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Thorndyke Conveyor Macrovegetation Survey Port Orchard, Washington

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Prepared for Fred Hill Materials

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CONTENTS

FIGURES

APPENDIX A
PHOTOGRAPHS

THORNDYKE CONVEYOR
MACROVEGETATION SURVEY
PORT ORCHARD, WASHINGTON

INTRODUCTION

Fred Hill Materials (FHM) proposes to construct and operate a conveyor system to transport aggregate materials from an existing sand and gravel site (the Shine Pit) located in Jefferson County to a marine loadout facility on the northwest shore of Hood Canal, approximately 3 miles south of the Hood Canal Bridge (Figure 1). During operation, the conveyor system will transport up to 4,000 tons of materials per hour to transport vessels docked at the marine loadout facility.

Construction and operation of the proposed facility will likely impact local areas of marine benthic habitat and species within the project area, with specific concerns centered on the existing eelgrass habitat present in the area (both *Zostera japonica* and *Z. marina*).

To identify these areas of potential impact, permitting agencies, primarily the Washington Department of Fish and Wildlife (WDFW), require a macrovegetation survey to evaluate potential eelgrass that may be present in the project area and thus subject to unavoidable impacts that may require mitigation. Macrovegetation within the project area was surveyed by geo-referenced video on August 8, 2001 and by divers on September 27, 2001 (Pentec 2003) but was out of date with respect to the recent proposal and did not include detailed mapping of the upper intertidal population of *Z. japonica*. As a result, the immediate proposed project area required a re-investigation of the existing macrovegetation, concentrating on eelgrass distribution in both the intertidal and subtidal elevations. A survey team consisting of a Pentec Environmental representative and Research Support Services, Inc. Sea-All™ team conducted this survey of the potentially affected area.

METHODS

The macrovegetation survey was subdivided into two parts, a low tide visual survey of the intertidal eelgrass (*Z. japonica*) using a handheld sub-meter differential global positioning system (DGPS) and a geo-referenced video transect survey documenting subtidal eelgrass (*Z. marina*) using the Sea-All™ system previously used in the original survey.

On August 28, 2007, we conducted the intertidal portion of the macrovegetation survey of the proposed project area for the Thorndyke conveyor using a highly modified version of an intermediate macrovegetation survey. Instead of sampling in discrete transects, we collected discrete patch shapes and sampled within several of the patches to determine eelgrass density. This method quantifies through direct measurement all of the eelgrass coverage and estimates density giving a much more robust data set, free of the heterogeneity of the samples often associated with random or transect sampling. Approximately 11.2 acres of proposed affected intertidal area was surveyed (Figure 2) using this method. The survey encompassed the area from +6 mean low lower water (MLLW) to –2 MLLW and extended laterally several hundred feet from the proposed centerline of the proposed conveyor alignment. GPS parameters were configured for maximum precision and the survey was performed on a clear day encompassing a minus tide. Eelgrass (*Z. japonica*) densities were estimated using a 0.01-m^2 quadrat randomly tossed within surveyed patches.

On September 28, 2007, the subtidal survey was completed covering approximately 14.2 acres with 32 transects approximately perpendicular to shore with one long transect paralleling the shore line as the depth *Z. marina* was most likely to colonize (Figure 2). The survey was conducted using the Sea-All™ underwater video mapping system, to view and record habitat and benthic substrates from the lower depth contours of the project area to approximately the –3- or +1-foot MLLW contours, depending on the transect. This was done to provide complete coverage of potential subtidal eelgrass/macroalgae habitat not observable from by the naked eye at the water surface. The system uses a combination of digital video, DGPS, program-based habitat characterization, and allows for on-board audio annotation and direct transfer of data in to an AutoCAD™ map.

SURVEY SYNOPSIS

Intertidal Results

The intertidal survey was performed during a falling tide from about 9:00 a.m. on August 28, 2007 and extended from the late ebb, through low tide (at approximately 11:21 a.m.), into the early flood tide. Weather conditions were generally calm with sunny skies. The following descriptions are taken in part from, and supplement the Pentec surveys in 2001 and 2002 (Pentec 2003).

Benthos and Macrovegetation

Intertidal substrate at the survey is composed of sand and silt likely originating from the bluff system along several miles of shoreline in either direction (Photograph 1). Wetlands are present, formed by seep water from sediment layers within the bluff and constrained by a significant storm berm made of coarser more gravel-laden material (Photograph 2). Along the high-tide drift line were scattered plants of *Atriplex patula, Salicornia virginica, Jaumea carnosa, Plantago maritima, Hordeum branchyantherum, Potentilla anserina,* and *Ambrosia chamissonis* (Photograph 3).

Where the lower edge of the beach face transitions to the sand flat, at low-tide seep water emerges to create shallow pools of standing water and eventually forms a channel that meanders across the flat. Patches of the green algae *Ulva* spp., *Ulva intestinalis*, and *U. linza* occurred in these fresh or brackish seeps along with scattered loose drift segments within the *Z. japonica*.

From +6 feet MLLW to 0-foot MLLW the sand flat supported scattered and discrete patches of *Z. japonica* (Photograph 4). Within each patch, shoots were very dense (Photograph 5) and fertile fronds were noted in patches located at lower elevations. Shoot-count densities of *Z. japonica* within representative patches ranged from 700 to 2,400 shoots per m^2. The mean density in all patches surveyed was 1,400 shoots per m^2. The band of *Z. japonica* patches tended to occupy the portion of the sandflat above the 0 MLLW mark and did not overlap with the more subtidal *Z. marina* population (Figure 2). *Z. japonica* is an introduced species that is known to occur throughout northern Puget Sound, although its distribution has not been well documented (Thom and Hallum 1990). This species of seagrass is thought to be an annual in Puget Sound, it is expected to be highly variable in space and time. This is especially true within the project area, where the advancing sand waves bury individual patches while new patches form in the lee of each wave.

Invertebrate Fauna

The benthos supported a low diversity invertebrate assemblage with areas of high abundance. Burrows of ghost shrimp (*Neotrypaea californiensis*) were abundant on the middle and upper portions of the flat. Associated with the ghost shrimp were the commensal bivalve *Cryptomya californica* and the polychaete *Nephtys* sp.

At the lower elevations on the sand flat, very high-density patches of sand dollars (*Dendraster excentricus*) tests (non-living) were found, primarily in shallow tidewater ponds and drainage channels. This is in contrast to the 2001 survey,

where high densities of live *D. excentricus* were documented. Occasional cockles, *Clinocardium nuttalli,* were also seen, and small holes of the burrowing polychaete *Nephtys* sp. were widespread. In shallow water along the shoreline and in the runoff channels, a few graceful crab (*Cancer gracilis*) were also present (Photograph 6).

Subtidal Results

The subtidal survey was conducted on September 28, 2007. Weather was mixed sun and clouds with variable wind gusts. The water column had an average visibility of 10 to 15 feet during the survey allowing full coverage to accurately document eelgrass and macroalgae in the project area.

Benthos and Macrovegetation

The subtidal substrate was primarily of sand with little silt. *Z. marina* was found to occur in a narrow band along the outer edge of the sandy beach as described from the intertidal survey. This band of eelgrass lay between –1-foot and –10 feet MLLW. The bottom along this depth contour had a moderate slope of approximately 3:1. The survey transects were aligned to be roughly perpendicular to the shoreline in order to cover as much of the depth gradient as possible during the survey. The eelgrass tended to occur in scattered sparse patches that were surrounded with large areas of bare sand. Densities could not be definitively calculated from video data, but estimates ranged from 2 to 25 shoots per m^2. In general, more patches and increased coverage were observed towards the northern portion of the study area (i.e., north of the proposed conveyor centerline; Figure 2), but much reduced from the original survey performed in 2001. In general, eelgrass health appeared poor with sparse densities and obvious stress due to macroalgal entanglement (see below).

Large amounts of drift macroalgae were recorded in the area. This drift algae was often noted as being entangled in the existing eelgrass to the point that a majority of the biomass in the seagrass patch was made up of the drift algae. Very little attached macroalgae was noted and was primarily *Ulva* spp., *Ulva intestinalis,* and *U. linza* that were noted in the intertidal survey. Diatoms mats were observed over most of the survey area.

Invertebrate Fauna

Large mobile invertebrates tended to be very sparse and often associated with the eelgrass patches. Invertebrates seen included the large pink sea star (*Pisaster brevispinus*), egg cases from a moon snail *(P. lewisii*), crabs represented by

Dungeness *(Cancer magister)*, graceful *(C. gracilis)*, and the kelp crab *(Pugettia producta)*.

Vertebrate Fauna

Fish were observed at several subtidal locations throughout the survey area. The fish most often encountered during the survey were juvenile and sub-adult starry flounder (*Platichthyes stellatus*) and rock sole (*Pleuronectes bilineatus*) in the unvegetated areas between the *Z. japonica* and *Z. marina* patches. There were several small, unidentified sculpins associated with the *Z. marina* patches.

Anthropogenic Impacts

Minimal debris and anthropogenic impact was observed during the survey. The only obvious example was the presence miscellaneous plastic debris and containers in upper intertidal as well as the occasional Olympia oyster (*Ostrea conchaphila;* aka *O. lurida*) culture bag (Photograph 7) with attached ballast. This area is relatively undeveloped and reflects minimal direct human influence in the area.

CONCLUSIONS AND SUMMARY

We observed a fairly healthy population of *Z. japonica* in the intertidal and what appeared to be distressed population of *Z. marina* that is declining and in poor health.

We documented the extent of *Z. japonica* in the project area with sub-meter accuracy and shows typical patch dynamics for the species. Compared to the 2001 survey data, the population seems to be increasing in density (27 percent increase) and possibly increasing in extent, as patch coverage seemed much higher (nearly 40 percent) than the qualitative 25 percent reported in the previous survey.

In 2007, *Z. marina* seemed to be declining relative to 2001 survey data. The number of patches in the video transects had greatly declined and in-patch shoot density had decreased between 50 and 90 percent over the survey area relative to 2001 data (Pentec 2003). These results are consistent with Washington Department of Natural Resources (DNR) data for submerged aquatic vegetation for the area (DNR 2007 and DNR personal communication); DNR has recorded large-scale seagrass disappearance in the area and attributed those declines to non-point source impacts (DNR 2007) and the general susceptibility of *Z. marina* habitat to disturbance in Hood Canal (i.e., fringe habitat effects; Koch 2001).

If you have any questions regarding this report, please do not hesitate to call Jason Stutes at (425) 329-1163 or Jon Houghton at (425) 329-1150.

REFERENCES

DNR (Washington State Department of Natural Resources), 2007. Puget Sound Submerged Vegetation Monitoring Project 2005 Monitoring Report. Nearshore Habitat Program, Aquatic Resources Division. Olympia, Washington.

Koch, E.W., 2001. Beyond Light: Physical, Geological, and Geochemical Parameters as Possible Submersed Aquatic Vegetation Habitat Requirements. *Estuaries* 24:1-17.

Pentec, 2003. Thorndyke Resource Operations Complex, Central Conveyor and Pier Biological Evaluation. Prepared for Reid Middleton.

Thom. R., and L. Hallum, 1990. Compilation and Characterization of Puget Sound Nearshore and Estuarine Wetland Habitat. U.S. Environmental Protection Agency, EPA 910/9-91-005, Seattle, Washington.

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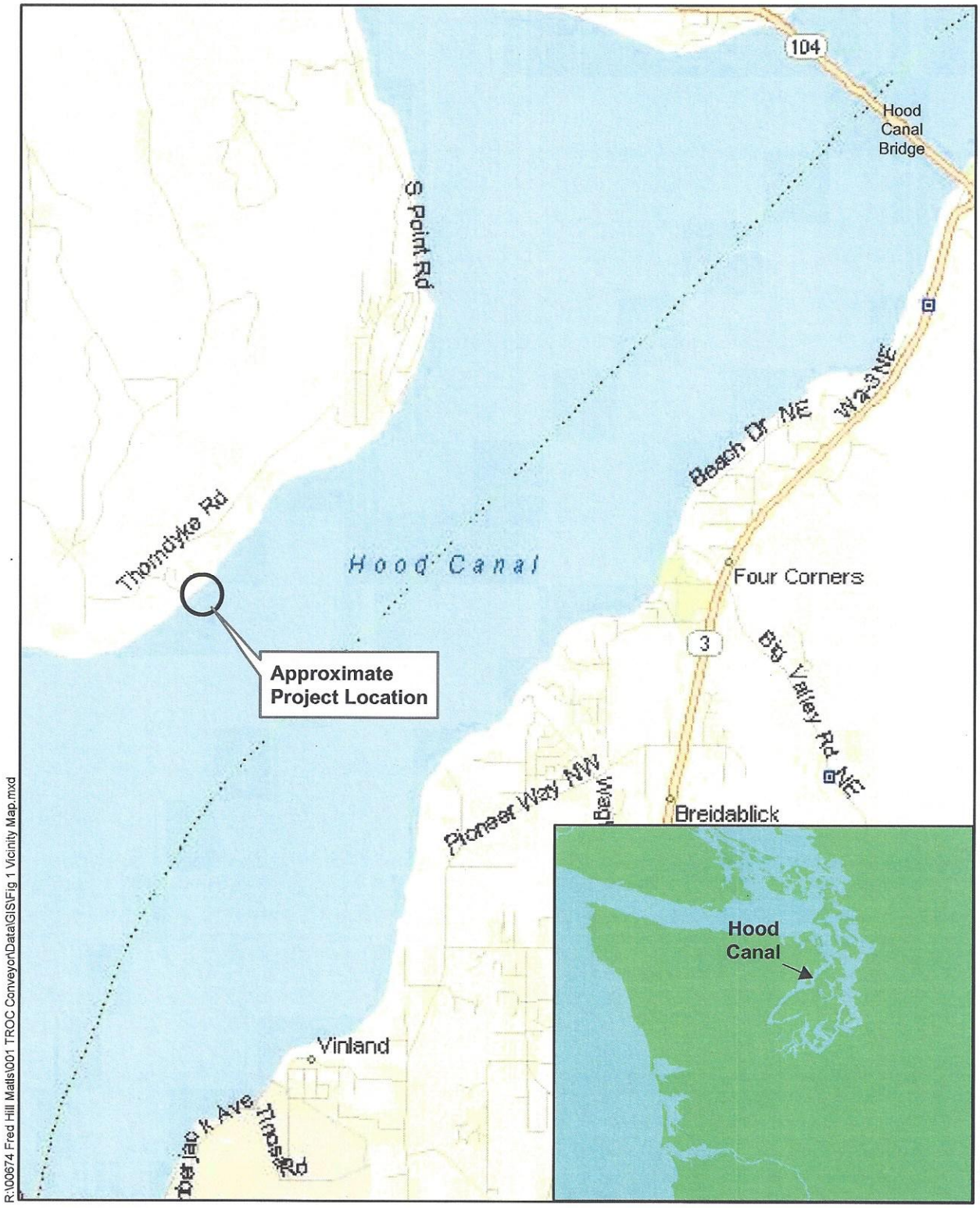
Thorndyke Bay Vicinity and Location Map



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Note: Map prepared from Microsoft Streets and Trips, 2007.

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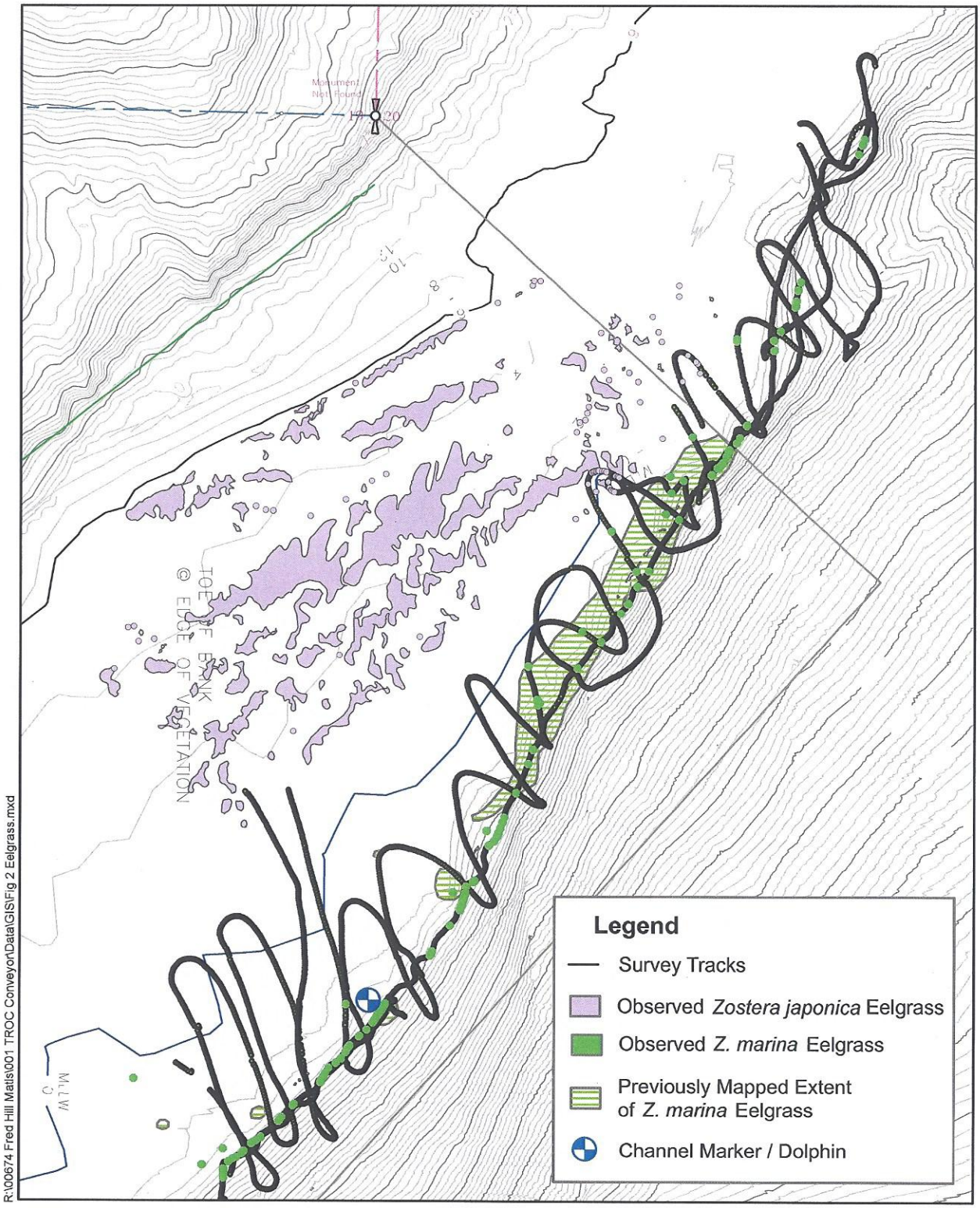
Figure 1

Thorndyke Bay Eelgrass Survey



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Note: Background ACAD file provided by Reid Middleton, Inc.

0 125 250 500 Feet

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Figure 2

Photograph 1 - Survey area with varied substrate originating from bluff system upshore.

Photograph 2 - Wetlands formed by seep water from sediment layers within the bluff and constrained by a significant storm berm made of coarser more gravel-laden material.

Photograph 3 - High-tide drift line composed of storm berm, large woody debris, and scattered plants (*Atriplex patula, Salicornia virginica, Jaumea carnosa, Plantago maritima, Hordeum branchyantherum, Potentilla ansirena,* and *Ambrosia chamissonis).*

Photograph 4 - Intertidal survey area with patchy *Z. japonica*.

Photograph 5 - *Z. japonica* patch density.

Photograph 6 - Graceful rock crab (*Cancer gracilis*) in the intertidal survey area.

Photograph 7 - Olympic Oyster (*Ostrea concaphila*) culture bag with attached ballast.