number of species (mean of 51.2 species per replicate sample) and the greatest species richness (mean = 7.64) of any of the sample locations (Table 12), but the Shannon-

Wiener index of species diversity at GJP-4 was among the lowest (mean = 1.99) because of the dominance of the bivalve molluscs *Nutricola lordi* and *Nutricola* spp., which composed from 52.7 percent to 63.8 percent of the total number of individuals within the replicate samples. This dominance is also reflected in the evenness index for this station (mean = 0.51), which was the lowest of any of the stations.

By comparison, Station GJP-45, which had the lowest species richness (mean = 4.00) and with the number of species (mean = 20.4) less than half of that of Station GJP-4, had a Shannon-Wiener diversity index (mean = 2.10) higher than that of Station GJP-4. These results arise because the dominant taxa at this station composed a smaller proportion (22.9 percent to 53.8 percent) of the total number of organisms within the replicates from this station. The evenness index (mean = 0.70) for Station GJP-45 was also greater than that for Station GJP-4.

Station GJP-37, with the greatest Shannon-Wiener diversity index (mean = 2.68) and the greatest evenness index (mean = 0.82), had just over half the number of species (mean = 26.6) as Station GJP-4. The dominant taxa within the replicate samples from this station made up a much smaller proportion (16.9 percent to 27.9 percent) of the total number of individuals when compared to the proportion of the dominant taxa in samples from Station GJP-4.

4.3 FISH

This section provides a discussion of the rockfish and forage fish results presented in Section 3.3. The rockfish evaluation includes an assessment of potential habitat relative to physical characteristics. The forage fish section provides a discussion of the potential for surf smelt to use Area A and Area C for spawning.

4.3.1 Rockfish Habitat

Rockfish are managed under the direction of the Puget Sound Groundfish Management Plan (Palsson, et al. 1998) by the Treaty Tribes of Washington and WDFW. Rockfish (Sebastes) are a diverse genus that requires different species-specific habitat at different life stages (Palsson, et al. 2009). Rockfish adult habitat is generally characterized by high-relief, rocky habitats, while larvae and juveniles use open water and nearshore habitats. Nearshore, vegetated habitats are particularly important for rockfish, as these habitats serve as nursery areas for juveniles and provide connecting pathways for movement to habitats favored by adults (Palsson, et al. 2009).

Rockfish habitat quality was scored based on the methods of Pacunski and Palsson (2001) that rely on the physical habitat features of substrate type, vertical relief, and habitat complexity (i.e., the degree of crevices and irregularities in rock features). This method does not consider the contribution of macroalgae to rockfish habitat quality.

Results of the underwater video survey to assess the quality of rockfish habitat in Area A and Area B indicate that the majority of the study area consists of low-quality rockfish habitat with only small areas of medium-quality rockfish habitat. The low quality of the rockfish habitat in the study area is attributable primarily to the absence of vertical relief and habitat complexity.

As mentioned previously, macroalgae and sea grasses can provide valuable habitat to some species of rockfish, especially during their early life stages (review by Palsson et al. 2009). At the end of the epipelagic larval stage, rockfish species common to Puget Sound (copper, quillback, and brown rockfish) “settle out” in shallow water and then in a short time (usually on the order of days) migrate to deeper water. While the study area did not contain physical habitat features commonly associated with adult rockfish, the submerged marine vegetation described previously may provide transitional habitat for recruiting young-of-the-year as part of the maturation process. Determining the extent to which juvenile rockfish use the macroalgae within the study area would be difficult due to the seasonal variability of macroalgae density, the annual timing of the settling out process, and the episodic recruitment events of rockfish species. Therefore, it remains unknown whether the macroalgae community within the study area is important for young-of-the-year rockfish.

4.3.2 Forage Fish

Surf smelt spawn on beaches with available suitable substrate at a suitable elevation. Specifically, surf smelt spawning substrate is defined as substrate with particle sizes ranging from 1 to 7 mm, and the potential spawning zone spans the uppermost one-third of the tidal range, from approximately +7 feet MLLW up to extreme high water (EHW) (Penttila 2007). In general, the substrate in Area A between +7 feet MLLW and EHW is characterized by medium to large cobbles, and is therefore unsuitable for spawning. However, as described previously, a narrow band (approximately 4 feet wide) of suitable substrate was identified near the extreme high tide line.

According to Penttila (2007), the physical area of spawning substrate could potentially include small patches around the high tide line, similar to what is described for Area A. The sampling effort in summer 2011 did not identify surf smelt using the shoreline in Area A for spawning, and due to the limited area of suitable spawning substrate, it is unlikely that surf smelt use Area A for spawning.

Area C has previously been documented as a surf smelt spawning location (WDFW 2012). Whereas, the identification of a single egg during a sampling event does not necessarily constitute a spawning event, it provides further evidence that surf smelt likely spawn at Area C. The habitat in Area C is more conducive to surf smelt spawning due to the suitable substrate within the correct tidal range, as described by Penttila (2007).

5.0 CONCLUSIONS

The baseline inventory of the marine biological community revealed a species community common to a Pacific Northwest cobble shoreline. In brief, the results presented in this report can be summarized as follows:

- The intertidal macroalgae community was dominated by *Fucus* and *Ulva*, and the area supported a community of clams embedded in the sand beneath the cobble substrate.
- Below the intertidal zone, understory (Laminariales) kelps and foliose red algae are abundant with sparse amounts of floating kelp (*Nereocystis*), along with an elevation band of the invasive brown algae *Sargassum*.
- Submerged marine vegetation does not grow much below -15 feet MLLW in Area A, and -20 feet MLLW in Area B.
- The geoduck population density within the study area is very small (0.005 per square foot).
- Incidental sightings of macroscopic epibenthic marine invertebrates included several species of crab, sea stars, anemones, and snails typical of northern Puget Sound and the Strait of Georgia.
- Data comparisons of the macroalgae and intertidal clam communities for Area A and Area B suggest that the two sites are sufficiently similar to be used to evaluate potential changes in the study area. Both sites are characterized by similar species composition and overall density of both macroalgae and clam species.
- Benthic macroinvertebrate abundance generally decreases with increasing depth.
- Evaluations of Area A and Area C for surf smelt suggest that while surf smelt likely spawn in Area C, the small amount of available spawning substrate likely precludes spawning at Area A. General habitat conditions and the lack of current or previous evidence of spawning supports the conclusion that surf smelt do not spawn in Area A.
- Results of the underwater video survey assessing the quality of rockfish habitat in the study areas indicates that the majority of the study area consists of low quality adult rockfish habitat with only small areas of medium quality adult rockfish habitat.

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APPENDIX A

Photographs of Underwater Video System

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Underwater Video System Control Station

Transect 2, Burrowing anemones with typical deep water substrate

Transect 3, Lost crab pot

Transect 11, Large anemone

Underwater Video System Camera Mount

Transect 2, Crab and anemone

Transect 29, Small patch of eelgrass SE of study area

Transect 72, Starfish with typical deep water substrate

CLIENT LOGO: Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: JULY 2011
		CHK'D BY: -		PROJECT NO: 091515338C.09
	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201	DATUM: NAD83, NORTH	TITLE: PHOTOS FROM VIDEO SURVEY	REV. NO.: -
	amec	PROJECTION: WA STATE PLANE		FIGURE No. Sheet 1
		SCALE: AS SHOWN		

Transect 76, Sea Pen

Transect 95, Starfish

Transect 66, Typical shallow water substrate

Transect 76, Crab

Transect 100, Starfish and algae with typical moderate depth substrate

Boulders inshore of reference area

CLIENT LOGO

Pacific International Terminals

CLIENT:
PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY: GSM
CHK'D BY: -
DATUM: NAD83, NORTH
PROJECTION: WA STATE PLANE
SCALE: AS SHOWN

PROJECT
GATEWAY PACIFIC TERMINAL

TITLE
PHOTOS FROM VIDEO SURVEY

DATE: JULY 2011
PROJECT NO: 091515338C.09
REV. NO.: -
FIGURE No. Sheet 2

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APPENDIX B

Benthic Infauna Taxonomic Data

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Table B-1. Benthic Infauna Taxonomic Data - GJP-4 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	1	Sipuncula	3	Sipuncula					
GJP-4-2011	1	Nematoda	2	Nematoda					
GJP-4-2011	1	Nemertea	9	Nemertea					
GJP-4-2011	1	Clinocardium sp.	5	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-4-2011	1	Rochefortia tumida	60	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-4-2011	1	Mactridae	1	Mollusca	Bivalvia	Veneroida	Mactridae		
GJP-4-2011	1	Tellinidae	5	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-4-2011	1	Macoma sp.	2	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-4-2011	1	Axinopsida serricata	28	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-4-2011	1	Veneridae	3	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-4-2011	1	Nutricola sp.	211	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-4-2011	1	Nutricola lordi	226	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-4-2011	1	Oligochaeta	1	Annelida	Clitellata				
GJP-4-2011	1	Lirularia sp.	12	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-4-2011	1	Cyclostremella concordia	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Cyclostremella	Cyclostremella concordia
GJP-4-2011	1	Alvania compacta	4	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-4-2011	1	Photis sp.	1	Arthropoda	Malacostraca	Amphipoda	Isaeidae	Photis	sp.
GJP-4-2011	1	Oxyurostylis sp.	1	Arthropoda	Malacostraca	Cumacea	Diastylidae	Oxyurostylis	sp.
GJP-4-2011	1	Brachyura	13	Arthropoda	Malacostraca	Decapoda			
GJP-4-2011	1	Pinnixa sp.	2	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-4-2011	1	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-4-2011	1	Ophiuroidea	9	Echinodermata	Ophiuroidea				
GJP-4-2011	1	Amphiuridae	8	Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae		
GJP-4-2011	1	Ostracoda	2	Arthropoda	Ostracoda				
GJP-4-2011	1	Mediomastus californiensis	4	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-4-2011	1	Clymenella zonalis	16	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-4-2011	1	Nereis procera	3	Annelida	Polychaeta		Neridae	Nereis	Nereis procera
GJP-4-2011	1	Ophelina acuminata	2	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-4-2011	1	Protodorvillea gracilis	2	Annelida	Polychaeta	Aciculata	Dorvilleidae	Protodorvillea	Protodorvillea gracilis
GJP-4-2011	1	Glycera americana	3	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-4-2011	1	Glycinde picta	9	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-4-2011	1	Lumbrineris californiensis	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-4-2011	1	Scoletoma luti	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-4-2011	1	Nephtys sp.	2	Annelida	Polychaeta	Aciculata	Nephtyidae	Nephtys	sp.
GJP-4-2011	1	Onuphis elegans	7	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-4-2011	1	Pholoe glabra	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-4-2011	1	Phyllodoce sp.	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	sp.
GJP-4-2011	1	Phyllodoce groenlandica	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-4-2011	1	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-4-2011	1	Exogone lourei	3	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-4-2011	1	Ampharete sp.	9	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-4-2011	1	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-4-2011	1	Magelona longicornis	1	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-4-2011	1	Owenia fusiformis	3	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-4-2011	1	Dipolydora cardalia	7	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-4-2011	1	Paraprionospio sp.	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-4-2011	1	Paraprionospio alata	7	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-4-2011	1	Leitoscoloplos sp.	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	sp.
GJP-4-2011	1	Leitoscoloplos pugettensis	2	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			702						

Table B-2. Benthic Infauna Taxonomic Data - GJP-4 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	2	Sipuncula	2	Sipuncula					
GJP-4-2011	2	Nemertea	13	Nemertea					
GJP-4-2011	2	Amphiodia urtica	3					Amphiodia	Amphiodia urtica
GJP-4-2011	2	Lyonsia californica	1	Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae	Lyonsia	Lyonsia californica
GJP-4-2011	2	Ennucula tenuis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-4-2011	2	Clinocardium sp.	2	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-4-2011	2	Rochefortia tumida	61	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-4-2011	2	Parvilucina tenuisculpta	3	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-4-2011	2	Mactridae	1	Mollusca	Bivalvia	Veneroida	Mactridae		
GJP-4-2011	2	Tellinidae	3	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-4-2011	2	Macoma sp.	3	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-4-2011	2	Axinopsida serricata	38	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-4-2011	2	Veneridae	2	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-4-2011	2	Nutricola sp.	365	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-4-2011	2	Nutricola lordi	2	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-4-2011	2	Gastropoda	1	Mollusca	Gastropoda				
GJP-4-2011	2	Lirularia sp.	5	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-4-2011	2	Turbonilla sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-4-2011	2	Muricidae	1	Mollusca	Gastropoda	Neogastropoda	Muricidae		
GJP-4-2011	2	Alvania compacta	13	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-4-2011	2	Holothuroidea	2	Echinodermata	Holothuroidea				
GJP-4-2011	2	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-4-2011	2	Byblis millsi	2	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Byblis	Byblis millsi
GJP-4-2011	2	Isaeidae	1	Arthropoda	Malacostraca	Amphipoda	Isaeidae		
GJP-4-2011	2	Dyopedos sp.	1	Arthropoda	Malacostraca	Amphipoda	Podoceridae	Dyopedos	sp.
GJP-4-2011	2	Brachyura	9	Arthropoda	Malacostraca	Decapoda			
GJP-4-2011	2	Crangon sp.	1	Arthropoda	Malacostraca	Decapoda	Crangonidae	Crangon	sp.
GJP-4-2011	2	Pinnixa sp.	4	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-4-2011	2	Anthuridae	1	Arthropoda	Malacostraca	Isopoda	Anthuridae		
GJP-4-2011	2	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-4-2011	2	Ophiuroidea	13	Echinodermata	Ophiuroidea				
GJP-4-2011	2	Mediomastus californiensis	1	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-4-2011	2	Clymenella zonalis	19	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-4-2011	2	Nereis procera	1	Annelida	Polychaeta		Neridae	Nereis	Nereis procera
GJP-4-2011	2	Protodorvillea gracilis	1	Annelida	Polychaeta	Aciculata	Dorvilleidae	Protodorvillea	Protodorvillea gracilis
GJP-4-2011	2	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-4-2011	2	Glycinde picta	3	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-4-2011	2	Lumbrineris californiensis	3	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-4-2011	2	Bipalponephtys cornuta	2	Annelida	Polychaeta	Aciculata	Nephtyidae	Bipaplonephtys	Bipalponephtys cornuta
GJP-4-2011	2	Onuphis elegans	2	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-4-2011	2	Phyllodoce groenlandica	2	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-4-2011	2	Gattyana sp.	2	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-4-2011	2	Syllidae	3	Annelida	Polychaeta	Aciculata	Syllidae		
GJP-4-2011	2	Exogone lourei	3	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-4-2011	2	Ampharete sp.	2	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-4-2011	2	Spiochaetopterus sp.	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-4-2011	2	Chaetozone sp.	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Chaetozone	sp.
GJP-4-2011	2	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-4-2011	2	Owenia fusiformis	2	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-4-2011	2	Pectinaria sp.	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	sp.
GJP-4-2011	2	Dipolydora cardalia	4	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-4-2011	2	Paraprionospio sp.	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
			616						

Table B-3. Benthic Infauna Taxonomic Data - GJP-4 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	3	Nemertea	9	Nemertea					
GJP-4-2011	3	Nematoda	1	Nematoda					
GJP-4-2011	3	Amphiodia urtica	2					Amphiodia	Amphiodia urtica
GJP-4-2011	3	Bivalvia	1	Mollusca	Bivalvia				
GJP-4-2011	3	Nuculana sp.	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-4-2011	3	Ennucula tenuis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-4-2011	3	Clinocardium sp.	10	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-4-2011	3	Rochefortia tumida	146	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-4-2011	3	Parvilucina tenuisculpta	6	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-4-2011	3	Tellinidae	9	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-4-2011	3	Macoma sp.	3	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-4-2011	3	Tellina sp.	5	Mollusca	Bivalvia	Veneroida	Tellinidae	Tellina	sp.
GJP-4-2011	3	Axinopsida serricata	27	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-4-2011	3	Veneridae	3	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-4-2011	3	Nutricola sp.	490	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-4-2011	3	Nutricola lordi	15	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-4-2011	3	Lirularia sp.	2	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-4-2011	3	Cyclostremella concordia	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Cyclostremella	Cyclostremella concordia
GJP-4-2011	3	Odostomia sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-4-2011	3	Muricidae	1	Mollusca	Gastropoda	Neogastropoda	Muricidae		
GJP-4-2011	3	Alvania compacta	6	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-4-2011	3	Holothuroidea	1	Echinodermata	Holothuroidea				
GJP-4-2011	3	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-4-2011	3	Aoridae	2	Arthropoda	Malacostraca	Amphipoda	Aoridae		
GJP-4-2011	3	Phoxocephalidae	1	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae		
GJP-4-2011	3	Campylaspis rufa	1	Arthropoda	Malacostraca	Cumacea	Nannastracidae	Campylaspis	Campylaspis rufa
GJP-4-2011	3	Brachyura	5	Arthropoda	Malacostraca	Decapoda			
GJP-4-2011	3	Pinnixa sp.	1	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-4-2011	3	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-4-2011	3	Balanidae	3	Arthropoda	Maxillopoda	Sessilia	Balanidae		
GJP-4-2011	3	Ophiuroidea	10	Echinodermata	Ophiuroidea				
GJP-4-2011	3	Mediomastus californiens	2	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-4-2011	3	Maldanidae	1	Annelida	Polychaeta		Maldanidae		
GJP-4-2011	3	Clymenella zonalis	13	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-4-2011	3	Nereis procera	2	Annelida	Polychaeta		Neridae	Nereis	Nereis procera
GJP-4-2011	3	Ophelina acuminata	4	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-4-2011	3	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-4-2011	3	Glycinde picta	3	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-4-2011	3	Lumbrineris californiensis	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-4-2011	3	Scoletoma sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-4-2011	3	Bipalponephtys cornuta	4	Annelida	Polychaeta	Aciculata	Nephtyidae	Bipaplonephtys	Bipalponephtys cornuta
GJP-4-2011	3	Onuphis elegans	5	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-4-2011	3	Phyllodoce sp.	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	sp.
GJP-4-2011	3	Syllidae	1	Annelida	Polychaeta	Aciculata	Syllidae		
GJP-4-2011	3	Exogone lourei	1	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-4-2011	3	Ampharete sp.	3	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-4-2011	3	Magelona longicornis	2	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-4-2011	3	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-4-2011	3	Owenia fusiformis	2	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-4-2011	3	Pectinaria granulata	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	Pectinaria granulata

Table B-3. Benthic Infauna Taxonomic Data - GJP-4 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	3	Dipolydora cardalia	13	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-4-2011	3	Paraprionospio sp.	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-4-2011	3	Paraprionospio alata	5	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-4-2011	3	Leitoscoloplos pugettensi	3	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			839						

Table B-4. Benthic Infauna Taxonomic Data - GJP-4 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	4	Nematoda	3	Nematoda					
GJP-4-2011	4	Sipuncula	2	Sipuncula					
GJP-4-2011	4	Nemertea	13	Nemertea					
GJP-4-2011	4	Amphiodia urtica	6					Amphiodia	Amphiodia urtica
GJP-4-2011	4	Lyonsia californica	1	Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae	Lyonsia	Lyonsia californica
GJP-4-2011	4	Acila castrensis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-4-2011	4	Ennucula tenuis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-4-2011	4	Clinocardium sp.	10	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-4-2011	4	Rochefortia tumida	53	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-4-2011	4	Parvilucina tenuisculpta	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-4-2011	4	Tellinidae	6	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-4-2011	4	Axinopsida serricata	27	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-4-2011	4	Veneridae	3	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-4-2011	4	Nutricola sp.	430	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-4-2011	4	Nutricola lordi	8	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-4-2011	4	Lirularia sp.	6	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-4-2011	4	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-4-2011	4	Ophiodermella sp.	1	Mollusca	Gastropoda	Neogastropoda	Borsoniidae	Ophiodermella	sp.
GJP-4-2011	4	Muricidae	1	Mollusca	Gastropoda	Neogastropoda	Muricidae		
GJP-4-2011	4	Alvania compacta	10	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-4-2011	4	Holothuroidea	1	Echinodermata	Holothuroidea				
GJP-4-2011	4	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-4-2011	4	Byblis millsi	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Byblis	Byblis millsi
GJP-4-2011	4	Monoculodes mertensi	1	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-4-2011	4	Brachyura	3	Arthropoda	Malacostraca	Decapoda			
GJP-4-2011	4	Ophiuroidea	10	Echinodermata	Ophiuroidea				
GJP-4-2011	4	Mediomastus californiensis	3	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-4-2011	4	Clymenella zonalis	21	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-4-2011	4	Ophelina acuminata	1	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-4-2011	4	Protodorvillea gracilis	1	Annelida	Polychaeta	Aciculata	Dorvilleidae	Protodorvillea	Protodorvillea gracilis
GJP-4-2011	4	Glycera americana	4	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-4-2011	4	Glycinde picta	6	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-4-2011	4	Lumbrineridae	3	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-4-2011	4	Lumbrineris californiensis	3	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-4-2011	4	Scoletoma luti	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-4-2011	4	Bipalponephtys cornuta	1	Annelida	Polychaeta	Aciculata	Nephtyidae	Bipaplonephtys	Bipalponephtys cornuta
GJP-4-2011	4	Onuphis elegans	2	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-4-2011	4	Pholoe glabra	3	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-4-2011	4	Lepidasthenia sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Lepidasthenia	sp.
GJP-4-2011	4	Exogone lourei	1	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-4-2011	4	Ampharetidae	2	Annelida	Polychaeta	Canalipalpata	Ampharetidae		
GJP-4-2011	4	Ampharete sp.	10	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-4-2011	4	Magelona longicornis	1	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-4-2011	4	Galathowenia oculata	2	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-4-2011	4	Owenia fusiformis	12	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-4-2011	4	Pectinaria granulata	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	Pectinaria granulata
GJP-4-2011	4	Dipolydora cardalia	3	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-4-2011	4	Paraprionospio alata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-4-2011	4	Leitoscoloplos sp.	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	sp.
GJP-4-2011	4	Leitoscoloplos pugettensis	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			686						

Table B-5. Benthic Infauna Taxonomic Data - GJP-4 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-4-2011	5	Nemertea	13	Nemertea					
GJP-4-2011	5	Amphiodia urtica	2					Amphiodia	Amphiodia urtica
GJP-4-2011	5	Bivalvia	4	Mollusca	Bivalvia				
GJP-4-2011	5	Ennucula tenuis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-4-2011	5	Clinocardium sp.	7	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-4-2011	5	Rochefortia tumida	79	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-4-2011	5	Parvilucina tenuisculpta	4	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-4-2011	5	Tellina sp.	5	Mollusca	Bivalvia	Veneroida	Tellinidae	Tellina	sp.
GJP-4-2011	5	Axinopsida serricata	34	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-4-2011	5	Veneridae	4	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-4-2011	5	Nutricola sp.	384	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-4-2011	5	Nutricola lordi	12	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-4-2011	5	Oligochaeta	1	Annelida	Clitellata				
GJP-4-2011	5	Lirularia sp.	10	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-4-2011	5	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-4-2011	5	Turbonilla sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-4-2011	5	Alia gausapata	1	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-4-2011	5	Alvania compacta	1	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-4-2011	5	Holothuroidea	3	Echinodermata	Holothuroidea				
GJP-4-2011	5	Byblis millsi	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Byblis	Byblis millsi
GJP-4-2011	5	Rhepoxynius lucubrans	1	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius	Rhepoxynius lucubrans
GJP-4-2011	5	Brachyura	4	Arthropoda	Malacostraca	Decapoda			
GJP-4-2011	5	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-4-2011	5	Ophiuroidea	6	Echinodermata	Ophiuroidea				
GJP-4-2011	5	Mediomastus californiensis	5	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-4-2011	5	Clymenella zonalis	34	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-4-2011	5	Nereis procera	1	Annelida	Polychaeta		Neridae	Nereis	Nereis procera
GJP-4-2011	5	Armandia brevis	1	Annelida	Polychaeta		Opheliidae	Armandia	Armandia brevis
GJP-4-2011	5	Glycera americana	3	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-4-2011	5	Glycinde picta	5	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-4-2011	5	Hesionidae	1	Annelida	Polychaeta	Aciculata	Hesionidae		
GJP-4-2011	5	Lumbrineris californiensis	6	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-4-2011	5	Nephtys caeca	1	Annelida	Polychaeta	Aciculata	Nephtyidae	Nephtys	Nephtys caeca
GJP-4-2011	5	Onuphis elegans	1	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-4-2011	5	Pholoe glabra	3	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-4-2011	5	Eteone sp.	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Eteone	sp.
GJP-4-2011	5	Phyllodoce sp.	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	sp.
GJP-4-2011	5	Phyllodoce groenlandica	3	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-4-2011	5	Syllidae	3	Annelida	Polychaeta	Aciculata	Syllidae		
GJP-4-2011	5	Exogone lourei	1	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-4-2011	5	Ampharete sp.	5	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-4-2011	5	Caulleriella pacifica sp.	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Caulleriella	sp.
GJP-4-2011	5	Magelona longicornis	4	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-4-2011	5	Galathowenia oculata	2	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-4-2011	5	Owenia fusiformis	34	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-4-2011	5	Chone sp.	1	Annelida	Polychaeta	Canalipalpata	Sabellidae	Chone	sp.
GJP-4-2011	5	Dipolydora cardalia	48	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-4-2011	5	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-4-2011	5	Paraprionospio alata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-4-2011	5	Prionospio steenstrupi	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Prionospio	Prionospio steenstrupi
GJP-4-2011	5	Leitoscoloplos pugettensis	2	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			752						

Table B-6. Benthic Infauna Taxonomic Data - GJP-6 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-6-2011	1	Nemertea	6	Nemertea					
GJP-6-2011	1	Amphiodia sp.	24					Amphiodia	sp.
GJP-6-2011	1	Amphiodia occidentalis	12					Amphiodia	Amphiodia occidentalis
GJP-6-2011	1	Amphiodia urtica	36					Amphiodia	Amphiodia urtica
GJP-6-2011	1	Acila castrensis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-6-2011	1	Ennucula tenuis	2	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-6-2011	1	Clinocardium sp.	1	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-6-2011	1	Rochefortia tumida	117	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-6-2011	1	Parvilucina tenuisculpta	7	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-6-2011	1	Macoma balthica	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	Macoma balthica
GJP-6-2011	1	Tellina sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Tellina	sp.
GJP-6-2011	1	Axinopsida serricata	36	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-6-2011	1	Veneridae	1	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-6-2011	1	Nutricola sp.	80	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-6-2011	1	Nutricola lordi	4	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-6-2011	1	Turbonilla sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-6-2011	1	Muricidae	1	Mollusca	Gastropoda	Neogastropoda	Muricidae		
GJP-6-2011	1	Alvania compacta	5	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-6-2011	1	Amphipoda	1	Arthropoda	Malacostraca	Amphipoda			
GJP-6-2011	1	Photis sp.	1	Arthropoda	Malacostraca	Amphipoda	Isaeidae	Photis	sp.
GJP-6-2011	1	Monoculodes mertensi	3	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-6-2011	1	Brachyura	10	Arthropoda	Malacostraca	Decapoda			
GJP-6-2011	1	Pinnixa sp.	3	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-6-2011	1	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-6-2011	1	Mediomastus californiensis	3	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-6-2011	1	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-6-2011	1	Clymenella zonalis	5	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-6-2011	1	Maldane sarsi	19	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-6-2011	1	Scalibregma californicum	1	Annelida	Polychaeta		Scalibregmatidae	Scalibregma	Scalibregma californicum
GJP-6-2011	1	Paleanotus bellis	1	Annelida	Polychaeta	Aciculata	Chrysopetalidae	Paleanotus	Paleanotus bellis
GJP-6-2011	1	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-6-2011	1	Glycinde picta	2	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-6-2011	1	Lumbrineris californiensis	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-6-2011	1	Scoletoma luti	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-6-2011	1	Onuphis elegans	1	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-6-2011	1	Pholoe sp.	2	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-6-2011	1	Pholoe glabra	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-6-2011	1	Gattyana sp.	3	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-6-2011	1	Malmgreniella bansei	1	Annelida	Polychaeta	Aciculata	Polynoidae	Malmgreniella	Malmgreniella bansei
GJP-6-2011	1	Spiochaetopterus sp.	6	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-6-2011	1	Aphelochaeta monilaris	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-6-2011	1	Magelona longicornis	1	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-6-2011	1	Galathowenia oculata	6	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-6-2011	1	Owenia fusiformis	4	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-6-2011	1	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-6-2011	1	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-6-2011	1	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
GJP-6-2011	1	Leitoscoloplos pugettensis	2	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
GJP-6-2011	1	Levinsenia gracilis	2	Annelida	Polychaeta	Orbiniida	Paraonidae	Levinsenia	Levinsenia gracilis
GJP-6-2011	1	Turbellaria	1	Platyhelminthes	Turbellaria				
			428						

Table B-7. Benthic Infauna Taxonomic Data - GJP-6 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-6-2011	2	Nemertea	4	Nemertea					
GJP-6-2011	2	Amphiodia sp.	25					Amphiodia	sp.
GJP-6-2011	2	Amphiodia urtica	53					Amphiodia	Amphiodia urtica
GJP-6-2011	2	Nuculana minuta	2	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-6-2011	2	Acila castrensis	2	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-6-2011	2	Ennucula tenuis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-6-2011	2	Clinocardium sp.	3	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-6-2011	2	Rochefortia tumida	74	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-6-2011	2	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-6-2011	2	Parvilucina tenuisculpta	7	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-6-2011	2	Mactridae	1	Mollusca	Bivalvia	Veneroida	Mactridae		
GJP-6-2011	2	Tellina sp.	2	Mollusca	Bivalvia	Veneroida	Tellinidae	Tellina	sp.
GJP-6-2011	2	Axinopsida serricata	38	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-6-2011	2	Nutricola sp.	79	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-6-2011	2	Nutricola lordi	3	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-6-2011	2	Oligochaeta	1	Annelida	Clitellata				
GJP-6-2011	2	Lirularia sp.	3	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-6-2011	2	Cyclostremella concordia	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Cyclostremella	Cyclostremella concordia
GJP-6-2011	2	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-6-2011	2	Calyptraea fastigiata	1	Mollusca	Gastropoda	Neotaenioglossa	Calyptraeidae	Calyptraea	Calyptraea fastigiata
GJP-6-2011	2	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-6-2011	2	Isaeidae	2	Arthropoda	Malacostraca	Amphipoda	Isaeidae		
GJP-6-2011	2	Brachyura	6	Arthropoda	Malacostraca	Decapoda			
GJP-6-2011	2	Pinnixa sp.	1	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-6-2011	2	Tanaidacea	2	Arthropoda	Malacostraca	Tanaidacea			
GJP-6-2011	2	Leptocheliidae	1	Arthropoda	Malacostraca	Tanaidacea	Leptocheliidae		
GJP-6-2011	2	Heteromastus sp.	1	Annelida	Polychaeta		Capitellidae	Heteromastus	sp.
GJP-6-2011	2	Mediomastus californiensis	1	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-6-2011	2	Maldane sarsi	6	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-6-2011	2	Ophelina acuminata	1	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-6-2011	2	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-6-2011	2	Lumbrineris californiensis	3	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-6-2011	2	Scoletoma sp.	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-6-2011	2	Pholoe sp.	5	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-6-2011	2	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-6-2011	2	Syllidae	1	Annelida	Polychaeta	Aciculata	Syllidae		
GJP-6-2011	2	Ampharete sp.	2	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-6-2011	2	Aphelochaeta monilaris	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-6-2011	2	Galathowenia oculata	5	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-6-2011	2	Owenia fusiformis	7	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-6-2011	2	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-6-2011	2	Laonice cirrata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Laonice	Laonice cirrata
GJP-6-2011	2	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-6-2011	2	Paraprionospio alata	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-6-2011	2	Prionospio lighti	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Prionospio	Prionospio lighti
GJP-6-2011	2	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
			363						

Table B-8. Benthic Infauna Taxonomic Data - GJP-6 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-6-2011	3	Nemertea	10	Nemertea					
GJP-6-2011	3	Nematoda	1	Nematoda					
GJP-6-2011	3	Sipuncula	3	Sipuncula					
GJP-6-2011	3	Amphiodia sp.	86					Amphiodia	sp.
GJP-6-2011	3	Nuculana sp.	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-6-2011	3	Acila castrensis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-6-2011	3	Clinocardium sp.	2	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-6-2011	3	Rochefortia tumida	192	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-6-2011	3	Parvilucina tenuisculpta	3	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-6-2011	3	Solen sicarius	1	Mollusca	Bivalvia	Veneroida	Solenidae	Solen	Solen sicarius
GJP-6-2011	3	Tellinidae	1	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-6-2011	3	Axinopsida serricata	41	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-6-2011	3	Veneridae	2	Mollusca	Bivalvia	Veneroida	Veneridae		
GJP-6-2011	3	Nutricola sp.	29	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-6-2011	3	Nutricola lordi	8	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-6-2011	3	Turbonilla sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-6-2011	3	Alvania compacta	4	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-6-2011	3	Monoculodes mertensi	2	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-6-2011	3	Brachyura	19	Arthropoda	Malacostraca	Decapoda			
GJP-6-2011	3	Pinnixa sp.	10	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-6-2011	3	Xanthidae	1	Arthropoda	Malacostraca	Decapoda	Xanthidae		
GJP-6-2011	3	Barantolla americana	2	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-6-2011	3	Capitella capitata	1	Annelida	Polychaeta		Capitellidae	Capitella	Capitella capitata
GJP-6-2011	3	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-6-2011	3	Maldane sarsi	8	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-6-2011	3	Nicomache lumbricalis	4	Annelida	Polychaeta		Maldanidae	Nicomache	Nicomache lumbricalis
GJP-6-2011	3	Ophelina acuminata	2	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-6-2011	3	Glycinde picta	7	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-6-2011	3	Ophiodromus pugettensis	1	Annelida	Polychaeta	Aciculata	Hesionidae	Ophiodromus	Ophiodromus pugettensis
GJP-6-2011	3	Lumbrineris californiensis	16	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-6-2011	3	Scoletoma sp.	4	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-6-2011	3	Pholoe sp.	6	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-6-2011	3	Pholoe glabra	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-6-2011	3	Pholoides asperus	6	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoides	Pholoides asperus
GJP-6-2011	3	Phyllodoce groenlandica	2	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-6-2011	3	Pilargis berkeleyae	1	Annelida	Polychaeta	Aciculata	Pilargidae	Pilargis	Pilargis berkeleyae
GJP-6-2011	3	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-6-2011	3	Ampharetidae	1	Annelida	Polychaeta	Canalipalpata	Ampharetidae		
GJP-6-2011	3	Spiochaetopterus sp.	2	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-6-2011	3	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-6-2011	3	Galathowenia oculata	9	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-6-2011	3	Owenia fusiformis	8	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-6-2011	3	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-6-2011	3	Paraprionospio alata	3	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-6-2011	3	Prionospio lighti	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Prionospio	Prionospio lighti
GJP-6-2011	3	Terebellides californica	2	Annelida	Polychaeta	Canalipalpata	Trichobranchidae	Terebellides	Terebellides californica
GJP-6-2011	3	Leitoscoloplos pugettensis	6	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			515						

Table B-9. Benthic Infauna Taxonomic Data - GJP-6 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-6-2011	4	Sipuncula	2	Sipuncula					
GJP-6-2011	4	Amphiodia urtica	60					Amphiodia	Amphiodia urtica
GJP-6-2011	4	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-6-2011	4	Clinocardium sp.	4	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-6-2011	4	Rochefortia tumida	104	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-6-2011	4	Parvilucina tenuisculpta	2	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-6-2011	4	Solen sicarius	1	Mollusca	Bivalvia	Veneroida	Solenidae	Solen	Solen sicarius
GJP-6-2011	4	Tellinidae	2	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-6-2011	4	Axinopsida serricata	45	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-6-2011	4	Nutricola lordi	105	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-6-2011	4	Calyptraea fastigiata	3	Mollusca	Gastropoda	Neotaenioglossa	Calyptraeidae	Calyptraea	Calyptraea fastigiata
GJP-6-2011	4	Alvania compacta	3	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-6-2011	4	Byblis millsi	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Byblis	Byblis millsi
GJP-6-2011	4	Gammarus sp.	3	Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	sp.
GJP-6-2011	4	Monoculodes mertensi	1	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-6-2011	4	Brachyura	8	Arthropoda	Malacostraca	Decapoda			
GJP-6-2011	4	Pinnixa sp.	1	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-6-2011	4	Balanidae	59	Arthropoda	Maxillopoda	Sessilia	Balanidae		
GJP-6-2011	4	Balanus crenatus	5	Arthropoda	Maxillopoda	Sessilia	Balanidae	Balanus	Balanus crenatus
GJP-6-2011	4	Ophiuroidea	18	Echinodermata	Ophiuroidea				
GJP-6-2011	4	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-6-2011	4	Heteromastus sp.	1	Annelida	Polychaeta		Capitellidae	Heteromastus	sp.
GJP-6-2011	4	Mediomastus californiensis	1	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-6-2011	4	Euclymeninae	1	Annelida	Polychaeta		Maldanidae		
GJP-6-2011	4	Maldane sarsi	8	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-6-2011	4	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-6-2011	4	Glycinde picta	3	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-6-2011	4	Lumbrineris californiensis	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-6-2011	4	Onuphis elegans	2	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-6-2011	4	Pholoe sp.	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-6-2011	4	Eteone sp.	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Eteone	sp.
GJP-6-2011	4	Phyllodoce groenlandica	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-6-2011	4	Gattyana sp.	2	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-6-2011	4	Exogone lourei	1	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-6-2011	4	Spiochaetopterus sp.	3	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-6-2011	4	Galathowenia oculata	4	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-6-2011	4	Owenia fusiformis	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-6-2011	4	Pectinaria granulata	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	Pectinaria granulata
GJP-6-2011	4	Paraprionospio alata	4	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-6-2011	4	Polycirrus sp.	1	Annelida	Polychaeta	Canalipalpata	Terebellidae	Polycirrus	sp.
GJP-6-2011	4	Levinsenia gracilis	1	Annelida	Polychaeta	Orbiniida	Paraonidae	Levinsenia	Levinsenia gracilis
			469						

Table B-10. Benthic Infauna Taxonomic Data - GJP-6 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-6-2011	5	Amphiodia urtica	81					Amphiodia	Amphiodia urtica
GJP-6-2011	5	Acila castrensis	2	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-6-2011	5	Clinocardium sp.	1	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-6-2011	5	Rochefortia tumida	57	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-6-2011	5	Solen sicarius	1	Mollusca	Bivalvia	Veneroida	Solenidae	Solen	Solen sicarius
GJP-6-2011	5	Macoma sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-6-2011	5	Axinopsida serricata	18	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-6-2011	5	Nutricola sp.	34	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-6-2011	5	Nutricola lordi	1	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-6-2011	5	Lirularia sp.	1	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-6-2011	5	Calyptraea fastigiata	1	Mollusca	Gastropoda	Neotaenioglossa	Calyptraeidae	Calyptraea	Calyptraea fastigiata
GJP-6-2011	5	Monoculodes mertensi	3	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-6-2011	5	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-6-2011	5	Brachyura	4	Arthropoda	Malacostraca	Decapoda			
GJP-6-2011	5	Mediomastus californiensis	2	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-6-2011	5	Notomastus hemipodus	2	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-6-2011	5	Clymenella zonalis	1	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-6-2011	5	Maldane sarsi	11	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-6-2011	5	Ophelina acuminata	2	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-6-2011	5	Glycinde picta	2	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-6-2011	5	Lumbrineris californiensis	3	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	Lumbrineris californiensis
GJP-6-2011	5	Scoletoma sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-6-2011	5	Onuphis elegans	2	Annelida	Polychaeta	Aciculata	Onuphidae	Onuphis	Onuphis elegans
GJP-6-2011	5	Pholoe sp.	2	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-6-2011	5	Spiochaetopterus sp.	3	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-6-2011	5	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-6-2011	5	Magelona longicornis	3	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-6-2011	5	Owenia fusiformis	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Owenia	Owenia fusiformis
GJP-6-2011	5	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-6-2011	5	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-6-2011	5	Paraprionospio alata	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-6-2011	5	Prionospio lighti	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Prionospio	Prionospio lighti
GJP-6-2011	5	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
GJP-6-2011	5	Terebellides californica	1	Annelida	Polychaeta	Canalipalpata	Trichobranchidae	Terebellides	Terebellides californica
GJP-6-2011	5	Leitoscoloplos sp.	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	sp.
GJP-6-2011	5	Leitoscoloplos pugettensis	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			251						

Table B-11. Benthic Infauna Taxonomic Data - GJP-21 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-21-2011	1	Nemertea	1	Nemertea					
GJP-21-2011	1	Amphiodia urtica	9					Amphiodia	Amphiodia urtica
GJP-21-2011	1	Lyonsia californica	1	Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae	Lyonsia	Lyonsia californica
GJP-21-2011	1	Nuculana sp.	2	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-21-2011	1	Acila castrensis	6	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-21-2011	1	Ennucula tenuis	17	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-21-2011	1	Clinocardium sp.	2	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-21-2011	1	Rochefortia tumida	1	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-21-2011	1	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-21-2011	1	Parvilucina tenuisculpta	8	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-21-2011	1	Macoma sp.	4	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-21-2011	1	Axinopsida serricata	22	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-21-2011	1	Nutricola sp.	24	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-21-2011	1	Nutricola lordi	1	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-21-2011	1	Cylichna attonsa	1	Mollusca	Gastropoda	Cephalaspidea	Cylichnidae	Cylichna	Cylichna attonsa
GJP-21-2011	1	Cerithiopsis sp.	1	Mollusca	Gastropoda	Neotaenioglossa	Cerithiopsidae	Cerithiopsis	sp.
GJP-21-2011	1	Ampelisca sp.	2	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-21-2011	1	Oxyurostylis sp.	1	Arthropoda	Malacostraca	Cumacea	Diastylidae	Oxyurostylis	sp.
GJP-21-2011	1	Brachyura	2	Arthropoda	Malacostraca	Decapoda			
GJP-21-2011	1	Ostracoda	9	Arthropoda	Ostracoda				
GJP-21-2011	1	Clymenella zonalis	1	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-21-2011	1	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-21-2011	1	Glycinde picta	1	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-21-2011	1	Spiochaetopterus sp.	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-21-2011	1	Galathowenia oculata	2	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-21-2011	1	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-21-2011	1	Trochochaeta multisetosa	3	Annelida	Polychaeta	Canalipalpata	Trochochaetidae	Trochochaeta	Trochochaeta multisetosa
			126						

Table B-12. Benthic Infauna Taxonomic Data - GJP-21 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-21-2011	2	Nemertea	1	Nemertea					
GJP-21-2011	2	Amphiodia urtica	1					Amphiodia	Amphiodia urtica
GJP-21-2011	2	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-21-2011	2	Ennucula tenuis	17	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-21-2011	2	Rochefortia tumida	3	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-21-2011	2	Parvilucina tenuisculpta	6	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-21-2011	2	Axinopsida serricata	8	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-21-2011	2	Nutricola sp.	9	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-21-2011	2	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-21-2011	2	Ophiuroidea	1	Echinodermata	Ophiuroidea				
GJP-21-2011	2	Ostracoda	7	Arthropoda	Ostracoda				
GJP-21-2011	2	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-21-2011	2	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-21-2011	2	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-21-2011	2	Scoletoma sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-21-2011	2	Tenonia priops	1	Annelida	Polychaeta	Aciculata	Polynoidae	Tenonia	Tenonia priops
GJP-21-2011	2	Trochochaeta multisetosa	1	Annelida	Polychaeta	Canalipalpata	Trochochaetidae	Trochochaeta	Trochochaeta multisetosa
			61						

Table B-13. Benthic Infauna Taxonomic Data - GJP-21 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-21-2011	3	Amphiodia sp.	6					Amphiodia	sp.
GJP-21-2011	3	Nuculana sp.	3	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-21-2011	3	Acila castrensis	5	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-21-2011	3	Ennucula tenuis	21	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-21-2011	3	Yoldia seminuda	1	Mollusca	Bivalvia	Nuculoida	Yoldiidae	Yoldia	Yoldia seminuda
GJP-21-2011	3	Rochefortia tumida	1	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-21-2011	3	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-21-2011	3	Parvilucina tenuisculpta	4	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-21-2011	3	Macoma sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-21-2011	3	Axinopsida serricata	15	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-21-2011	3	Nutricola sp.	22	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-21-2011	3	Nutricola lordi	4	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-21-2011	3	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-21-2011	3	Turbonilla sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-21-2011	3	Ostracoda	1	Arthropoda	Ostracoda				
GJP-21-2011	3	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-21-2011	3	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-21-2011	3	Lumbrineridae	2	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-21-2011	3	Lumbrineris sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Lumbrineris	sp.
GJP-21-2011	3	Scoletoma sp.	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-21-2011	3	Phyllodoce groenlandica	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
			96						

Table B-14. Benthic Infauna Taxonomic Data - GJP-21 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-21-2011	4	Nemertea	1	Nemertea					
GJP-21-2011	4	Amphiodia urtica	22					Amphiodia	Amphiodia urtica
GJP-21-2011	4	Bivalvia	1	Mollusca	Bivalvia				
GJP-21-2011	4	Pandora sp.	1	Mollusca	Bivalvia	Anomalodesmata	Pandoridae	Pandora	sp.
GJP-21-2011	4	Mytilidae	1	Mollusca	Bivalvia	Mytiloida	Mytilidae		
GJP-21-2011	4	Acila castrensis	3	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-21-2011	4	Ennucula tenuis	26	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-21-2011	4	Rochefortia tumida	12	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-21-2011	4	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-21-2011	4	Macoma sp.	3	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-21-2011	4	Axinopsida serricata	13	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-21-2011	4	Nutricola sp.	41	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-21-2011	4	Nutricola lordi	8	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-21-2011	4	Ampelisca sp.	2	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-21-2011	4	Monoculodes mertensi	1	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Monoculodes	Monoculodes mertensi
GJP-21-2011	4	Phoxocephalidae	2	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae		
GJP-21-2011	4	Rhepoxynius barnardi	1	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius	Rhepoxynius barnardi
GJP-21-2011	4	Oxyurostylis sp.	1	Arthropoda	Malacostraca	Cumacea	Diastylidae	Oxyurostylis	sp.
GJP-21-2011	4	Eudorella pacifica	4	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-21-2011	4	Brachyura	3	Arthropoda	Malacostraca	Decapoda			
GJP-21-2011	4	Ophiuroidea	3	Echinodermata	Ophiuroidea				
GJP-21-2011	4	Ostracoda	14	Arthropoda	Ostracoda				
GJP-21-2011	4	Euclymeninae	1	Annelida	Polychaeta		Maldanidae		
GJP-21-2011	4	Microphthalmus sp.	1	Annelida	Polychaeta	Aciculata	Hesionidae	Microphthalmus	sp.
GJP-21-2011	4	Scoletoma luti	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-21-2011	4	Pholoe sp.	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-21-2011	4	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-21-2011	4	Mesochaetopterus taylori	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Mesochaetopteru	Mesochaetopterus taylori
GJP-21-2011	4	Spiochaetopterus sp.	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-21-2011	4	Cirratulidae	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae		
GJP-21-2011	4	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-21-2011	4	Dipolydora cardalia	3	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-21-2011	4	Lanassa venusta	1	Annelida	Polychaeta	Canalipalpata	Terebellidae	Lanassa	Lanassa venusta
GJP-21-2011	4	Trochochaeta multisetosa	3	Annelida	Polychaeta	Canalipalpata	Trochochaetidae	Trochochaeta	Trochochaeta multisetosa
			182						

Table B-15. Benthic Infauna Taxonomic Data - GJP-21 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-21-2011	5	Sipuncula	1	Sipuncula					
GJP-21-2011	5	Amphiodia urtica	10					Amphiodia	Amphiodia urtica
GJP-21-2011	5	Nuculana sp.	4	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-21-2011	5	Acila castrensis	6	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-21-2011	5	Ennucula tenuis	9	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-21-2011	5	Rochefortia tumida	1	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-21-2011	5	Mactridae	1	Mollusca	Bivalvia	Veneroida	Mactridae		
GJP-21-2011	5	Axinopsida serricata	19	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-21-2011	5	Nutricola sp.	18	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-21-2011	5	Nutricola lordi	3	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-21-2011	5	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-21-2011	5	Brachyura	1	Arthropoda	Malacostraca	Decapoda			
GJP-21-2011	5	Ophiuroidea	3	Echinodermata	Ophiuroidea				
GJP-21-2011	5	Ostracoda	2	Arthropoda	Ostracoda				
GJP-21-2011	5	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-21-2011	5	Scoletoma sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-21-2011	5	Bipalponephtys cornuta	1	Annelida	Polychaeta	Aciculata	Nephtyidae	Bipaplonephtys	Bipalponephtys cornuta
GJP-21-2011	5	Pholoe sp.	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-21-2011	5	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-21-2011	5	Dipolydora cardalia	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-21-2011	5	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
GJP-21-2011	5	Trochochaeta multisetosa	2	Annelida	Polychaeta	Canalipalpata	Trochochaetidae	Trochochaeta	Trochochaeta multisetosa
			89						

Table B-16. Benthic Infauna Taxonomic Data - GJP-10 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-10-2011	1	Sipuncula	6	Sipuncula					
GJP-10-2011	1	Amphiodia urtica	27					Amphiodia	Amphiodia urtica
GJP-10-2011	1	Pandora filosa	1	Mollusca	Bivalvia	Anomalodesmata	Pandoridae	Pandora	Pandora filosa
GJP-10-2011	1	Nuculana minuta	2	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-10-2011	1	Acila castrensis	3	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-10-2011	1	Ennucula tenuis	13	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-10-2011	1	Clinocardium sp.	2	Mollusca	Bivalvia	Veneroida	Cardiidae	Clinocardium	sp.
GJP-10-2011	1	Rochefortia tumida	43	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-10-2011	1	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-10-2011	1	Parvilucina tenuisculpta	4	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-10-2011	1	Macoma sp.	3	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-10-2011	1	Axinopsida serricata	63	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-10-2011	1	Nutricola lordi	157	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-10-2011	1	Trochidae	1	Mollusca	Gastropoda	Archaeogastropoda	Trochidae		
GJP-10-2011	1	Rhepoxynius tridentatus	1	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius	Rhepoxynius tridentatus
GJP-10-2011	1	Tanaidacea	1	Arthropoda	Malacostraca	Tanaidacea			
GJP-10-2011	1	Ophiuroidea	16	Echinodermata	Ophiuroidea				
GJP-10-2011	1	Ostracoda	2	Arthropoda	Ostracoda				
GJP-10-2011	1	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-10-2011	1	Mediomastus californiensis	2	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-10-2011	1	Euclymeninae	1	Annelida	Polychaeta		Maldanidae		
GJP-10-2011	1	Clymenella zonalis	2	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-10-2011	1	Maldane sarsi	16	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-10-2011	1	Praxillella gracilis	1	Annelida	Polychaeta		Maldanidae	Praxillella	Praxillella gracilis
GJP-10-2011	1	Glycinde picta	1	Annelida	Polychaeta	Aciculata	Goniadidae	Glycinde	Glycinde picta
GJP-10-2011	1	Scoletoma luti	3	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-10-2011	1	Pholoe sp.	8	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-10-2011	1	Phyllodoce groenlandica	2	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-10-2011	1	Exogone lourei	1	Annelida	Polychaeta	Aciculata	Syllidae	Exogone	Exogone lourei
GJP-10-2011	1	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-10-2011	1	Magelona longicornis	2	Annelida	Polychaeta	Canalipalpata	Magelonidae	Magelona	Magelona longicornis
GJP-10-2011	1	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-10-2011	1	Pectinaria granulata	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	Pectinaria granulata
GJP-10-2011	1	Paraprionospio alata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-10-2011	1	Terebellidae	1	Annelida	Polychaeta	Canalipalpata	Terebellidae		
			391						

Table B-17. Benthic Infauna Taxonomic Data - GJP-10 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-10-2011	2	Nemertea	1	Nemertea					
GJP-10-2011	2	Sipuncula	1	Sipuncula					
GJP-10-2011	2	Amphiodia urtica	28					Amphiodia	Amphiodia urtica
GJP-10-2011	2	Actiniaria	1	Cnidaria		Actiniaria			
GJP-10-2011	2	Lyonsia californica	1	Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae	Lyonsia	Lyonsia californica
GJP-10-2011	2	Acila castrensis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-10-2011	2	Ennucula tenuis	5	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-10-2011	2	Rochefortia tumida	27	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-10-2011	2	Parvilucina tenuisculpta	4	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-10-2011	2	Solen sicarius	1	Mollusca	Bivalvia	Veneroida	Solenidae	Solen	Solen sicarius
GJP-10-2011	2	Axinopsida serricata	29	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-10-2011	2	Nutricola lordi	63	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-10-2011	2	Muricidae	1	Mollusca	Gastropoda	Neogastropoda	Muricidae		
GJP-10-2011	2	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-10-2011	2	Pinnotheridae	2	Arthropoda	Malacostraca	Decapoda	Pinnotheridae		
GJP-10-2011	2	Ophiuroidea	10	Echinodermata	Ophiuroidea				
GJP-10-2011	2	Barantolla americana	3	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-10-2011	2	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-10-2011	2	Clymenella zonalis	1	Annelida	Polychaeta		Maldanidae	Clymenella	Clymenella zonalis
GJP-10-2011	2	Maldane sarsi	9	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-10-2011	2	Nereis procera	1	Annelida	Polychaeta		Neridae	Nereis	Nereis procera
GJP-10-2011	2	Ophelina acuminata	1	Annelida	Polychaeta		Opheliidae	Ophelina	Ophelina acuminata
GJP-10-2011	2	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-10-2011	2	Pholoe sp.	2	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-10-2011	2	Phyllodoce groenlandica	2	Annelida	Polychaeta	Aciculata	Phyllodocidae	Phyllodoce	Phyllodoce groenlandica
GJP-10-2011	2	Aphelochaeta sp.	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	sp.
GJP-10-2011	2	Paraprionospio alata	2	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	Paraprionospio alata
GJP-10-2011	2	Leitoscoloplos pugettensis	3	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			203						

Table B-18. Benthic Infauna Taxonomic Data - GJP-10 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-10-2011	3	Nemertea	1	Nemertea					
GJP-10-2011	3	Sipuncula	5	Sipuncula					
GJP-10-2011	3	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-10-2011	3	Ennucula tenuis	3	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-10-2011	3	Rochefortia tumida	6	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-10-2011	3	Macoma sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-10-2011	3	Axinopsida serricata	14	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-10-2011	3	Nutricola lordi	68	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-10-2011	3	Ophiuroidea	11	Echinodermata	Ophiuroidea				
GJP-10-2011	3	Ostracoda	2	Arthropoda	Ostracoda				
GJP-10-2011	3	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-10-2011	3	Maldane sp.	1	Annelida	Polychaeta		Maldanidae	Maldane	sp.
GJP-10-2011	3	Scoletoma luti	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
			115						

Table B-19. Benthic Infauna Taxonomic Data - GJP-10 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-10-2011	4	Phoronida	1	Phoronida					
GJP-10-2011	4	Amphiodia urtica	2					Amphiodia	Amphiodia urtica
GJP-10-2011	4	Pandora filosa	3	Mollusca	Bivalvia	Anomalodesmata	Pandoridae	Pandora	Pandora filosa
GJP-10-2011	4	Acila castrensis	1	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-10-2011	4	Ennucula tenuis	2	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-10-2011	4	Rochefortia tumida	4	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-10-2011	4	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-10-2011	4	Parvilucina tenuisculpta	4	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-10-2011	4	Axinopsida serricata	19	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-10-2011	4	Nutricola lordi	84	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-10-2011	4	Haminoea vesicula	2	Mollusca	Gastropoda	Cephalaspidea	Haminoeidae	Haminoea	Haminoea vesicula
GJP-10-2011	4	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-10-2011	4	Turbonilla sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-10-2011	4	Alvania compacta	1	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-10-2011	4	Photis sp.	1	Arthropoda	Malacostraca	Amphipoda	Isaeidae	Photis	sp.
GJP-10-2011	4	Diastylis bidentata	1	Arthropoda	Malacostraca	Cumacea	Diastylidae	Diastylis	Diastylis bidentata
GJP-10-2011	4	Ophiuroidea	2	Echinodermata	Ophiuroidea				
GJP-10-2011	4	Barantolla americana	3	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-10-2011	4	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-10-2011	4	Euclymeninae	2	Annelida	Polychaeta		Maldanidae		
GJP-10-2011	4	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-10-2011	4	Scoletoma luti	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-10-2011	4	Spiochaetopterus sp.	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-10-2011	4	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
			142						

Table B-20. Benthic Infauna Taxonomic Data - GJP-10 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-10-2011	5	Sipuncula	3	Sipuncula					
GJP-10-2011	5	Nemertea	1	Nemertea					
GJP-10-2011	5	Amphiodia urtica	2					Amphiodia	Amphiodia urtica
GJP-10-2011	5	Acila castrensis	3	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-10-2011	5	Rochefortia tumida	4	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-10-2011	5	Lucinoma annulata	2	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-10-2011	5	Tellinidae	1	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-10-2011	5	Axinopsida serricata	22	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-10-2011	5	Nutricola lordi	83	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-10-2011	5	Lirularia sp.	2	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Lirularia	sp.
GJP-10-2011	5	Acteocina sp.	1	Mollusca	Gastropoda	Cephalaspidea	Cylichnidae	Acteocina	sp.
GJP-10-2011	5	Cyclostremella concordia	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Cyclostremella	Cyclostremella concordia
GJP-10-2011	5	Naticidae	1	Mollusca	Gastropoda	Neotaenioglossa	Naticidae		
GJP-10-2011	5	Amphipoda	1	Arthropoda	Malacostraca	Amphipoda			
GJP-10-2011	5	Rhepoxynius lucubrans	1	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius	Rhepoxynius lucubrans
GJP-10-2011	5	Balanidae	1	Arthropoda	Maxillopoda	Sessilia	Balanidae		
GJP-10-2011	5	Ophiuroidea	6	Echinodermata	Ophiuroidea				
GJP-10-2011	5	Heteromastus sp.	4	Annelida	Polychaeta		Capitellidae	Heteromastus	sp.
GJP-10-2011	5	Pholoe glabra	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	Pholoe glabra
GJP-10-2011	5	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-10-2011	5	Syllidae	1	Annelida	Polychaeta	Aciculata	Syllidae		
GJP-10-2011	5	Pectinaria granulata	1	Annelida	Polychaeta	Canalipalpata	Pectinariidae	Pectinaria	Pectinaria granulata
GJP-10-2011	5	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
			144						

Table B-21. Benthic Infauna Taxonomic Data - GJP-37 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-37-2011	1	Amphiodia urtica	15					Amphiodia	Amphiodia urtica
GJP-37-2011	1	Acila castrensis	3	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-37-2011	1	Ennucula tenuis	4	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-37-2011	1	Rochefortia tumida	2	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-37-2011	1	Parvilucina tenuisculpta	3	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-37-2011	1	Solen sicarius	1	Mollusca	Bivalvia	Veneroida	Solenidae	Solen	Solen sicarius
GJP-37-2011	1	Macoma sp.	5	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-37-2011	1	Axinopsida serricata	9	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-37-2011	1	Nutricola lordi	13	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-37-2011	1	Odostomia sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-37-2011	1	Alia gausapata	1	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-37-2011	1	Alvania compacta	2	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-37-2011	1	Amphipoda	1	Arthropoda	Malacostraca	Amphipoda			
GJP-37-2011	1	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-37-2011	1	Diastylis bidentata	1	Arthropoda	Malacostraca	Cumacea	Diastylidae	Diastylis	Diastylis bidentata
GJP-37-2011	1	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-37-2011	1	Brachyura	3	Arthropoda	Malacostraca	Decapoda			
GJP-37-2011	1	Pinnixa sp.	1	Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa	sp.
GJP-37-2011	1	Ophiuroidea	6	Echinodermata	Ophiuroidea				
GJP-37-2011	1	Ostracoda	4	Arthropoda	Ostracoda				
GJP-37-2011	1	Mediomastus californiensis	1	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-37-2011	1	Glycera nana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera nana
GJP-37-2011	1	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-37-2011	1	Eranno bicirrata	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Eranno	Eranno bicirrata
GJP-37-2011	1	Diopatra ornata	1	Annelida	Polychaeta	Aciculata	Onuphidae	Diopatra	Diopatra ornata
GJP-37-2011	1	Pholoe sp.	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-37-2011	1	Chaetozone setosa	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Chaetozone	Chaetozone setosa
GJP-37-2011	1	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-37-2011	1	Polydora limicola	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Polydora	Polydora limicola
GJP-37-2011	1	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
			89						

Table B-22. Benthic Infauna Taxonomic Data - GJP-37 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-37-2011	2	Phoronida	1	Phoronida					
GJP-37-2011	2	Amphiodia urtica	15					Amphiodia	Amphiodia urtica
GJP-37-2011	2	Acila castrensis	5	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-37-2011	2	Ennucula tenuis	9	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-37-2011	2	Yoldia sp.	1	Mollusca	Bivalvia	Nuculoida	Yoldiidae	Yoldia	sp.
GJP-37-2011	2	Rochefortia tumida	8	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-37-2011	2	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-37-2011	2	Parvilucina tenuisculpta	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-37-2011	2	Tellinidae	1	Mollusca	Bivalvia	Veneroida	Tellinidae		
GJP-37-2011	2	Axinopsida serricata	22	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-37-2011	2	Nutricola sp.	25	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-37-2011	2	Alvania compacta	3	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-37-2011	2	Ampelisca sp.	3	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-37-2011	2	Brachyura	1	Arthropoda	Malacostraca	Decapoda			
GJP-37-2011	2	Ophiuroidea	3	Echinodermata	Ophiuroidea				
GJP-37-2011	2	Ostracoda	8	Arthropoda	Ostracoda				
GJP-37-2011	2	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-37-2011	2	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-37-2011	2	Maldane sarsi	1	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-37-2011	2	Glycera nana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera nana
GJP-37-2011	2	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-37-2011	2	Eranno bicirrata	2	Annelida	Polychaeta	Aciculata	Lumbrineridae	Eranno	Eranno bicirrata
GJP-37-2011	2	Scoletoma luti	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-37-2011	2	Eumida longicornuta	1	Annelida	Polychaeta	Aciculata	Phyllodocidae	Eumida	Eumida longicornuta
GJP-37-2011	2	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-37-2011	2	Malmgreniella bansei	1	Annelida	Polychaeta	Aciculata	Polynoidae	Malmgreniella	Malmgreniella bansei
GJP-37-2011	2	Asabellides lineata	1	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Asabellides	Asabellides lineata
GJP-37-2011	2	Aphelochaeta monilaris	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-37-2011	2	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-37-2011	2	Laonice cirrata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Laonice	Laonice cirrata
GJP-37-2011	2	Spio cirrifera	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Spio	Spio cirrifera
GJP-37-2011	2	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
GJP-37-2011	2	Polycirrus sp.	2	Annelida	Polychaeta	Canalipalpata	Terebellidae	Polycirrus	sp.
GJP-37-2011	2	Leitoscoloplos pugettensis	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			128						

Table B-23. Benthic Infauna Taxonomic Data - GJP-37 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-37-2011	3	Nemertea	2	Nemertea					
GJP-37-2011	3	Amphiodia urtica	2					Amphiodia	Amphiodia urtica
GJP-37-2011	3	Acila castrensis	4	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-37-2011	3	Ennucula tenuis	9	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-37-2011	3	Rochefortia tumida	3	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-37-2011	3	Lucinoma annulata	2	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-37-2011	3	Parvilucina tenuisculpta	3	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-37-2011	3	Macoma sp.	2	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-37-2011	3	Macoma nasuta	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	Macoma nasuta
GJP-37-2011	3	Axinopsida serricata	13	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-37-2011	3	Nutricola lordi	24	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-37-2011	3	Odostomia sp.	4	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-37-2011	3	Alia gausapata	3	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-37-2011	3	Ophiuroidea	2	Echinodermata	Ophiuroidea				
GJP-37-2011	3	Ostracoda	5	Arthropoda	Ostracoda				
GJP-37-2011	3	Barantolla americana	4	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-37-2011	3	Maldane sarsi	1	Annelida	Polychaeta		Maldanidae	Maldane	Maldane sarsi
GJP-37-2011	3	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-37-2011	3	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-37-2011	3	Terebellidae	1	Annelida	Polychaeta	Canalipalpata	Terebellidae		
			87						

Table B-24. Benthic Infauna Taxonomic Data - GJP-37 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-37-2011	4	Phoronida	1	Phoronida					
GJP-37-2011	4	Amphiodia urtica	4					Amphiodia	Amphiodia urtica
GJP-37-2011	4	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-37-2011	4	Acila castrensis	7	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-37-2011	4	Ennucula tenuis	11	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-37-2011	4	Rochefortia tumida	9	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-37-2011	4	Lucinoma annulata	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Lucinoma	Lucinoma annulata
GJP-37-2011	4	Parvilucina tenuisculpta	7	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-37-2011	4	Macoma sp.	8	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-37-2011	4	Axinopsida serricata	24	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-37-2011	4	Nutricola lordi	18	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-37-2011	4	Odostomia sp.	1	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-37-2011	4	Cerithiopsis sp.	1	Mollusca	Gastropoda	Neotaenioglossa	Cerithiopsidae	Cerithiopsis	sp.
GJP-37-2011	4	Ampelisca sp.	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca	sp.
GJP-37-2011	4	Westwoodilla tone	1	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Westwoodilla	Westwoodilla tone
GJP-37-2011	4	Brachyura	1	Arthropoda	Malacostraca	Decapoda			
GJP-37-2011	4	Pinnotheridae	1	Arthropoda	Malacostraca	Decapoda	Pinnotheridae		
GJP-37-2011	4	Ophiuroidea	12	Echinodermata	Ophiuroidea				
GJP-37-2011	4	Ostracoda	11	Arthropoda	Ostracoda				
GJP-37-2011	4	Barantolla americana	3	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-37-2011	4	Euclymeninae	2	Annelida	Polychaeta		Maldanidae		
GJP-37-2011	4	Scoletoma luti	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	Scoletoma luti
GJP-37-2011	4	Gattyana sp.	2	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-37-2011	4	Aphelochaeta monilaris	3	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-37-2011	4	Chone magna	1	Annelida	Polychaeta	Canalipalpata	Sabellidae	Chone	Chone magna
GJP-37-2011	4	Boccardia sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Boccardia	sp.
GJP-37-2011	4	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-37-2011	4	Sternaspis fossor	3	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
GJP-37-2011	4	Leitoscoloplos pugettensis	1	Annelida	Polychaeta	Orbiniida	Orbiniidae	Leitoscoloplos	Leitoscoloplos pugettensis
			138						

Table B-25. Benthic Infauna Taxonomic Data - GJP-37 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-37-2011	5	Acila castrensis	10	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-37-2011	5	Ennucula tenuis	6	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-37-2011	5	Rochefortia tumida	5	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-37-2011	5	Parvilucina tenuisculpta	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-37-2011	5	Macoma sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-37-2011	5	Axinopsida serricata	23	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-37-2011	5	Nutricola lordi	15	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-37-2011	5	Solariella vancouverensis	1	Mollusca	Gastropoda	Archaeogastropoda	Trochidae	Solariella	Solariella vancouverensis
GJP-37-2011	5	Haminoea vesicula	1	Mollusca	Gastropoda	Cephalaspidea	Haminoeidae	Haminoea	Haminoea vesicula
GJP-37-2011	5	Alia gausapata	2	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-37-2011	5	Alvania compacta	8	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-37-2011	5	Amphipoda	1	Arthropoda	Malacostraca	Amphipoda			
GJP-37-2011	5	Pagurus sp.	1	Arthropoda	Malacostraca	Decapoda	Paguridae	Pagurus	sp.
GJP-37-2011	5	Ophiuroidea	11	Echinodermata	Ophiuroidea				
GJP-37-2011	5	Ostracoda	1	Arthropoda	Ostracoda				
GJP-37-2011	5	Notomastus hemipodus	1	Annelida	Polychaeta		Capitellidae	Notomastus	Notomastus hemipodus
GJP-37-2011	5	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-37-2011	5	Nephtys caeca	1	Annelida	Polychaeta	Aciculata	Nephtyidae	Nephtys	Nephtys caeca
GJP-37-2011	5	Ampharete sp.	1	Annelida	Polychaeta	Canalipalpata	Ampharetidae	Ampharete	sp.
GJP-37-2011	5	Cirratulidae	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae		
			93						

Table B-26. Benthic Infauna Taxonomic Data - GJP-45 R1

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-45-2011	1	Amphiodia urtica	6					Amphiodia	Amphiodia urtica
GJP-45-2011	1	Nuculana minuta	2	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-45-2011	1	Acila castrensis	66	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-45-2011	1	Ennucula tenuis	10	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-45-2011	1	Macoma sp.	4	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-45-2011	1	Axinopsida serricata	10	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-45-2011	1	Nutricola lordi	34	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-45-2011	1	Odostomia sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-45-2011	1	Alia gausapata	3	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-45-2011	1	Cerithiopsis sp.	1	Mollusca	Gastropoda	Neotaenioglossa	Cerithiopsidae	Cerithiopsis	sp.
GJP-45-2011	1	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-45-2011	1	Ophiuroidea	2	Echinodermata	Ophiuroidea				
GJP-45-2011	1	Ostracoda	5	Arthropoda	Ostracoda				
GJP-45-2011	1	Maldane sp.	2	Annelida	Polychaeta		Maldanidae	Maldane	sp.
GJP-45-2011	1	Glycera americana	2	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-45-2011	1	Cirratulidae	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae		
			151						

Table B-27. Benthic Infauna Taxonomic Data - GJP-45 R2

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-45-2011	2	Nuculana sp.	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	sp.
GJP-45-2011	2	Acila castrensis	49	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-45-2011	2	Ennucula tenuis	6	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-45-2011	2	Rochefortia tumida	1	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-45-2011	2	Axinopsida serricata	5	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-45-2011	2	Nutricola sp.	8	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	sp.
GJP-45-2011	2	Odostomia sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-45-2011	2	Turbonilla sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-45-2011	2	Ampeliscidae	1	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae		
GJP-45-2011	2	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-45-2011	2	Ophiuroidea	8	Echinodermata	Ophiuroidea				
GJP-45-2011	2	Bipalponephtys cornuta	1	Annelida	Polychaeta	Aciculata	Nephtyidae	Bipaplonephtys	Bipalponephtys cornuta
GJP-45-2011	2	Pholoe sp.	1	Annelida	Polychaeta	Aciculata	Pholoidae	Pholoe	sp.
GJP-45-2011	2	Spiochaetopterus sp.	1	Annelida	Polychaeta	Canalipalpata	Chaetopteridae	Spiochaetopterus	sp.
GJP-45-2011	2	Aphelochaeta monilaris	2	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-45-2011	2	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-45-2011	2	Laonice cirrata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Laonice	Laonice cirrata
			91						

Table B-28. Benthic Infauna Taxonomic Data - GJP-45 R3

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-45-2011	3	Amphiodia urtica	4					Amphiodia	Amphiodia urtica
GJP-45-2011	3	Nuculana minuta	2	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-45-2011	3	Acila castrensis	42	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-45-2011	3	Ennucula tenuis	16	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-45-2011	3	Yoldia hyperborea	1	Mollusca	Bivalvia	Nuculoida	Yoldiidae	Yoldia	Yoldia hyperborea
GJP-45-2011	3	Rochefortia tumida	3	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-45-2011	3	Parvilucina tenuisculpta	2	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-45-2011	3	Macoma sp.	5	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-45-2011	3	Axinopsida serricata	15	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-45-2011	3	Nutricola lordi	21	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-45-2011	3	Odostomia sp.	4	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-45-2011	3	Alia gausapata	1	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-45-2011	3	Brachyura	2	Arthropoda	Malacostraca	Decapoda			
GJP-45-2011	3	Ophiuroidea	14	Echinodermata	Ophiuroidea				
GJP-45-2011	3	Ostracoda	4	Arthropoda	Ostracoda				
GJP-45-2011	3	Glycera americana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera americana
GJP-45-2011	3	Cirratulidae	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae		
GJP-45-2011	3	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-45-2011	3	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-45-2011	3	Laonice cirrata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Laonice	Laonice cirrata
GJP-45-2011	3	Trochochaeta multisetosa	1	Annelida	Polychaeta	Canalipalpata	Trochochaetidae	Trochochaeta	Trochochaeta multisetosa
			142						

Table B-29. Benthic Infauna Taxonomic Data - GJP-45 R4

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-45-2011	4	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-45-2011	4	Acila castrensis	38	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-45-2011	4	Ennucula tenuis	21	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-45-2011	4	Rochefortia tumida	1	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-45-2011	4	Parvilucina tenuisculpta	2	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-45-2011	4	Axinopsida serricata	9	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-45-2011	4	Nutricola lordi	34	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-45-2011	4	Odostomia sp.	4	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-45-2011	4	Turbonilla sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-45-2011	4	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-45-2011	4	Ophiuroidea	5	Echinodermata	Ophiuroidea				
GJP-45-2011	4	Amphiodia urtica	2	Echinodermata	Ophiuroidea			Amphiodia	Amphiodia urtica
GJP-45-2011	4	Ostracoda	3	Arthropoda	Ostracoda				
GJP-45-2011	4	Barantolla americana	1	Annelida	Polychaeta		Capitellidae	Barantolla	Barantolla americana
GJP-45-2011	4	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-45-2011	4	Scoletoma sp.	1	Annelida	Polychaeta	Aciculata	Lumbrineridae	Scoletoma	sp.
GJP-45-2011	4	Paraprionospio sp.	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Paraprionospio	sp.
GJP-45-2011	4	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor

Table B-30. Benthic Infauna Taxonomic Data - GJP-45 R5

Marine Biology Baseline Inventory

Gateway Pacific Terminal

Sample ID	Replicate	Taxon Name	Total	Phylum	Class	Order	Family	Genus	Species
GJP-45-2011	5	Nemertea	1	Nemertea					
GJP-45-2011	5	Phoronida	1	Phoronida					
GJP-45-2011	5	Amphiodia urtica	1					Amphiodia	Amphiodia urtica
GJP-45-2011	5	Pandora sp.	1	Mollusca	Bivalvia	Anomalodesmata	Pandoridae	Pandora	sp.
GJP-45-2011	5	Nuculana minuta	1	Mollusca	Bivalvia	Nuculoida	Nuculanidae	Nuculana	Nuculana minuta
GJP-45-2011	5	Acila castrensis	28	Mollusca	Bivalvia	Nuculoida	Nuculidae	Acila	Acila castrensis
GJP-45-2011	5	Ennucula tenuis	12	Mollusca	Bivalvia	Nuculoida	Nuculidae	Ennucula	Ennucula tenuis
GJP-45-2011	5	Rochefortia tumida	2	Mollusca	Bivalvia	Veneroida	Lasaeidae	Rochefortia	Rochefortia tumida
GJP-45-2011	5	Parvilucina tenuisculpta	1	Mollusca	Bivalvia	Veneroida	Lucinidae	Parvilucina	Parvilucina tenuisculpta
GJP-45-2011	5	Macoma sp.	1	Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma	sp.
GJP-45-2011	5	Axinopsida serricata	9	Mollusca	Bivalvia	Veneroida	Thyasiridae	Axinopsida	Axinopsida serricata
GJP-45-2011	5	Nutricola lordi	30	Mollusca	Bivalvia	Veneroida	Veneridae	Nutricola	Nutricola lordi
GJP-45-2011	5	Odostomia sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Odostomia	sp.
GJP-45-2011	5	Turbonilla sp.	2	Mollusca	Gastropoda	Heterostropha	Pyramidellidae	Turbonilla	sp.
GJP-45-2011	5	Alia gausapata	1	Mollusca	Gastropoda	Neogastropoda	Columbellidae	Alia	Alia gausapata
GJP-45-2011	5	Alvania compacta	2	Mollusca	Gastropoda	Neotaenioglossa	Rissoidae	Alvania	Alvania compacta
GJP-45-2011	5	Eudorella pacifica	1	Arthropoda	Malacostraca	Cumacea	Leuconidae	Eudorella	Eudorella pacifica
GJP-45-2011	5	Brachyura	2	Arthropoda	Malacostraca	Decapoda			
GJP-45-2011	5	Ophiuroidea	7	Echinodermata	Ophiuroidea				
GJP-45-2011	5	Ostracoda	14	Arthropoda	Ostracoda				
GJP-45-2011	5	Mediomastus californiensis	2	Annelida	Polychaeta		Capitellidae	Mediomastus	Mediomastus californiensis
GJP-45-2011	5	Euclymeninae	2	Annelida	Polychaeta		Maldanidae		
GJP-45-2011	5	Glycera nana	1	Annelida	Polychaeta	Aciculata	Glyceridae	Glycera	Glycera nana
GJP-45-2011	5	Lumbrineridae	1	Annelida	Polychaeta	Aciculata	Lumbrineridae		
GJP-45-2011	5	Gattyana sp.	1	Annelida	Polychaeta	Aciculata	Polynoidae	Gattyana	sp.
GJP-45-2011	5	Aphelochaeta monilaris	1	Annelida	Polychaeta	Canalipalpata	Cirratulidae	Aphelochaeta	Aphelochaeta monilaris
GJP-45-2011	5	Galathowenia oculata	1	Annelida	Polychaeta	Canalipalpata	Oweniidae	Galathowenia	Galathowenia oculata
GJP-45-2011	5	Dipolydora cardalia	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Dipolydora	Dipolydora cardalia
GJP-45-2011	5	Laonice cirrata	1	Annelida	Polychaeta	Canalipalpata	Spionidae	Laonice	Laonice cirrata
GJP-45-2011	5	Sternaspis fossor	1	Annelida	Polychaeta	Canalipalpata	Sternaspidae	Sternaspis	Sternaspis fossor
			131						

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APPENDIX C

Representative Photographs of Field Activities

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Photo 1. Representative intertidal macroalgae quadrat.

Photo 2. Area A Macroalgae Transects.

Photo 3. Area B macroalgae transects. Note small patch of eelgrass between bottom two transects pictured.

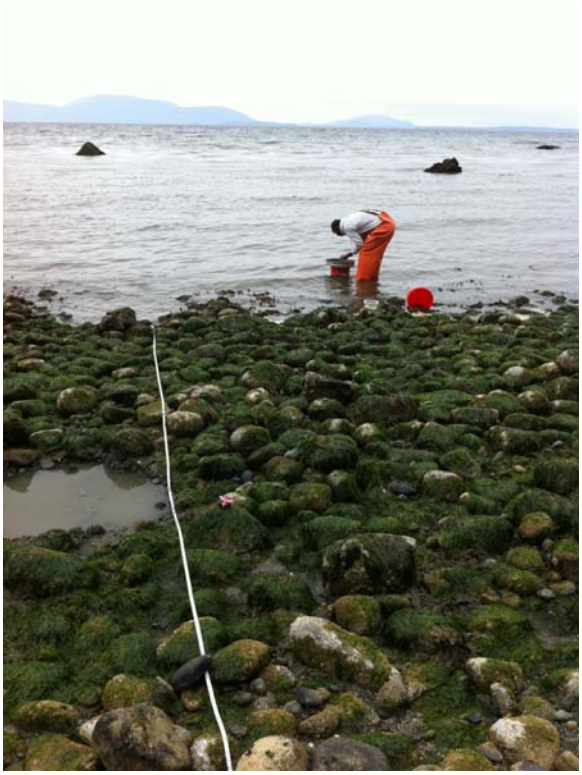

Photo 4. Intertidal clam transect, quadrat, and sieving.

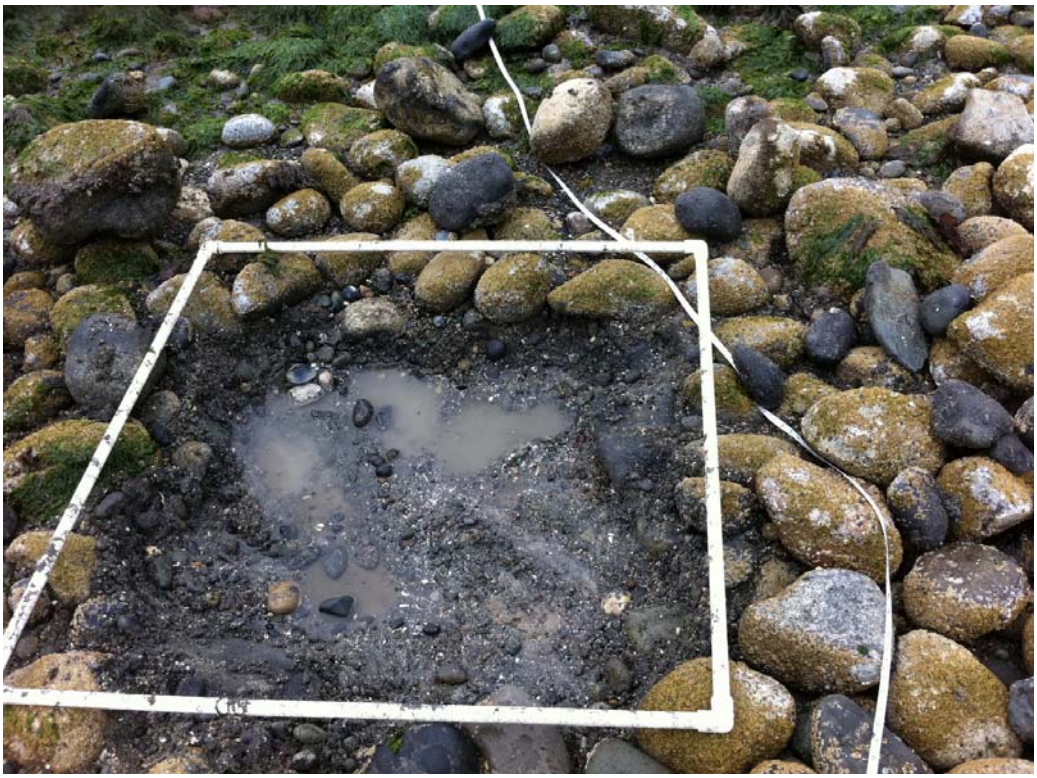

Photo 5. Intertidal clam quadrat sampling, in progress.

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APPENDIX D

Macroalgae Quantitative Data

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This appendix provides data sheets from the quantitative diver surveys of the submerged marine vegetation. Each data sheet provides data for each of the quadrats sampled along the transect. Each line on the data sheet represents one quadrat.

Depths are reported relative to Mean Lower Low Water (MLLW), as calculated from the value measured by the dive computer, subtracted from the estimated stage of the predicted tide. Although depths are reported in tenths of feet, the accuracy and precision is not this fine. As a result, depths reported should not be considered as true and accurate depths, but as depths for comparing data between transects. A portion of the survey was conducted from shore during a low tide event of -2.5 MLLW. Therefore, dive computers were not used, and depths were estimated based on stage of the predicted tide.

Each data sheet lists algae in order of the most dominant species present in each sampled quadrat first, with subdominant taxa listed in order of the percent cover at each quadrat (most to least). Similarly, substrate is listed in order of the most dominant first, with subdominant material second. Cobble and sand is an observation where cobbles are more dominant than sand, whereas sand and cobble is an observation where sand is the more dominant substrate.

Holdfast counts are included for kelp species, which are listed as one of the taxa observed in the vegetation column. Taxa incorporated into the holdfast count include *Laminaria saccharina, Costaria costata,* and *Agarum*. In some quadrats, *Sargassum* holdfasts were counted as well, and are listed second (for example 1&2 would be 1 *Laminaria* and 2 *Sargassum*).

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Submerged Marine Vegetation Dive Surveys

Sample Date: 6/4/2011

Transect: Area A, T-1

Station	Distance	Depth (MLLW)[1]	Substrate[2]	Vegetation (Dominant/Subdominant)[3]	Total Areal Cover (%)	Holdfast Count
1	0	approx +5	Cobble	None	0	0
2	20		Cobble	*Ulva*	5	0
3	40		Cobble	*Ulva*	20	0
4	60	MLLW	Cobble	*Ulva, Fucus*	30	0
5	80		Cobble	*Ulva, Fucus, micro*[4]	100	0
6	100		Cobble and sand	*Ulva, micro, Laminaria saccharina*	100	1
7	120		Cobble and sand	*Ulva, micro, Sargassum, Mazzaella*	100	0
8	140		Cobble and sand	*Sargassum* (30%)*, Mazzaella, Ulva*	100	0
9	160		Cobble and sand	*Sargassum* (30%), *Mazzaella, Ulva*	100	0
10	180		Cobble and sand	*Sargassum* (30%)*, Mastocarpus, Ulva*	100	0
11	200	-2.7	Sand and cobble	*Sargassum* (30%)*, Mastocarpus, Ulva*	100	2
12	220	-2.7	Cobble and sand	*Sargassum* (30%)*, Ulva*	100	3
13	240	-2.7	Sand and cobble	*Ulva*	1	0
14	260	-3.8	Sand and cobble	*Ulva, Fauchea, Mazzaella*	100	0
15	280	-3.8	Sand	*Cryptosiphonia, Gracilaria*	1	0
16	300	-2.8	Cobble and sand	*Laminaria saccharina*	100	3
17	320	-3.8	Cobble and sand	*Ulva, Fauchea, Mazzaella*	100	0

Submerged Marine Vegetation Dive Surveys

Sample Date: 6/4/2011

Transect: Area A, T-1

Station	Distance	Depth (MLLW)[1]	Substrate[2]	Vegetation (Dominant/Subdominant)[3]	Total Areal Cover (%)	Holdfast Count
18	340	-4.9	Cobble and sand	*Ulva, Fauchea, micro*	100	0
19	360	-5.9	Cobble and sand	*Mazzaella, Fauchea, Cryptopleura, Sargassum* (10%)	100	2
20	380	-6.9	Cobble and sand	*Fauchea*	100	0
21	400	-7.9	Cobble and sand	*Fauchea, Laminaria saccharina, Sargassum* (10%)	100	1 & 2
22	420	-8.9	Cobble and sand	*Laminaria saccharina, Sargassum* (10%)	100	2 & 1
23	440	-10.0	Cobble and silt	*Fauchea, Laminaria saccharina, micro*	100	1
24	460	-11.0	Cobble and silt	*Fauchea, micro*	100	0
25	480	-12.0	Cobble and silt	*Fauchea, Laminaria saccharina*	60	2
26	500	-13.0	Silt and cobble	*Laminaria saccharina, Desmarestia viridis*	100	2
27	520	-14.1	Silt	*Gracilaria*	1	0
28	540	-15.1	Silt	*Laminaria saccharina, Gracilaria*	20	1
29	560	-16.1	Silt	*Laminaria saccharina, Desmarestia ligulata, Gracilaria*	25	1
30	580	-17.1	Silt	*Desmarestia ligulata*	1	0
31	600	-19.1	Silt	*Gracilaria*	1	0
32	620	-20.2	Silt	*Gracilaria*	1	0
33	640	-21.2	Silt	None	0	0

Submerged Marine Vegetation Dive Surveys

Sample Date: 6/4/2011

Transect: Area A, T-1

Station	Distance	Depth (MLLW)[1]	Substrate[2]	Vegetation (Dominant/Subdominant)[3]	Total Areal Cover (%)	Holdfast Count
34	660	-22.2	Silt	None	0	0
35	680	-23.2	Silt	None	0	0
36	700	-24.3	Silt	None	0	0
37	720	-26.3	Silt	None	0	0
38	740	-28.3	Silt	None	0	0

Submerged Marine Vegetation Dive Surveys

Date: 4-Jun-11

Transect: Area A, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble		0	0	
2	20		Cobble	*Ulva*	5	0	
3	40		Cobble	*Enteromorpha, Ulva*	15	0	
4	60	MLLW	Cobble	*Fucus, micro*[2]*, Ulva*	35	0	
5	80		Cobble	*Ulva, micro*	90	0	
6	100		Cobble	*micro, Ulva*	90	0	
7	120		Cobble and sand	*Sargassum, Ulva, Fauchea*	100	6	Inner margin of dense *Sargassum*
8	140		Cobble and sand	*Sargassum, Ulva, Fauchea*	100	5	
9	160		Cobble and sand	*Sargassum, Ulva, Fauchea*	100	10	
10	180		Cobble and sand	*Sargassum, Ulva, Fauchea*	100	7	
11	200		Cobble and sand	*Sargassum, Ulva, Fauchea*	100	5	
12	220	-2.7	Sand and cobble	*Ulva, Fauchea, Sargassum*	80	5	Outer margin of dense *Sargassum*
13	240	-3.7	Sand	*micro, Ulva, Sargassum*	50	2	
14	260	-3.7	Sand	*None*	0	0	Bare sand
15	280	-4.8	Sand and cobble	*Fauchea, micro, Ulva*	90	0	
16	300	-5.8	Sand and cobble	*Laminaria saccharina, Fauchea, micro*	80	2	
17	320	-5.8	Sand and cobble	*Fauchea, mico, Ulva*	80		

Submerged Marine Vegetation Dive Surveys

Date: 4-Jun-11

Transect: Area A, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
18	340	-6.8	Sand and cobble	*Fauchea, mico, Sargassum*	80	4	
19	360	-6.9	Sand and cobble	*Laminaria saccharina, Fauchea, micro, Sargassum*	90	6	
20	380	-7.9	Sand and cobble	*Laminaria saccharina, Fauchea, micro*	80	3	
21	400	-8.9	Sand and cobble	*Laminaria saccharina, Fauchea, micro, Sargassum*	90	5	
22	420	-9.9	Sand and cobble	*Laminaria saccharina, Fauchea, micro*	80	4	
23	440	-11.0	Sand and cobble	*Laminaria saccharina, Fauchea, micro*	80	5	
24	460	-12.0	Sand and cobble	*Laminaria saccharina, Gracilaria*	80	5	
25	480	-13.0	Silt and sand	*Laminaria saccharina*	5	3	
26	500	-14.0	Silt and sand	*Gracilaria, Laminaria saccharina, Ulva*	10	1	
27	520	-15.0	Silt and sand	*Gracilaria, Laminaria saccharina*	10	1	
28	540	-16.1	Silt and sand	*Gracilaria*	5	0	
29	560	-17.1	Silt and sand	*Gracilaria*	10	0	
30	580	-18.1	Silt and sand	*Gracilaria*	5	0	
31	600	-20.1	Silt and sand	None	0	0	
32	620	-21.2	Silt and sand	None	0	0	

Submerged Marine Vegetation Dive Surveys

Date: 4-Jun-11

Transect: Area A, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
33	640	-23.2	Silt and sand	*Gracilaria*	5	0	
34	660	-24.2	Silt and sand	None	0	0	
35	680	-25.2	Silt and sand	None	0	0	
36	700	-27.3	Silt and sand	None	0	0	
37	720	-29.3	Silt and sand	None	0	0	
38	740	-32.3	Silt and sand	None	0	0	

Submerged Marine Vegetation Dive Survey

Date: 6/4/2011

Transect: Area A, T-3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble	*Ulva*	1	0	Top of vegetation line
2	20		Cobble	*Ulva*	30	0	Barnacles
3	40		Cobble	*Ulva*	20	0	Whelks & shore crab
4	60	MLLW	Cobble	*Fucus, Ulva*	50	0	
5	80		Gravel and Cobble	*Ulva, Fucus, Rhodomela*	90	0	
6	100	-2.3	Gravel and Cobble	*Ulva,* micro[2]	100	0	Water Edge at 12:05
	110	-2.8	Gravel and Cobble	*Ulva, Sargassum* (80/20)	100	4	Inner margin of *Sargassum* band
7	120	-2.9	Sand and cobble	*Sargassum, Ulva, Fauchea*	100	6	
8	140	-3.0	Sand and cobble	*Sargassum, Ulva, Fauchea*	100	5	
9	160	-3.1	Sand and cobble	*Sargassum, Ulva, Fauchea*	100	10	
10	180	-3.2	Sand and cobble	*Sargassum, Ulva, Fauchea*	100	7	
11	200	-3.2	Sand and cobble	*Sargassum*	80	8	Outer margin of dense *Sargassum*
12	220	-3.3	Sand and cobble	Micro*, Laminaria saccharina, Ulva*	50	1	
13	240	-3.3	Sand and cobble	Micro*, Fauchea, Ulva, Sargassum*	60	2	
14	260	-3.4	Sand	*Sargassum*	5	1	

Submerged Marine Vegetation Dive Survey

Date: 6/4/2011

Transect: Area A, T-3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-4.4	Sand and cobble	*Laminaria saccharina, Fauchea, micro*	90	3	
16	300	-4.5	Sand and cobble	*Laminaria saccharina, Fauchea,* micro	90	4	
17	320	-4.5	Sand and cobble	*Mastocarpus,* micro*, Fauchea, Sargassum*	90	2	
18	340	-5.6	Sand and cobble	*Laminaria saccharina,* micro*, Mastocarpus*	90	4	
19	360	-6.7	Sand and cobble	*Fauchea, micro, Laminaria saccharina, Sargassum*	80	2	
20	380	-7.7	Sand and cobble	*Fauchea, micro, Mastocarpus, Laminaria saccharina*	90	1	
21	400	-8.8	Sand and cobble	*Fauchea, micro, Mastocarpus*	90	0	
22	420	-10.8	Sand and cobble	*Fauchea, micro, Mastocarpus, Laminaria saccharina*	80	5	
23	440	-11.9	Sand and cobble	*Fauchea, Laminaria saccharina, micro*	90	4	
24	460	-11.9	Sand and cobble	*Laminaria saccharina, micro*	80	5	
25	480	-13.0	Sand and silt	*Gracilaria, Laminaria saccharina*	20	2	
26	500	-14.0	Sand and silt	*Gracilaria, Laminaria saccharina*	10	1	
27	520	-15.1	Sand and silt	*Gracilaria, Laminaria saccharina*	10	1	
28	540	-16.2	Sand and silt	*Gracilaria*	5	0	

Submerged Marine Vegetation Dive Survey

Date: 6/4/2011

Transect: Area A, T-3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
29	560	-17.2	Sand and silt	None	0	0	
30	580	-19.3	Sand and silt	None	0	0	
31	600	-20.3	Sand and silt	None	0	0	
32	620	-21.4	Sand and silt	None	0	0	
33	640	-23.4	Sand and silt	None	0	0	
34	660	-24.5	Sand and silt	None	0	0	

Submerged Marine Vegetation Diver Survey

Date: 6/1/2011

Transect: Area A, T-4 (Proposed Trestle Centerline)

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	3.0	Cobble	*Ulva*	20	0	
2	20	0.9	Cobble	*Fucus*	40	0	
3	40	-0.2	Cobble	*Fucus, Porphyra*	60	0	*Pisaster ochraceus*
4	60	-1.3	Cobble	*Ulva, Odonthalia*	80	0	
5	80	-1.4	Cobble and sand	*Sargassum*	100	10	Inner margin of dense *Sargassum*
6	100	-2.5	Cobble and sand	*Sargassum*	100	10	*Pugettia producta*
7	120	-2.6	Cobble and sand	*Sargassum Odonthalia*	100	4	
8	140	-2.6	Cobble and sand	*Sargassum, Odonthalia*	100	4	*Pugettia producta*
9	160	-2.7	Cobble and silt	*Sargassum, Laminaria saccharina*	90	3	
10	180	-3.7	silt and cobble	*Sargassum, Mazzaella*	90	6	
11	200	-3.4	silt and cobble	*Ulva, Sargassum, Mazzaella*	50	4	Outer margin of dense Sargassum
12	220	-3.4	Sand and large gravel	*Sargassum, Fauchea*	50	1	
13	240	-3.3	Sand and cobble	*Odonthalia, Ulva, Sargassum*	20	1	
14	260	-3.3	Sand and cobble	*Fauchea, Ulva, Laminaria saccharina*	75	1	*Pisaster ochraceus*
15	280	-3.2	Sand and cobble	*Porphyra, Fauchea*	80	0	
16	300	-4.2	Sand and cobble	*Ulva, Mazzaella*	100	0	

Submerged Marine Vegetation Diver Survey

Date: 6/1/2011

Transect: Area A, T-4 (Proposed Trestle Centerline)

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
17	320	-4.1	Sand and cobble	*Sargassum, Fauchea*	90	2	*Cancer productus, P. ochraceus*
18	340	-6.1	Sand and cobble	*Fauchea, Sargassum*	100	1	
19	360	-8.0	Sand and cobble	*Fauchea, Laminaria saccharina, Sargassum*	90	2	
20	380	-9.0	Sand and cobble	*Laminaria saccharina, Fauchea, Porphyra*	70	2	
21	400	-8.9	Sand and silt	*Odonthalia, Fauchea, Laminaria saccharina*	80	1	*Cancer productus*
22	420	-9.9	Sand and silt	*Laminaria saccharina, Sargassum, Fauchea*	50	3	
23	440	-11.9	Sand and silt	*Gracilaria, Fauchea*	70	1	*Start Nereocystis band*
24	460	-12.8	Sand and silt	*Porphyra, Gracilaria*	30	0	*Pycnopodia helianthoides*
25	480	-14.8	Sand and silt	*Gracilariopsis, Laminaria saccharina*	40	0	
26	500	-14.7	Silt and sand	*Gracilaria, Desmarestia, Nereocystis*	10	1	*Armina californica (2)*
27	520	-15.7	Silt and sand	*Gracilariopsis*	20	0	*Ptilosarcus gurneyi*
28	540	-17.6	Silt and sand	*Desmarestia ligulata*	10	1	*Cancer productus*
29	560	-18.6	Silt and sand	*Gracilaria*	1	0	*Ptilosarcus gurneyi*
30	580	-20.5	Silt and sand	*Nereocystis*	1	1	*End Nereocystis band*
31	600	-21.5	Silt and sand	None	0	0	*Ptilosarcus gurneyi*

Submerged Marine Vegetation Diver Survey

Date: 6/1/2011

Transect: Area A, T-4 (Proposed Trestle Centerline)

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
32	620	-23.4	Silt and sand	None	0	0	*Ptilosarcus gurneyi*
33	640	-25.4	Silt and sand	None	0	0	

Submerged Marine Vegetation Diver Survey

Date: 6/4/2011

Transect: Area A, T-5

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble	None	0	0	Top of vegetation line
2	20		Cobble	*Ulva*	20	0	Barnacles
3	40		Cobble	*Ulva, Fucus*	30	0	Whelks & shore crab
4	60	MLLW	Cobble	*Fucus, Mastocarpus, Ulva*	50	0	
5	80		Gravel and Cobble	*Ulva, Rhodomela*	100	0	
6	100	-2.3	Gravel and Cobble	*Ulva, Fucus, micro*[2]	100	0	Edge of Water at 12:10
	105	-2.8	Gravel and Cobble	*Ulva, micro, Sargassum* (10%)	100	4	Inner margin of *Sargassum* band
7	120	-3.4	Cobble and gravel	*Ulva, Fucus, Sargassum*	100	1	
8	140	-3.4	Cobble and gravel	*Ulva, Fucus, Sargassum* (10%)	100	1	
9	160	-4.5	Cobble and gravel	*Sargassum* (70%), *Ulva*	100	4	
10	180	-4.5	Cobble and sand	*Sargassum* (70%), *micro*	100	4	
11	200	-5.5	Cobble and sand	*Laminaria saccharina, Sargassum* (40%)	100	1 & 3	Dense *Sargassum*
12	220	-5.6	Sand and cobble	*Ulva, Fauchea*	50	0	
13	240	-5.6	Cobble and sand	*Laminaria saccharina, Ulva*	100	2	
14	260	-6.6	Cobble and sand	*Laminaria bongardiana*	100	1	

Submerged Marine Vegetation Diver Survey

Date: 6/4/2011

Transect: Area A, T-5

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-6.7	Cobble and sand	*Laminaria saccharina, Fauchea, micro*	100	1	comb jellyfish
16	300	-7.7	Cobble and sand	*Laminaria saccharina, Fauchea,* micro	100	0	
17	320	-9.7	Cobble and sand	*Laminaria saccharina*	100	1	
18	340	-9.8	Cobble and sand	*Laminaria saccharina*	100	2	*Outer edge of Sargassum* bed
19	360	-11.8	Cobble and sand	*Laminaria saccharina, Fauchea*	100	2	
20	380	-12.8	Cobble and sand	*Laminaria saccharina, Gracilaria*	50	1	
21	400	-13.8	Sand and cobble	*Laminaria saccharina, Desmarestia viridis, Nereocystis*	100	1 & 3	one *Laminaria* and 3 *Nereocystis* holdfasts
22	420	-14.9	Cobble and sand	*Nereocystis, Gracilaria*	10	1	
23	440	-14.9	Silt	*Laminaria saccharina*	10	1	
24	460	-15.9	Silt	*Laminaria saccharina*	10	1	
25	480	-18.0	Silt	*Laminaria saccharina*	10	1	
26	500	-19.0	Silt	*Gracilaria*	1	0	stripped nudibranch (*Armina californica*)
27	520	-20.0	Silt	*Gracilaria*	1	0	Sea pens (*Ptilosarcus gurneyi*)
28	540	-21.1	Silt	*Gracilaria*	1	0	Sea pens *(Ptilosarcus gurneyi*)
29	560	-22.1	Silt	None	0	0	
30	580		Silt	None		0	

Submerged Marine Vegetation Diver Survey

Date: 6/5/2011

Transect: Area A, T-6

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble		0	0	
2	20		Cobble	*Ulva*	30	0	
3	40		Cobble	*Fucus, Ulva*	10	0	
4	60	MLLW	Cobble	*Fucus, Ulva*	30	0	
5	80		Cobble	*Ulva, micro*	90	0	
6	100		Cobble	*Ulva, micro*	100	0	
7	120	-0.8	Cobble and sand	*Ulva, micro, Fucus, Mazzaella*	60	0	
8	140	-0.7	Cobble and sand	*micro, Ulva*	60	0	
9	160	-0.7	Cobble and sand	*micro, Ulva, Fucus*	60	0	
10	180	-1.6	Cobble and sand	*micro, Ulva, Sargassum*	80	3	inner margin of dense *Sargassum*
11	200	-1.6	Cobble and sand	*micro, Ulva*	90	0	
12	220	-1.5	Cobble and sand	*Sargassum, micro, Ulva*	90	10	ten stems of *Sargassum*
13	240	-2.4	Cobble and sand	*micro, Ulva, Sargassum*	90	9	
14	260	-2.4	Cobble and sand	*Fauchea, micro, Sargassum*	90	8	
15	280	-2.3	Cobble and sand	*Fauchea, Ulva, Sargassum*	90	12	
16	300	-2.3	Cobble and sand	*Fauchea, micro, Ulva, Laminaria saccharina*	80	3	outer margin of dense *Sargassum*
17	320	-3.2	Cobble and sand	*Fauchea, micro, Ulva, Laminaria saccharina*	80	2	

Submerged Marine Vegetation Diver Survey

Date: 6/5/2011

Transect: Area A, T-6

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
18	340	-4.2	Cobble and sand	*Fauchea, micro, Mastocarpus, Ulva, Laminaria saccharina*	90	2	
19	360	-5.1	Cobble and sand	*Fauchea, micro, Mastocarpus, Mazzaella*	90	0	
20	380	-6.0	Cobble and sand	*Fauchea, micro, Mastocarpus, Laminaria saccharina, Mazzaella*	90	1	outer margin of *Sargassum*
21	400	-7.0	Cobble and sand	*Fauchea, micro, Mastocarpus*	90	0	
22	420	-8.9	Cobble and sand	*Fauchea, micro, Mastocarpus, Laminaria saccharina, Mazzaella*	90	2	
23	440	-9.9	Cobble and sand	*Fauchea, micro, Mastocarpus, Laminaria saccharina*	90	2	
24	460	-10.8	Cobble and sand	*Fauchea, micro, Mastocarpus*	90	0	
25	480	-11.7	Cobble and sand	*micro, Laminaria saccharina, Nereocystis luetkeana*	60	4	
26	500	-12.7	Silt	*Laminaria saccharina, Ulva*	10	1	
27	520	-13.6	Silt	*Gracilaria, Ulva, Laminaria saccharina*	10	1	
28	540	-14.6	Silt	*Gracilaria, Laminaria saccharina*	5	2	
29	560	-15.5	Silt	*Gracilaria, Laminaria saccharina*	5	3	

Submerged Marine Vegetation Diver Survey

Transect: Area A, T-7

Date: 6/5/2011

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble		0	0	
2	20		Cobble	*Ulva*	80	0	
3	40		Cobble	*Fucus, Ulva*	30	0	
4	60	MLLW	Cobble	*Fucus, Ulva*	50	0	
5	80		Cobble and sand	*Ulva,* micro	70	0	
6	100		Cobble and sand	*Ulva,* micro[2]	100	0	
7	120		Cobble and sand	*Ulva,* micro*, Fucus*	100	0	
8	140	-2.4	Cobble and sand	micro*, Fucus, Ulva*	100	0	Waters edge 12:30
9	160	-2.9	Sand and cobble	*Sargassum* (50%)*, Ulva, Fucus*	100	3	Inner margin of dense *Sargassum* band
10	180	-3.4	Cobble and sand	*Sargassum* (30%)*, Odonthalia, Fucus*	100	5	
11	200	-3.3	Cobble and sand	*Odonthalia, Ulva, Sargassum* (20%)	100	2	
12	220	-3.3	Cobble and sand	*Odonthalia, Sargassum* (10%)*, Fauchea*	100	2	Helmut crab *(Telmessus cheiragonus)*
13	240	-4.2	Sand	*Sargasssum,* micro	25	2	outer margin of dense *Sargassum*
14	260	-4.2	Cobble and sand	*Laminaria saccharina*	100	1	

Submerged Marine Vegetation Diver Survey

Transect: Area A, T-7

Date: 6/5/2011

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-5.1	Cobble and sand	*Laminaria saccharina, Fauchea, Sargassum*	100	1 & 1	1 *Laminaria* and 1 *Sargassum* holdfast
16	300	-6.1	Cobble and sand	*Laminaria saccharina, Fauchea*	100	1	Pisaster ochraceous
17	320	-7.0	Cobble and sand	*Fauchea*	100	0	
18	340	-8.0	Cobble and sand	*Laminaria saccharina,* micro	100	1	
19	360	-8.9	Cobble and sand	*Fauchea*	100	0	
20	380	-9.9	Cobble and sand	*Fauchea*, micro*, Laminaria saccharina*	100	0	
21	400	-10.8	Cobble and sand	*Fauchea,* micro	100	0	*Sargassum* begins at 404 feet
22	420	-11.8	Cobble and sand	*Laminaria saccharina, Fauchea*, micro	100	0	
23	440	-12.7	Sand and cobble	*Laminaria saccharina, Fauchea*	100	0	red rock crab (*Cancer productus*)
24	460	-13.7	Cobble and silt	*Laminaria saccharina, Nereocystis luetkeana*	100	1 & 1	young Nereocystis along transect
25	480	-14.6	Silt and shell		0	0	Sea pens (*Ptilosarcus gurneyi*) along transect
26	500	-15.6	Silt and shell	*Gracilaria*	10	0	

Submerged Marine Vegetation Diver Survey

Transect: Area A, T-7

Date: 6/5/2011

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
27	520	-16.5	Silt and shell	*Gracilaria*	20	0	
28	540	-17.5	Silt and shell	*Costaria costata, Gracilaria*	20	0	
29	560	-18.4	Silt	*Desmarestia ligulata*	1	0	
30	580	-19.4	Silt	*Gracilaria*	1	0	Sea pens (*Ptilosarcus gurneyi*)

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-1

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble and gravel	*Ulva*	10		Top of vegetation line
2	20		Cobble and sand	*Ulva, Mastocarpus*	10		
3	40		Cobble and sand	*Ulva, Mastocarpus*	60		Anemones, *Anthopleura xanthogrammica*
4	60	Approx MLLW	Cobble and sand	*Fucus , Ulva*	40		Anemones
5	80		Cobble	*Fucus, Fauchea,* micro[2]	70		
6	100		Cobble and sand	*Fucus, micro, Ulva*	70		*Pisaster ochraceus*
	106.5		Sand and cobble	*Fucus, Ulva, Odanthalia*	50		Reference pt 1
7	120		Sand	*periphyton*	0		Bare sand
8	140		Sand	*periphyton*	0		Bare sand
9	160	-2.3	Sand	*Ulva, Odanthalia*	5		
10	180	-2.8	Cobble and gravel	*Ulva, Odanthalia*	100		
11	200	-3.3	Cobble and gravel	*Ulva, Sargassum* (25%), *Odanthalia*	100	5	Inner margin of dense *Sargassum* band
12	220	-4.0	Cobble and gravel	*Ulva, Sargassum*	100		
13	240	-4.5	Cobble and gravel	*Ulva, Sargassum*	100		
14	260	-5.0	Cobble and gravel	*Ulva, Sargassum*	100		

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-1

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-5.5	Cobble and sand	*Laminaria saccharina, Sargassum, micro*	90	3	
16	300	-6.5	Cobble and sand	*Fauchea, micro*	100		Outer margin of dense *Sargassum* band
17	320	-6.5	Cobble and sand	*Fauchea, Mazzaella, micro*	80		
18	340	-7.5	Cobble and sand	*Desmarestia, Mazzaella, micro*	60	2	
19	360	-7.5	Cobble and sand	*Laminaria saccharina, Fauchea, micro*	60	2	
20	380	-8.5	Cobble and sand	*Fauchea, micro*	100		
21	400	-9.5	Cobble and sand	*Laminaria saccharina, Fauchea, micro*	80	3	
22	420	-10.5	Sand and silt	*Laminaria saccharina, Fauchea, micro*	80	2	
23	440	-11.5	Sand and silt	*Fauchea, micro*	60		
24	460	-11.5	Sand and silt	*Laminaria saccharina, Fauchea, micro*	80	3	
25	480	-12.5	Sand and silt	*Laminaria saccharina*	100	4	
26	500	-13.5	Sand and silt	*Laminaria saccharina*	60	3	
27	520	-13.5	Sand and silt	*Laminaria saccharina*	60	4	
28	540	-15.5	Sand and silt	*Laminaria saccharina*	80	3	
29	560	-16.5	Sand and silt	*Nereocystis*	NR[3]	6	tube worm mat

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-1

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
30	580	-17.5	Sand and silt	*Nereocystis*		2	tube worm mat
31	600	-19.5	Sand and silt	*Desmarestia, Nereocystis*		3	tube worm mat
32	620	-21.5	Sand and silt	*Gracilaria, Nereocystis*		5	tube worm mat
33	640	-22.5	Sand and silt	*Nereocystis*		1	tube worm mat
34	660	-24.5	Sand and silt	*Gracilaria*	10		
35	680	-25.5	Sand and silt	Gracilaria	5		

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble and gravel	*Ulva*	1	0	Top of vegetation line
2	20		Cobble and sand	*Ulva*	30	0	
3	40		Cobble and sand	*Ulva*	30	0	Anemones, *Anthopleura xanthogrammica*
4	60		Cobble	*Ulva, Fucus*	60	0	Anemones
5	80	Approx MLLW	Cobble	*Fucus, Ulva*	50	0	
6	100		Cobble and sand	*Fucus, Ulva, Mastocarpus*	60	0	Reference pt 3 at 103 feet
7	120		Sand		0	0	
8	140		Sand	*Mastocarpus, Ulva*	5	0	Bare sand
9	160	-2.2	Sand	periphyton	30	0	Bare sand
10	180	-2.7	Cobble and gravel	*Ulva, Odanthalia*	100	0	
11	200	-3.2	Cobble and gravel	*Ulva, Sargassum* (20%)	100	3	Inner margin of dense *Sargassum* band
12	220	-3.2	Cobble and gravel	*Ulva, Sargassum*	100	0	
13	240	-3.3	Cobble and gravel	*Ulva, Sargassum*	100	0	
14	260	-3.4	Cobble and gravel	*Ulva, Sargassum*	100	0	
15	280	-3.5	Cobble	*Laminaria saccharina, Fauchea*	100	2	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
16	300	-4.5	Cobble and sand	*Laminaria saccharina, Sargassum (10%)*	100	3 & 1	Outer margin of dense *Sargassum* band
17	320	-5.5	Cobble and sand	*Laminaria saccharina*	100	4	
18	340	-6.5	Sand and cobble	*Fauchea, micro*[2]	60	0	*Pisaster ochraceus*
19	360	-6.5	Cobble and silt	*Laminaria saccharina, Sargassum* (10%), *micro*	100	2 & 1	
20	380	-7.5	Cobble and silt	*Laminaria saccharina, Sargassum* (10%), *micro*	100	1 & 1	herring spawn on *Sargassum*
21	400	-8.5	Silt and cobble	*Laminaria saccharina, Sargassum* (10%), *micro*	60	1 & 1	
22	420	-9.5	Silt and cobble	*Laminaria saccharina, Fauchea*	80	2	
23	440	-11.5	Silt and cobble	*Laminaria saccharina, Fauchea, micro*	80	1	Helmut crab (*Telemessus cheiragonus)*
24	460	-12.5	Silt and cobble	*Laminaria saccharina, Fauchea*	80	1	Kelp crab (*Pugettia producta*) Pisaster brevispinus
25	480	-13.5	Silt and cobble	*Laminaria saccharina, micro*	80	2	
26	500	-14.5	Silt and cobble	*Laminaria saccharina*	100	3	
27	520	-15.5	Silt and cobble	*Laminaria saccharina*	100	2	Silt is mixed with shell
28	540	-16.5	Silt and cobble	*Laminaria saccharina*	100	3	*Pycnopodia helianthoides*

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-2

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
29	560	-17.5	Silt		0	0	young Nereocystis along transect
30	580	-18.5	Silt	*Gracilaria, Laminaria saccharina*	10	1	
31	600	-20.5	Silt	*Desmarestia, Gracilaria*	5		*Cancer magister*
32	620	-21.5	Silt	*Desmarestia*	1	1	mat of tube worms
33	640	-22.5	Silt	*Gracilaria, Laminaria saccharina, Desmarestia*	5	2	mat of tube worms
34	660	-24.5	Silt	*Gracilaria*	1		mat of tube worms
35	680	-25.5	Silt	*Gracilaria*	1		mat of tube worms

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T- 3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble	*Ulva*	10	0	Top of vegetation line
2	20		Cobble	*Ulva*	10	0	
3	40		Cobble	*Ulva*	40	0	Anemones, *Anthopleura xanthogrammica*
4	60		Cobble	*Ulva*	60	0	Anemones
5	80		Cobble and sand	*Fucus, Ulva*	70	0	
6	100	Approx MLLW	Cobble and sand	*Ulva, Fucus*	70	0	Reference pt 5 at 97 feet
7	120		Sand		0	0	Bare sand
8	140	-2.3	Sand	*Ulva, micro*[2]	20	0	Bare sand, waters edge at 12:50
9	160		Cobble and sand	*Ulva*	100	0	
10	180	-2.7	Cobble and sand	*Ulva*	100	0	
11	200	-3.0	Cobble and sand	*Ulva and Sargassum*	100	0	Inner margin of *Sargassum* band
12	220	-3.0	Cobble	*Sargassum, Ulva*	100		
13	240	-3.9	Cobble	*Sargassum* (20%), *Laminaria saccharina*	100	5 & 1	
14	260	-3.9	Gravel and cobble	*Laminaria saccharina, Ulva*	30	0	butter clam and cockle shells
15	280	-4.8	Cobble and sand	*Fauchea, Sargassum* (10%)	100	1	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T- 3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
16	300	-4.8	Cobble and sand	*micro, Sargassum* (10%)	100	1	Outer margin of dense Sargassum band
17	320	-4.7	Cobble and sand	*Laminaria saccharina, Fauchea, micro*	100	2	
18	340	-4.6	Cobble and sand	*Laminaria saccharina, Sargassum* (10%)	100	4 & 1	
19	360	-5.6	Cobble and sand	*Laminaria saccharina, Sargassum* (20%)	100	4 & 3	
20	380	-5.5	Sand and cobble	*Laminaria saccharina, Sargassum* (10%)	80	1 & 1	*Sargassum* starts
21	400	-6.5	Cobble	*Laminaria saccharina, Fauchea, Mazzaella*	100	2	
22	420	-7.4	Silt and cobble	*Laminaria saccharina, Fauchea*	100	2	
23	440	-8.4	Silt and cobble	*Laminaria saccharina*	100	4	*Pisaster ochraceus*
24	460	-9.3	Silt and cobble	*Laminaria saccharina*	100	4	*Pisaster brevispinus*
25	480	-10.3	Silt and cobble	*Laminaria saccharina*	100	3	Sand lance
26	500	-11.3	Silt	*Laminaria saccharina*	100	1	
27	520	-13.2	Silt	*Laminaria saccharina, Gracilaria*	20	3	*Pycnopodia helianthoides*
28	540	-14.2	Silt	*Desmarestia, Laminaria saccharina*	10	2	
29	560	-15.2	Silt	*Desmarestia, Gracilaria*	10	0	
30	580	-17.1	Silt	*Gracilaria, Desmarestia*	5	0	
31	600	-20.1	Silt	*Gracilaria*	5	0	Sea pens (*Ptilosarcus gurneyi*)

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T- 3

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
32	620	-21.0	Silt	*Gracilaria*	1	0	
33	640	-22.0	Silt	*Gracilaria*	1	0	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-4

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble	*Ulva*	10	0	Top of vegetation line
2	20		Cobble	*Ulva*	10	0	
3	40		Cobble	*Ulva, Fucus*	30	0	Anemones, *Anthopleura xanthogrammica*
4	60		Cobble	*Ulva, Fucus*	90	0	Anemones
5	80	Approx MLLW	Cobble	*Ulva, Fucus, micro*[2]	80	0	
6	100		Cobble and sand	*Ulva*	40	0	Reference pt 7 at 94 feet
7	120		Sand	None	0	0	Bare sand
8	140	-2.3	Sand	*Ulva, micro*	30	0	Bare sand, waters edge at 12:50
9	160		Cobble and sand	*Ulva*	100	0	
10	180	-2.7	Cobble and sand	*Ulva*	100	0	
11	200	-3.3	Cobble and sand	*Ulva and Sargassum* (20%)	100	0	Inner margin of *Sargassum* band at 186 feet
12	220	-3.8	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	80	3	
13	240	-4.9	Cobble and sand	*Fauchea, Laminaria saccharina*	50	5	
14	260	-5.9	Cobble and sand	*Fauchea, micro, Mastocarpus*	60	0	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-4

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-7.0	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	90	4	
16	300	-8.1	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	90	2	
17	320	-10.2	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	80	3	
18	340	-10.2	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	70	3	
19	360	-11.3	Cobble and sand	*Fauchea, Laminaria saccharina, micro*	80	2	
20	380	-12.4	Cobble and sand	*Laminaria saccharina, micro*	60	1	
21	400	-12.5	Cobble and sand	*Gracilaria, Laminaria saccharina, micro*	60	2	
22	420	-14.5	Silt and sand	*Gracilaria, Laminaria saccharina*	80	4	
23	440	-15.6	Silt and sand	*Laminaria saccharina*	80	5	
24	460	-16.7	Silt and sand	*Gracilaria, Desmarestia*	5	2	
25	480	-18.8	Silt and sand	*Gracilaria, Desmarestia*	10	3	
26	500	-20.8	Silt and sand	*Desmarestia*	5	3	
27	520	-21.9	Silt and sand	*Gracilaria*	5	0	
28	540	-24.0	Silt and sand	*Gracilaria, Desmarestia*	10	2	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-4

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
29	560	-25.1	Silt and sand	*Gracilaria*	5	0	
30	580	-26.2	Silt and sand	*Gracilaria*	10	0	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-5

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
1	0	approx +5	Cobble	*Ulva*	5	0	Top of vegetation line
2	20		Cobble	*Ulva*	20	0	
3	40		Cobble	*Ulva, Fucus*	25	0	Anemones, *Anthopleura xanthogrammica*
4	60		Cobble	*Fucus, Ulva, Mastocarpus*	40	0	Anemones
5	80	Approx MLLW	Cobble	*Ulva, Fucus*	90	0	
6	100		Sand	*Ulva*	5	0	Reference pt 7 at 94 feet
7	120		Sand		0	0	Bare sand
8	140	-2.2	Sand		0	0	Bare sand, waters edge at 12:50
9	160	-2.7	Cobble and sand	*Ulva*	100	0	
10	180	-2.8	Cobble and sand	*Ulva and Sargassum* (20%)	100	4	Inner margin of dense *Sargassum* band
11	200	-2.8	Cobble and sand	*Laminaria saccharina, Ulva, Mazzaella*	100	1	
12	220	-2.9	Cobble and sand	*Laminaria saccharina, Fauchea*	100	1	
13	240	-2.9	Cobble and sand	*Fauchea, Ulva, Mazzaella*	100	0	
14	260	-3.0	Cobble and sand	*Fauchea, Ulva*	100	0	

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-5

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
15	280	-3.0	Boulder	*Laminaria saccharina, Fauchea*	100	1	
16	300	-4.0	Cobble and sand	*Fauchea*	100	0	
17	320	-4.1	Cobble and sand	*Laminaria saccharina, Fauchea*	100	2	
18	340	-4.1	Cobble and sand	*Fauchea, Ulva, Mazzaella*	100	0	
19	360	-4.2	Cobble and sand	*Laminaria saccharina, Sargassum, Mazzaella*	100	3	
20	380	-4.2	Cobble and sand	*Fauchea, Sargassum*	100	2	
21	400	-5.3	Cobble and sand	*Laminaria saccharina*	100	4	
22	420	-5.3	Cobble and sand	*Fauchea, micro*	100	0	1500 tide=-0.7
23	440	-5.4	Cobble and sand	*Fauchea, Mastocarpus, Laminaria saccharina*	100	1	
24	460	-7.4	Cobble and sand	*Sargassum, Fauchea, micro*	100	4	
25	480	-8.5	Cobble and sand	*Fauchea, micro, Sargassum*	100	1	Outer edge *Sargassum*
26	500	-9.5	Cobble and sand	*Fauchea, Laminaria saccharina*	100	1	
27	520	-10.6	Cobble and sand	*Fauchea, Agarum fimbriatum, Laminaria saccharina*	100	3	
28	540	-12.6	Silt and cobble	*Fauchea*	80	0	
29	560	-12.7	Silt and cobble	*Laminaria saccharina*	100	3	*Pisaster ochraceus*

Submerged Marine Vegetation Diver Survey

Date: 6/3/2011

Transect: Area B, T-5

Station	Distance	Depth (MLLW)[1]	Substrate	Vegetation (Dominant/Subdominant)	Total % Cover	Holdfast Count	Incidental observations
30	580	-13.7	Silt and sand	*Laminaria saccharina, Gracilaria*	50	1	
31	600	-14.8	Silt and sand	*Gracilaria, Laminaria saccharina*	30	1	
32	620	-15.8	Silt and cobble	*Costaria costata*	30	2	
33	640	-16.9	Silt	*Desmarestia*	1	0	Tube worm mat start, flat fish
34	660	-18.9	Silt	*Costaria costata*	10	1	
35	680	-20.0	Silt	*Desmarestia*	1	0	*Cancer magister*
36	700	-22.0	Silt	*Gracilaria*	1	0	
37	720	-23.1	Silt	*Gracilaria, Laminaria saccharina, Nereocystis*	1	1 & 1	
38	740	-25.1	Silt	*Gracilaria*	1	0	
39	760	-26.2	Silt	*Gracilaria*	1	0	Tube worm mat

APPENDIX E

Epibenthic Invertebrate Species List

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This appendix provides a table summarizing incidental observations of epibenthic invertebrates as described in the text. The species provides the common name, genus, and species (if identified) of each taxa documented. An “x” indicates whether the taxa was observed in Area A, Area B, or both.

Epibenthic Invertebrate Species List

Common Name	**Scientific Name**		
INVERTEBRATES		**Area A**	**Area B**
Cniderians			
Giant green anemone	*Anthopleura xanthogrammica*		x
comb jelly	*Ctenophora*	x	
tube dwelling anemones	*Pachycerianthus fimbriatus*	x	
sea pens	*Ptilosarcus sp.*	x	
Orange sea pen	*Ptilosarcus gurneyi*	x	x
Frilled anemone	*Metridium senile*	x	
Arthropods			
ghost shrimp	*Callianassa californiensis*	x	
Dungeness crab	*Cancer magister*	x	*x*
Kelp crab	*Pugettia producta*		
shorecrab	*Hemigrapsus nudus*	x	*x*
Rock crab	*Cancer Productus*	x	
barnacle	*Balanus sp.*	x	
Helmet crab	*Telmessus cheirangonus*		x
Annedlida			
Tube worm	*Eudistylia sp.*		x
Echinoderms			
Sunflower star	*Pycnopodia helianthoides*	x	x
Short spined sea star	*Pisaster brevispinus*	x	x
Sunflower star	*Pycnopodia helianthoides*	x	
Ochre star	*Pisaster ochraceous*	x	x
Mollusks			
Unidentified whelk	Genus or species not identified	x	
Striped nudibranch	*Armina californica*	x	

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APPENDIX F

Representative Photographs of Dominant Benthic Invertebrate Fauna

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PHOTOGRAPHS OF DOMINANT TAXA

Photo 1. *Acila castrensis*

Photo 2. *Amphiodia urtica* (dorsal view)

Photo 3. *Amphiodia urtica* (dorsal view)

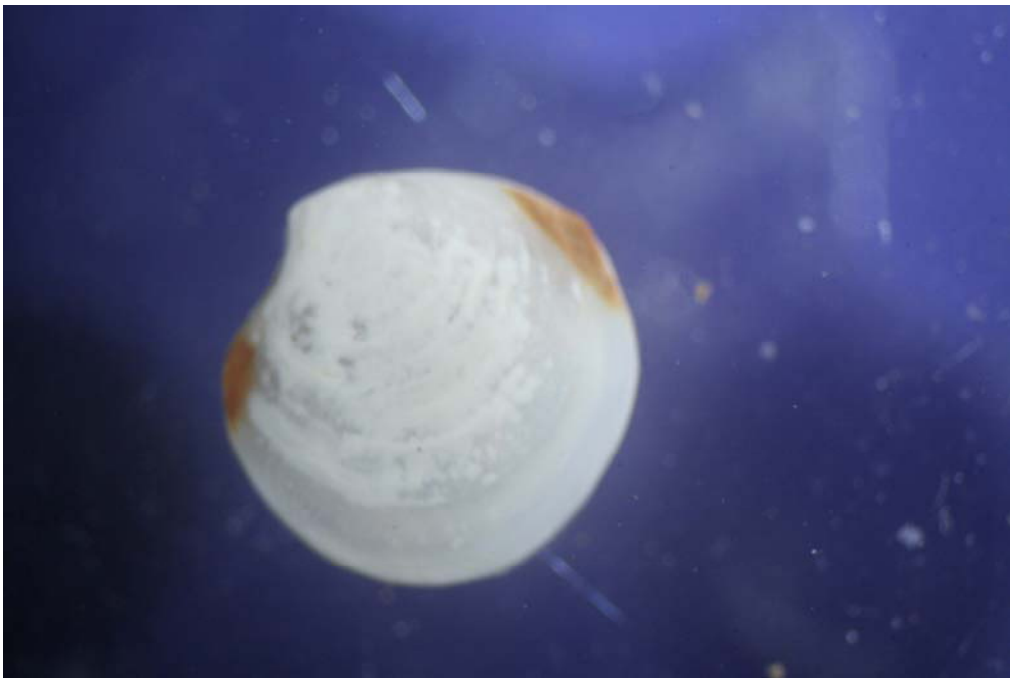

Photo 4. *Axinopsida serricata*

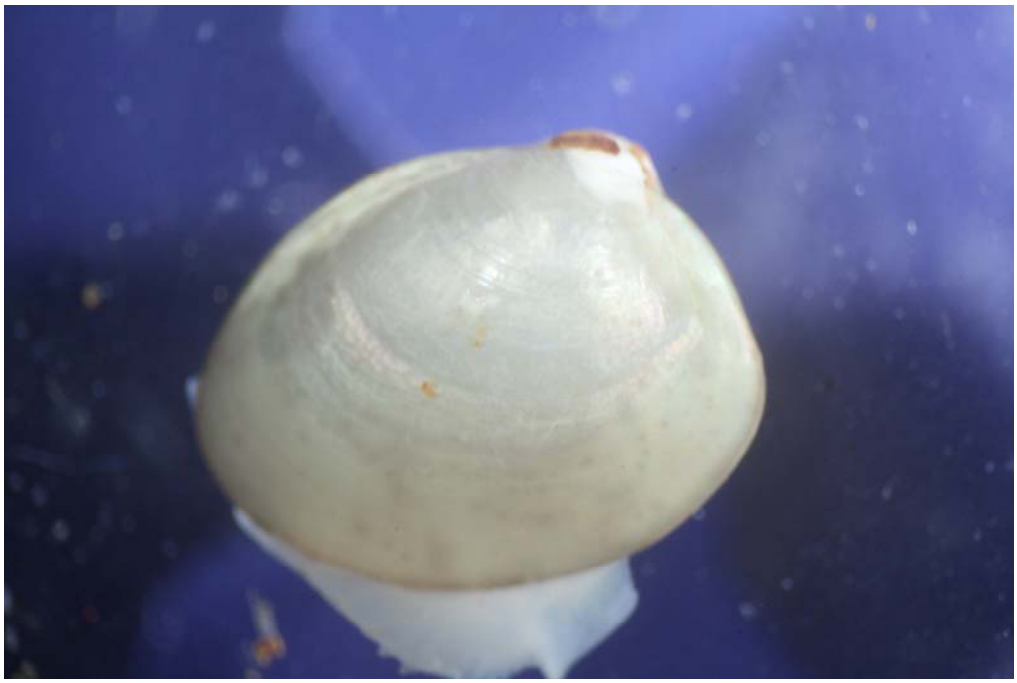

Photo 5. *Ennucula tenuis*

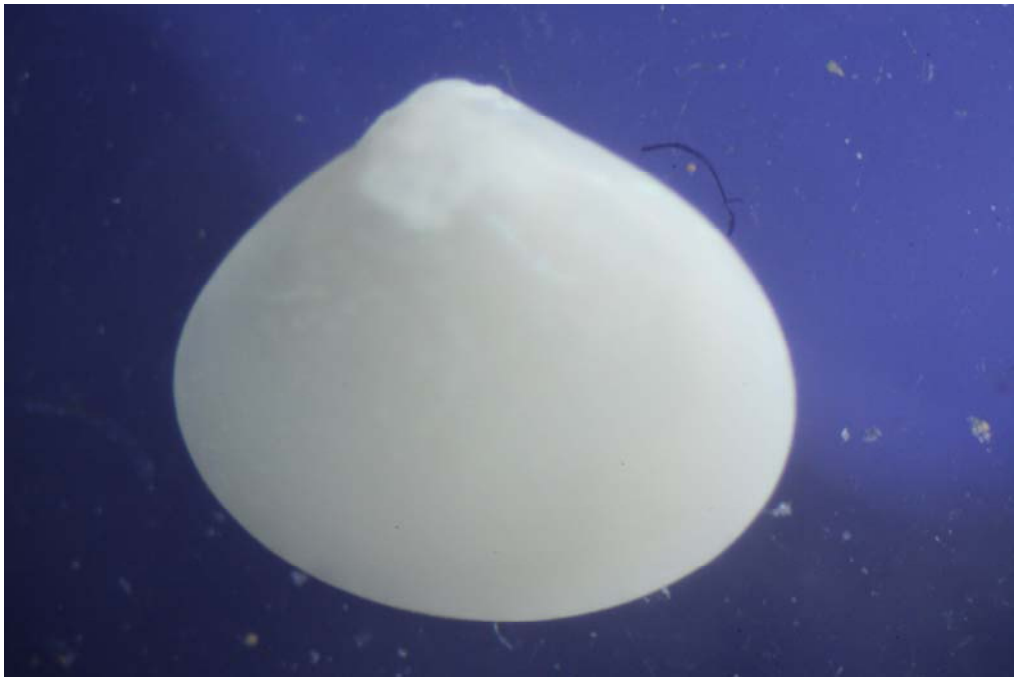

Photo 6. *Nutricola lordi*

Photo 7. *Rochefortia tumida*

APPENDIX G

Forage Fish Data Sheets

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SJC Forage Fish Spawning Surveys

Page ____ of ____

Reviewed By: _____

last high tide time	last high tide elevation	second effective high tide time	second effective high tide elevation
0359	8.16	20:00	9.58

Island: N/A

Date: day 01, month 07, year 2011

Beach Number	Sample Number	Time	latitude °	latitude '	latitude "	longitude °	longitude '	longitude "	beach	uplands	sample zone	sand mark	tidal elevation	smelt	sand lance	rock sole	herring	width	length	shading	comments
GPT	1	0945	48	51	22.359	122	43	50.498	5	1	90'	2		NONE				45'		1	no eggs in field
Ref	H	1103	48	51	15.703	122	43	32.734	2	1	9.5'	2						25'	C		no eggs left in field
Ref	L	1120		"			"		2	1	22'	2						25'			

Samplers: M. Gray T. Schwagger

Figure 9. Field data form used to record data associated with surf smelt and Pacific sand lance bulk sampling.

low: 06:15
1.45 ft.

high: 12:30
5.86 ft.

Water Time
9 AM: 3.5 ft
10 AM: 4 ft
11 AM: 5.5 ft.

SJC Forage Fish Spawning Surveys

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last high tide		second effective high tide	
23:01	9.77	1230	5.86
time	elevation	time	elevation

Island	day	month	year
N/A	08	07	2011

Beach Number	Sample Number	Time	latitude °	latitude '	latitude "	longitude °	longitude '	longitude "	beach	uplands	sample zone	land mark	tidal elevation	smelt	sand lance	rock sole	herring	width	length	shading	comments
SPF2	1	0912	48	51	22	122	43	50	5	1	10'	2						4.5		1	No eggs yet
SPF1	1	1000	48	51	16	122	43	32	2	1	9.5'	2		NONE				25'	C		in field
RCF2	2	1015	"	"	"	"	"	"	2	1	22'	2						25'			

Samplers: A. Gray T. Schwager

Figure 9. Field data form used to record data associated with surf smelt and Pacific sand lance bulk sampling.

last high tide: 0535 (time) | 7.47 (elevation)

second effective high tide: 1926 (time) | 8.91 (elevation)

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Island: N/A

Date: 14 (day) | 07 (month) | 2011 (year)

Tide @ sample time ~ 2.0

Beach Number	Sample Number	Time	latitude °	'	"	longitude °	'	"	beach	uplands	sample zone	land mark	tidal elevation	smelt	sand lance	rock sole	herring	width	length	shading	comments
GBT	1	1430	48	51	22	122	43	50	5	1	10'	2						4.5		1	IDU
Ref 1	H	1445	48	51	16	122	43	32	2	1	9.5'	2						2.5			No eggs in field
Ref 2	L	1450	48	51	160	122	43	32	2	1	2-2'	2		1				2.5			

Samplers: M. Gray, T. Schrager

Figure 9. Field data form used to record data associated with surf smelt and Pacific sand lance bulk sampling.

last high tide: 0134 (time) | 8.14 (elevation)

second effective high tide: 0931 (time) | -1.19 (elevation)

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Island: N/A

10 (day) | 08 (month) | 2011 (year)

Beach Number	Sample Number	Time	latitude °	latitude '	latitude "	longitude °	longitude '	longitude "	beach	uplands	sample zone	land mark	tidal elevation	smelt	sand lance	rock sole	herring	width	length	shading	comments
GPT	1	1300	48	51	22	122	43	50	5	1	13'	2									
Ref	11	1320	48	51	16	122	43	32	2	1	9.5'	2		Wrack							
Ref	L	1330	48	51	16	122	43	32	2	1	2.2'	2									No eggs ID'd during full inshore

Samplers: M. Gray, T. Schroeger

Figure 9. Field data form used to record data associated with surf smelt and Pacific sand lance bulk sampling.