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NOAA NATIONAL STATUS & TRENDS

MUSSEL WATCH PROGRAM

Mussel Watch Site Descriptions and Sampling Procedures for Washington State

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NOAA Technical Memorandum NOS NCCOS 106

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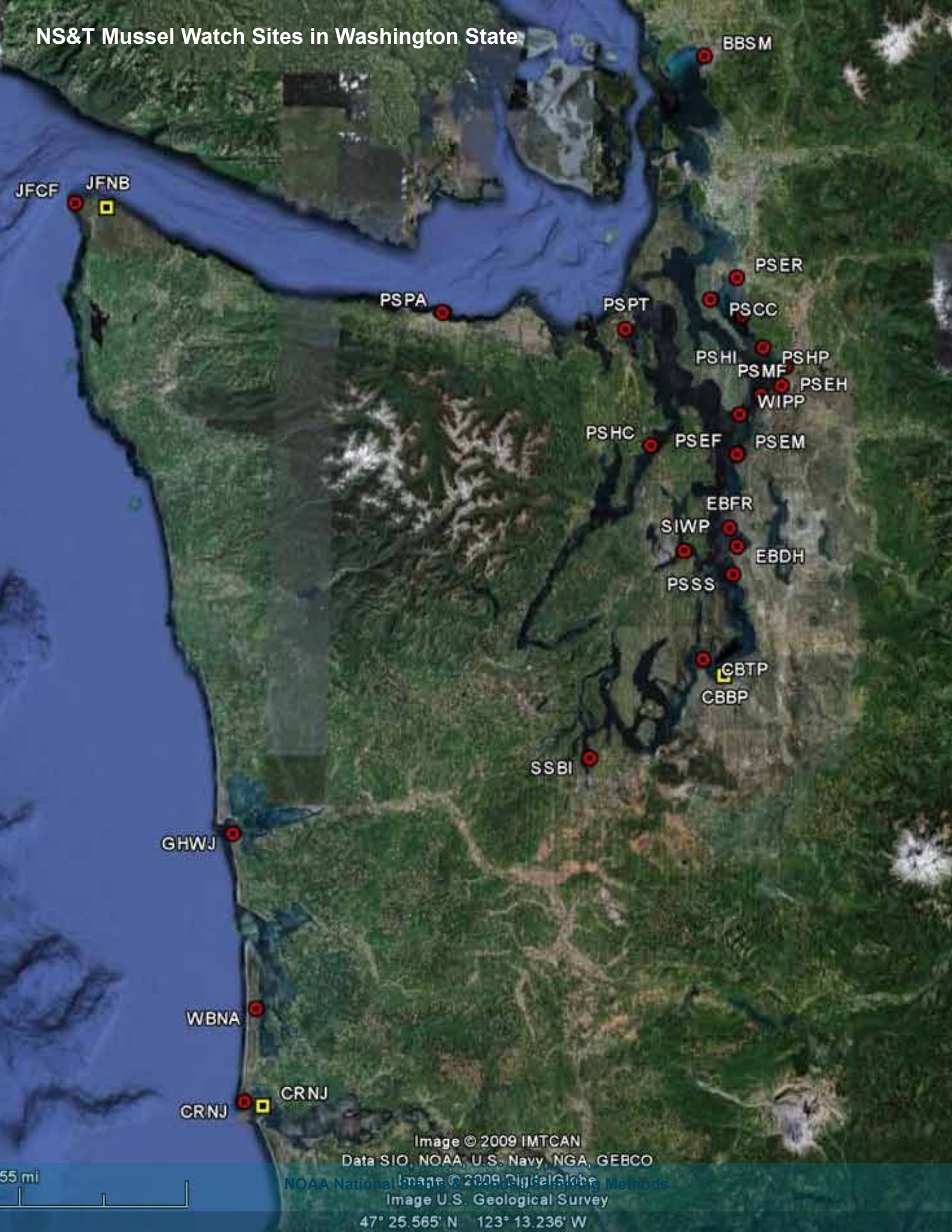
NS&T Mussel Watch Sites in Washington State
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CRNJ
Image © 2009 IMTCAN
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2009 DigitalGlobe
Image U.S. Geological Survey
47° 25.565' N 123° 13.236' W
55 mi
NOAA National Status & Trends Sampling Methods

Overview

National Status and Trends (NS&T) Mussel Watch Program provides status of and temporal trends of coastal contaminant conditions. Sediments and bivalve tissue are analyzed for a suite of about 130 legacy and emerging chemicals of concern. In addition, bivalve tissue is assessed for histopathology and gonadal index. The Program's data, metadata and information products are managed within the guidance provided by NOAA's Integrated Ocean Observing System (IOOS) and the National Monitoring Network, as recommended by the 2004 Ocean Action Plan. This document describes the Standard Operating Procedure (SOP) for mussel collections in Washington State. For more detail on the collection protocols see Apeti, et. al. 2012. Since 1986, Mussel Watch has established about 300 sites nationwide and 28 of these are in Washington State (Table 1). Site descriptions can be found in Appendix 1.

Acknowledgements

The Mussel Watch Team would like to thank those who through their hard work made this make our work possible. As a result of their efforts, Mussel Watch has been greatly enhanced.

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Table 1A. Table of Mussel Watch monitoring sites in Washington State, showing target sampling date.

Site	General location	Specific location	Latitude	Longitude	Target Date
BBSM	Bellingham Bay	Squalicum Jettty	48° 45.130'	122° 29.870'	9-Jan
CBTP	Commencement Bay	Tahlequah Point	47° 19.855’	122° 30.262’	11-Dec
CRNJ	Columbia River	North Jetty	46° 16.670'	124° 03.730'	5-Feb
EBDH	Elliott Bay	Duwamish Head	47° 35.750'	122° 23.300'	9-Jan
EBFR	Elliott Bay	Four-Mile Rock	47° 38.330'	122° 24.830'	11-Dec
GHWJ	Gray's Harbor	Westport Jetty	46° 54.747’	124° 7.047’	21-Feb
JFCF	Strait of Juan de Fuca	Cape Flattery	48° 23.043'	124° 43.598'	3-Mar
PRPR	Point Roberts	Point Roberts	48° 59.420'	123° 05.300'	10-Jan
PSCC	Puget Sound	Cavalero County Park	48° 10.514'	122° 28.701'	22-Dec
PSEC	Puget Sound	Everett Cemex	48° 1.016'	122° 12.967'	22-Dec
PSEF	Puget Sound	Edmonds Ferry	47° 48.839’	122° 22.937'	22-Dec
PSEH	Puget Sound	Everett Harbor	47° 58.360'	122° 13.820'	9-Jan
PSEM	Puget Sound	Edmonds Marina	47° 48.665‘	122° 23.288‘	21-Dec
PSER	Puget Sound	Eide Road	48° 13.617'	122° 23.139'	20-Dec
PSHC	Puget Sound	Hood Canal	47° 49.910'	122° 41.300'	8-Jan
PSHI	Puget Sound	Hat Island	48° 34.360’	122° 19.330’	22-Dec
PSHP	Puget Sound	Hermosa Point	48° 03.688’	122° 17.612’	21-Dec
PSKP	Port Susan	Kayak Point	48° 8.205’	122° 22.037’	21-Dec
PSMF	Puget Sound	Mukilteo	47° 56.981’	122° 18.095’	21-Dec
PSPA	Puget Sound	Port Angeles	48° 08.380'	123° 25.210'	8-Jan

Table 1A cont'd. Table of Mussel Watch monitoring sites in Washington State, showing target sampling date.

PSPT	Puget Sound	Port Townsend	48° 06.280'	122° 46.680'	8-Jan
PSSS	Puget Sound	South Seattle	47° 31.796'	122° 24.094'	11-Dec
SIWP	Sinclair Inlet	Waterman Point	47° 35.110'	122° 34.250'	11-Dec
SSBI	South Puget Sound	Budd Inlet	47° 5.952'	122° 53.685'	5-Jan
WBNA	Willapa Bay	Nahcotta	46° 29.950'	124° 01.630'	6-Feb
WIPP	Whidbey Island	Possession Point	47° 54.320'	122° 22.620'	11-Dec

Table 1B. Table of Mussel Watch sediment sites in Washington State indicating site locations and dates.

Site	General location	Specific location	Latitude	Longitude	Target Date
CBBP	Commencement Bay	Browns Point	47° 17.59'	122° 25.99'	9-Jan
JFNB	Strait of Juan de Fuca	Neah Bay	48° 22.46'	124° 36.96'	5-Feb

Standard Operating Procedure (SOP)
for
NOAA NS&T Bivalve Collection and Shipment

Method Summary

Successful and efficient Mussel Watch sampling first and foremost requires careful planning and preparation. Field teams must be competent in their ability to navigate precisely to the sampling site (use GPS), by the appropriate means (auto, boat, plane, on foot), at the precise time (usually low tide), with the proper equipment, return safely with samples that have been carefully protected from deterioration and contamination, then properly ship the samples to laboratories with documentation. For more detailed information see Lauenstein, et. al. 1997 and Apeti, et. al. 2012.

Mussel Watch sites vary in regards to their accessibility, and mode of sampling. Therefore, knowledge of existing site description and accessibility is essential condition prior to conducting sampling. Mussel Watch sites are assigned target latitude and longitude coordinates. Field crews should use GPS to locate sites and report the actual sampling coordinates with each site visit. Collection date and time should be selected to meet the target date and tide criteria. Collections should be within 3 weeks of the target collection date (Table 1).

For intertidal sites the time must correspond to a tidal stage when bivalves are easily accessible. Height of collection (above the water level at the time of collection) and height of the highest bivalve distribution is information to be recorded at the time of collection.

Federal and state sampling permits, or permission access to private property may take

Mytilus galloprovincialis/trossullus (top) and *Mytilus californianus* (bottom)

weeks to obtain. The process should begin six to eight weeks prior to the desired start date. This is also the time to begin communication with the Mussel Watch Program Staff and the laboratories that will be receiving the samples (Appendix 2) and provide them with a list of where (site codes and site names) and when (date and low tide prediction) the field team plans to sample. The 28 Mussel Watch sites in Washington State are described in detail in Appendix 1.

Mytilus galloprovincialis/trossullus and *Mytilus californianus* are typically found at Mussel Watch sites in Washington State. Either species is acceptable for use. Permit requests should specify both species.

1. Planning and Preparation

This section lists tasks that should be accomplish prior to entering the field. When sampling begins the field team should communicate with the Program Manager on a daily basis or other previously agreed upon schedule. Clear and timely communication with Mussel Watch staff and laboratories receiving the samples are critical.

Deviations from the SOP are sometimes necessary but approval from the Program Manager should be obtained prior to sampling. If prior approval is not possible, notification of Program staff should be done as soon as possible. In every case, changes in sampling procedures or location must be clearly documented by the field crew.

1.1 Four to eight weeks prior to entering the field:

- Contact NOAA staff and identify sites to be sampled (Appendix 2);
- Review the site descriptions (Appendix 1);
- Prepare a sampling schedule based on tide prediction tables.
- Travel time between stations and mode of transportation (ferry schedules, or boat support)
- Site access considerations (e.g., private property, boat support requirements, etc.)
- Staff and experience level, training and procedure review
- Communications (cell phone, marine radio, other)
- Request sampling permits and/or permission to access private property (Appendix 2).
- Order necessary equipment and supplies; review instrument operating procedures and calibration, and confirm equipment is operating correctly (Table 2)
- Contact laboratories that will be receiving the samples or doing the analyses and provide them your tentative sampling schedule (Appendix 2). Confirm their availability to receive samples.

Table 2. Equipment and Supplies List.

Item	Quantity	Description
ELECTRONIC EQUIPMENT		
Handheld GPS	1 plus a backup	Set datum to NAD83 (NOAA chart standard); become familiar with operation of GPS.
Water Quality Meter	1 plus a backup	To measure salinity, water temperature, dissolved oxygen.
Digital Camera	1 plus backup	To document site visits
SAMPLING & SHIPPING SUPPLIES		
Clam rake, epibenthic dredge or other appropriate bivalve collecting equipment	1 plus backup	Some sites may require a rake or dredge to sample bivalves.
Gloves, Kevlar	2 pair / person	For protection when removing bivalve from substrate.
Gloves, nitrile (unpowdered)	2 pair / person / site	To protect samples from contamination when sorting.
Data Sheets	As needed	
Chain of Custody forms	As needed	
1 gallon Ziploc bags	1 box / 5 sites	
Clipboard (with paper storage)	1	
Sharpies	2 boxes	Regular tip for labelling sample bags and fine tip for data sheets
Ball Point Pens	1 box	For filling out shipping forms (air bills)
1 inch wide trapping tape	1 roll / 5 sites	Nylon reinforced tape to keep cooler lids from opening during shipping.

Table 2 cont'd. Equipment and Supplies List.

28 Qt Cooler	1 per 5 sites	Note this size typically does not have a drain port and is used for shipping bivalves to chemistry lab. Other sizes may be used but drain ports must be sealed shut.
16 Qt Cooler	1 per 5 sites	Note this size typically does not have a drain port and is used for shipping bivalves to histopathology lab. Other sizes may be used but drain ports must be sealed shut.
48 Qt Cooler	1 or 2	With drain port. Used for storing samples on ice (drain port open to allow melt water to drain) pending transfer to shipping coolers.
Shipping labels	2 per 5 sites	One air bill label per shipping cooler.
Paper towels	1 roll / 5 sites	
Water ice	As needed	Minimum 10 lbs per 28 quart shipping cooler
Blue ice gel	As needed	Can be substituted for water ice if necessary.
Road Maps	As needed	
NOAA charts	As needed	

1.2 Planning Resources:

Tide predictions: http://tidesandcurrents.noaa.gov/tide_predictions.shtml
Weather forecast: http://www.wrh.noaa.gov/sew/
Google Earth: KML file from NOAA staff.

2. Sampling Method

2.1 Personal Safety

Coastal environments can be dangerous and unpredictable; exercise due caution.

- Do not sample alone. Use a minimum of two people; three is preferable.
- Wear appropriate clothing for thermal and water protection. "Cold Water Kills." Review coldwater safety prior to entering the field.
- Be alert to breaking waves; use a spotter with a throw line; wear a PFD if appropriate.
- Avoid falls; wet rocks and logs are slippery.
- Wear gloves: protect hands from cuts (Kevlar) and samples from contamination (nitrile).

Field teams should use good judgment and not risk their personal safety when conditions pose undue risk. Abandon the site and return when conditions improve.

2.2 Site location and documentation

Use a handheld GPS (NAD83 datum) to navigate to the sampling site. Sample are to be collected at three locations, however, only information of the initial site (center) should be recorded. This should includes site name, Lat/Long, depth, Time/Date, weather event, Station condition (floating trash, surface oil sheens, buoy markers, etc.), photographs of the site, etc. A sample data sheet is provided in Appendix 3.

2.3 Water Quality and Site Description

Use a water quality meter (e.g., YSI or Hydrolab) to measure and record salinity, water temperature, and dissolved oxygen. All field equipment should be tested and calibrated as required by the manufacturer weeks in advance of entering the field. A detailed account of field-QC check and calibration of instruments customarily utilized during Mussel Watch field work (e.g. YSI, Hydrolab or similar meter) is described in the EMAP Quality Assurance Plan (EPA, 2001). All field-QC check procedures must be appropriately documented including dates and name of the person conducting the procedures.

Salinity	± 1.0ppt	10%	100%
Water Depth	± 0.5 m	10%	100%
Temperature	± 1.0 degrees Celsius	10%	100%
Secchi depth	Not applicable	10%	100%

Measurement quality objectives for NOAA's Mussel Watch Program Water Column Indicators

Height of collection refers to the height above the water level at the time of collection. Estimate the "height of collection" as being the height above the water level at which mussels are available for collection. For example if samples are collected three feet above the water level sample height is indicated as 3 or if samples are collected at water level, the height of collection is 0. The other value is height of highest access. For example, bivalves are at current water level, but you note that they are available up the intertidal zone (the vertical extent which is washed by the tides) all the way up to approximately 6 feet above the current water level, then the Highest Access is 6 feet. On the other hand if collection was conducted at water level of 0 feet, but there were no other bivalve beds, the Height of Highest Access in this instance is also 0 feet. Access in this instance is also 0 feet. By correlation with time of collection and a graphical depiction of the tide, the tide stage can be determined (and hence time for future collections) when specimen are expected to be accessible.

2.4 Bivalve Collection

2.4.1 Existing Mussel Watch Sites

Specimen can be collected by snorkeling or scuba diving, dredging or hand. Protective gloves (Kevlar) should be worn to protect hands from cuts. Samples should be double bagged in Ziploc bags and placed in a cooler with water ice.

At each Mussel Watch site, bivalve samples should be collected from three different stations to constitute the site composite sample. However, when new sites are established, samples from the 3 unique stations are analyzed separately.

It may not be possible or practical to delimit three separate stations at each site. In such a case, the collection could be made without distinction, but the "picking" should be separated into three based on relative spatial distance. The purpose of this is to avoid sampling a single non-representative "clump" of bivalves. Depending on the region, littoral zone (subtidal, intertidal), and depth, sampling techniques differ. Bivalves may be handpicked at low tide in intertidal zones, hand collected by diving (SCUBA or snorkeling) or dredged at site located in the subtidal zones.

At each Mussel Watch site, bivalve samples should be collected from three different stations to constitute the site composite sample. Collect approximately 80 - 160 bivalves depending on size. The optimal size for *Mytilus* is 5 – 8 cm (2 – 3 ¼ inches) or about 80 mussels from a sampling site (20 for histology and 60 for tissue analysis). The 20 bivalve for histology (minimum number needed) is always fixed but the remaining number of bivalves will vary depending on their size. If bivalves are about 1 cm (< ½ inch), collect 160 maximum. Sixty is the minimum number of bivalves needed for the standard analyte suite of analyses. Separate locations or stations into individual plastic bags and label accordingly (i.e., A, B, C). Note GPS coordinate for each location.

A cooler of adequate size should be brought into the field that can hold all the samples, before they are sorted and packaged for shipping. This cooler should contain ice that is kept separate from the samples. The samples should be placed on water ice immediately after collection and

should arrive cold at the laboratory. It is especially important that samples for histopathology and gonadal index not be allowed to freeze as these bivalves must arrive at the laboratory alive.

- Avoid contamination of samples from oil, fuel, pesticide, PCBs, exhaust fumes, flaking or rusty metal.
- Avoid collection of samples on other than natural substrates. Untreated concrete and nature rock used for breakwaters are acceptable.
- The specimens' shells should be thoroughly rinsed in water at the site to remove mud and debris which are sources of contamination of the tissues inside.
- Sample bags should be properly labeled to indicate site code and collection date.

2.4.2 Establishing a New Mussel Watch Site

When a new site is established, samples from the 3 unique stations are analyzed separately. For intertidal sites this would be three locations along 100 m of shoreline. For subtidal sites this would be three stations in a 400 m (radius) area. It may not be possible or practical to collect three separate stations at a new site. In such a case, the collection could be made without distinction, but the "picking" should be separated into three based on relative spatial distance. The purpose of this is to avoid sampling a single non-representative "clump" of bivalves.

3. Field Documentation

Document collection information (site, date, time, temperature, coordinates), check that salinity has been collected and record any relevant comments (dangers that should be noted by subsequent field teams). All Mussel Watch sites must be described with the following information: latitude, longitude, datum, written descriptions of how to reach newly established site, and photographs. It is equally important to accurately determine the "center of each bivalve site" (if not coincident with the bivalve site) so that valid comparisons can be made spatially among sites and temporally within each site. Field crews will use GPS to locate sites and report latitude, and longitude to the nearest 0.000001 decimal degrees along with the appropriate datum (e.g. NAD83).

4. Sample Holding

Bivalves can survive for many days if the conditions are properly maintained. Double bagged samples of bivalve stored in coolers filled with water ice works very well provided melt water is allowed to drain. Do not allow bagged samples of bivalves to site in melt water. Check coolers regularly for excessive melt water; drain and replenish with water ice as needed. Do NOT allow bivalves to freeze. Use extra caution when ambient air temperatures drop below freezing; ensure iced samples do not get too cold. This is especially important for samples that will be analyzed for histopathology/gondal index.

Try to ship samples within 24 to 48 hrs of collection. However, experience has shown that it is better to hold bivalve samples as described above over weekends or holidays rather than risk shipping on a Friday with a Saturday delivery.

5. Sample Packing and Shipping Procedures

"Sample shipping conditions" are the same as "sample holding conditions" described above with the exception that water ice is double bagged in Ziploc bags to ensure that the melt water is retained and unable to contact the sample bags or to leak from the cooler. If cooler have drain ports tape them shut.

5.1 Packing Samples

Separate the double bagged bivalve samples for chemical analysis from those for histopathology/gonadal index and place in separate shipping coolers. Coolers that are 48 qt size or smaller may be used for shipping. However, coolers that are 28 Qt (or smaller) are best as these coolers typically do not have drain ports and can be easily handled by one person. Completely fill the entire volume of the cooler with a combination of samples and ice. This will help to minimize sample movement. Water ice should account for at least one-third of the cooler's volume (about 10 lbs of ice for a 28 qt cooler). Gel packs may be substituted for water ice but should account for one-half the cooler volume.

Use the Chain-of-Custody form (a multi-copy form) to inventory the samples as they are placed into a shipping cooler. This process is easier and faster when done with two people; one recording and the other handling the samples.

5.2 Shipping

Before sealing the shipping cooler place a copy of the chain-of-custody form in a Ziploc bag and tape it to the inside of the cooler lid. Retain a copy for your records.

- Use nylon reinforced strapping tape to securely fasten the cooler lids shut and prevent them from opening when dropped (Figure 2). Wrap tape completely around the cooler (top, sides, and bottom) twice so that the tape covers itself. Repeat on the other half of the cooler.
- Attach the courier's air bill to the top of the cooler. Be sure to include cell phone numbers of people in the field (shipper) and the lab (receiver).
- Deliver shipping coolers to an overnight courier office or authorized agent. Do not leave the shipping coolers at a drop box or a location which is not an authorized agent.

Packaging Mussel Watch Samples for Shipment

1. Bagged ice on bottom with label laid on ice. Site label and salinity vial with samples.

2. Drained, bagged samples

3. Bagged samples layered between bag of ice.

4. Bagged ice on top. Fill void with more ice.

5. Three address labels.

6. Sealed with at least two bands of (3 wraps each) fiber tape, and 1 band wide clear tape wide clear tape. Airbill and tag affixed to chest with fiber tape, not handle.

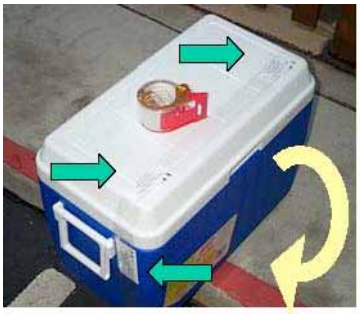

Figure 2. Illustration showing packaging and labeling Mussel Watch samples for shipping.

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Columbia River, North Jetty (CRNJ)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 266

NOMINAL SITE CENTER - 46° 16.67' N 124° 03.73' W

SEDIMENT SITE CENTER - 46° 16.15' N 123° 59.92' W

LOCATED ON NOAA CHART - 18521

SITE ACCESS - Access is at the end of the road in Fort Canby State Park.

SITE DESCRIPTION - Mussels are collected on the rocks forming the north jetty located in the Fort Canby State Park camping area.
This sediment site is located in Baker's Bay on the north side of the Columbia River mouth. Access is by boat from the boat basin in Ilwaco. A sling launch is available year-round at the Port of Ilwaco facilities. From the boat basin, take the navigation channel south and enter the river mouth proper. Enter Baker's Bay from the south tip of Sand Island and locate the tower just inside the mouth of Baker's Bay. Note that entry to Baker's Bay must be made on a high and flooding tide due to the shallowness of the bay.

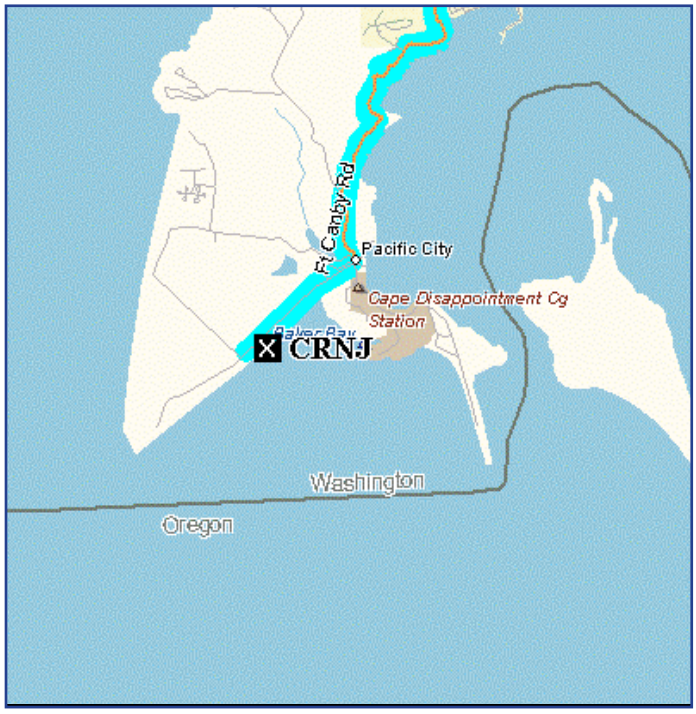
SEDIMENT COLLECTIONS - N/A

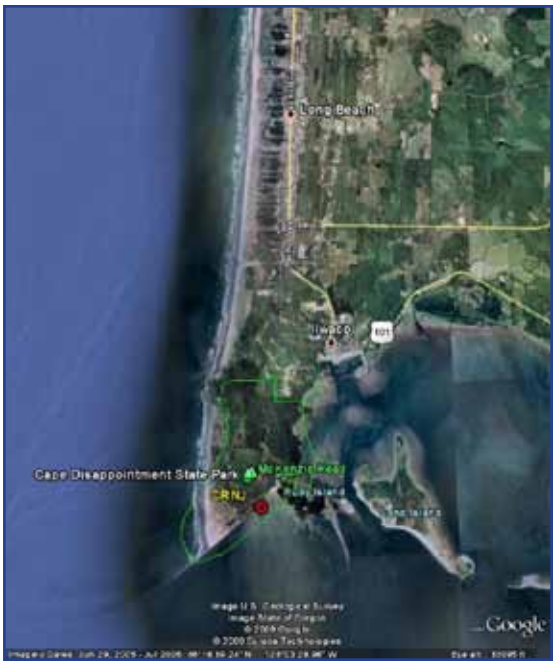
SAMPLING METHODS
Bivalves - Intertidal, hand
Sediments - stainless steel grab and stainless steel scoop

WATER DEPTH - intertidal, +1.0 m MLLW.
- sediments, 2.5 m.

POSSIBLE CONTAMINANTS – The Columbia River watershed includes a vast area of rural/agricultural and urban/industrial areas.


Loomis
Willapa N.W.R.
Oceanside
Long Beach
Naselle
4
Seaview
401
Rosburg
Holman
Ilwaco
Oneida
Eden
Pacific City
Chinook
Frankfort
CRNJ
Knappton
Altoona
McGowan
Dahlia
Megler
Fort Stevens
101
Blind Slough
Flavel
Astoria
Battery Russell
Knappa
Fern Hill
Warrenton
30
Clatsop Station
Trotter
Jeffers Garden
Biddle
Lilleas
Pacific Grange Hall
Chadwell
Stavebolt Landing
Allendale
Surf Pines
202
Gearhart


Ft Canby Rd
Pacific City
Cape Disappointment Cg Station
CRNJ
Washington
Oregon


Long Beach
Cape Disappointment State Park
CRNJ
Google

Willapa Bay, Nahcotta (WBNA)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 267

NOMINAL SITE CENTER - 46° 29.95' N124° 01.63' W

LOCATED ON NOAA CHART - 18504

SITE ACCESS - Follow Highway 101 out to the North Beach peninsula, and drive into Seaview. Take Highway 103 north through Ocean Park to Nahcotta. In Nahcotta, take a right onto 273rd Street and drive down to the breakwater and the Jolly Roger Seafood Plant. There is a small boat basin present, along with a boat ramp.

SITE DESCRIPTION - The site is located just to the south of the breakwater, on the oyster farming racks owned by the State of Washington Oyster Laboratory in Nahcotta. The surrounding area is a large intertidal mud flat.

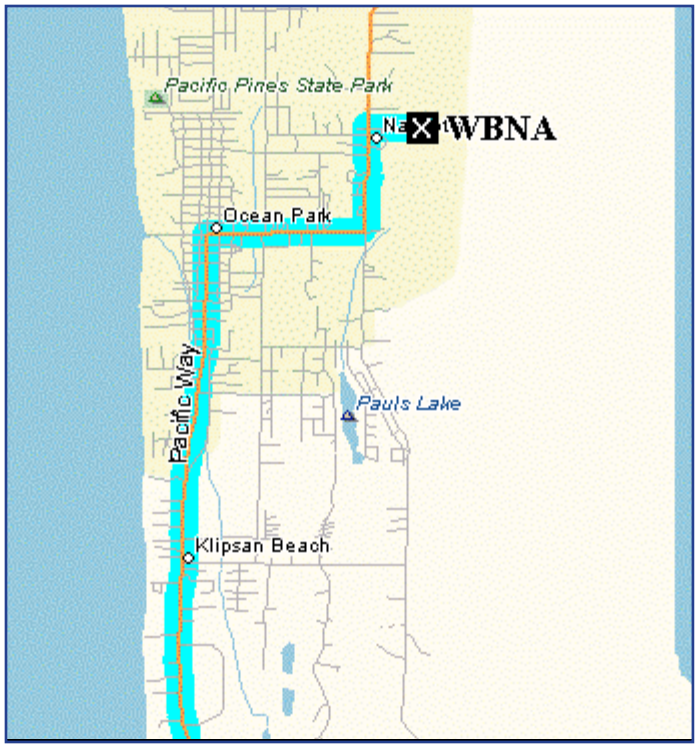
SAMPLING METHODS

Bivalves - hand
Sediments - hand held stainless steel scoop

WATER DEPTH - intertidal, 0 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.


Tokeland
North Cove
Seahaven
Raymond
Burt
Willapa N.W.R.
Bay Center
Menlo
Doty
Murnen
Hines
Oysterville
Lebam
Frances
Pe Ell
Boistfort
WBNA
Klipsan Beach
Middle Nemah
Loomis
Long Beach
Naselle
4
Rosburg
Ryderwood
Ilwaco
Pacific City
Chinook
Altoona
Skamokawa
Astoria
Blind Slough
Warrenton
Burnside
Biddle
Waterford
30
Chadwell
Kerry
101
Melville
Swedetown
Surf Pines
Seaside
202
Neverstill
Mist
Medley
Jewell
Natal
Necanicum
Pittsburg
Cannon Beach
26
Elsie
Keasey
Hamlet


Pacific Pines State Park
WBNA
Ocean Park
Pacific Way
Pauls Lake
Klipsan Beach


WBNA
Google

Gray's Harbor, Westport Jetty (GHWJ)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 268

124° 7'2.80"W

NOMINAL SITE CENTER - 46°54'44.82"N

LOCATED ON NOAA CHART - 18502

SITE ACCESS - This site is located on the seawall at the base of the jetty in Westport, on Gray's Harbor. Take Highway 105 into Westport, turn right onto Dock Ave. and then left onto Westhaven Drive at the stop sign. Locate the tall blue and white observation tower next to the Islander Restaurant/Motel. The collection site is on the seawall, just to the north of the observation tower.

SITE DESCRIPTION - The site center is on the bayward side of the seawall, north-northeast of the observation tower. Mussels were collected from the nominal site center and two other discrete stations separated by 15 m on either side of the site center.

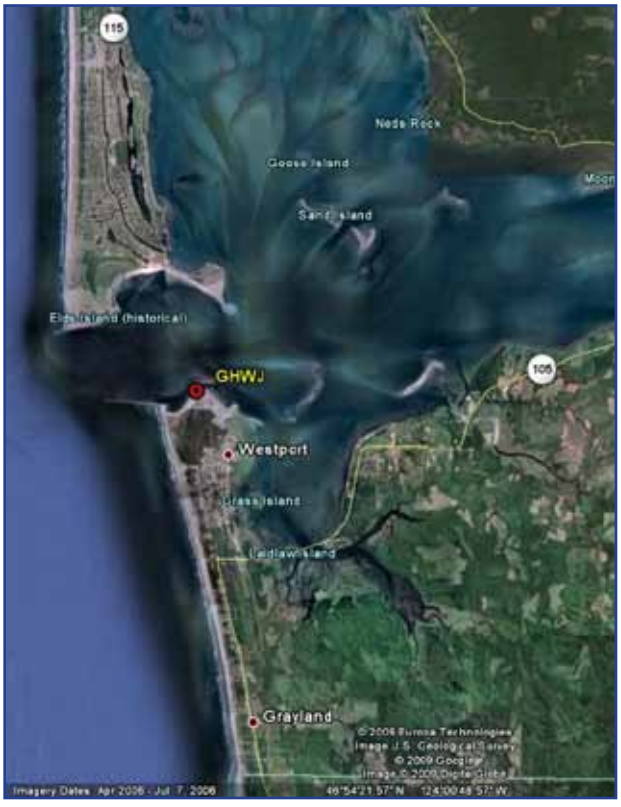
SAMPLING METHODS
Bivalves - hand
Sediments - N/A

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – Potential sources include fishing, timber, and shipping industries located in the vicinity of the site.


Taholah
Weatherwax
Grisdale
Skokomish
109
101
Brockdale
Moclips
Deckerville
Matlock
102
Humptulips
Pacific Beach
Ocean Grove
Carlisle
Nisson
Forbes
Copalis Beach
Ocean City
New London
McCleary
Sampson
Satsop
Elma
Sine
Hoquiam
Aberdeen
Ocean Shores
Montesano
Porter
Cosmopolis
Rony
GHWJ
Lankner
Artic
Laidlow
Vesta
Oakville
Grayland
Baloh
Brooklyn
Heather
Tokeland
Raymond
North Cove
Seahaven
Sutico
Doty
Willapa N.W.R.
Bay Center
Menlo
Hines
Pe Ell
Lebam
Frances
Oysterville
Boistfort
Ocean Park
Klipsan Beach


GHWJ
Westhaven
Grays Harbor Cg Station
Westhaven State Park
(Westp
Westport Airport
Westport Light State Park
Westport
Pacific Ocean
Cohassett
105


115
Neds Rock
Goose Island
Sand Island
GHWJ
105
Westport
Grayland

Strait of Juan de Fuca, Cape Flattery (JFCF)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 269

NOMINAL SITE CENTER - 48°23'2.59"N 124°43'35.88"W

LOCATED ON NOAA CHART - 18485

SITE ACCESS - This site is remote and should not be attempted alone. The Fisheries Office is in the old Makah Air Force Station. To access the site, follow the signs from Neah Bay to Cape Flattery. Drive past the old Makah Air Force Station, now the Makah Indian Reservation Tribal Council Offices, and out to the parking area for the Cape Flattery Trail. Access from here is via narrow footpaths and game trails. A 200' length of 1/2" rope is necessary to descend the cliff above the site. There are bear and cougars present in this wilderness area, it would be prudent to inform the police prior to sampling. Highway 112 west from Port Angeles via Sekiu is often subject to closure during the winter months, as a result of heavy snowfall and/or rock/mud slides.

SITE DESCRIPTION - The site lies just to the north of Hole in the Wall Cove. This is an extremely high surf area, and sampling should only be undertaken at minus tides on calm days. This site should not be attempted at night, or in wet weather - as the path is very slippery and dangerously close to the edge of the cliff. The three discrete stations are located 250 to 25 m apart, around the nominal site center.

SAMPLING METHODS

Bivalves - hand
Sediments - N/A

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.


Anacla 12
Nitinat Lake
Gordon River
Hillcrest
Duncan
Pender Island
Saturna
Fairbridge
Genoa Bay
Moresby Island
Mt. Walbran
Claoose 4
Edinburgh Mtn.
Mill Bay
North Saanich
Carmanah Pacific Park
Mt. Todd
James Island
Central Saanich
Saanich
Port Renfrew
14
Beaver Lake
Leechtown
Colwood
Victoria
China Beach Park
River Jordan
JFCE
Sooke
Harris Creek
Metchosin
Waatch
112
Becher Bay 1
Makah Ind. Res.
Sekiu
Clallam Bay
Pysht
Old Royal
Dungeness N.W.R.
Ozette Ind. Res.
Ozette
Twin
Disque
Joyce
Port Angeles
113
Ozette Lake
Olympic Natl. Park
Sappho
101
Fairholm
Snug Harbor
King Hill
Sequim
Elwha
Beaver
Windy Arm
Olympic Hot Springs
Forks
110
Whiskey Bend
La Push


Midway
Classet
JFCF
Neah Bay
Makah Afs
Neah Bay
Makah Afs
Waatch
Waatch River
Hobuck Lake
Sooes River


JFCF

Strait of Juan de Fuca, Neah Bay (JFNB)

TARGET MATRIX – Sediments

SITE NUMBER - 270

NOMINAL SITE CENTER - 48° 22.46' N124° 36.96' W

LOCATED ON NOAA CHART - 18484

SITE ACCESS - This sediment site can only be accessed by boat. Follow Highway 101 west from Port Angeles to Sappho, then turn north onto Highway 113 and drive towards Sekiu. When the road intersects Highway 112, continue on towards Sekiu and Neah Bay. There is a good boat ramp in Neah Bay, the Big Salmon Ramp. Contact should be made beforehand with the Makah Indian Reservation Fisheries Office.

SITE DESCRIPTION - The sediment site is located on the north side of Neah Bay, just inside the outer rock breakwater and to the east of the log boom area.

SAMPLING METHODS

Bivalves - N/A
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - subtidal, -8.0 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.

Bivalves are not collected here, they are collected at Cape Flattery (JFCF).


Midway
Classet
Neah Bay
JFNB
Neah Bay
Makah Afs
Strait Of Juan De Fuca
112
Makah Afs
Waatch
Waatch River
Hobuck Lake
Sooes River


Nitinat Lake
Gordon River
Mt. Walbran
Whyac
Claoose 4
Edinburgh Mtn.
Sprin
Port Renfrew
14
River Jordan
Jordan Riv
Waatch
JFNB
112
Makah Ind. Res.
Sekiu
Clallam Bay
Pysht
Old Royal
Ozette Ind. Res.
Ozette
113
Ozette Lake
Olympic Natl. Park
Sappho
101
Beaver
Forks
La Push


Waadah Island
JFNB
Neah Bay
Image © 2009 DigitalGlobe
© 2009 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Europa Technologies
Goog

Puget Sound, Port Angeles (PSPA)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 271

NOMINAL SITE CENTER - 48° 08.38' N123° 25.21' W

LOCATED ON NOAA CHART - 18468

SITE ACCESS - The sampling site is located at the salmon pens in Port Angeles Harbor, and can only be accessed by boat. Permission is required to sample at the salmon pens. Follow Highway 101 north out to the Olympic Peninsula, through Sequim and on to Port Angeles. Follow the signs out to Ediz Hook, where there is a good boat ramp just short of the U.S. Coast Guard Station entrance and the Pilot Station.

SITE DESCRIPTION - The Salmon pens are located just to the southeast of the boat ramp, and west of the Coast Guard Station on the Point of Ediz Hook. The discrete sampling stations are located 20 to 25 m apart, around the nominal site center.

SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - subtidal, 0-0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination


Mt. Todd
Central Saanich
Saanich
Beaver Lake
Leechtown
Colwood
Victoria
River Jordan
Harris Creek
Sooke
Sooke 2
Metchosin
Trail Island
Olga
Orcas
Lopez
Anacortes
Richardson
Blanchard
Sunset
Dewey
Gibraltar
Swinomish Village
Ault Field
Swantown
Oak Harbor
San de Fuca
Utsalady
Captains Choloe
Warm Beach
Pysht
Twin
Disque
Joyce
Ramapo
Snug Harbor
Dungeness N.W.R.
PSPA
Dungeness
Port Townsend
Mabana
Greenbank
Port Hadlock
Port Angeles East
King Hill
Hadlock-Irondale
Everett
Freeland
Clinton
Maynard
Olympic Hot Springs
Windy Arm
Whiskey Bend
Port Ludlow
Paine Field-Lake
Stickney
Leland
Quilcene
Lynnwood
Mt. Olympus
Bees Mill
Richmond Highlands
112
101
104
405
5
9
231
230
228
226
221
208
199
189


Port Angeles Air Station
PSPA
Port Angeles Harbor
Port Angeles
S Lincoln St
E 1st St
117


PSPA

Puget Sound, Port Townsend (PSPT)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 272

NOMINAL SITE CENTER - 48° 06.28' N 122° 46.68' W

LOCATED ON NOAA CHART - 18464

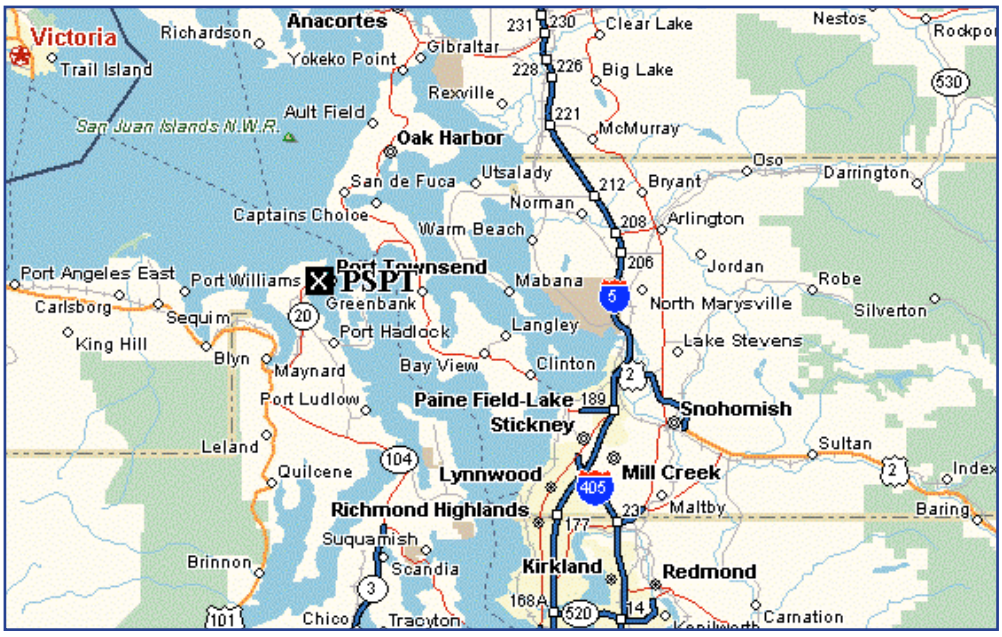
SITE ACCESS - This sampling site is an easy walk-up from the shore. Follow Highway 101 north out to the Olympic Peninsula, and then turn right (east) on Highway 20 and drive to Port Townsend. A boat is necessary if sediments are to be collected. There is a good small boat ramp at the Port Townsend Marina - right next to the bivalve site.

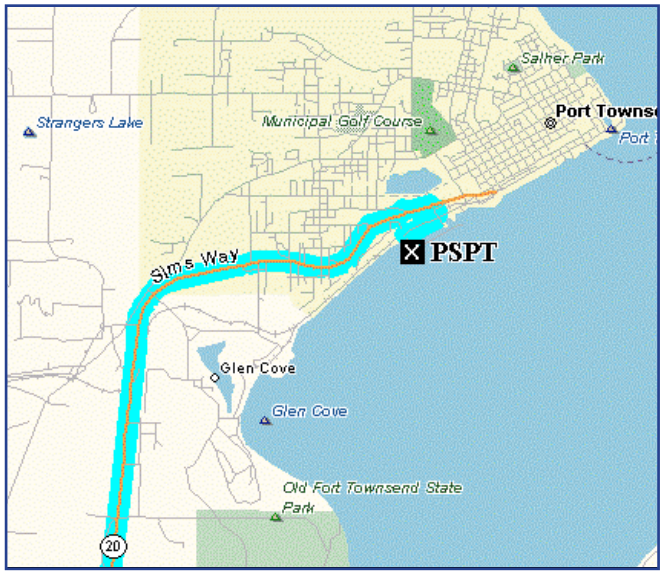
SITE DESCRIPTION - The site is located at the southwest corner of the Port Townsend Marina breakwater, next to the abandoned railroad ferry terminal. Station 1 is located at the nominal site center, the southwest corner of the rock breakwater, Station 2 is 10 m to the northwest and Station 3 is a further 30 m along the northwest breakwater.

SAMPLING METHODS
Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.


Victoria
Trail Island
Richardson
Anacortes
Yokeko Point
Gibraltar
Clear Lake
Nestos
Rockpo
231
230
228
226
Big Lake
530
Rexville
Ault Field
San Juan Islands N.W.R.
221
McMurray
Oak Harbor
Oso
Darrington
San de Fuca
Utsalady
212
Bryant
Norman
Captains Choloe
208
Arlington
Warm Beach
206
Jordan
Port Angeles East
Port Williams
PSPT
Mabana
Robe
Carlsborg
Greenbank
5
North Marysville
Silverton
Sequim
20
Port Hadlock
Langley
King Hill
Lake Stevens
Blyn
Maynard
Bay View
Clinton
2
Port Ludlow
Paine Field-Lake
189
Snohomish
Stickney
Leland
Sultan
Quilcene
104
Lynnwood
Mill Creek
Index
405
Richmond Highlands
Maltby
Baring
177
Suquamish
Brinnon
Scandia
Kirkland
Redmond
3
168A
520
14
101
Chico
Tracyton
Carnation


Salher Park
Strangers Lake
Municipal Golf Course
Port Towns
Port
PSPT
Sims Way
Glen Cove
Glen Cove
Old Fort Townsend State
Park
20


PSPT
Google

Puget Sound, Hood Canal (PSHC)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 273

NOMINAL SITE CENTER - 47° 49.91' N122° 41.30' W

LOCATED ON NOAA CHART - 18473

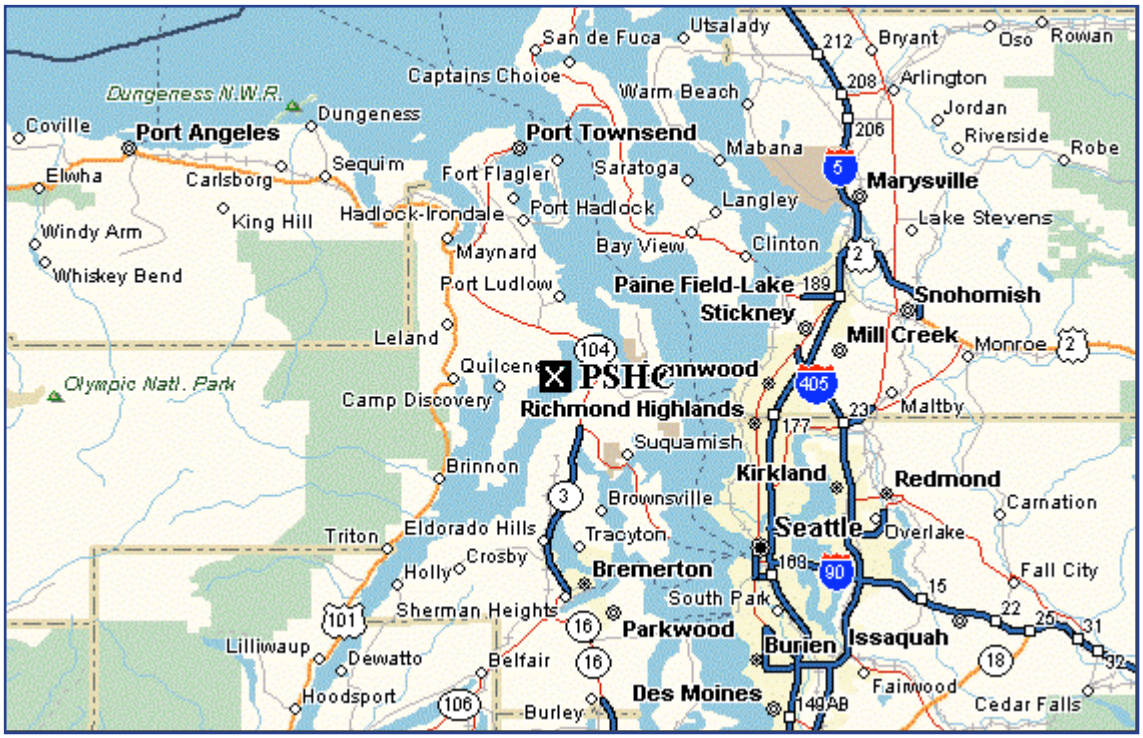
SITE ACCESS - The bivalve site is located at the abandoned Southpoint Ferry Terminal in Bridgehaven, just to the southwest of the Hood Canal Floating Bridge. From Highway 104 several miles west of the Hood Canal Floating Bridge, turn south onto Southpoint Rd., which runs between Highway 104 and the abandoned ferry terminal. Proceed to the end of Southpoint Rd. Park near the pilings of the abandoned ferry terminal. The site is now in private hands and is in the process of being developed, it is imperative to get permission to sample prior to sampling. A boat is necessary if sediments are to be collected. There is a good ramp under the west end of the Hood Canal Floating Bridge, on the north side at Termination Point. There is a second ramp on the east side of the bridge, near Salsbury Point.

SITE DESCRIPTION - The site center is the northeast corner of the parking lot at the abandoned ferry terminal. The only observed mussel habitat was the pilings of the abandoned ferry terminal, approximately 25 m north of the site center. This is a rather small site, so discrete collection stations were not designated.

SAMPLING METHODS
Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +2.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination, however the piling of the ferry terminal are heavily coated with creosote and should be avoided.


San de Fuca
Utsalady
Bryant
Oso
Rowan
Captains Choice
Warm Beach
Arlington
Dungeness N.W.R.
Dungeness
Jordan
Coville
Port Angeles
Port Townsend
Mabana
Riverside
Robe
Elwha
Carlsborg
Sequim
Fort Flagler
Saratoga
Marysville
Langley
Lake Stevens
King Hill
Hadlock-Irondale
Port Hadlock
Windy Arm
Maynard
Bay View
Clinton
Whiskey Bend
Port Ludlow
Paine Field-Lake
Snohomish
Stickney
Leland
Mill Creek
Monroe
Quilcene
PSHC
Olympic Natl. Park
Camp Discovery
Richmond Highlands
Maltby
Suquamish
Brinnon
Kirkland
Redmond
Brownsville
Carnation
Triton
Eldorado Hills
Tracyton
Seattle
Overlake
Crosby
Holly
Bremerton
Fall City
South Park
Sherman Heights
Parkwood
Burien
Issaquah
Lilliwaup
Dewatto
Belfair
Fairwood
Hoodsport
Des Moines
Cedar Falls
Burley


Shine-Gri-La
Squamish Harbor
Bridgehaven
PSHC


PSHC

Puget Sound, Edmonds Marina (PSEM)

TARGET SPECIES- *Mytilus species*

NOMINAL SITE CENTER - 47° 48.665‘N 122° 23.288‘ W

LOCATED ON NOS CHART # - 18446

SITE ACCESS -
From I-5 take exit 177 and go west. Proceed west about 5 miles following signs to Edmonds and Kingston Ferry. Prior to the ferry boat toll booth, turn left on West Dayton Street. Cross the railroad tracks and then turn into the parking lot on the right and park.

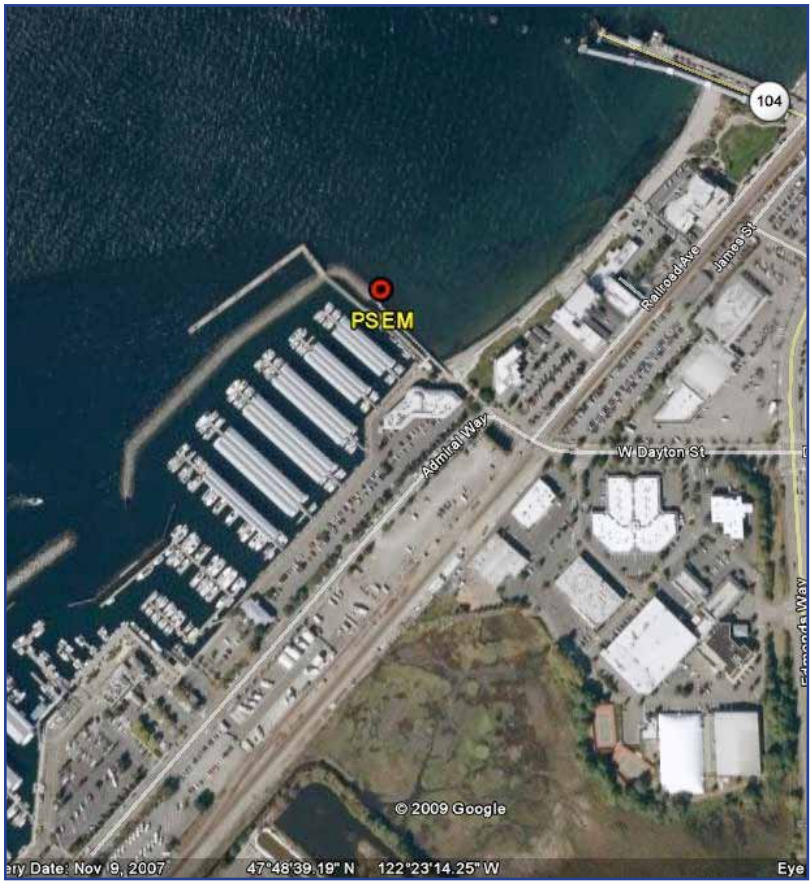
SITE DESCRIPTION -
The site is the northern side of the breakwater for the Edmonds Marina. Station 2, the middle station, is reachable from the beach at low tide and is on the breakwater just below an art work consisting of metal salmon at the top of wooden poles. Station 3 is about 50 feet to the east of Station 2 and Station 1 is on the breakwater under the fishing pier walkway to the west of Station 2. Station 3 was also near a very narrow vertical gap in the breakwater. Although not near the entrance to the Marina, tidal driven currents are observed to flow through the porous rip-rap breakwater, and also through the narrow vertical gap. Therefore, the contaminant concentrations in the mussels are expected to be influenced by the marina. The marina also has an intertidal stormwater outfall that discharges inside the marina close to the breakwater. The site is a short walk to the south from the ferry boat terminal. A long-term NOAA mussel watch site known as the Edmonds Ferry site (PSEF) is located at Beckett's Landing, on the north side of the ferry boat terminal. The Edmonds Ferry site had the highest level of PBDEs of any site on the west coast in the winter of 2006. The Edmonds Marina site was selected to compare the PBDEs and other parameters with same day sampled mussels from the Edmonds Ferry site. The Edmonds Marina site is close to the marina and also close to a secondary treated municipal sewage effluent discharged subtidally through two outfalls at depths of 58 and 66 feet below MLLW.
Stations 2 and 3 are well protected and easily accessed at any time of night or day and in essentially in any weather when the tides are favorable. Station 1 is more difficult to reach and work on and requires permission from the Port of Edmonds. Station 1 for future sampling should be moved closer to Station 2 and accessed from the shore.

SAMPLING METHODS
Mussels – by hand.

DEPTH OF SAMPLE COLLECTION
Mussels – intertidal centered at about +5 or 6 feet above MLLW.

POSSIBLE CONTAMINANTS
PSEM probably will experience PAH and PBDE values comparable to other marina site in the NOAA National mussel watch program.

Photo shows Station 2 on the breakwater below the artistic fish on poles and Station 3 to theleft near the narrow vertical gap in the breakwater. Station 1 is not shown but is around the tip of the breakwater on the right. For future sampling, Station 1 should be moved to the same side of the breakwater as Stations 2 and 3 and would then be visible in this photo to the right of the samplers at Station 2. Photo taken August 17, 2009.



PUGET SOUND, EDMONDS FERRY (PSEF)

TARGET SPECIES: *Mytilus species*

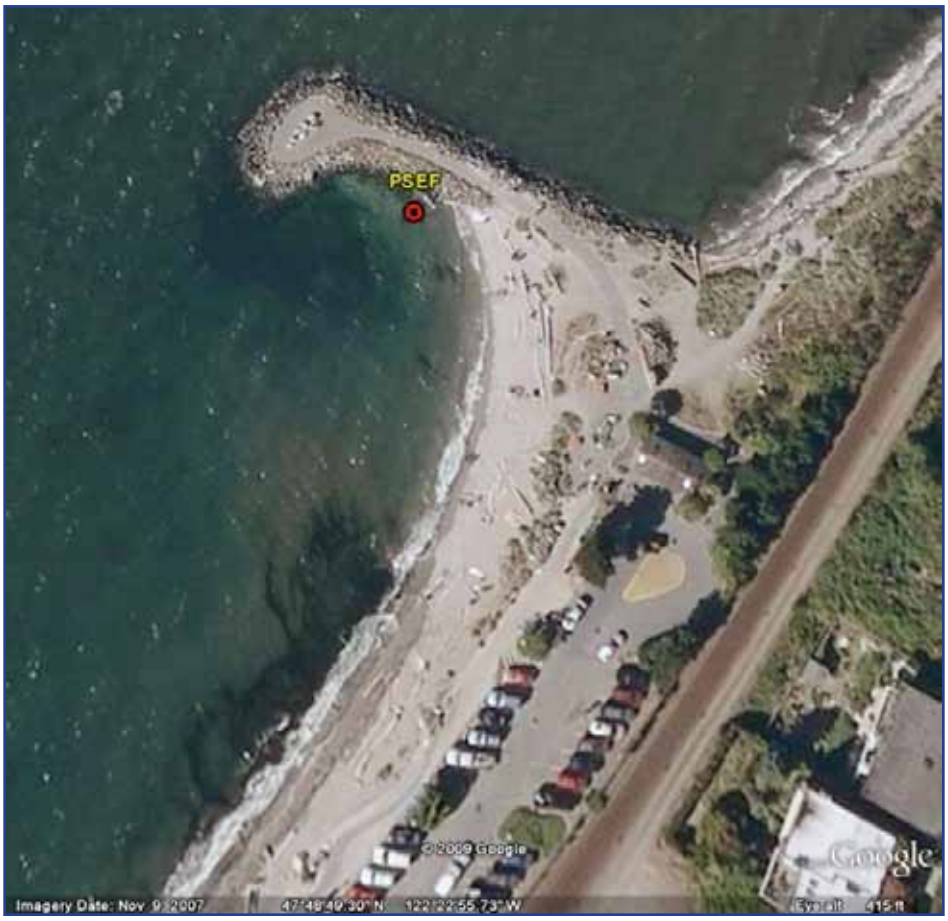
NOMINAL SITE CENTER- 47°48'50.33"N 122°22'56.24"W

LOCATED ON NOS CHART #: 18446_1

SITE ACCESS:
From I
5, take WA
104 (Exit 177) west to Edmonds ferry landing. On the right, just after crossing the railroad tracks, is Brackett's Landing Park. The site is on the south side of the jetty north of the parking lot. Walk north from the parking lot to the beach to access the sample sites.

SITE DESCRIPTION:
Site is located on the south side of the jetty at Brackett's Landing Park north of the ferry terminal in downtown Edmonds. Mussels are very abundant and easily accessible at any low tide (less than +1 feet).

Looking northwest towards the sample site at Edmonds Jetty. People in photograph indicate location of sampling stations.


PSEF
Imagery Date: Nov 9, 2007
Google


PSEF
PSEM
104
James St
Railroad Ave
Sunset Ave S
2nd Ave S
Admiral Way
W Dayton St
Dayton St

PUGET SOUND HAT ISLAND (PSHI)

TARGET SPECIES: *Mytilus species*

NOMINAL SITE CENTER- 48° 34.36' N 122° 19.33' W

LOCATED ON NOS CHART #: 18443_1

SITE DESCRIPTION:
Site consists of remnants of an old pier structure with 20+ pilings and a cement structure on Hat Island (Gedney Island). Two populations of *Mytilus species*(*M. trossulus*) were located in sufficient numbers. One was located on non creosote* pilings from the old pier structure. A second population is located on the cement structure with mussels measuring 1/2" or less, and can potentially be large enough for collection in winter 2009. Mussels on pilings are of suitable size (>1") and numbers for collection. Mussels are located 12 feet from the seafloor, and are not accessible by land. Mussel collectors must have boat transport to access the island and to sample the mussels.

*Original October 2007 site visit determined the pilings to be non creosote. In March 2008, during sampling, potential creosote oozing was discovered. Confirmation will be made following lab analysis of piling sample collected Summer 2008.

SITE ACCESS:
Piling samples can only be accessed by boat. Snohomish County Sheriff's Office is willing to transport staff and volunteers to island for sampling, and can use any of their boats, as long as the boat can be tied off to the pilings in order to sample. Options include: 33 boat, with or without a zodiac, or their two 20 boats. The Sheriffs will meet staff and volunteers at 10th Street Boat Launch or 14th Street Boat Launch on the Everett Waterfront (depending on the boat used).

Aerial view of west side of Hat Island. Old pier structure consisting of 20+ pilings and cement structure in lower right corner. Red arrow indicates site location.


PS HI
Google


Langley
Tulalip Bay
Priest Point
PS HI
Clinton
Google

PUGET SOUND, HERMOSA POINT (PSHP*)

TARGET SPECIES- *Mytilus species*

NOMINAL SITE CENTER – 48° 03.688’ N 122° 17.612’ W

LOCATED ON NOS CHART # 18443_1

SITE ACCESS:
From I-5 heading North take exit 199 for WA-528 towards Marysville. Stay in the left (west) exit lane and proceed west at stop light onto 4th St/WA 528 back under I-5 and cross onto the Tulalip Indian Reservation.
From I-5 heading Southbound, also take exit 199 and turn right (west) onto 4th St/WA 528. 4th St/WA528 becomes Marine Dr. NE. Continue for roughly 6.6 miles until Hermosa Beach Road. Hermosa Beach Road will be on your left just after you go under a large concrete foot bridge and pass the Tulalip Boys and Girls Club. Proceed along Hermosa Beach Road. Parking is available along the beach at the boat launch south and across the street from 7598 Hermosa Beach Road. The site is a five minute or less walk to Hermosa Point – north along Tulalip Bay.

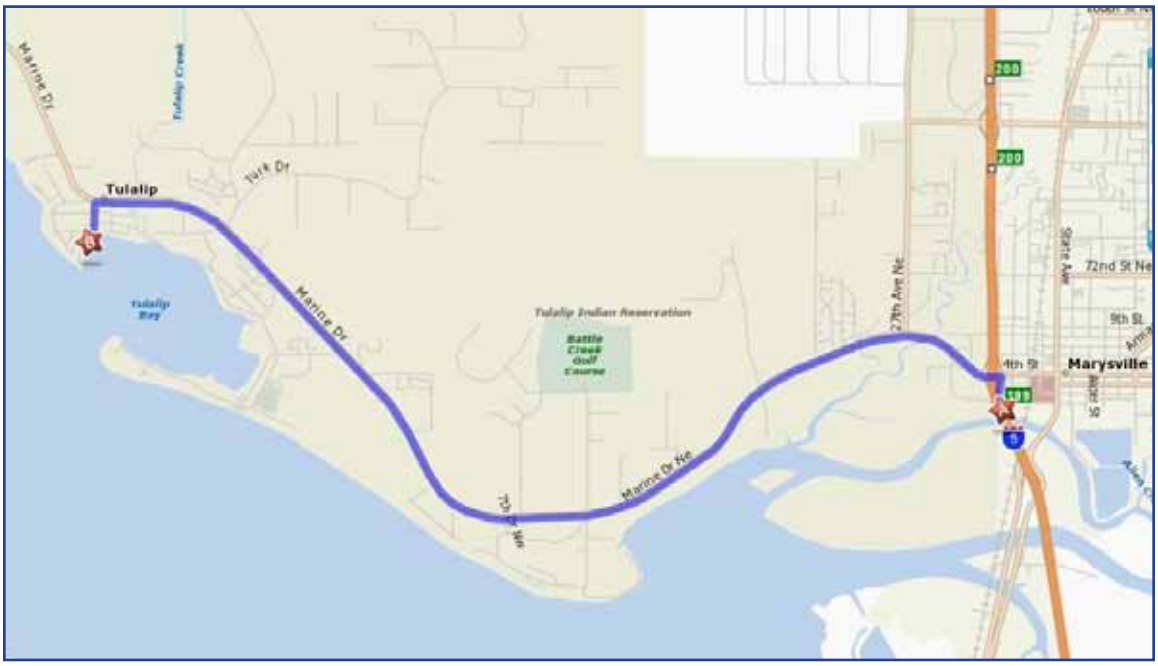
SITE DESCRIPTION
The site is located just outside of Tulalip Bay at Hermosa Point and northwest of the point. The site is on the Tulalip Indian Reservation. The substrate is sand and cobble.

SAMPLING METHODS
Mussels – by hand

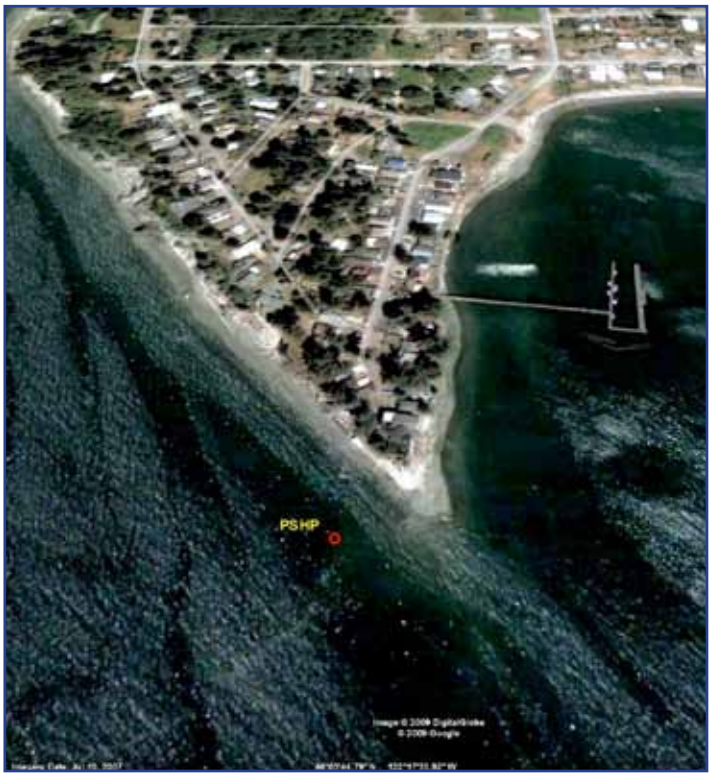
DEPTH OF SAMPLE COLLECTION
Mussels – intertidal

POSSIBLE CONTAMINANTS
Unknown

* This site was renamed from PSTP/ Puget Sound, Tulalip Bay.


Tulalip
Marine Dr
Tulalip Creek
Tulalip Bay
Tulalip Indian Reservation
Battle Creek Golf Course
Marine Dr NE
27th Ave NE
72nd St NE
9th St
4th St
Marysville
State Ave
Alder St
529
5
200


PSHP
Shaker Church
Tulalip Bay
Priest Point
PSEC
PSHI


PSHP

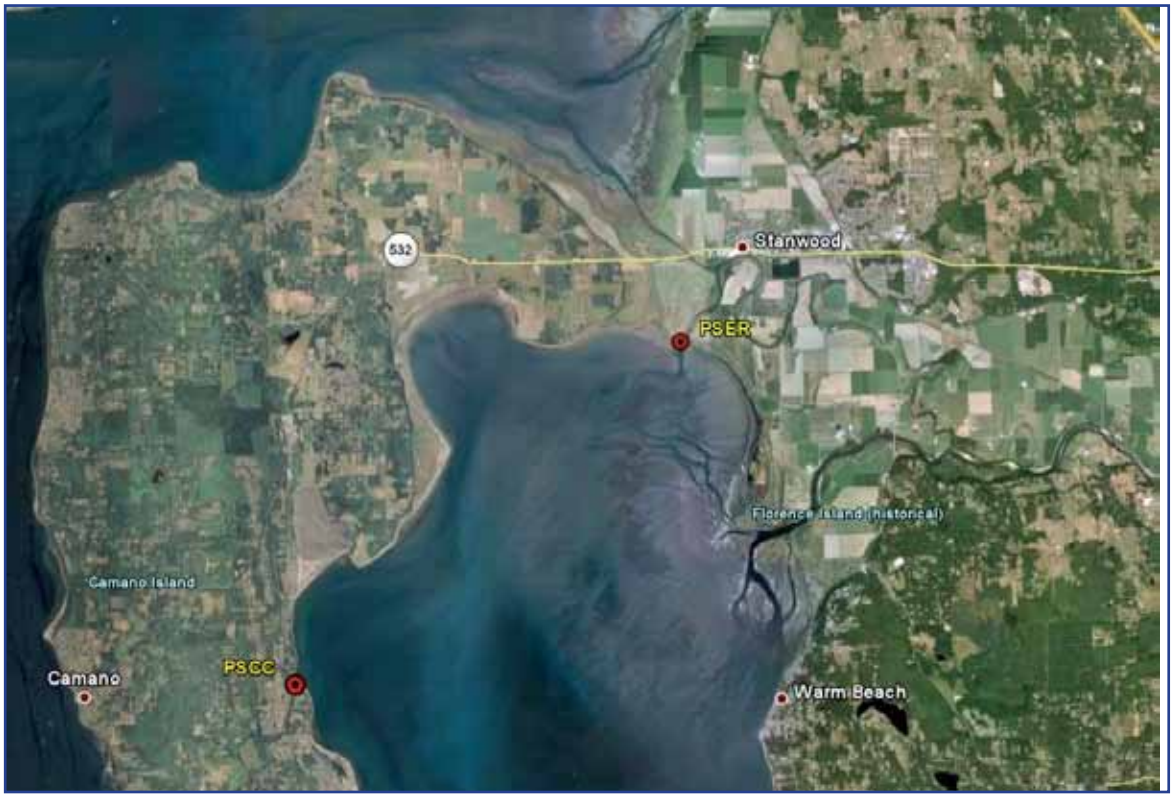
PUGET SOUND EIDE ROAD (PSER)

TARGET SPECIES - *Mytilus species*

NOMINAL SITE CENTERS:
Station 1: 48 13.618; 122 23.139
Station 2: 48 13.616; 122 23.137
Station 3: 48 13.616; 122 23.141

SITE ACCESS - From the I-5 heading north, take a left onto highway 532 (Exit 212). Head west on the Stanwood to Bryant Rd. and continue through Stanwood past the Twin City Food plant on the south side of the road. After exiting into the open flats, you will take a sharp left turn onto Eide Rd before going up the hill. Travel to the end of the road and park. Up to four cars are permitted to park in WDFW designated areas. The site is accessible on foot. Walk about 1/2 mile south along edge of farm field to the tide gates, where you will see a culvert inflow heading east towards the slough. At this point, walk east climbing up and over the dike. Once on the top of the dike, you will see the culvert's outflow where sampling occurs.

SITE DESCRIPTION - Site is on the nearshore intertidal portion of the slough. Mussels are located in the riprap underneath the culvert outflow. Mussel abundance is relatively low, and as of August 2008, it was advised to cease sampling site until at least winter 2009. Additional sites are located north and south of this point on rocks and root balls. There may be other outfalls to research in case this portion of the Eide Road site may never fully recover.


532
Stanwood
PSER
Camano Island
Camano
PSCC
Warm Beach


Stanwood
532
PSER
Google

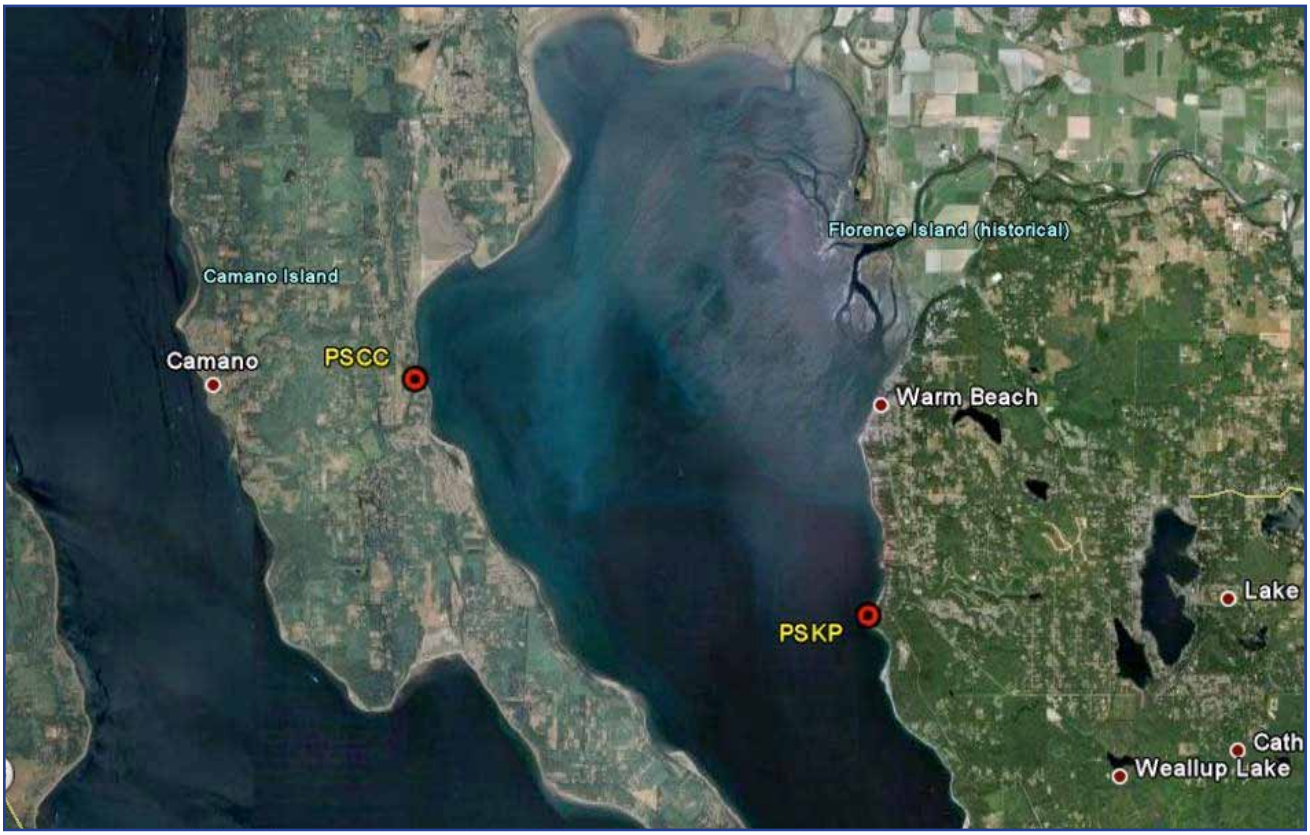
PUGET SOUND CAVALERO COUNTY PARK (PSCC)

TARGET SPECIES: *Mytilus species*

NOMINAL STATION CENTERS -
Station 1: 48 10 31.2; -122 28 42.3
Station 2: 48 10 30.7; -122 28 42.7
Station 3: 48 10 30.7; -122 28 41.2

SITE ACCESS -
From I-5, take exit #212 and turn left on West 532 towards Stanwood/Camano Island. Follow WA-532 W approximately 10 miles, and take a slight left on NE Camano Drive, and follow this road for approximately 5 miles. Turn left on Cavalero Road, then another left on Simonson Place. Signs to County Boat Launch Park (located in residential community) can also be followed if necessary. Parking is located south of the boat launch, and site is accessed by walking north over the ramp to the beach.

SITE DESCRIPTION -
The PSCC site collection area is a 30 x 100 m cobble beach, with scattered boulders, centered about 100 m north northwest of the Cavalero County Park boat launch ramp and parking lot, Camano Island, Island County, Washington. Mussels are found in the intertidal zone on patchy boulders, and within cobble beaches. Stations 1 and 2 are 1-2 meter sized boulders located 56 feet (19 m) apart. When standing north of the station 2 boulder these two boulders form a straight line-of-sight south to a house with a deck jutting over the beach. Station 3 is cobble only (no boulder) and located 33 meters to the southeast of the Station 1 boulder.


Florence Island (historical)
Camano Island
Camano
PSCC
Warm Beach
Lake
PSKP
Cath
Weallup Lake


PSCC
Gaviero Rd
Simonson Pl
Shamrock Ln
Lucky Ln
E Thunder Rd
Fisher King Way

PUGET SOUND, KAYAK POINT (PSKP)

TARGET SPECIES- *Mytilus species*

NOMINAL SITE CENTER – 48° 8.205’ N 122° 22.037’ W

LOCATED ON NOS CHART # 18423_15

SITE ACCESS
Drive to Kayak Point State Regional Park (15610 Marine Drive Stanwood, WA 98292, 360-652-7992) and park at the north beach near the picnic enclosures.

SITE DESCRIPTION
A central point was established along the beach - north of the fishing pier. From the fourth picnic enclosure from the north end of the beach, it is 160 feet @ 274 degrees to station #1. From Station #1, station #2 is 134 feet @ 212 degrees. From Station #1, station #3 is 70 feet @ 43 degrees.


PSCC
Warm Beach
PSKP
Lake Goodwin
Cathan
Weallup Lake
John Sam Lak
PSHP
Lanctey
© 2009 DigitalGlobe
© 2009 Google
Image Island County
Google
Imagery Dates: May 27, 2007 - Aug 23, 2007
Eye alt 11.51 mi

PUGET SOUND, MUKILTEO FERRY (PSMF)

TARGET SPECIES- *Mytilus species*

NOMINAL SITE CENTER – 47° 56.981' N 122° 18.095' W

LOCATED ON NOS CHART # - 18473-1

This new site was added in 2004 (like PSEF) in response to the oil spill at Wells Point, and was reported to have a robust mussel population attached to the floating docks at the public boat ramp. However, a winter storm the previous year had wiped out the docks (and many businesses were still closed from the damage) thus the substratum and mussels were not there this year. Collection was made among the intertidal rocks that border the government property adjacent to the Silver Cloud Hotel, though the entire rocky shoreline from the launch ramp, past the ferry landing to the hotel was searched without finding mussels.

SITE ACCESS -
From I-5 take exit 189 and go east on Hwy 526 past Snohomish County airport (where Boeing assembles the 747 and 757 aircraft) to Hwy 525 at Nelson's Corner. Turn right on 525 and follow signs indicating "To Mukilteo Ferry". Approaching the ferry landing go right and park at the Silver Cloud Inn or left to the boat ramp and large public parking area to access the shoreline at either point.

SITE DESCRIPTION -
The entire shoreline from southwest of the ferry (at the boat ramp) to east of the ferry into the fenced former military facility is comprised of rock riprap suitable for mussel habitat. The site had received a recommendation as a collecting location due to the abundance of mussels attached to the floating docks at the boat ramp. However, the floating docks were gone along with their mussels. A severe storm in the previous year reportedly took out the docks, and probably the resident mussel population on the rocky shoreline. The severity of the storm was such that several businesses at the waterfront remained closed and were still rebuilding from the storm damage. The site is well protected and easily accessed at any time of night or day and in essentially in any weather for which the tides are favorable.

SAMPLING METHODS
Mussels – by hand

DEPTH OF SAMPLE COLLECTION
Mussels – intertidal, essentially all at the waterline

POSSIBLE CONTAMINANTS
Unknown. Apart from the oil spill at Wells Point the preceding week, little could be ascertained about the site environs at the time of collection (in the heaviest snow storm in 10 years). The port of Everett is but 4 miles to the north, and the spill at Point Wells was 12 miles to the south.


PSHI
PSEC
Smith Island
Jetty Island
Ferry Baker
Clinton
525
529
2
Everett
PSMF
Mukilteo


PSMF
Silver Cloud Inn
525
Google

Budd Inlet, South Puget Sound (SSBI)

TARGET SPECIES - *Mytilus species*

SITE NUMBER -274

NOMINAL SITE CENTER - 47° 5.952' N 122° 53.685' W

LOCATED ON NOAA CHART – 18456_1

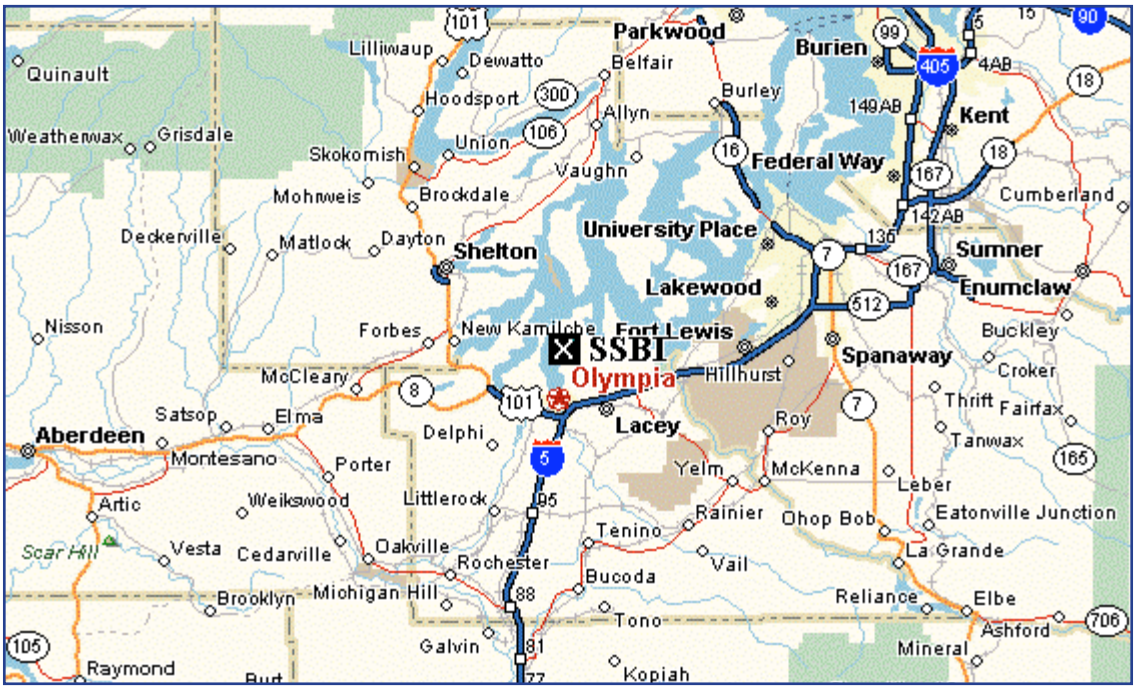
SITE ACCESS - This site is located adjacent to the abandoned Washington State Department of Natural Resources Marine Research and Development Center Laboratory, near Olympia. From downtown Olympia, drive north on East Bay Drive, which turns into Boston Harbor Rd. From Boston Harbor Rd., turn left onto 47th Ave. SW and proceed to the Washington State Department of Natural Resources Marine Research and Development Center Laboratory (WSDNR). This facility has been abandoned because of leaking fuel storage tanks, so permission is required to access this site across State property. Alternatively, the site can be accessed through a trailer park just north of the laboratory property. The trailer park information is as follows: Sea Shore Villa Trailer Park, 4805 Cushman Rd., Olympia, WA. From 47th Ave. SW, which is located just after the Lutheran Church on the right hand side of Boston Harbor Rd., turn right on Cushman Rd. and proceed to the trailer park. Find the road to the beach on the left (south) side of the trailer park, and drive down to the beach. A small boat is necessary if sediments are to be collected. There is a good boat ramp at the East Bay Marina, just off Marina Access Rd.

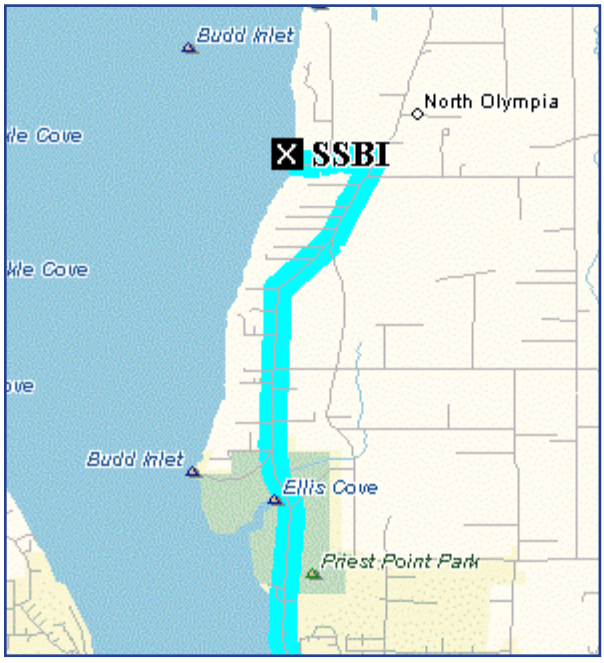
SITE DESCRIPTION - The site center is the landward end of the marine laboratory pier. The three discrete collection stations were as follows: 1) the rip-rap at the base of the pier, 2) the first pair of pilings from shore, and 3) a set of unattached pilings 10 m north of the pier.

SAMPLING METHODS
Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – This site is only a few miles from Olympia so potential contaminants may include urban runoff, as well as input from the timber and fishing industries. The U.S. Navy also had some underwater dump sites nearby. This site was abandoned by the WSDNR due to leaking fuel tanks on the adjacent property.


SSBI
Olympia
Parkwood
Burien
Kent
Federal Way
University Place
Lakewood
Fort Lewis
Shelton
Sumner
Enumclaw
Spanaway
Lacey
Aberdeen
Hoodsport
Union
Brockdale
Dayton
Matlock
Deckerville
Mohrweis
Skokomish
Weatherwax
Grisdale
Quinault
Lilliwaup
Dewatto
Belfair
Burley
Allyn
Vaughn
Cumberland
Buckley
Croker
Thrift
Fairfax
Tanwax
Roy
Yelm
McKenna
Leber
Eatonville Junction
Ohop Bob
La Grande
Rainier
Tenino
Vail
Bucoda
Reliance
Elbe
Ashford
Mineral
Tono
Kopiah
Galvin
Michigan Hill
Brooklyn
Rochester
Oakville
Cedarville
Vesta
Scar Hill
Artic
Weikswood
Littlerock
Delphi
Porter
Montesano
Satsop
Elma
McCleary
Hillhurst
New Kamilche
Forbes
Nisson
Raymond


Budd Inlet
North Olympia
SSBI
Budd Inlet
Ellis Cove
Priest Point Park


SSBI

Commencement Bay, Tahlequah Point (CBTP)

TARGET SPECIES - *Mytilus species*

SITE NUMBER -275

NOMINAL SITE CENTER - 47°19.855’ N 122°30.262’ W

LOCATED ON NOAA CHART – 18474_1

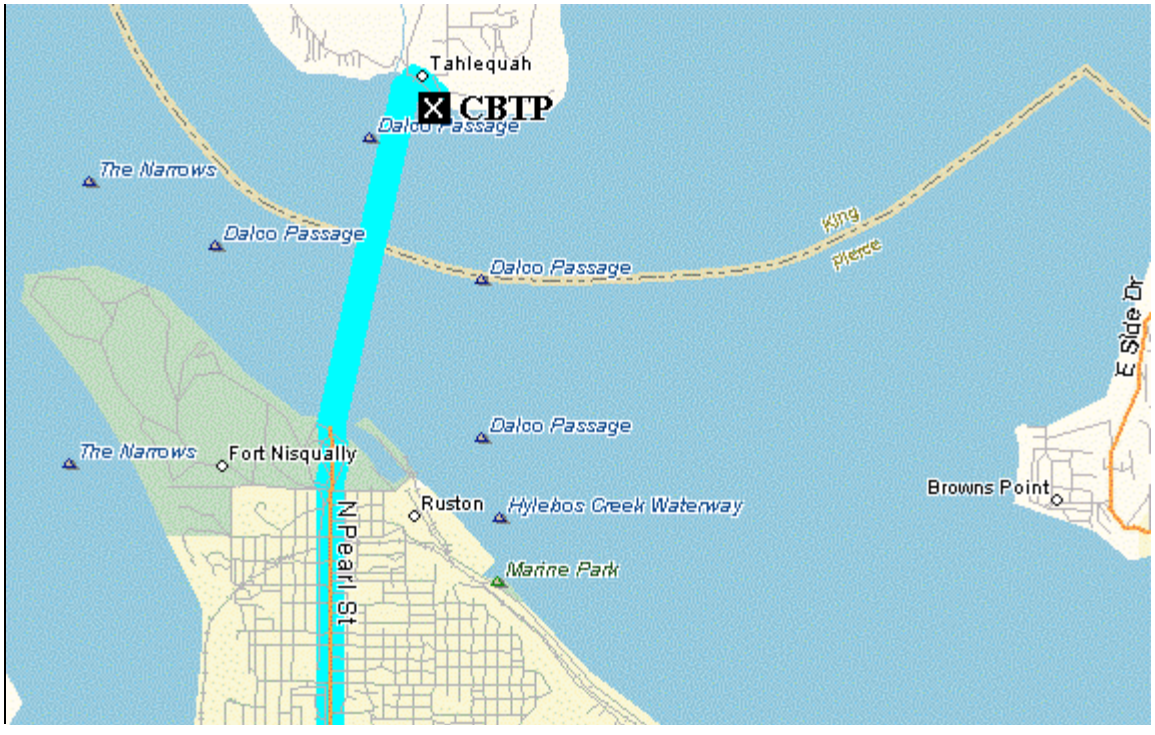
SITE ACCESS - This site is a walk-up, and is easily accessible. From Tacoma, cross over the Dalco Passage to Vashon Island, on the Point Defiance - Tahlaquah Ferry.

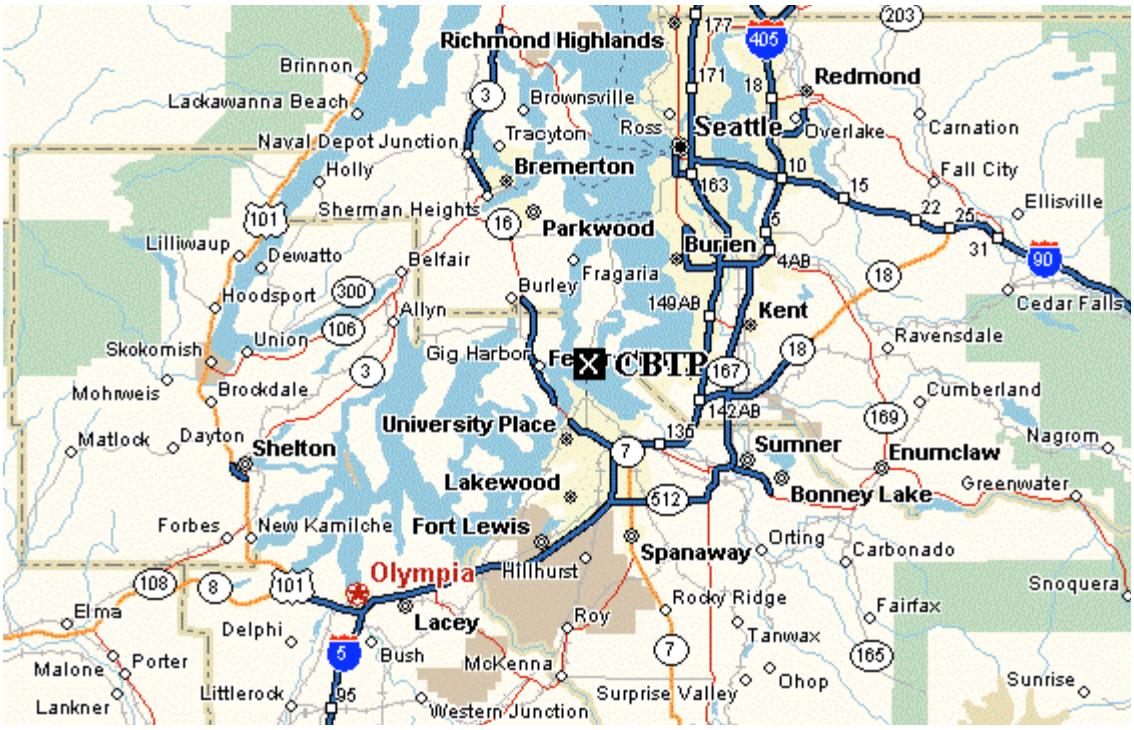
SITE DESCRIPTION - The site is located about 150 m to the east of the Tahlequah Ferry dock. There are the remains of an old wooden jetty structure on the beach at Tahlequah Point.

SAMPLING METHODS
Bivalves - hand
Sediments - N/A

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination aside from the ferry operations near the site.




Richmond Highlands
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Lackawanna Beach
Naval Depot Junction
Holly
Sherman Heights
Lilliwaup
Dewatto
Belfair
Hoodsport
Allyn
Union
Skokomish
Mohrweis
Brockdale
Matlock
Dayton
Shelton
Forbes
New Kamilche
Fort Lewis
Olympia
Elma
Delphi
Malone
Porter
Littlerock
Lankner
Lacey
Bush
Western Junction
Brownsville
Tracyton
Ross
Bremerton
Parkwood
Fragaria
Burley
Gig Harbor
CBTP
University Place
Lakewood
Hillhurst
Roy
McKenna
Surprise Valley
Seattle
Redmond
Overlake
Carnation
Fall City
Ellisville
Cedar Falls
Burien
Kent
Ravensdale
Cumberland
Nagrom
Enumclaw
Sumner
Bonney Lake
Greenwater
Spanaway
Orting
Carbonado
Snoquera
Fairfax
Rocky Ridge
Tanwax
Ohop
Sunrise


CBTP

Commencement Bay, Browns Point (CBBP)

TARGET MATRIX – Sediments

SITE NUMBER - 276

NOMINAL SITE CENTER - 47° 17.59' N 122° 25.99' W

LOCATED ON NOAA CHART - 18453

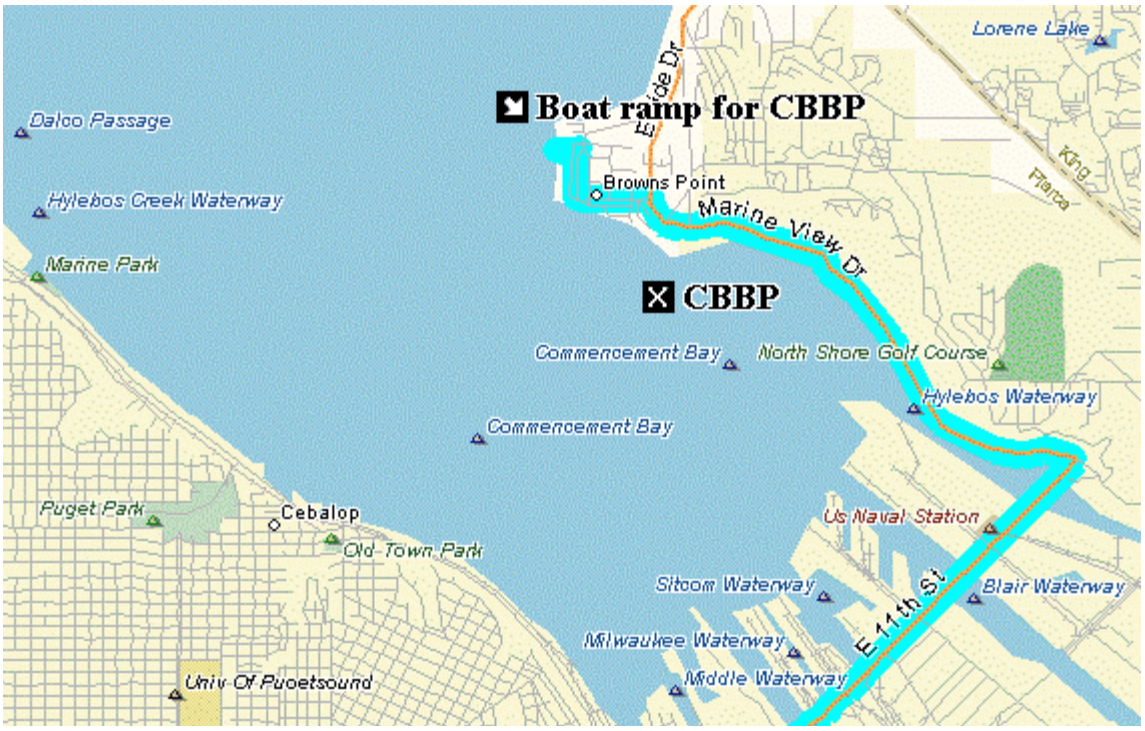
SITE ACCESS - This site is only accessible by boat, as it is located southeast of Browns Point in Commencement Bay. From U.S. Highway 5, take Exit 137 north onto 54th Ave East. This road goes into Taylor way and then intersects East 11th St. (Highway 509). Turn right onto E. 11th St. and cross over the Hylebos Creek Waterway. Then turn left on Marine View Drive (continuation of Highway 509) and continue for about 1/2 a mile to Ole & Charlie's Marina which is on the left.

SITE DESCRIPTION - The sampling site is located about 1 mile to the northwest of the marina, just to the south of the barge storage area and west of the log booming ground.

SAMPLING METHODS
Bivalves - N/A
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, (sediments -58.0 m MLLW).

POSSIBLE CONTAMINANTS –There is no obvious point sources of contamination aside from marine transportation activities.


Boat ramp for CBBP
CBBP
Browns Point
Marine View Dr
E 11th St
Lorene Lake
Dalco Passage
Hylebos Creek Waterway
Marine Park
Commencement Bay
North Shore Golf Course
Hylebos Waterway
Commencement Bay
Puget Park
Cebalop
Old Town Park
Us Naval Station
Sitcom Waterway
Blair Waterway
Milwaukee Waterway
Middle Waterway
Univ Of Puoetsound

Puget Sound, South Seattle (PSSS)

TARGET SPECIES - *Mytilus species*

SITE NUMBER -277

NOMINAL SITE CENTER - 47° 31.796' N 122° 24.094' W

LOCATED ON NOAA CHART - 18449

SITE ACCESS - The original sampling site is located at Point Williams, in Lincoln Park. From U.S. Highway 5, take Exit 163 west onto the West Seattle Freeway which goes into Fauntleroy Ave. Proceed south down Fauntleroy Ave. for about 3.5 miles to Lincoln Park, which will be on the right/west (Puget Sound) side of the road. Park the vehicle in the parking lot, and walk approximately 300 m through the park to the point. A boat is necessary if sediment samples are to be collected. There is a good boat ramp (the Armeni Boat Ramp) approximately 5 miles to the north at Duwamish Head.

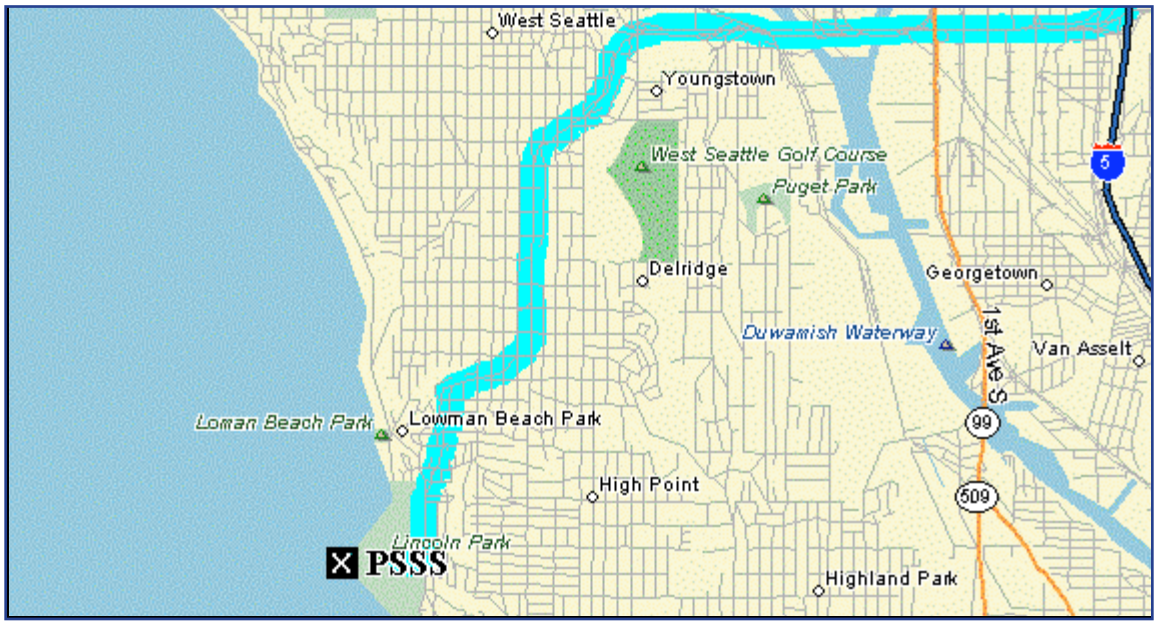
SITE DESCRIPTION - The original site was located on the large cobble rocks at Point Williams.

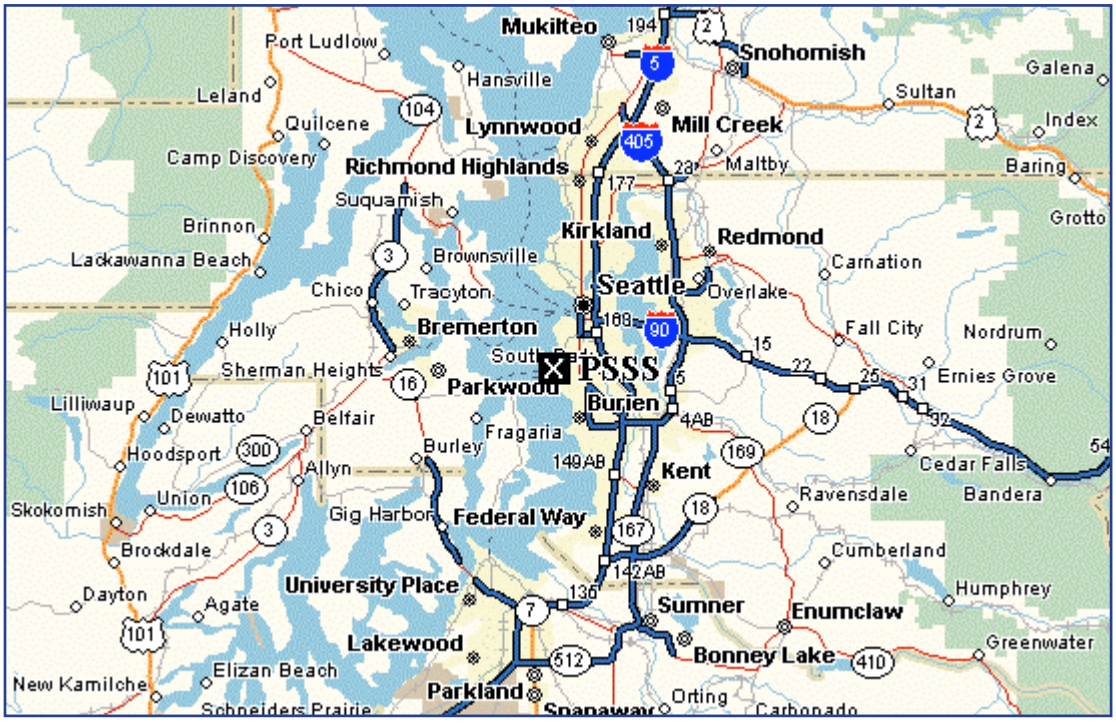
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.




Mukilteo
Port Ludlow
Hansville
Snohomish
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Chico
Tracyton
Seattle
Overlake
Holly
Bremerton
Fall City
Nordrum
PSSS
Sherman Heights
Parkwood
Ernies Grove
Lilliwaup
Dewatto
Belfair
Burien
Fragaria
Hoodsport
Burley
Kent
Cedar Falls
Allyn
Union
Ravensdale
Bandera
Skokomish
Gig Harbor
Federal Way
Brockdale
Cumberland
University Place
Dayton
Agate
Sumner
Enumclaw
Humphrey
Lakewood
Bonney Lake
Greenwater
Elizan Beach
New Kamilche
Parkland
Orting
Carbonado


Williams Point
PSSS
Google

Sinclair Inlet, Waterman Point (SIWP)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 278

NOMINAL SITE CENTER - 47° 35.110' N 122° 34.250' W

LOCATED ON NOAA CHART - 18449

SITE ACCESS - This site is a walk-up and is easily accessible. From U.S. Highway 5 in Tacoma, take Highway 16 north towards Bremerton, then turn right onto Highway 160 and proceed into Port Orchard. At the intersection of Highway 166, turn left and go north, then turn right onto Beach Drive. This road runs parallel to the east side of Sinclair Inlet. Turn left onto Lighthouse Rd. and park at the end. Access to the site is through private property. A small boat is needed if sediment samples are to be collected. There are two good boat ramps located to the south in Port Orchard.

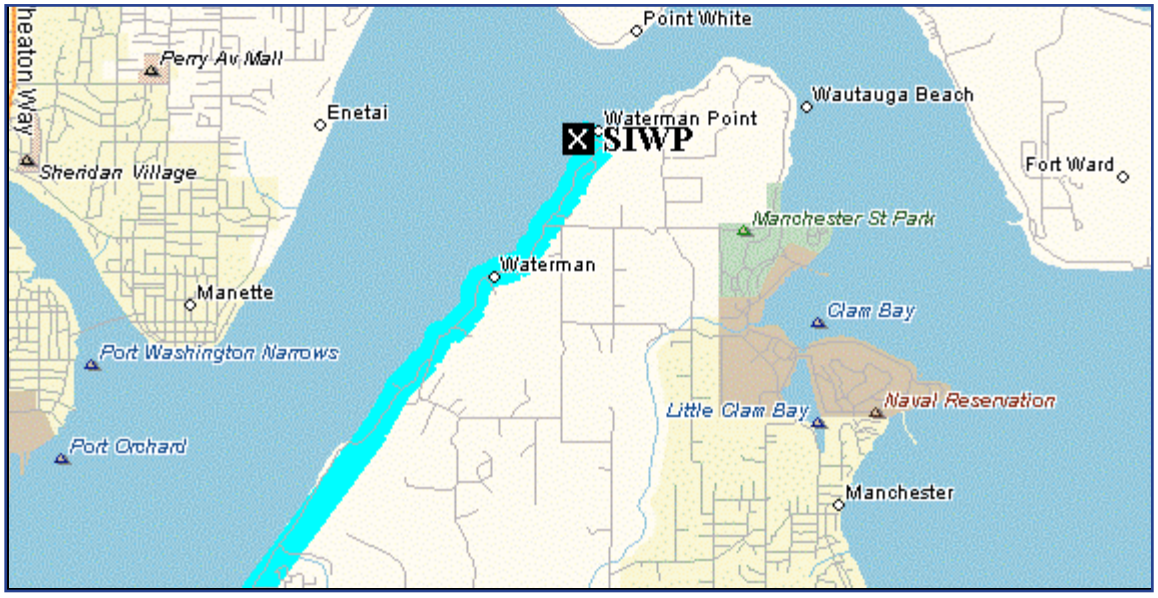
SITE DESCRIPTION - The sampling site is located at the Waterman Point Light, in Sinclair Inlet. The discrete stations are located about 25 m apart, on the rocks around the base of the light.

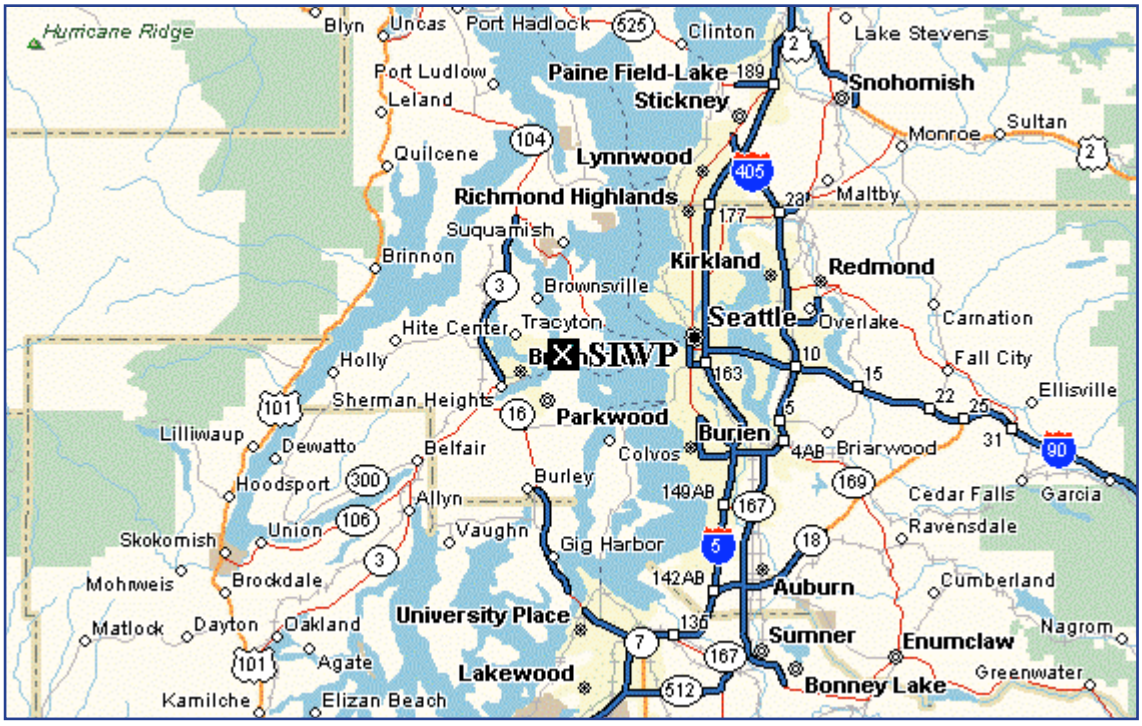
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.




Hurricane Ridge
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Paine Field-Lake
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Gig Harbor
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Bonney Lake
Greenwater
Kamilche
Elizan Beach
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SIWP

Elliott Bay, Duwamish Head (EBDH)

TARGET SPECIES - *Mytilus species*

SITE NUMBER -279

NOMINAL SITE CENTER - 47° 35.75' N 122° 23.30' W

LOCATED ON NOAA CHART - 18449

SITE ACCESS - This site is a walk-up, and is easily accessible. From U.S. Highway 5 in Seattle, take Exit 163 west onto the West Seattle Freeway. Then take the exit north onto Harbor Ave. SW and continue on to Duwamish Head. A small boat is needed if sediment samples are to be collected. There is a good public boat at Armeni Park.

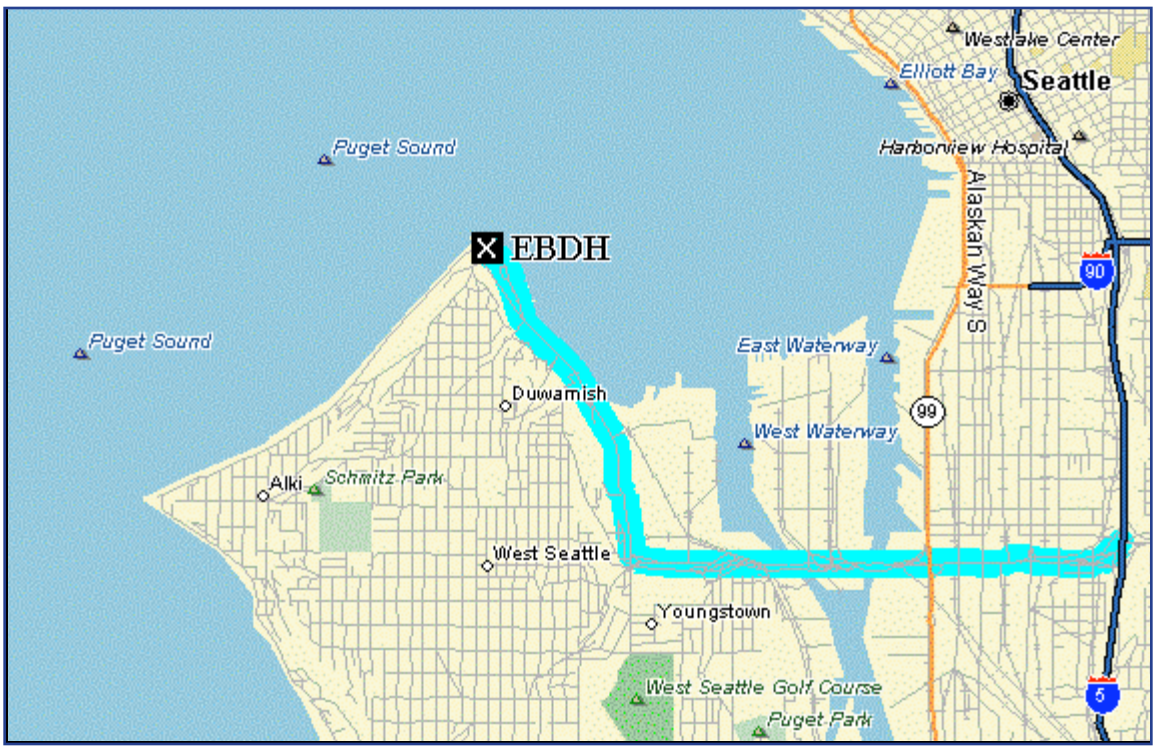
SITE DESCRIPTION - The site is located just to the southeast of Duwamish Head, on Harbor Ave. SW at the Luna Park. The three discrete stations are located on the east, north and west sides of the stone seawall that form the three sides to the park.

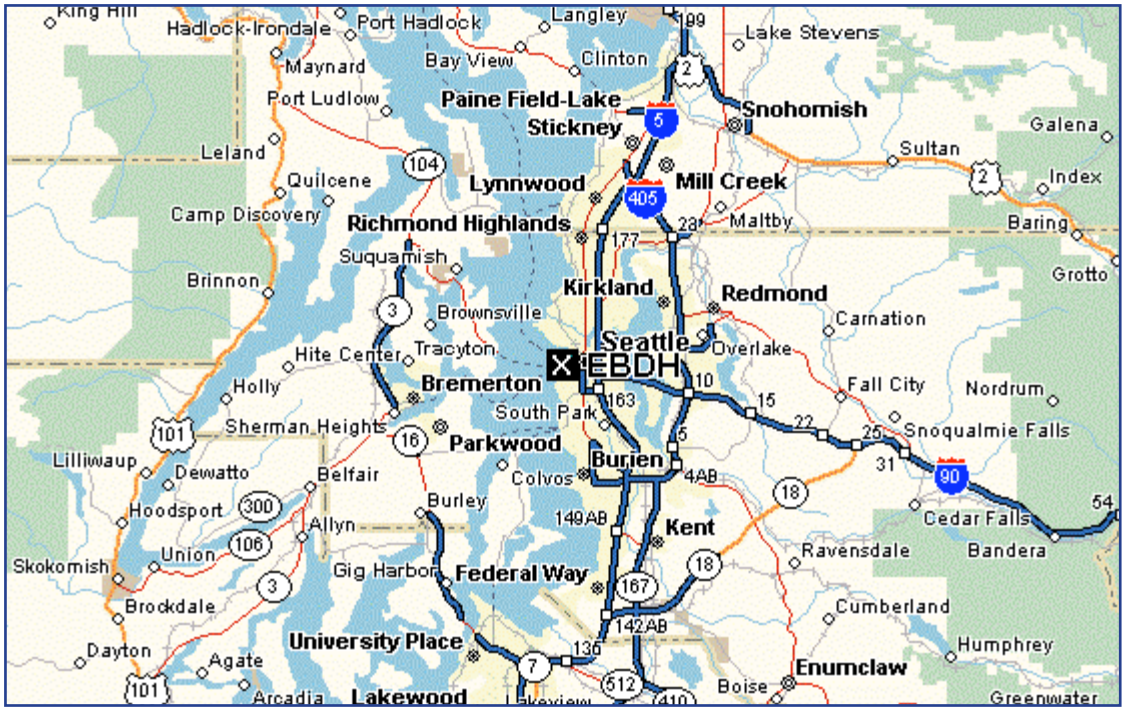
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +1.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.




King Hill
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Port Hadlock
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Maynard
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Seattle
EBDH
Overlake
Holly
Bremerton
Fall City
Nordrum
South Park
Sherman Heights
Parkwood
Snoqualmie Falls
Lilliwaup
Dewatto
Belfair
Burien
Colvos
Hoodsport
Burley
Cedar Falls
Allyn
Kent
Union
Ravensdale
Bandera
Skokomish
Gig Harbor
Federal Way
Brockdale
Cumberland
University Place
Humphrey
Dayton
Agate
Enumclaw
Arcadia
Lakewood
Boise
Greenwater


EBDH

Elliott Bay, Four-Mile Rock (EBFR)

TARGET SPECIES - *Mytilus species*

SITE NUMBER -280

NOMINAL SITE CENTER - 47° 38.33' N 122° 24.83' W

LOCATED ON NOAA CHART - 18449

SITE ACCESS - This is a walk-up site that is easily accessible at low tide. Take Exit 166 on U.S. Highway 5 in Seattle, and head west down Denny Way. At the end of Denny Way, turn right (north) onto Western Ave. which goes into Elliott Ave. West. Continue on and take the right exit go over the Magnolia Bridge and up the hill onto Magnolia Way West. At the stop sign, turn left onto W. Howe St. and cross the bridge, and turn left again onto Magnolia Blvd. Turn left again onto W. Raye St. and drive down the hill to the bottom. Take a left on Perkins Lane. Look for a 6' high yellow picket fence on the right, that spans the width of two properties with no buildings. This land is owned by the City Council, and lies directly above Four-Mile Rock. A small boat is necessary if sediments are to be sampled. There is a good small boat ramp at Duwamish Head, a few miles away to the south across Elliott Bay.

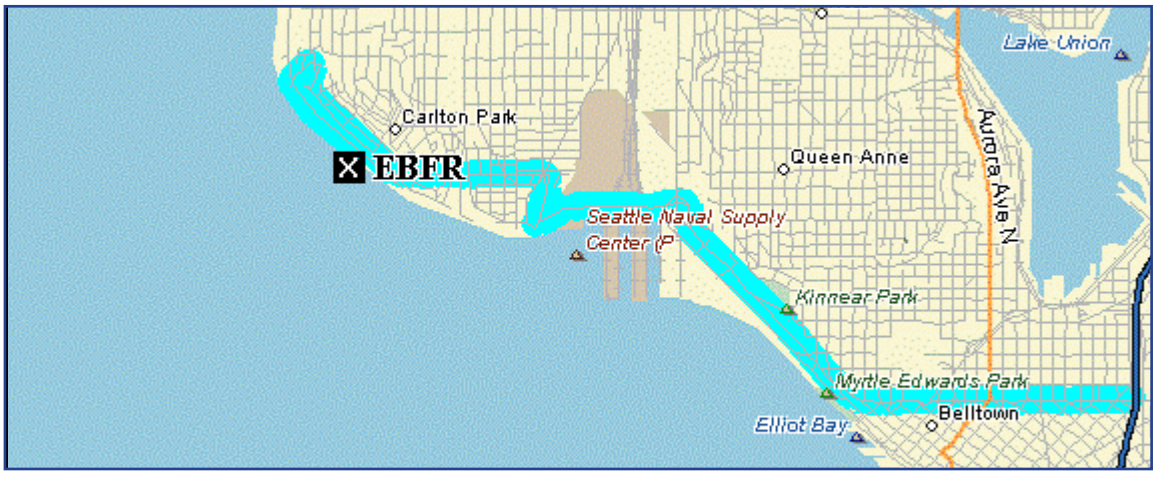
SITE DESCRIPTION - The site is located at Four-Mile Rock, a five meter high boulder lying just offshore and below Magnolia Bluff. The rock has a green navigation marker/light built on top of it. The discrete stations are located around the rock. Station 1 lies to the northeast on the pebble beach, Station 2 lies to the northwest and Station 3 lies to the southeast.

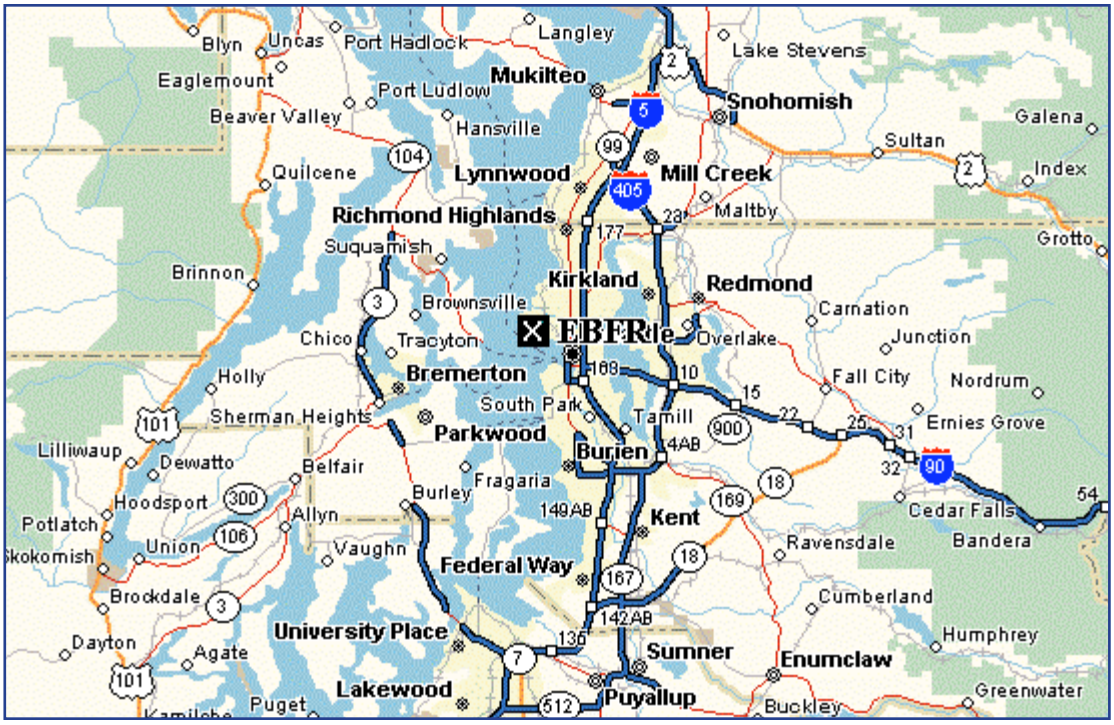
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.




EBFR
Blyn
Uncas
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South Park
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Lilliwaup
Dewatto
Belfair
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Burley
Cedar Falls
Allyn
Kent
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Federal Way
Brockdale
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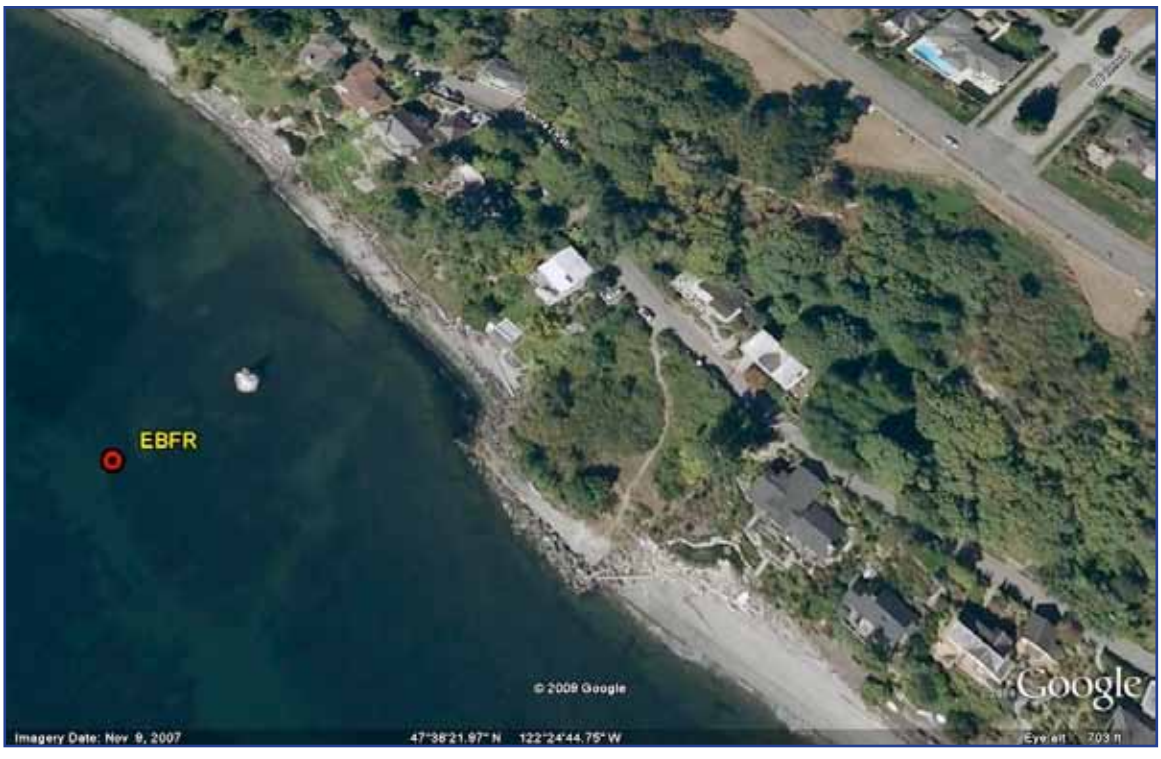
Lakewood
Puget
Puyallup
Buckley
Greenwater


EBFR
© 2008 Google
Google
Imagery Date: Nov 9, 2007
47°38'21.97" N 122°24'44.75" W

Whidbey Island, Possession Point (WIPP)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 281

NOMINAL SITE CENTER - 47° 54.32' N 122° 22.62' W

LOCATED ON NOAA CHART - 18473

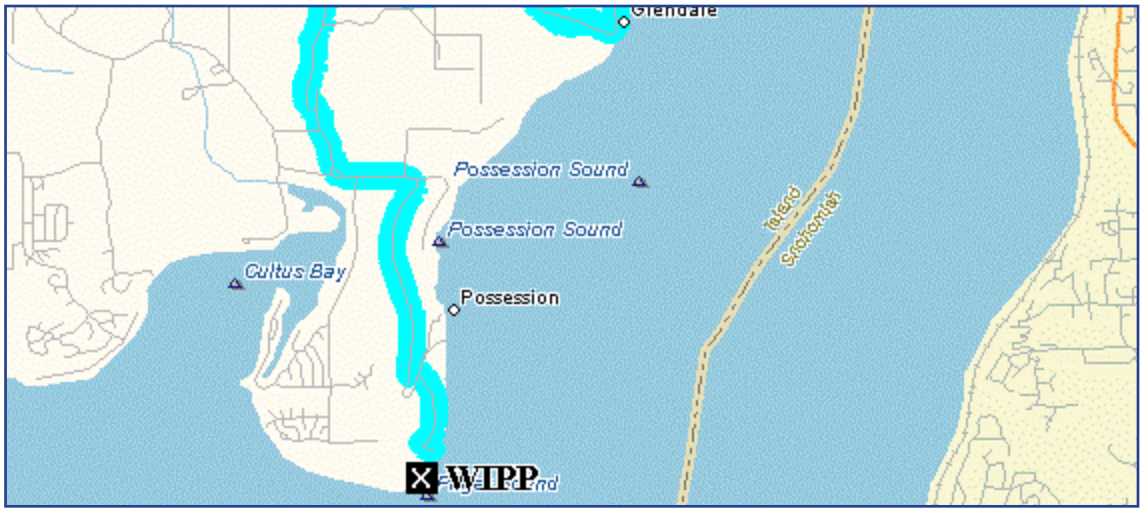
SITE ACCESS - This site is on the east side of Possession Point, at the south end of Whidbey Island. It is most easily accessed via private property, and prior permission must be obtained for collections. Take the ferry from Mukilteo to Clinton. Exit the ferry terminal and turn left at the first intersection onto Humphrey Rd. Proceed south to Glendale Rd., then turn left onto Jewett Rd., which turns into Possession Point Rd. From Possession Point Rd., turn right onto South Franklin Rd. and proceed to the end of the road. At the end of the road, access is gained to the shore across private property. The site is the cobble beach just to the south of the private residence.

SITE DESCRIPTION - The site center is on the beach approximately 150 m south of the retaining wall between the private property and top of the beach. Discrete collection stations were not established because mussels were extremely rare. This site is a cobble beach with widely scattered boulders. Mussels were found attached to the undersides of a few of the larger boulders that could be turned over.

SAMPLING METHODS
Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +1.0 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.




Ault Field
Oak Harbor
McMurray
Oso
Rowan
Darrington
San de Fuca
Utsalady
Bryant
Captains Choice
Norman
Arlington
Warm Beach
English
Dungeness
Port Townsend
Smokey Point
Robe
Silverton
Sequim
Mabana
Fort Flagler
Saratoga
Marysville
King Hill
Hadlock-Irondale
Port Hadlock
Langley
Lake Stevens
Maynard
Bay View
Clinton
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Richmond Highlands
Maltby
Grotto
Suquamish
Brinnon
Kirkland
Redmond
Brownsville
Carnation
Tracyton
Seattle
Overlake
Triton
Crosby
Bremerton
Fall City
Nordrum
Eldon
Holly Park
Ernies Grove
Parkwood
Burien
Lilliwaup


WIPP

PUGET SOUND, CEMEX (PSEC)

TARGET SPECIES- *Mytilus sepicies*

NOMINAL SITE CENTER –47.94968 N 122.30158 W

LOCATED ON NOS CHART # - 18444

SITE ACCESS -
The site is located at 222 W Marine View Dr., Everett, WA
From I-5 northbound take exit 195 for E. Marine View Dr. Turn left at E. Grand Ave. East Grand Ave turns slightly right and becomes E. Marine View Drive. Follow that around the north end of Everett where it becomes W Marine View Drive. Turn right at the gated driveway entrance by the Cemex sign. It's currently the first business you see as you start turning south.

From I-5 southbound
Take exit 198 to merge onto WA-529 toward N Broadway. Take the ramp to E. Marine View Drive. Turn right at E. Marine View Drive. Turn right at the gated driveway entrance by the Cemex sign. It's currently the first business you see after you start heading south.

Park vehicles along the south fence along the driveway about 50 feet before the 2nd gate. Large vehicles with wide turning movements will be coming through the 2nd gate and need plenty of room. Collectors must get into 1 or 2 vehicles which can enter the site and park in the southwest corner of the site. All collectors/volunteers must have hard hats, orange vests, and safety glasses (regular eye glasses and sun glasses are OK).

Contact office when entering site (inside the building) – Jay Harmon at 425-252-8600 Contact to schedule site visit – David McCauley, Cemex, 425-754-9246.

SITE DESCRIPTION -
The site is on property owned by Jeld-Wen and leased to Cemex for a barge off-loading facility for cement, concrete, and asphalt operation. The entire Jeld-Wen property is about 33 acres, with the western 6.1 acres leased to Cemex. The upland site is primarily composed of fill material deposited onto the original Snohomish River delta to create upland for industrial and commercial uses. The fill occurred primarily between 1921 and 1945.
The site is surrounded by the Snohomish River on the north, west and south sides, and has a pier for barge operations on the west side. The south side abuts Maulsby Mudflat, an area of historic log-rafting.
The bank has riprap/rock armoring. Along the south side logs have been chained near the shore by pilings. The logs and rock bank on the southwest corner contain abundant mussel populations, with some mussels extending into the mud along the rock edge. Mud is also interspersed between the rock in many areas. The metal pilings on the west side also contain significant mussel populations. Because the site access is difficult due to business activity and controlled access to the site, mussels are generally protected from public collection.
The site is near the mouth of the Snohomish River and will have a wide range of salinity.

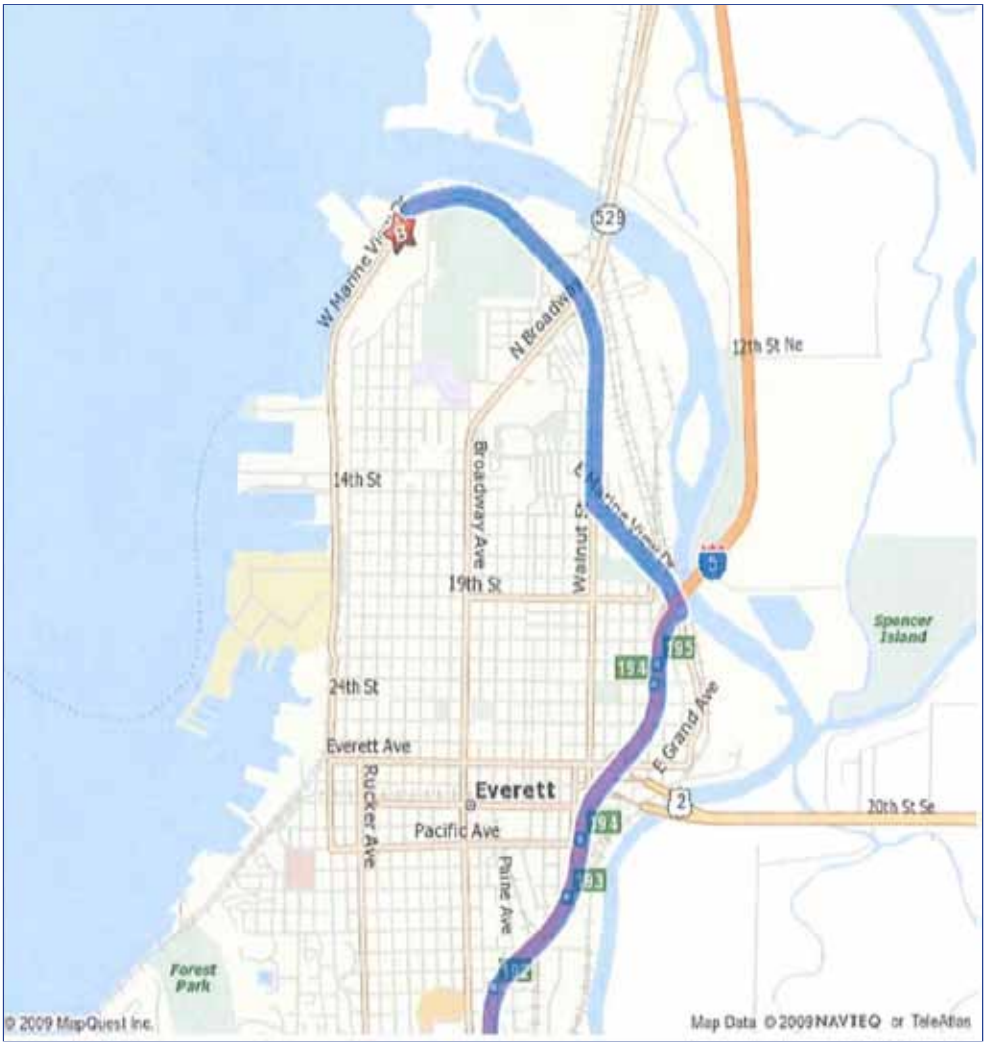
BIVALVE COLLECTIONS
Mussels were collected at the southwest corner of the site, with site 1 on the south side, site 2 at the point, and site 3 on the west side. The mussels were large and plentiful.

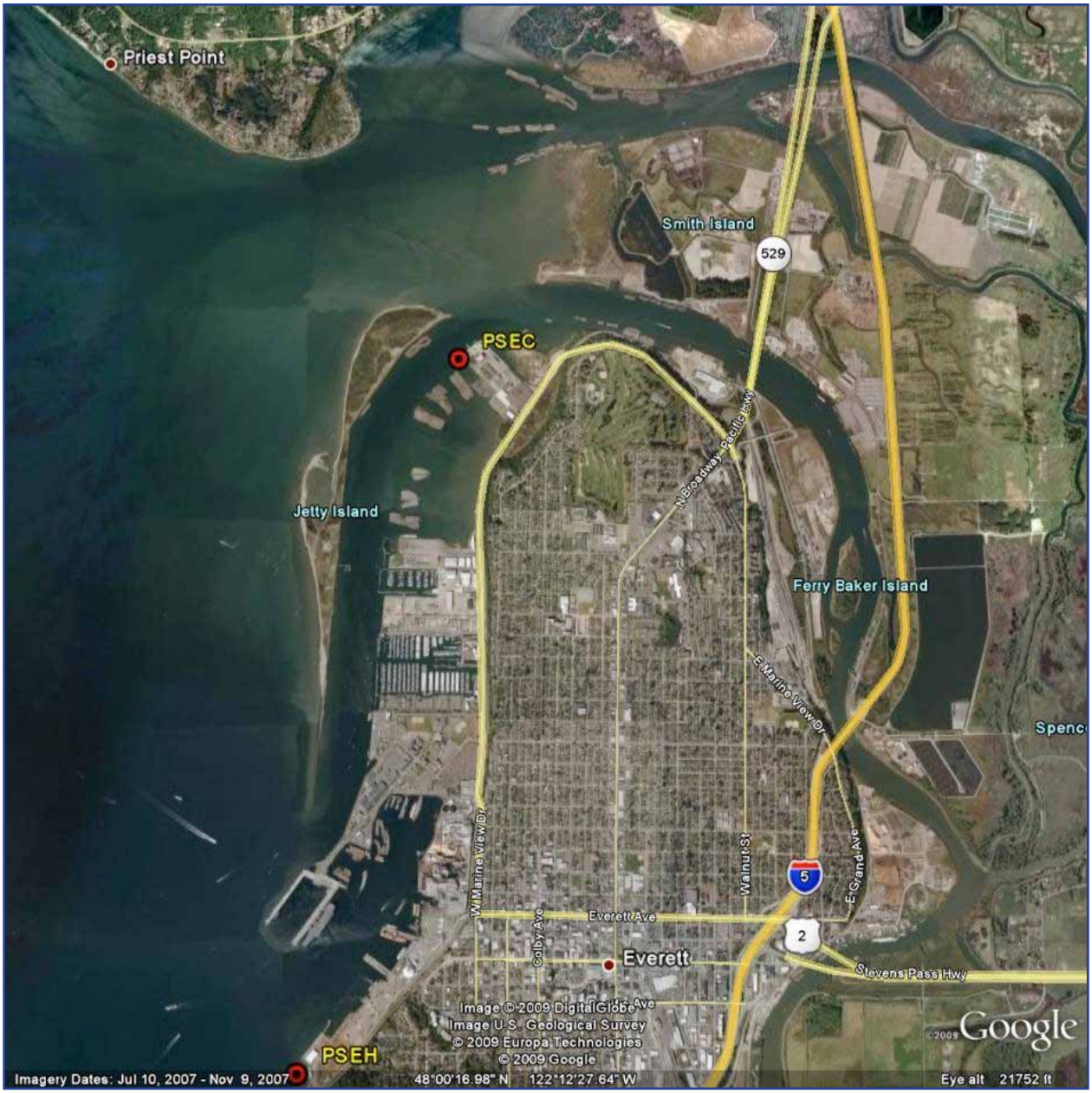
SEDIMENT COLLECTIONS
None were collected.

SAMPLING METHODS
Mussels – by hand.

DEPTH OF SAMPLE COLLECTION
Mussels – intertidal, essentially all at the waterline.

POSSIBLE CONTAMINANTS
Unknown. A stormwater outfall was located approximately 20 feet from Station 3, between Stations 2 and 3. This site was selected to evaluate the effect of the river on contaminants.




Priest Point
Smith Island
529
PSEC
Jetty Island
N Broadway
Pacific Hwy
Ferry Baker Island
E Marine View Dr
W Marine View Dr
Walnut St
E Grand Ave
5
Everett Ave
2
Colby Ave
Everett
Stevens Pass Hwy
Image © 2009 DigitalGlobe
Image U.S. Geological Survey
© 2009 Europa Technologies
© 2009 Google
PSEH
Imagery Dates: Jul 10, 2007 - Nov 9, 2007
48°00'16.98" N 122°12'27.64" W
Eye alt 21752 ft
Google


PSEC
529

Puget Sound, Everett Harbor (PSEH)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 282

NOMINAL SITE CENTER - 47° 58.36' N 122° 13.82' W

LOCATED ON NOAA CHART - 18444

SITE ACCESS - This site is a walk-up, and is easily accessible on foot. Prior permission has to be obtained from the Everett Port Authority, as access is needed to the site across their property. Take Exit 192 on U.S. Highway 5 in Everett, and go west on Mukilteo Blvd. Turn right (north) onto Rucker Ave. and then left (west) onto California St. Go under the railroad bridge and turn left (south) onto Terminal Ave. and into the Port area. Park next to the Maintenance Shop near Pier 1, and obtain the key to the corner gate through the fence to the seawall. A small boat is needed if sediments are to be collected. There is a good public ramp on 13th St., which is farther north off Marine View Drive. The ramp is on the Snohomish River, and inside the Everett Harbor Breakwater.

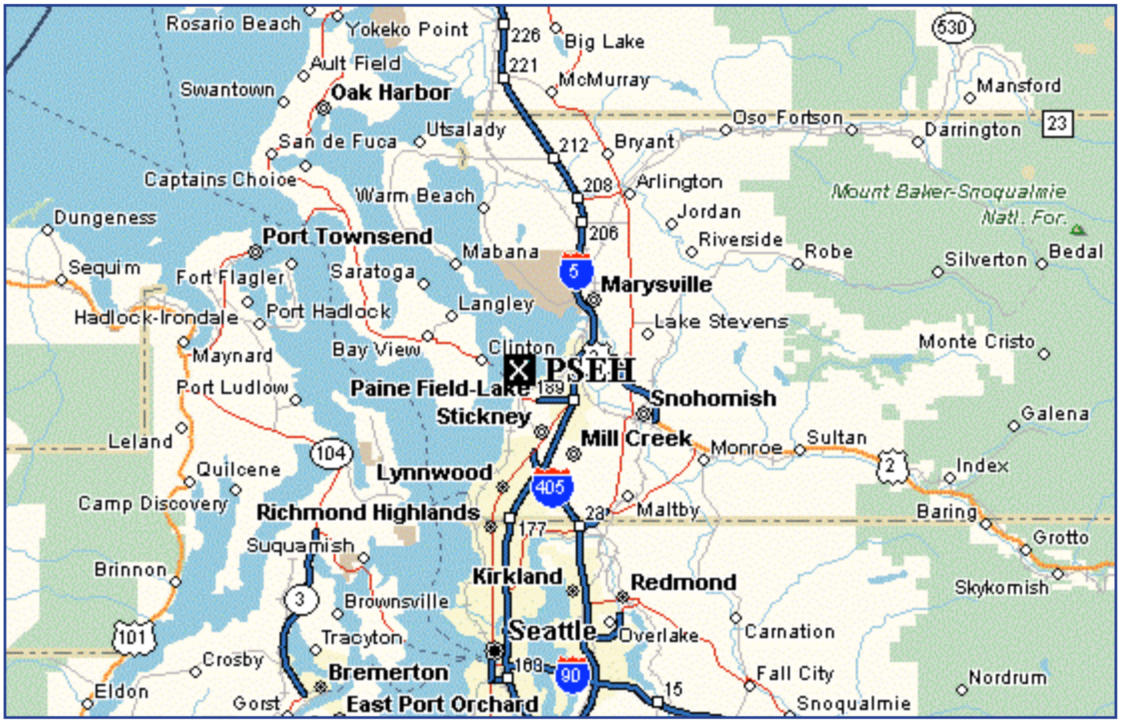
SITE DESCRIPTION - The site is located on the rocks of the breakwater and tidal flat below the Port Authority Maintenance Shop. The discrete stations on the breakwater are as follows: Station 1 is on the corner below the gate, Station 2 is about 15 m to the north and Station 3 is about 15 m east of Station 1.

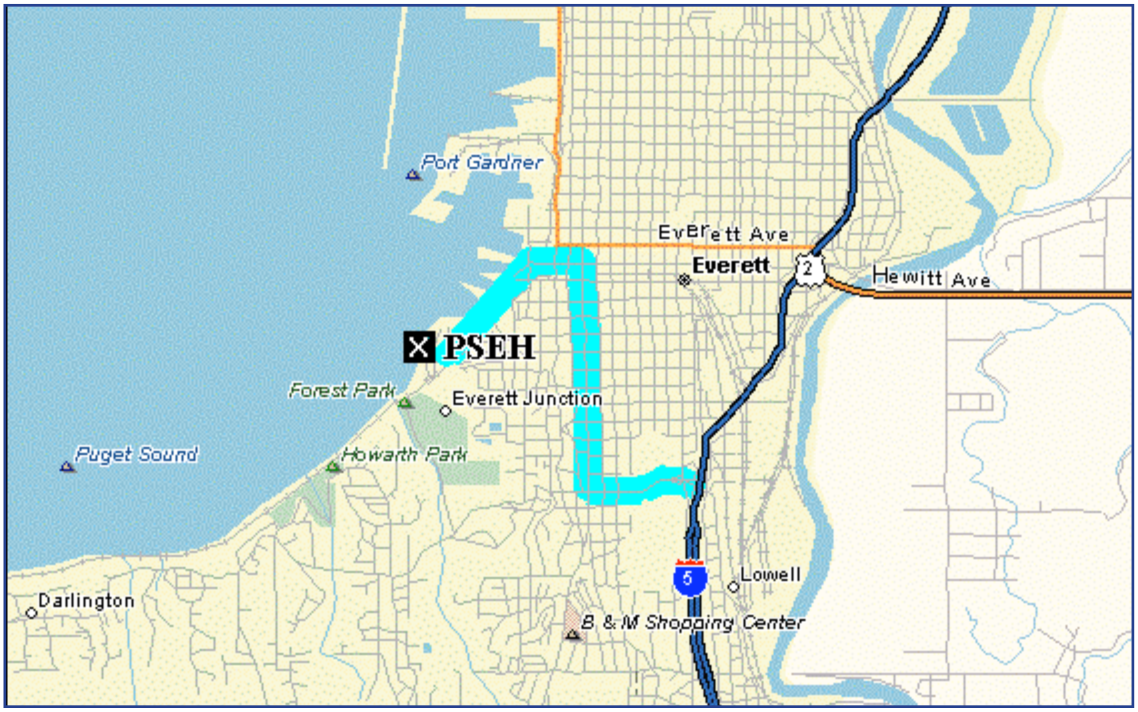
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.25-0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination except runoff from maintenance facility.


Rosario Beach
Yokeko Point
Big Lake
Ault Field
McMurray
Swantown
Oak Harbor
Mansford
Oso
Fortson
Darrington
San de Fuca
Utsalady
Bryant
Captains Choice
Arlington
Warm Beach
Mount Baker-Snoqualmie Natl. For.
Dungeness
Jordan
Port Townsend
Riverside
Mabana
Robe
Silverton
Bedal
Sequim
Fort Flagler
Saratoga
Marysville
Langley
Hadlock-Irondale
Port Hadlock
Lake Stevens
Monte Cristo
Maynard
Bay View
Clinton
PSEH
Port Ludlow
Paine Field-Lake Stickney
Snohomish
Galena
Leland
Mill Creek
Sultan
Monroe
Quilcene
Lynnwood
Index
Camp Discovery
Richmond Highlands
Maltby
Baring
Suquamish
Grotto
Brinnon
Kirkland
Redmond
Skykomish
Brownsville
Seattle
Overlake
Carnation
Tracyton
Crosby
Bremerton
Fall City
Nordrum
Eldon
Gorst
East Port Orchard
Snoqualmie


Port Gardner
Everett Ave
Everett
Hewitt Ave
PSEH
Forest Park
Everett Junction
Puget Sound
Howarth Park
Lowell
Darlington
B & M Shopping Center

Bellingham Bay, Squalicum Marina Jetty (BBSM)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 283

NOMINAL SITE CENTER - 48° 45.13' N 122° 29.87' W

LOCATED ON NOAA CHART - 18424

SITE ACCESS - This site is located on the jetty adjacent to the Squalicum Marina in Bellingham. From U.S. Highway 5 in Bellingham, take Exit 255 west onto Sunset Drive. Proceed on through town, Sunset Drive then turns into Broadway. At the intersection at the end of Broadway, turn left onto West Holly Street. Proceed along West Holly Street to F Street and make a left onto F Street. Drive down F Street and make a right onto Roeder Avenue. Continue down Roeder Avenue, then turn left onto Coho Way and drive into the Marina complex. Wind around the marina, bearing left and park next to the parking lot adjacent to the jetty at the end. If sediments are to be collected, a small boat is necessary. There is a good boat ramp next to the U.S. Coast Guard Station on Glenn Drive, which exits off Marine Drive.

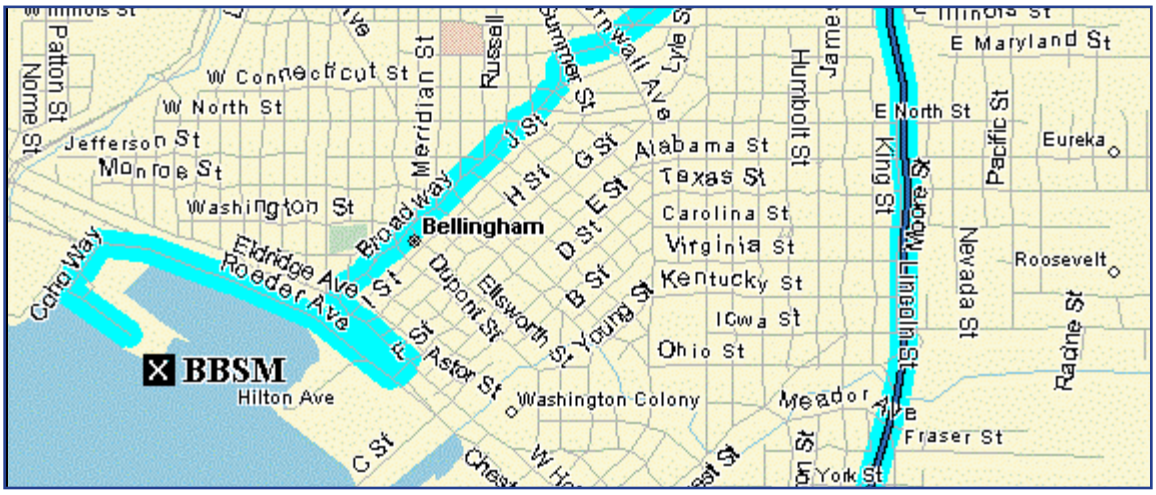
SITE DESCRIPTION - The **nominal site center** approximately 2/3 of the way down the rock jetty from the parking lot, on the bay side of the jetty. Discrete collection stations included the site center and two other stations approximately 10 m away, on either side of the **NOMINAL SITE CENTER**.

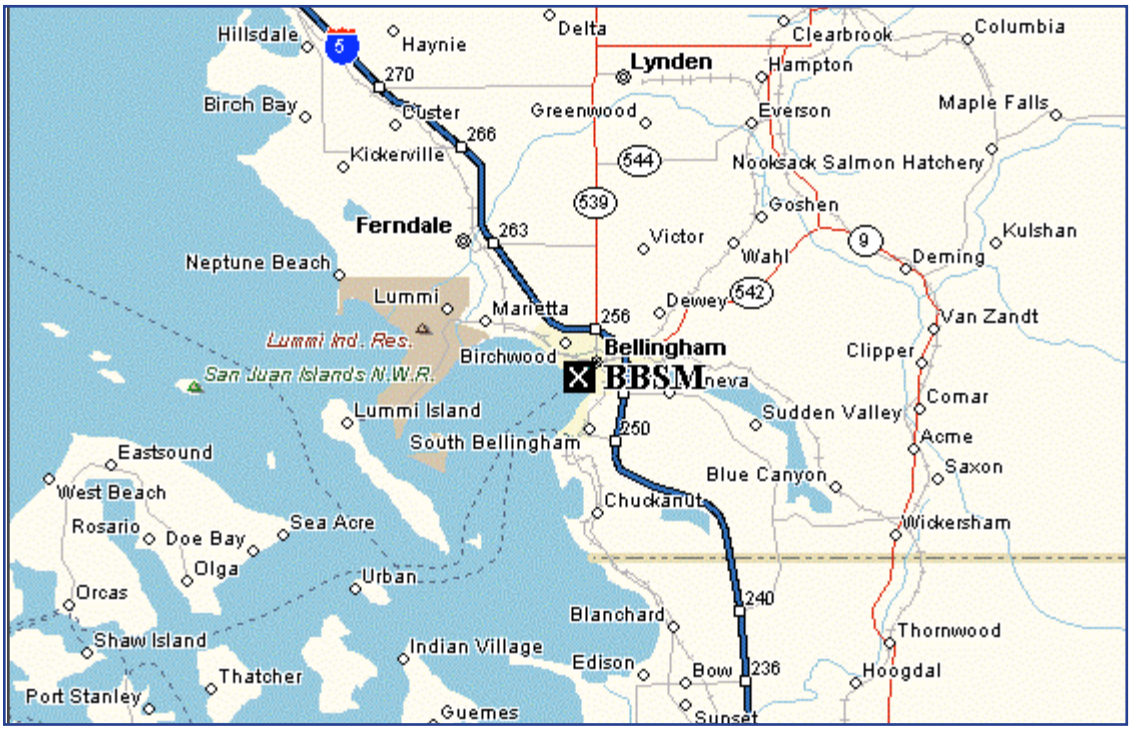
SAMPLING METHODS

Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.25 m MLLW.

POSSIBLE CONTAMINANTS – Potential sources of contamination include urban runoff from this heavily industrialized area including a large fishing, timber and pulp and paper industries.




Hillsdale
Haynie
Delta
Clearbrook
Columbia
Lynden
Hampton
270
Birch Bay
Custer
Greenwood
Everson
Maple Falls
266
Kickerville
544
Nooksack Salmon Hatchery
539
Goshen
Ferndale
263
Victor
Wahl
9
Deming
Kulshan
Neptune Beach
Lummi
Marietta
Dewey
542
256
Van Zandt
Lummi Ind. Res.
Bellingham
Clipper
San Juan Islands N.W.R.
Birchwood
BBSM
Neva
Comar
Lummi Island
Sudden Valley
South Bellingham
250
Acme
Eastsound
Saxon
Blue Canyon
West Beach
Chuckanut
Rosario
Doe Bay
Sea Acre
Wickersham
Olga
Urban
Orcas
240
Blanchard
Thornwood
Shaw Island
Indian Village
Edison
Bow
236
Hoogdal
Thatcher
Port Stanley
Guemes
Sunset


Bellingham
BBSM

Point Roberts, Point Roberts (PRPR)

TARGET SPECIES - *Mytilus species*

SITE NUMBER - 284

NOMINAL SITE CENTER - 48° 59.42' N 123° 05.30' W

LOCATED ON NOAA CHART - 18421

SITE ACCESS - This site is a walk-up, and is easily accessible. To reach this site, one has to travel into Canadian Territory and then back again into the United States. Follow U.S. Highway 5 north to the Canadian border and cross over, then follow Highway 99 north towards Vancouver. At Delta, take Highway 17 south to Tsawwassen. In Tsawwassen, turn left (south) onto 56th St. and follow the signs to the U. S. border and Point Roberts. South of the border, the main road is called Tyee Drive. At the gas station and stop sign, turn right onto Gulf Rd. and drive to the end. Park in the parking lot next to Breaker's Bar, which is on the beach. If sediments are to be collected, a small boat is necessary. There is a small boat ramp on the beach at Lighthouse Point County Park, in Point Roberts. This ramp can only be used in good weather, as there is no protection from the wind and waves.

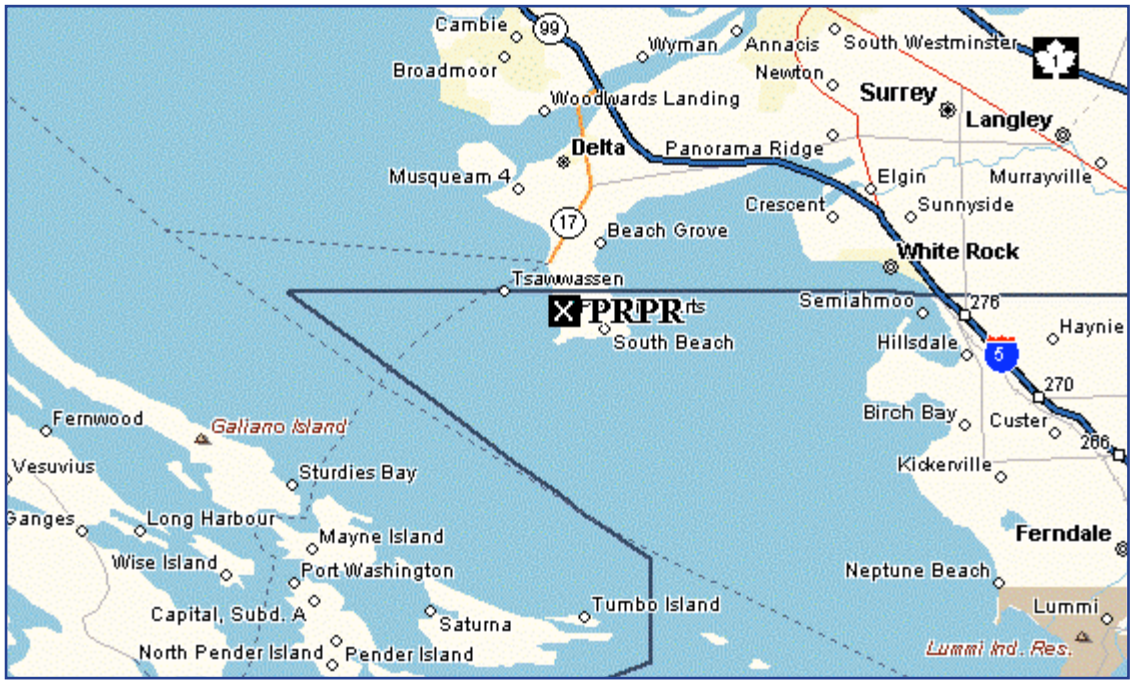
SITE DESCRIPTION - The western site is located about 0.35 miles to the north of the old dock pilings on the beach at Breaker's bar. The site is on the rocks in the intertidal area, below a small bluff. Due to the poor survival rate of the mussels at this site, there is an alternate site on the eastern side of Point Roberts. From the stop sign intersection, continue straight on and then turn left onto A.P.A. Rd. Continue on for about 1.5 miles until the road surface ends and it becomes a dirt road. Go through the gate and on to the end of the road at the beach. Go down the stairs and onto the beach, and the site is about 0.5 miles to the south at the large rock. The **NOMINAL SITE CENTER** for this eastern site is 48° 58.90' N and 123° 01.30' W.

SAMPLING METHODS

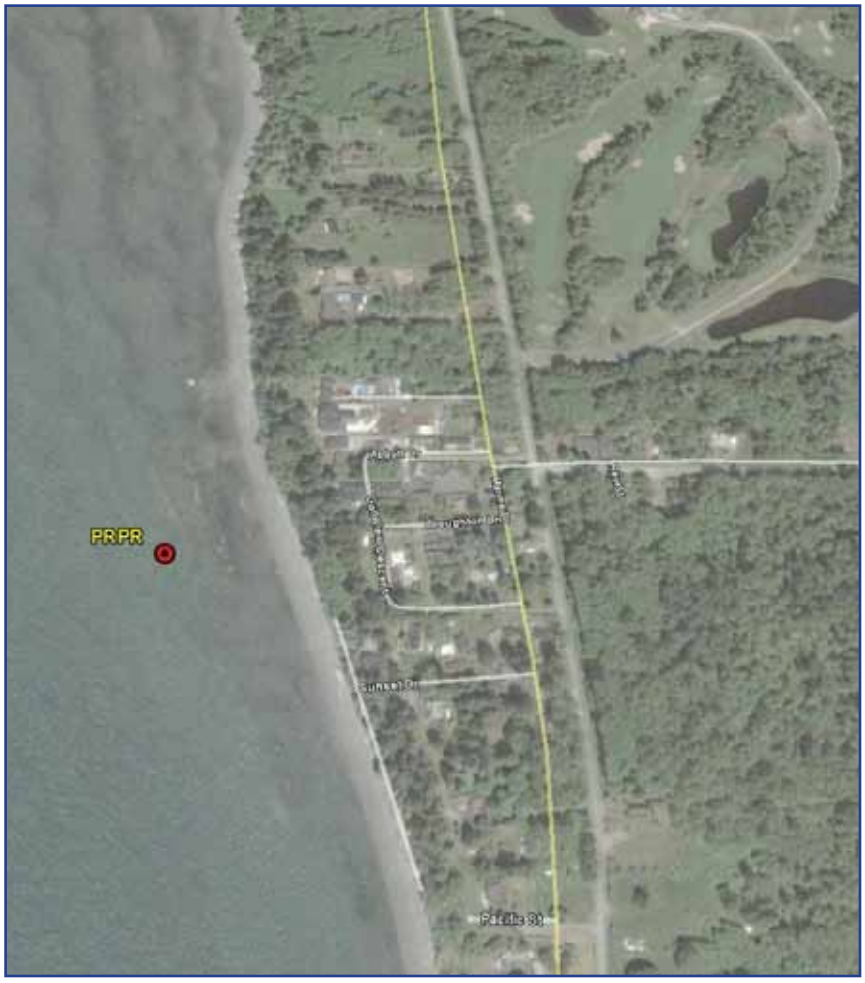
Bivalves - hand
Sediments - stainless steel sediment grab and stainless steel scoop

WATER DEPTH - intertidal, +0.5 m MLLW.

POSSIBLE CONTAMINANTS – There is no obvious point source of contamination.


Cambie
99
Wyman
Annacis
South Westminster
Broadmoor
Newton
Surrey
Langley
Woodwards Landing
Delta
Panorama Ridge
Musqueam 4
Elgin
Murrayville
Crescent
Sunnyside
17
Beach Grove
White Rock
Tsawwassen
PRPR
Semiahmoo
276
Haynie
South Beach
Hillsdale
5
270
Fernwood
Galiano Island
Birch Bay
Custer
Vesuvius
Sturdies Bay
Kickerville
Ganges
Long Harbour
Mayne Island
Ferndale
Wise Island
Port Washington
Neptune Beach
Capital, Subd. A
Saturna
Tumbo Island
Lummi
North Pender Island
Pender Island
Lummi Ind. Res.


Rex St
Iris Blvd
Jonna Dr
Mark Rd
Tyee Dr
Benson Dr
Columbia Cres
PRPR
Point Roberts
Park Ln
Gulf Rd
Peltier Dr
Terrace Ave
Freemans Ln
Marina Dr
Iolanda P
Marina Dr


PRPR

Appendix 1: Contacts

NOAA Contacts

NS&T Mussel Watch Program - 24/7 Cell Phone: (240) 687-3075.
This number is intended for field crews who are actively sampling.

Primary NOAA contact: Dennis Apeti, PhD. - NOAA Mussel Watch Program
(301) 713-3028; (Email) dennis.apeti@noaa.gov

Secondary NOAA Contact: Ed Johnson, PhD. – NOAA Mussel Watch Program
(301) 713-3028; (Email) ed.johnson@noaa.gov

Tertiary NOAA Contact: Kimani Kimbrough, PhD. - NOAA Mussel Watch Program
(301) 713-3028; (Email) kimani.kimbrough@noaa.gov

Laboratory Contacts

Juan Ramirez, TDI Brooks
(979) 693-3446; juanramirez@tdi-bi.com
Juan is the contact at the TDI Brooks Laboratory in College Station, TX. He is responsible for the chemical analyses in both tissue and sediment.

Amanda Brewster, TDI Brooks
(979) 693-3446; amandafryer@tdi-bi.com
Amanda is the Sample Custodian at the TDI Brooks Laboratory. Keep her informed of upcoming sample dates, and the shipment of the samples.

Michael Gaskins, TDI Brooks
(979) 693-3446; mikegaskins@tdi-bi.com. He is responsible for the chemical analyses in both tissue and sediment.

Permit Contacts

Dave Gadwa
(360) 902-2473; gadwadlg@dfw.wa.gov
Dave is the Special Licensing Permit Tech with Washington Department of Fish and Wildlife. He is the contact for any questions regarding our Scientific Collection Permit, including submitting our annual report, and renewing our permit.

Carol Stedman
(360) 902-2474; stedmcas@dfw.wa.gov
Carol works in the Licensing Division of Washington Department of Fish and Wildlife. If Dave Gadwa is unavailable, and the deadline is approaching for adding new names to the contact, Carol will be able to add the names.

Appendix 2

Sampling Agency Contacts

Graham Anderson
(425) 388-0703; grahama@portofeverett.com
Graham is the Senior Environmental Planner for the Port of Everett. Contact him to inform him of the Everett Harbor sampling date and time. He will likely have you contact Ed Madura to gain access to the site.

Ed Madura
(425) 259-5428; (425) 754-0382; edm@portofeverett.com
Ed is the head of the Security at the Port of Everett terminal. Contact him before sampling Everett Harbor to ensure access to the site. Inform him of each individual who will be sampling.

Sally Lider
(425) 771-0227; lider@ci.edmonds.wa.us
Sally is the Environmental Education Coordinator with the City of Edmonds Parks and Recreation Department. Contact her to inform her of the sampling date if sampling the Edmonds site, or with any questions about our Shoreline Sanctuary Permit with the City of Edmonds. It is best to contact her by e-mail.

Jerry Smith (360) 652-7992; jerry.smith@co.snohomish.wa.us
Jerry is the Senior Park Ranger at Kayak Point County Park. Contact him to inform him of the sampling date if the MRC is sampling Kayak Point.

John Garrett (360) 445-4441; garrejgg@dfw.wa.gov
John is the Skagit/Snoqualmie Wildlife Area Manager for Washington Department of Fish and Wildlife. Contact him to inform him of the sampling date if sampling Eide Road, or with questions regarding the Right-of-Access Permit.

Chuck Motson (360) 444-6611; hioffice@hatisland.com
Chuck is the Hat Island Manager, and should be informed of the sampling date if sampling Hat Island. It is best to contact him by email.

Paul Plesha (425) 743-3307 x229; paul.d.plesha@noaa.gov
Paul is the Biological Station Manager at NOAA's Mukilteo Station. Contact him to inform him of the sampling for Mukilteo.

Sheriff Contacts

Scot Fenter, Snohomish County Sheriff's Office
(425) 754-6509;scot.fenter@co.snohomish.wa.us
Scot is the Sergeant in charge of the Marine Division Unit with the Snohomish County Sheriff's Office. He is the contact for arranging transportation to Hat Island for sampling. Contact Scot first by phone, and follow-up with email.

Ryan Gausman, Snohomish County Sheriff's Office
(425) 388-5255; ryan.gausman@co.snohomish.wa.us
Ryan is the Detective for the Marine Division Unit, and assists with the transportation to Hat Island for sampling. Contact Scot Fenter first, but will likely finalize arrangements with Ryan, depending on his schedule.

Snohomish County MRC Contacts

Stef Frenzl, Snohomish County MRC
(425) 388-6466; stef.frenzl@co.snohomish.wa.us
Stef is the lead staff for the Snohomish County MRC. He is the contact for any questions regarding the Mussel Watch coordination in Snohomish County. CC him on emails related to Mussel Watch.

Amy Johnson, former WCC IP and Mussel Watch Coordinator
(425) 780-9351; amyhj@myuw.net
Contact her if necessary for any questions regarding previous samplings she was responsible for. Best to contact her by phone.

Chris Betchley, Associate Planner for the Snohomish County MRC
(425) 870-5590; chrisbe1@juno.com
Chris is the former Associate Planner for the Snohomish County MRC, and previous Mussel Watch Coordinator. Contact her if necessary for any questions regarding previous samplings she was responsible for. Best to contact her by phone.

Stillaguamish Tribe Contacts

Jen Sevigny, Stillaguamish Tribe
(360) 631-2372; jense@stillaguamish.nsn.us
Jen is a former MRC member, representing the Stillaguamish Tribe as Wildlife Biologist. The Tribe conducts sampling at Cavelero County Park, and Kayak Point County Park. Contact Jen on matters regarding sampling at either of those sites. Also update her on general sampling plans for the MRC (i.e. when we're planning to sample).

Robbie Hutton, Stillaguamish Tribe
rhutton@stillaguamish.nsn.us
Robbie is the Fish and Wildlife Technician for the Stillaguamish Tribe.

Appendix 3

Target Species	Site Code	Alternate	Date (mm/dd/yyyy)	Time (local)

SITE DESCRIPTION Photographic verification Y/N:

(bivalve abundance; collection method; access; permits; safety issues; tide & current; sea state; weather; sources; etc)

STATION LOCATION

GPS:		Station 1	Station 2	Station 3
Latitude (decimal degrees)				
Longitude (decimal degrees)				
Water Depth (meters)				
Tidal Horizon (meters)				

WATER QUALITY

Instrument:		Station 1	Station 2	Station 3
Temperature (C)	Surface			
	Bottom-0.5m			
Salinity (ppt)	Surface			
	Bottom-0.5m			
Specific Conductance (mS/cm^3)	Surface			
	Bottom-0.5m			
Dissolved Oxygen (mg/L)	Surface			
	Bottom-0.5m			
Secchi Depth (ft or m)				

Other Comments: