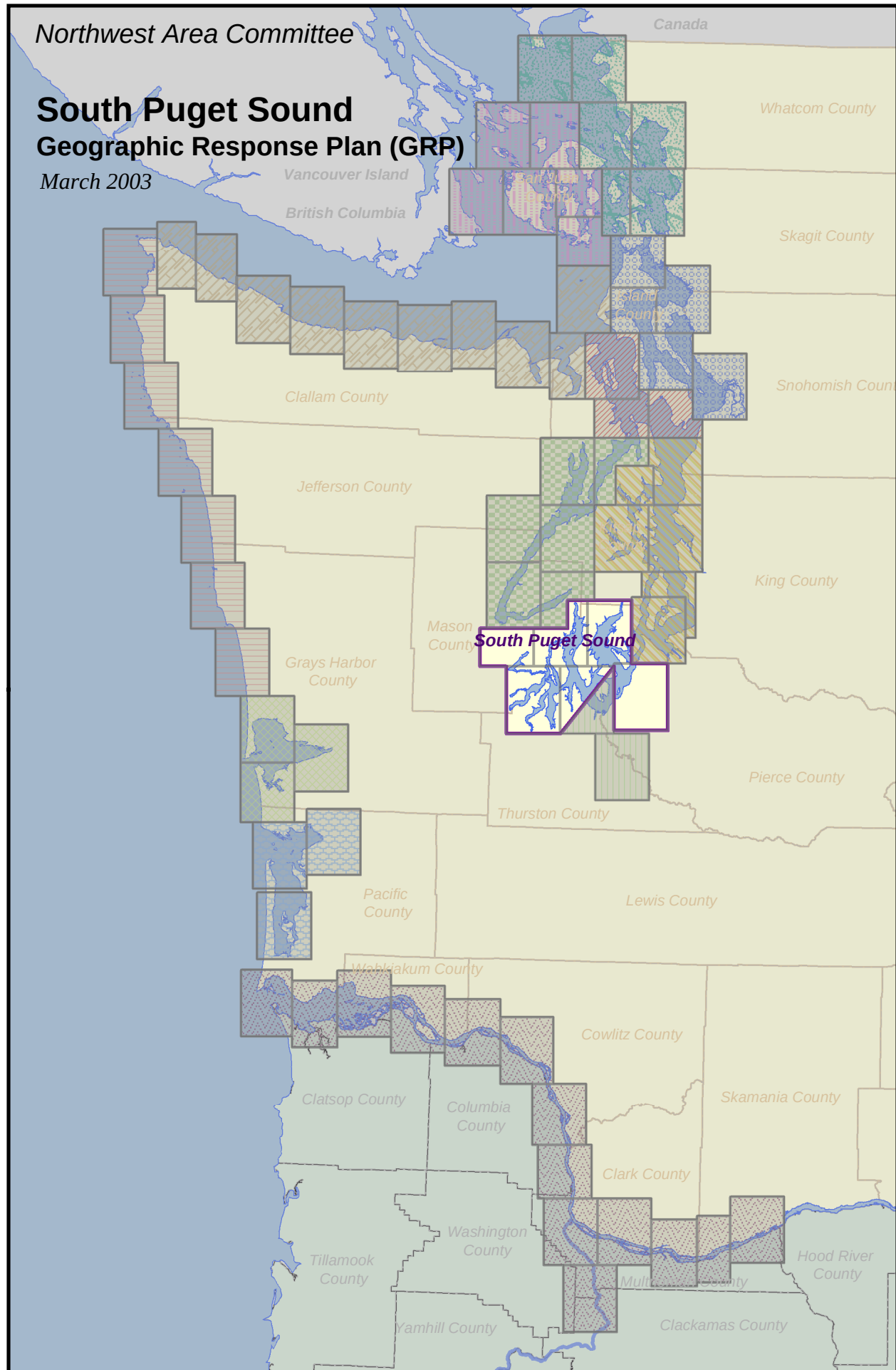


Northwest Area Committee

South Puget Sound Geographic Response Plan (GRP)

March 2003



SPILL RESPONSE CONTACT SHEET

Required Notifications For Hazardous Substance or Oil Spills

USCG National Response Center.....**(800) 424-8802**

In Oregon:

Department of Emergency Management**(800) 452-0311**

In Washington:

Emergency Management Division.....**(800) 258-5990**

Department of Ecology Northwest Regional Office.....**(425) 649-7000**

Department of Ecology Southwest Regional Office.....**(360) 407-6300**

U.S. Coast Guard

National Response Center **(800) 424-8802**

Marine Safety Office Puget Sound:

Watchstander **(206) 217-6232**

Safety Office (206) 217-6232

Marine Safety Office Portland:

Watchstander **(503) 240-9301**

Safety Office (503) 240-9379

Pacific Strike Team **(415) 883-3311**

District 13:

MEP/drat (206) 220-7210

Command Center (206) 220-7001

Public Affairs (206) 220-7237

Vessel Traffic Service (VTS) **(206) 217-6050**

Environmental Protection Agency (EPA)

Region 10 Spill Response **(206) 553-1263**

Washington Ops Office (360) 753-9083

Oregon Ops Office (503) 326-3250

Idaho Ops Office (208) 334-1450

RCRA/ CERCLA Hotline (800) 424-9346

Public Affairs **(206) 553-1203**

National Oceanic Atmosphere Administration

Scientific Support Coordination (206) 526-6829

Weather (206) 526-6087

Canadian

Marine Emergency Ops/Vessel Traffic (604) 666-6011

Environmental Protection (604) 666-6100

B.C. Environment (604) 356-7721

Department of Interior

Environmental Affairs (503) 231-6157

(503) 621-3682

U.S. Navy

Naval Shipyard **(360) 476-3466**

Naval Base Seattle (360) 315-5440

Supervisor of Salvage **(202) 695-0231**

Army Corps of Engineers

Hazards to Navigation (206) 764-3400

Muckleshoot Tribe

Tribal Office (253) 939-3311

Tribal Police (253) 833-7616

Nisqually Tribe

Tribal Office (360) 456-5221

After Hours Emergencies (360) 459-9603

Puyallup Tribe of Indians

Tribal Office (253) 573-7800

After Hours Emergencies **(253) 573-7911**

Squaxin Island Tribe

Tribal Office (360) 426-9781

After Hours Emergencies (360) 426-5222

Federal O.S.R.O./

State Approved Response Contractors

All Out Indust. & Env. Services (360) 414-8655

Certified Cleaning Services, Inc. (253) 536-5500

Clean Sound Cooperative, Inc. **(425) 783-0908**

Cowlitz Clean Sweep, Inc. (360) 423-6316

FOSS Environmental **(800) 337-7455**

Global Diving and Salvage (206) 623-0621

Guardian Industrial Services, Inc. (253) 536-0455

MSRC (425) 252-1300

National Response Corporation (206) 340-2772

Washington State

Department of Ecology Headquarters (360) 407-6900

Southwest Region **(360) 407-6300**

Northwest Region **(425) 649-7000**

Central Region **(509) 575-2490**

Eastern Region **(509) 456-2926**

Department of Fish and Wildlife **(360) 534-8233**

Emergency Management Division (360) 438-8639

(800) 258-5990

State Patrol

Bellevue (425) 455-7700

Tacoma (253) 536-6210

Bremerton (360) 478-4646

Oregon State

Department of Environmental Quality (503) 229-5733

Emergency Management **(503) 378-6377**

(800) 452-0311

HOW TO USE THIS GEOGRAPHIC RESPONSE PLAN

Purpose of Geographic Response Plan (GRP)

This plan prioritizes resources to be protected and allows for immediate and proper action. By using this plan, the first responders to a spill can avoid the initial confusion that generally accompanies any spill.

Geographic Response Plans are used during the emergent phase of a spill which lasts from the time a spill occurs until the Unified Command is operating and/or the spill has been contained and cleaned up. Generally this lasts no more than 24 hours. The GRPs constitute the federal on-scene coordinators' and state on-scene coordinators' (Incident Commanders) "orders" during the emergent phase of the spill. During the project phase, the GRP will continue to be used, and the planned operation for the day will be found in the Incident Action Plan's Assignment List (ICS Form 204). The Assignment List is prepared in the Planning Section with input from natural resource trustees, the Incident Objectives (ICS Form 202), Operations Planning Worksheet (ICS Form 215), and Operations Section Chief.

Strategy Selection

Chapter 4 contains complete strategy descriptions in matrix form, response priorities, and strategy maps. The strategies depicted in Chapter 4 should be implemented as soon as possible, following the priority table in Section 2 with the "Potential Spill Origin" closest to the actual spill origin. These strategy deployment priorities may be modified by the Incident Commander(s) after reviewing on scene information, including: tides, currents, weather conditions, oil type, initial trajectories, etc.

It is assumed that control and containment at the source is the number one priority of any response. If, in the responder's best judgment, this type of response is infeasible then the priorities laid out in Chapter 4, Section 2 take precedence over containment and control.

It is important to note that strategies rely on the spill trajectory. A booming strategy listed as a high priority would not necessarily be implemented if the spill trajectory and booming location did not warrant action in that area. However, the priority tables should be followed until spill trajectory information becomes available, and modifications to the priority tables must be approved by the Incident Commander(s).

The strategies discussed in this GRP have been designed for use with persistent oils and may not be suitable for other petroleum or hazardous substance products. For hazardous substance spills, refer to the Northwest Area Contingency Plan, Chapter 7000.

Standardized Response Language

In order to avoid confusion in response terminology, this GRP uses standard National Interagency Incident Management System, Incident Command System (NIIMS, ICS) terminology and strategy names, which are defined in Appendix A, Table A-1 (e.g. diversion, containment, exclusion).

Record of Changes

March 2003

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South Puget Sound, WA

GEOGRAPHIC RESPONSE PLAN

1. INTRODUCTION: SCOPE OF THIS PROJECT

Geographic Response Plans are intended to help the first responders to a spill avoid the initial confusion that generally accompanies any spill. This document serves as the federal and state on-scene-coordinators “orders” during a spill in the area covered by this GRP (see Chapter 3 for area covered). As such, it has been approved by the U.S. Coast Guard Marine Safety Office and the Washington State Department of Ecology Spills Program. Changes to this document are expected as more testing is conducted through drills, site visits, and actual use in spill situations. To submit comments, corrections, or suggestions please refer to Appendix C.

GRPs have been developed for the marine and inland waters of Washington, Oregon, and Idaho. They are prepared through the efforts and cooperation of the Washington Department of Ecology, Washington Department of Fish and Wildlife, Oregon Department of Environmental Quality, Idaho State Emergency Response Commission, the U.S. Coast Guard, the Environmental Protection Agency, tribes, other state and federal agencies, response organizations, and local emergency responders.

GRPs were developed through workshops involving federal, state, and local oil spill emergency response experts, response contractors, and representatives from tribes, industry, ports, environmental organizations, and pilots. Workshop participants identified resources which require protection, developed operational strategies, and pinpointed logistical support. A similar process has been used for major updates.

Following the workshops, the data gathered was processed and reproduced in the form of maps and matrices which appear in Chapters 4 through 6. The maps in Chapters 5 and 6 were generated using Canvas. Maps for Chapter 4 were generated using ArcView GIS. The matrices were created using MS Excel, and the balance of each GRP was produced using MS Word.

The first goal of a GRP was to identify, with the assistance of the Washington State Natural Resource Damage Assessment Team, resources needing protection; response resources (boom, boat ramps, vessels, etc.) needed, site access and staging, tribal and local response community contacts, and local conditions (e.g. physical features, hydrology, currents and tides, winds and climate) that may affect response strategies. Note that GRPs only address protection of sensitive **public** resources. It is the responsibility of private resource owners and/or potentially liable parties to address protection of private resources (such as commercial marinas, private water intakes, and non-release aquaculture facilities).

Secondly, response strategies were developed based on the sensitive resources noted, hydrology, and climatic considerations. Individual response strategies identify the amount of boom necessary for implementation. The response strategies are then applied to Potential Spill Origins and trajectory modeling, and prioritized, taking into account factors such as resource sensitivity, feasibility, wind, and tidal conditions.

Draft strategy maps and matrices were sent out for review and consideration of strategy viability. Field verification was conducted for some strategies, and changes proposed by the participants were included in a semi-final draft, which was offered for final review to all interested parties and the participants of the field verification.

Finally, the general text of the GRP was compiled along with the site description, reference maps, and logistical support.

Items included in Logistical Support:

- Location of operations center for the central response organization;
- Local equipment and trained personnel;
- Local facilities and services and appropriate contacts for each;
- Site access & contacts;
- Staging areas;
- Helicopter and air support;
- Local experts;
- Volunteer organizations;
- Potential wildlife rehabilitation centers;
- Marinas, docks, piers, and boat ramps;
- Potential interim storage locations, permitting process;
- Damaged vessel safe-havens;
- Vessel repairs & cleaning;
- Response times for bringing equipment in from other areas.

2. SITE DESCRIPTION

South Puget Sound is comprised of numerous inlets and bays extending from Colvos Passage to Totten Inlet. The South Puget Sound area includes Case Inlet, Budd Inlet, Ed Inlet, Carr Inlet, Hammersly Inlet, Henderson Inlet and several other small areas. Oakland Bay, Pickering Passage, Hale Passage, Peale Passage, Dana Passage, Drayton Passage, Balch Passage, Nisqually Reach and North Bay are also covered.

Refer to Chapter 6 for detailed resource information.

2.1. Physical Features

South Puget Sound is comprised mostly of sand and gravel, and sand and cobble beaches. Much of the adjacent land is rural or conservancy, however, several population centers such as Shelton, Olympia and Tacoma have manmade features such as docks and marinas along the shore. Inlets, passages and small bays dominate the area. South Puget Sound includes the following shoreline habitats:¹

- Sand and cobble beaches
- Sand and gravel beaches
- Exposed tidal flats
- Sheltered tidal flats
- Marshes

Squaxin Island, located at the head of Totten Inlet, is an Indian Reservation. McNeil Island houses a state prison. Ferry routes connect several of the peninsulas and islands, and may need to be considered when attempting to reach a spill by motor vehicle.

2.2 Hydrology

Puget Sound is an estuary with a two-layer net flow. Surface waters are less saline due to freshwater inputs, and generally flow seaward. Deeper waters tend to flow landward. Vertical mixing takes place throughout the Sound in constricted or shallow areas, such as the Tacoma Narrows.²

2.3 Currents and Tides

The mean tidal range (MHW - MLW) for South Puget Sound is 9.4 to 10.48 feet. The diurnal tidal range (MHHW - MLLW) is 13.1 to 15.0 feet. Tidal ranges increase further south.³

South Puget Sound is made up almost entirely of inlets and narrow passages. Generally, currents in inlets are weak and variable and the currents through passages are strong. The currents range from approximately 1 to 2.5 knots.⁴

¹ National Oceanic and Atmospheric Administration, Environmental Sensitivity Index, Central & Southern Puget Sound (Seattle: 1984).

² Evans Hamilton, Inc. and D.R. Systems, Inc., Puget Sound Environmental Atlas, vol. 1 (1987) 122-125.

³ National Oceanic and Atmospheric Administration, Tide Tables West Coast of North and South America (1994).

⁴ National Oceanic and Atmospheric Administration, Tidal Current Tables Pacific Coast of North America and Asia (1994).

Tides and currents vary with seasonal runoff and lunar cycles in localized areas. Spill responders should consult tide and current tables for their particular location.

2.4. Winds

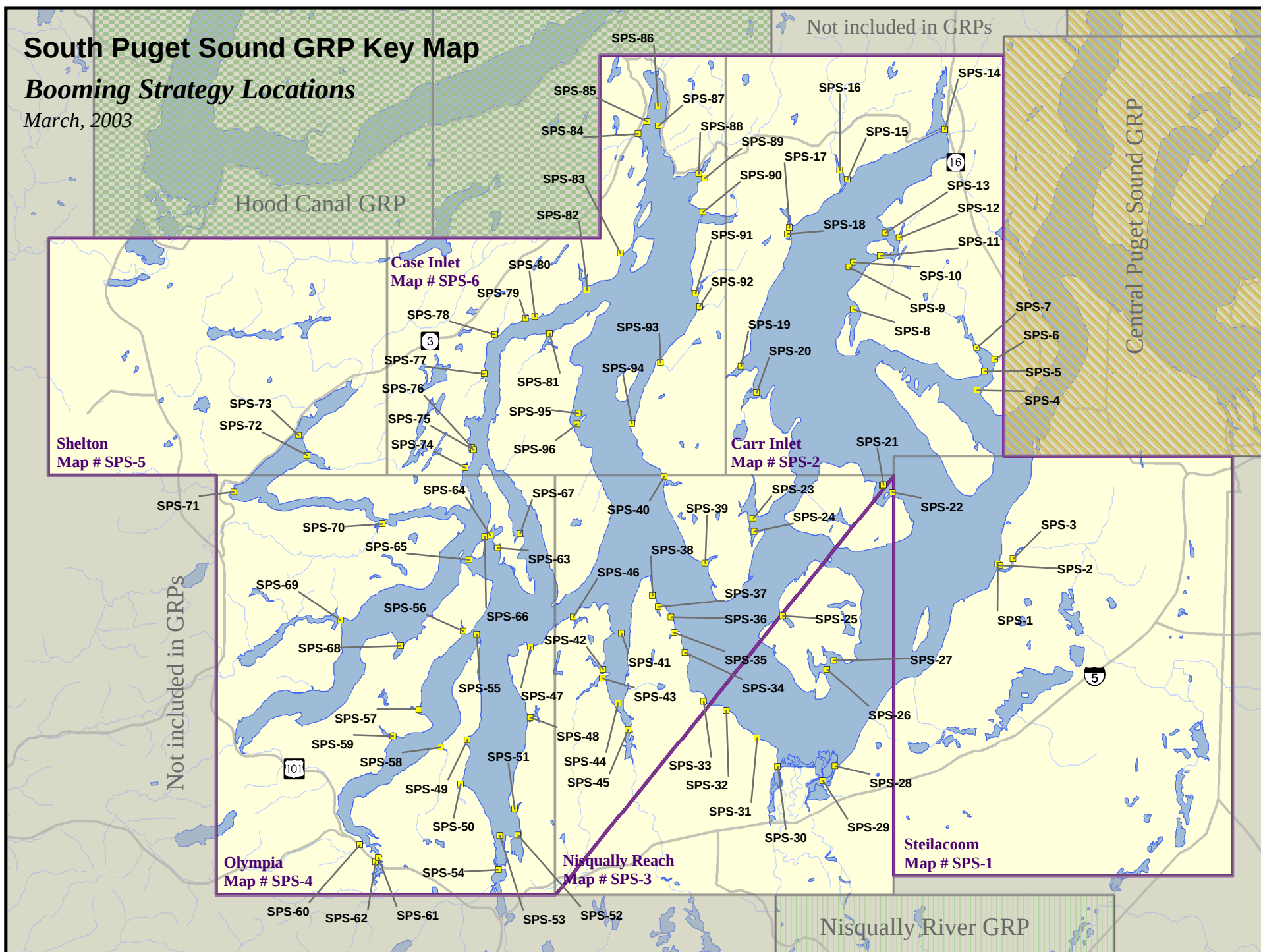
The winds in this area are a result of diverse topography including the Cascade and Olympic Mountains. The westerly winds from the Pacific appear to flow to the north and south around the Olympics, causing what is commonly known as the “Puget Sound Convergence” on the eastern side.

From October through March, winds are generally southwest at 10 to 20 mph. During the summer months, June through September, winds may be northeast or southwest at approximately 0 to 9 mph. Southwesterly winds at 10 to 20 mph dominate the area from April through May.⁵ Local wind conditions may vary.

2.5. Climate

The area has a maritime climate with cool summers and mild winters. Annual precipitation is between 18 and 50 inches. Fog may cause visibility problems on about 25 to 40 days per year, usually in autumn and again in January and February.

⁵ State of Washington Department of Natural Resources, Washington Marine Atlas, South Inland Waters, vol. 2 (1972).



4. GENERAL PROTECTION/COLLECTION STRATEGIES

4.1. Chapter Overview

This chapter details the specific response strategies and resources to protect as outlined by the participants of the GRP workshop for the South Puget Sound area. It describes the strategies determined for each area and the prioritization of those strategies. Note that GRPs only address protection of sensitive **public** resources. It is the responsibility of private resource owners and/or potentially liable parties to address protection of private resources (such as commercial marinas, private water intakes, and non-release aquaculture facilities).

Maps & Matrices

The maps in this chapter provide information on the specific location of booming strategies. They are designed to help the responder visualize response strategies. Details of each booming strategy are listed in corresponding matrix tables. Each matrix indicates the exact location, intent and implementation of the strategy indicated on the map. The "Status" column describes whether the strategy has been visited or tested in the field, and the date of the visit/test. Most strategies include a number for the corresponding shoreline photo, which is available on the Washington Department of Ecology's internet site at <http://www.ecy.wa.gov/apps/shorephotos/>.

Major Protection Techniques

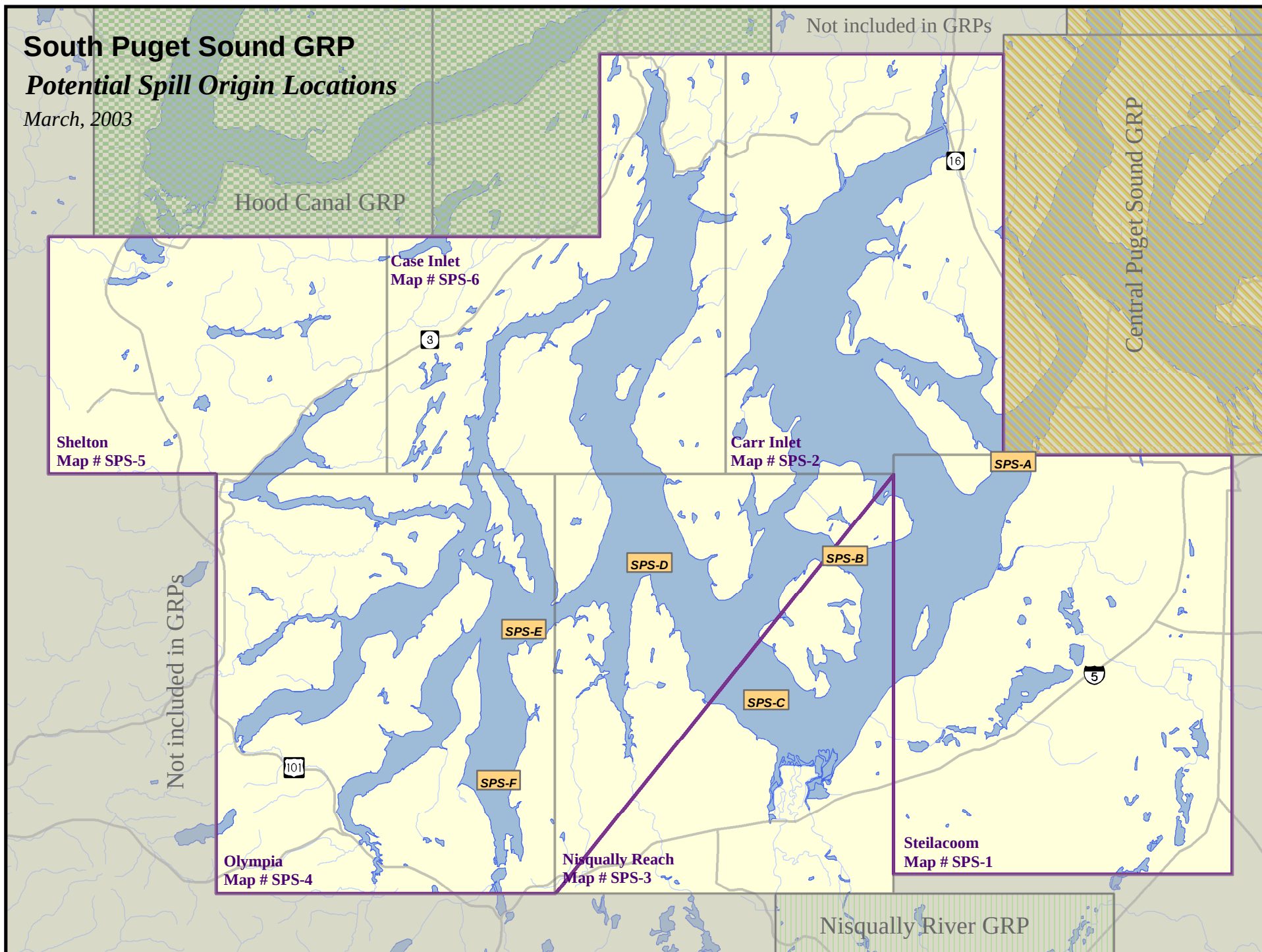
All response strategies fall into one of three major techniques that may be utilized either individually or in combination. The strategies listed in Section 4.2 are based on the following techniques, and are explained in detail in Section 4.3:

Dispersants: Washington State Policy currently does not allow use of dispersants in this area. Certain chemicals break up slicks on the water. Dispersants can decrease the severity of a spill by speeding the dissipation of certain oil types. Their use will require approval of the Unified Command. Dispersants will only be used in offshore situations under certain conditions, until further determinations are made by the Area Committee and published in the Area Contingency Plan.

In Situ Burning: Approval to burn in this area is unlikely due to the proximity of population to a potential burn site. Burning requires the authorization of the Unified Command, who determine conformance of a request to burn with the guidelines set forth in the Area Plan. This option is preferable to allowing a slick to reach the shore provided that population areas are not exposed to excessive smoke. Under the right atmospheric conditions, a burn can be safely conducted in relative close proximity to human population. This method works on many types of oil, and requires special equipment including a fire boom and igniters.

Mechanical Recovery and Protection Strategies: If a spill is too close to shore to use In Situ burning or dispersants, the key strategies are skimming and use of collection, diversion, or exclusion booming to contain and recover the oil, and prevent it from entering areas with sensitive wildlife and fisheries resources. These options are described in detail in Appendix A. Specific skimming strategies are not listed in the maps and matrices, but skimming should be used whenever possible and is often the primary means of recovering oil and protecting resources, especially when booming is not possible or feasible.

Priorities: The strategy priority tables (Section 4.2.) were developed using specific locations where spills are likely to occur. Trajectory modeling was used for each of these "Potential Spill Origins" to identify sensitive resources that would likely be impacted within the initial hours of the spill. A booming strategy priority table was developed for each of the "Potential Spill Origins" based on the sensitivity of resources, feasibility, etc. **Booming strategies should be deployed following the priority table for the "Potential Spill Origin" closest to the actual spill origin.** The map on page 4-2 shows the locations of all Potential Spill Origins for the South Puget Sound GRP. The booming strategies indicated in the priority tables are explained in detail in the Maps & Matrices section (Section 4.3.). It is implied that control and containment at the source is the number one priority of any response. If in the responder's best judgment this is not feasible, then the priorities laid out in the priority tables take precedence over containment and control.



4.2.2 Booming Strategy Priority Tables

Table 4-1

Potential Spill Origin: SPS-A - Fox Island/Tacoma Narrows			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-21	4-10	Refer to South Puget Sound GRP for SPS strategies
2	SPS-22	4-10	
3	CPS-64	4-30	Refer to Central Puget Sound GRP for CPS strategies
4	CPS-63	4-29	
5	CPS-62	4-29	
6	CPS-56	4-28	
7	SPS-1	4-8	Refer to South Puget Sound GRP for SPS strategies
8	SPS-7	4-9	
9	SPS-6	4-9	
10	SPS-4	4-9	
11	SPS-5	4-9	

Table 4-2

Potential Spill Origin: SPS-B - Combined Balch Passage and McNeil Island			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-21	4-10	
2	SPS-22	4-10	
3	SPS-23	4-10	
4	SPS-24	4-10	
5	SPS-25	4-10	
6	SPS-39	4-10	
7	SPS-26	4-10	
8	SPS-27	4-10	
9	SPS-1	4-8	
10	SPS-28	4-10	
11	SPS-29	4-10	
12	SPS-30	4-10	

Table 4-3

Potential Spill Origin: SPS-C - Nisqually National Wildlife Refuge			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-28	4-10	
2	SPS-29	4-10	
3	SPS-30	4-10	
4	SPS-26	4-10	
5	SPS-27	4-10	
6	SPS-25	4-10	
7	SPS-31	4-10	
8	SPS-32	4-10	
9	SPS-33	4-10	
10	SPS-34	4-10	
11	SPS-35	4-10	
12	SPS-36	4-10	
13	SPS-37	4-10	
14	SPS-39	4-10	
15	SPS-38	4-10	
16	SPS-23	4-10	
17	SPS-24	4-10	

Table 4-4

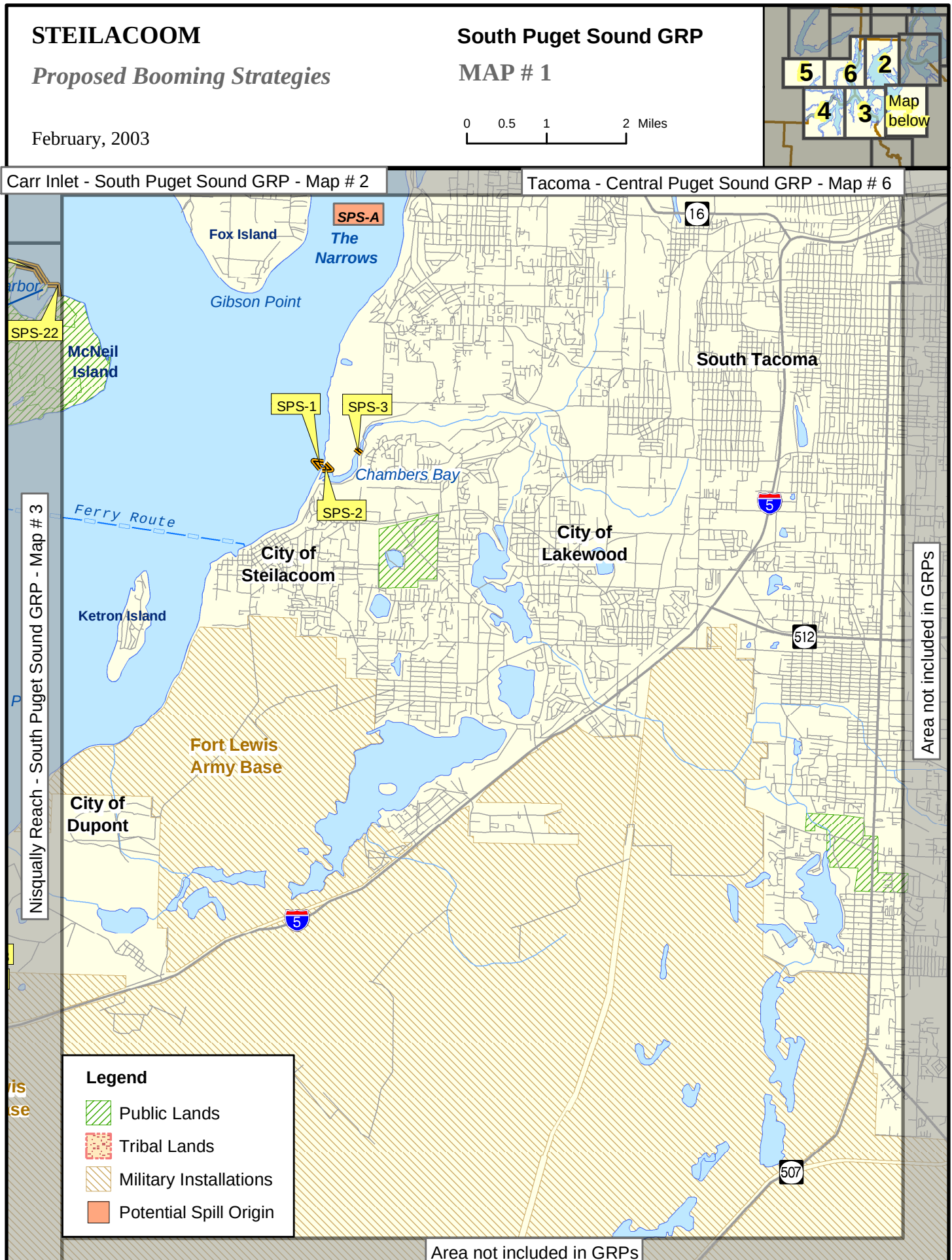
Potential Spill Origin: SPS-D – Johnson Point			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-41	4-10	
2	SPS-46	4-10	
3	SPS-38	4-10	
4	SPS-37	4-10	
5	SPS-36	4-10	
6	SPS-35	4-10	
7	SPS-34	4-10	
8	SPS-39	4-10	
9	SPS-25	4-10	
10	SPS-56	4-11	
11	SPS-55	4-11	
12	SPS-47	4-11	

Table 4-5

Potential Spill Origin: SPS-E – Boston Harbor			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-46	4-10	
2	SPS-47	4-11	
3	SPS-56	4-11	
4	SPS-65	4-11	
5	SPS-66	4-11	
6	SPS-64	4-11	
7	SPS-63	4-11	
8	SPS-39	4-10	
9	SPS-67	4-11	
10	SPS-49	4-11	
11	SPS-41	4-10	
12	SPS-48	4-11	
13	SPS-57	4-11	
14	SPS-50	4-11	

Table 4-6

Potential Spill Origin: SPS-F - Budd Inlet			
BOOMING PRIORITY	STRATEGY NUMBER	MAP PAGE NUMBER	COMMENTS
1	SPS-53	4-11	
2	SPS-52	4-11	
3	SPS-48	4-11	
4	SPS-51	4-11	
5	SPS-50	4-11	
6	SPS-49	4-11	
7	SPS-47	4-11	
8	SPS-46	4-10	
9	SPS-55	4-11	
10	SPS-56	4-11	
11	SPS-65	4-11	
12	SPS-66	4-11	
13	SPS-64	4-11	
14	SPS-63	4-11	
15	SPS-67	4-11	



NISQUALLY REACH

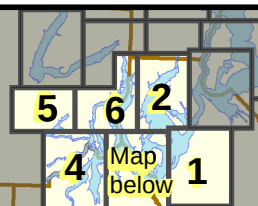
Proposed Booming Strategies

February, 2003

South Puget Sound GRP

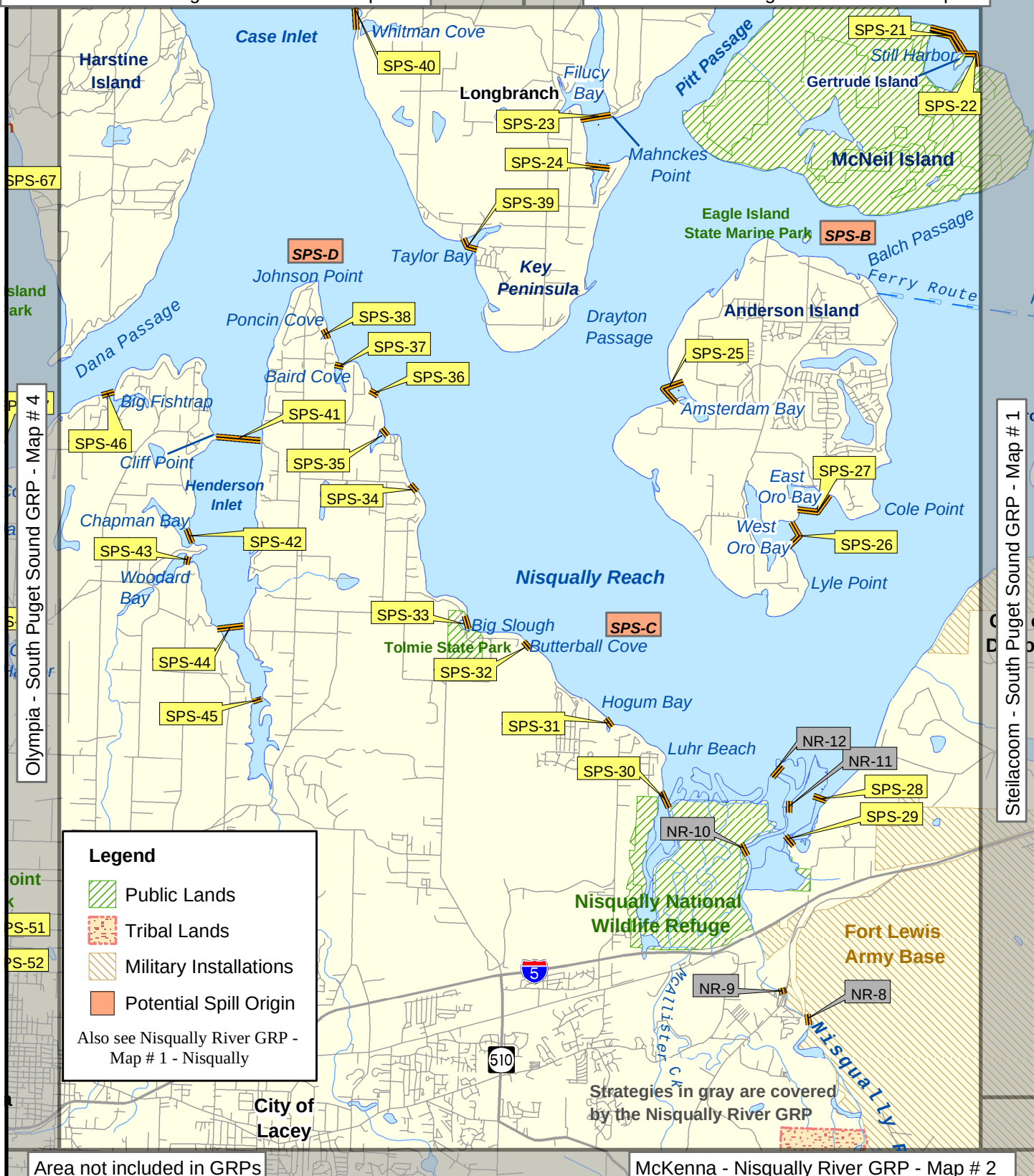
MAP # 3

0 0.5 1 2 Miles



Case Inlet - South Puget Sound GRP - Map # 6

Carr Inlet - South Puget Sound GRP - Map # 2



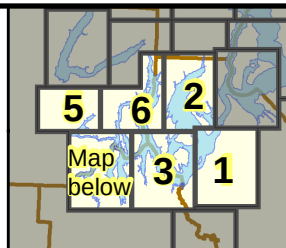
OLYMPIA

Proposed Booming Strategies

February, 2003

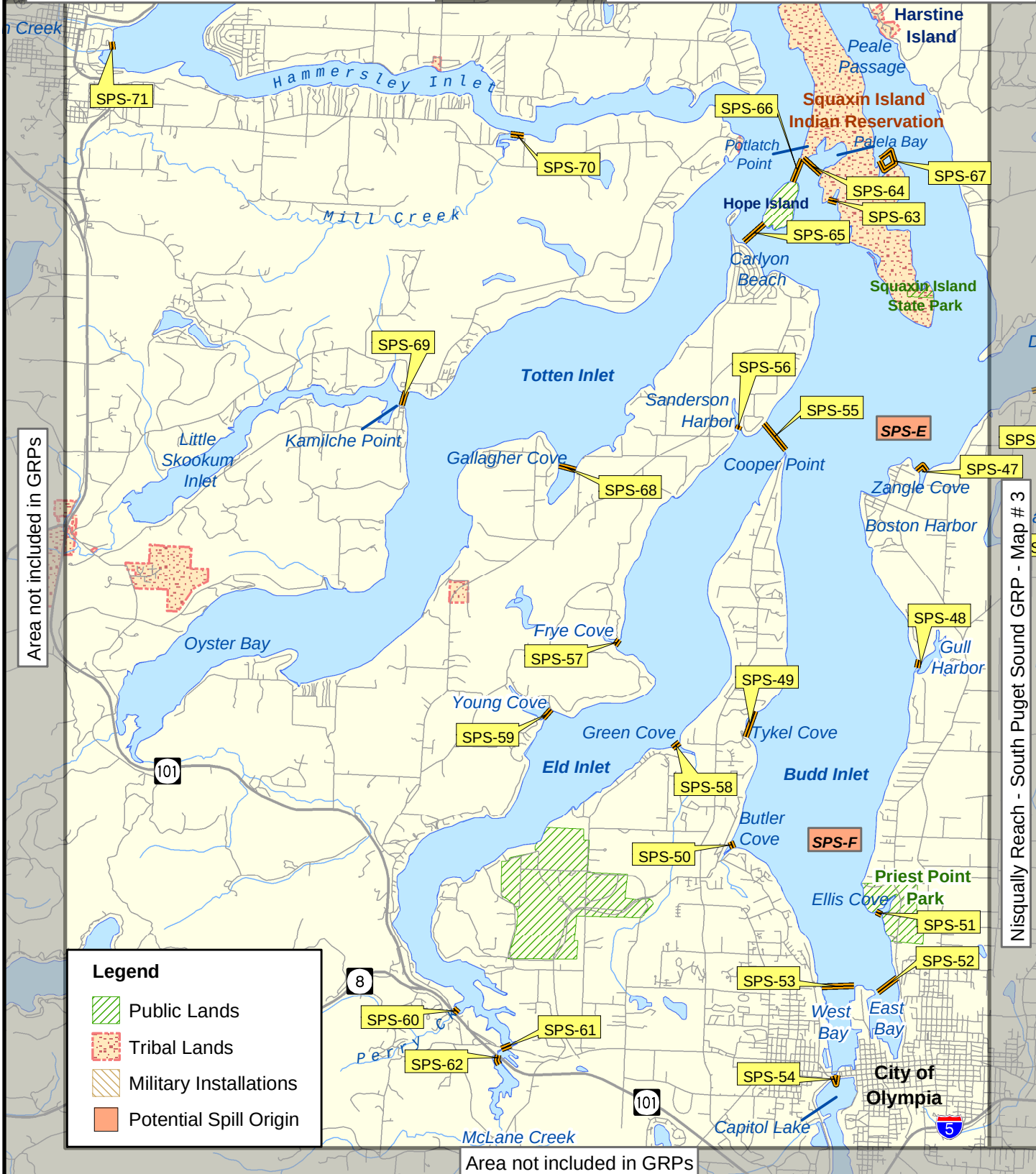
South Puget Sound GRP

MAP # 4



the Shelton - South Puget Sound GRP - Map # 5

Case Inlet - South Puget Sound GRP - Map # 6



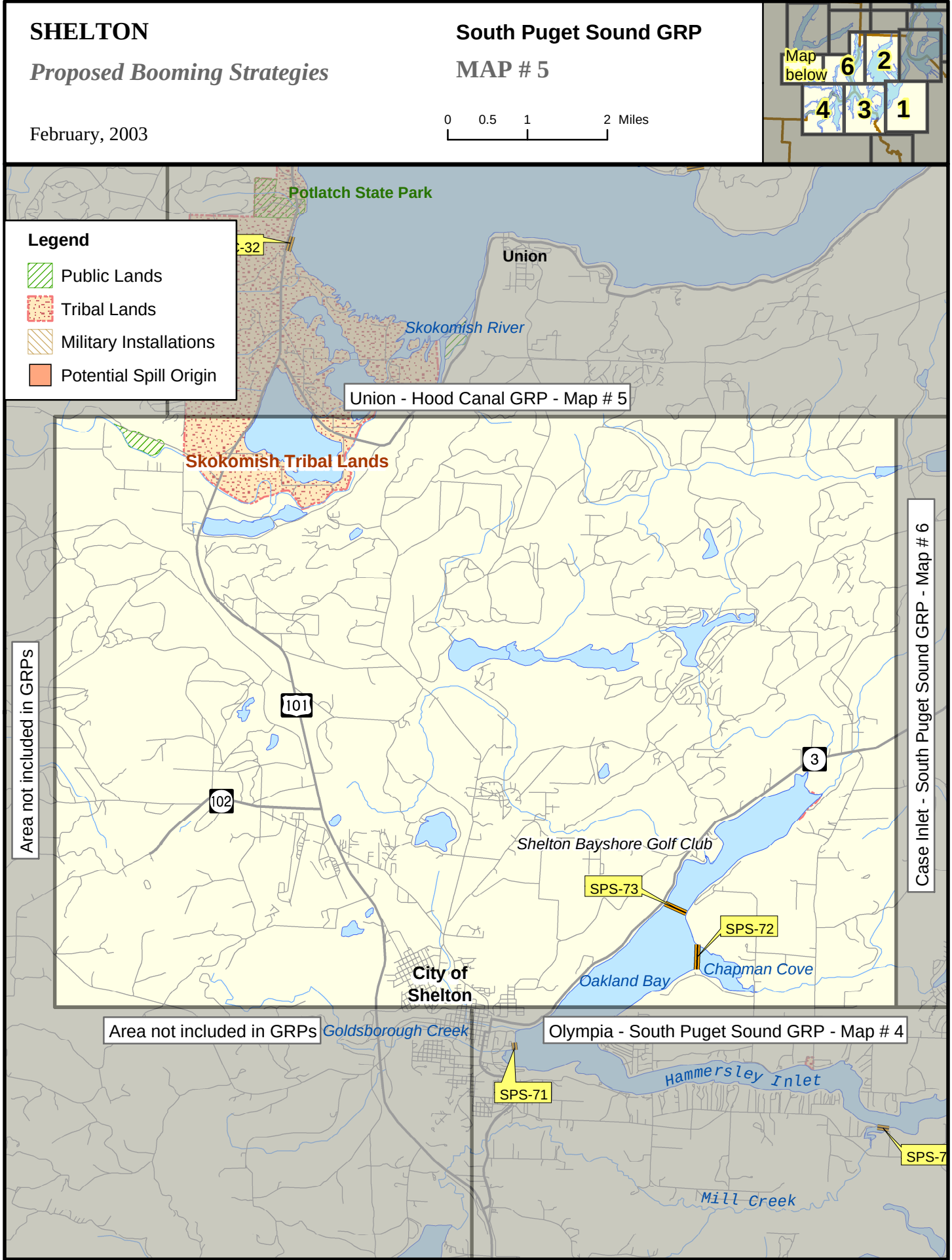
Legend

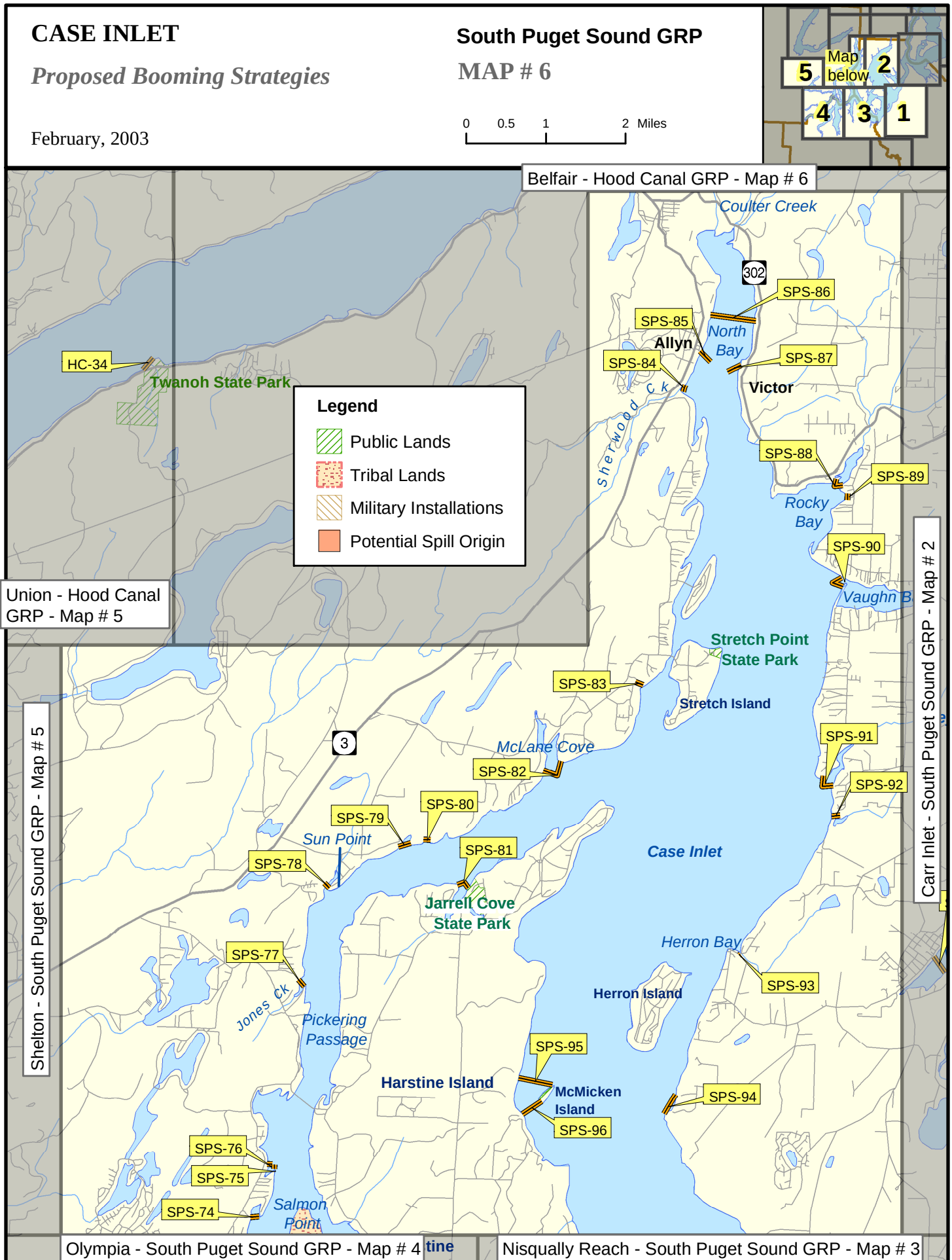
- Public Lands
- Tribal Lands
- Military Installations
- Potential Spill Origin

Area not included in GRPs

Nisqually Reach - South Puget Sound GRP - Map # 3

Area not included in GRPs





4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-1		Chambers Bay PIE0145 47°-11.25'N 122°-35.00'W	Exclusion booming - Keep oil out of Chambers Bay.	400'	Deploy boom in a chevron configuration on the west side of the railroad trestle to keep oil out of the bay.	Boise Cascade	Chambers Creek Road.	Fish ladder, salmonids, creek estuary.
SPS-2		Chambers Bay PIE0145 47°-11.24'N 122°-34.97'W	Containment booming - Keep spill inside the bay.	400'	Deploy boom in a chevron configuration on the east side of the railroad trestle to keep oil in the bay.	Steilacoom	Chambers Creek Road.	Fish ladder, salmonids, creek estuary.
SPS-3		Chambers Bay PIE0146 47°-11.44'N 122°-34.40'W	Exclusion booming - Keep oil out of the fish ladder.	200'	Deploy boom across the north end of the bay to keep oil out of the fish ladder and trap.	Steilacoom	Chambers Creek Road.	Fish ladder, salmonids, creek estuary.
SPS-4		Wollochet Bay PIE0481 47°-16.01'N 122°-35.79'W	Deflection/ Collection - Keep oil out of bay.	2000'	Anchor to boat ramp near old ferry dock, tend end w/ boat (30" boom in high winds).	Wollochet close to Tacoma Narrows Airport.	Road access around entire bay. Private property access to boat ramp for (a).	Herring smelt and sandlance spawning, juvenile crab & geoduck.
SPS-5		Wollochet Bay PIE0460 47°-16.24'N 122°-36.69'W	Deflection/ Collection - Keep oil out of bay.	2000'	Anchor to cement bulkhead just around point near E Cromwell, tend end w/ boat (30" boom in high winds).	same as above.	same as above.	same as above.
SPS-6		Sullivan Creek PIE0477 47°-16.80'N 122°-35.34'W	Exclusion booming - Keep oil out of creek.	400'	Deploy boom in a chevron configuration across the creek mouth.	same as above.	same as above.	same as above.
SPS-7		Wollochet Bay PIE0474 47°-17.18'N 122°-36.17'W	Exclusion booming - Keep oil out of the head of the bay.	1500'	Exclude end of bay w/ chevron formation.	same as above.	same as above.	same as above.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-8		Horse Head Bay PIE0436 47°-17.79'N 122°-41.02'W	Exclusion Booming - Keep oil out of bay.	2000'	Deploy boom to close off bay.	Forest Beach or Kopachuck State Park. Boat ramp on SE end of Horse Head Bay.	Boat	Fisheries and wildlife (uncertain about resources, may be low priority).
SPS-9		Cuts Island - South End PIE0423 47°-19.19'N 122°-41.27'W	Exclusion Booming - Keep oil off island.	1200'	Deploy boom in a chevron configuration to protect the south end of the island.	Purdy or Gig Harbor.	Boat	Shellfish & State Park, Harbor seal haulout.
SPS-10		Cuts Island - North End PIE0423 47°-19.57'N 122°-41.81'W	Exclusion Booming - Keep oil off island.	1200'	Deploy boom in a chevron configuration to protect the north end of the island.	Purdy or Gig Harbor.	Boat	Shellfish & State Park, Harbor seal haulout.
SPS-11		Raft Island PIE0415 47°-19.52'N 122°-40.03'W	Exclusion Booming - Keep oil off island.	800'	Boom along bridge w/800' boom.	Purdy or Gig Harbor.	Road access from bridge, access via private property N. side of Is. and small bay on mainland, road access to E side of Lay Inlet.	Clams, harbor seal haulouts and shellfish.
SPS-12		Lay Inlet PIE0407 47°-20.04'N 122°-39.31'W	Exclusion Booming - Keep oil out of Lay Inlet.	600'	Boom mouth of Lay Inlet.	Purdy or Gig Harbor.	same as above.	Clams, harbor seal haulouts and shellfish.
SPS-13		Raft Island PIE0418 47°-20.15'N 122°-39.86'W	Exclusion Booming - Keep oil off island.	2000'	Boom north side of island w/ 2000' from large floating dock on island to shoreline directly to the north.	Purdy or Gig Harbor.	same as above.	Clams, harbor seal haulouts and shellfish.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-14		Burley Lagoon PIE0387 47°-23.03'N 122°-37.60'W	Exclusion Booming - Keep oil out of lagoon.	2000'	Double chevron @ entrance to lagoon. Anchor both to powerline tower and NE bridge abutment. Need - (2) 100lb anchors @ apex.	Purdy	Good road access from Hwy 302.	Wildlife, shellfish, juvenile salmon and waterfowl concentration.
SPS-15		Minter Creek PIE0354 47°-21.55'N 122°-41.50'W	Exclusion Booming - Keep oil out of creek.	1000'	Close off creek with chevron, can use trees on N side of creek as anchors.	Boat launch @ Wauna.	Land access to Sunrise and Minter Beaches.	Minter Creek Hatchery, archeological site and shellfish.
SPS-16		Minter Creek PIE0355 47°-21.85'N 122°-41.77'W	Exclusion Booming - Keep oil out of creek.	500'	Deploy boom running NE/SW along pilings about 1/8 mile upstream from Oyster Co.	Boat launch @ Wauna.	Land access to Sunrise and Minter Beaches.	Minter Creek Hatchery, archeological site and shellfish.
SPS-17		Glen Cove PIE0346 47°-20.38'N 122°-43.73'W	Exclusion Booming - Keep oil out of cove.	1000'	Deploy boom in a chevron configuration across the mouth of Glen Cove.	Glen Cove boat launch in Wauna.	Boat	Cove, shoreline, fisheries.
SPS-18		Thompson Spit PIE0340 47°-20.04'N 122°-43.76'W	Exclusion Booming - Keep oil out of cove.	200'	Deploy boom in a chevron configuration across the mouth of the cove.	Glen Cove boat launch in Wauna.	Boat	Cove, shoreline, fisheries.
SPS-19		Van Geldern Cove PIE0322 47°-16.44'N 122°-45.41'W	Exclusion Booming - Keep oil out of cove.	2000'	Place boom at launch ramp on north shore across to closest point on south shore. Anchor at middle.	City of Home.	Road access on both sides of cove.	Salmon spawning creek, waterfowl, brant.
SPS-20		Mayo Cove (Penrose State Park) 47°-15.75'N 122°-44.81'W	Diversion Booming - Isolate small bay on south shore of cove.	2000'	Angle NE from spit (PIE0316) to wooden bulkhead at Penrose State Park (PIE0310).	Penrose State Park.	Boat launch and good roads; State Parks.	Sensitive nesting species, seabird concentrations, surf smelt, herring, & sandlance spawning.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-21		Still Harbor - SE McNeil PIE0596 47°-13.30'N 122°-39.68'W	Exclusion Booming - Prevent oil from entering harbor.	5000'	Double chevron from Baldwin Pt. to Gertrude Is.	Possible to stage from the penitentiary (security issue high priority on McNeil Island). Foss has access to island.	Boat access only. Road exists but security clearance necessary. Must clear any operations with prison staff.	Marine mammal haulout, 400 seals (one of largest). Shellfish, waterfowl, great blue heron.
SPS-22		Still Harbor - SE McNeil PIE0592 47°-13.08'N 122°-39.40'W	Exclusion Booming - Prevent oil from entering harbor.	2000'	Double chevron from Gertrude Is. to E shore. Need - (2) 100# anchors @ each apex = total of 100# anchors.	same as above.	same as above.	same as above.
SPS-23		North Filucy Bay PIE0278 47°-12.43'N 122°-44.83'W	Exclusion Booming - Keep oil out of bay.	2000'	Deploy boom across the entrance to the north part of the bay from Mahnckes Point to the beach directly to the west.	Longbranch	Limited road access. County boat launch outside bay to the south.	Protect archaeological and shellfish sites.
SPS-24		South Filucy Bay PIE0266 47°-11.86'N 122°-44.75'W	Exclusion Booming - Keep oil out of bay.	1500'	Deploy boom across the entrance to the south part of the bay.	Longbranch	Limited road access. County boat launch outside bay to the south.	Protect archaeological and shellfish sites.
SPS-25		Amsterdam Bay (NW side of Anderson I.) PIE0675 47°-21.85'N 122°-41.77'W	Exclusion booming - Keep oil out of bay.	1000'	Boom off bay with chevron formation. Need shore anchors and 100# anchor at apex. Bay is shallow: 10'-20' at mouth.	Steilacoom	Boat access on south shore.	Clams, herring and sandlance.
SPS-26		Anderson Island - West Oro Bay PIE0641 47°-08.29'N 122°-42.03'W	Exclusion booming - Keep oil out of bay.	2200'	Boom west bay with chevron. Attach intertidal boom to each shoreside leg end if available.	Steilacoom	Some road access to Lyle and Cole Points. Strategy best implemented by water.	Birds, high value clam beds, Dungeness Crab.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-27		Anderson Island - East Oro Bay PIE0646 47°-08.64'N 122°-41.53'W	Exclusion booming - Keep oil out of bay	2800'	Boom east bay in a chevron configuration. Attach intertidal boom to each shoreside leg end. If the strategy cannot be deployed as described, or if winds are likely to drive oil past the boom, back up the strategy with 200' to prevent oil from entering the slough.	Steilacoom	Some road access to Lyle and Cole Points. Strategy best implemented by water.	Birds, high value clam beds, Dungeness Crab.
SPS-28		Nisqually NWR/ Nisqually River Sloughs THU0006 47°-05.68'N 122°-41.26'W	Exclusion booming - Keep oil out of sloughs.	400'	Deploy boom across the entrance to the sloughs to the east of the Nisqually River.	Nisqually NWR reach through Thurston Co. EMD. Barn could be command post & bird care center.	Dike behind refuge office. Very shallow area - may need to implement from Nisqually River side.	Waterfowl, fish, wetland area.
SPS-29		Nisqually NWR/ Nisqually River Sloughs THU0007 47°-05.23'N 122°-41.73'W	Exclusion booming - Keep oil out of sloughs.	400'	Deploy boom across the slough to the east of the Nisqually River at the foot bridge.	same as above.	same as above.	same as above.
SPS-30		McAllister Creek THU0025 47°-05.55'N 122°-43.56'W	Exclusion booming - Keep oil out of creek.	1200'	Exclusion boom across McAllister Creek at Luhr Beach (move upstream if upstream spill from I-5).	Could be command post and bird care center.	Luhr Beach (busy); Zittel's or Martin Way access to McAllister.	Hatchery, bird and fish habitat, public use area.
SPS-31		Cove in Hogum Bay THU0029 47°-06.37'N 122°-44.37'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-32		Butterball Cove THU0032 47°-07.11'N 122°-45.62'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-33		Big Slough THU0034 47°-07.31'N 122°-46.52'W	Exclusion - Keep oil out of slough.	300'	Deploy boom across the mouth of the slough.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-34		Small cove south of Mill Bight THU0039 47°-08.63'N 122°-47.34'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-35		Mill Bight THU0042 47°-09.21'N 122°-47.78'W	Exclusion - Keep oil out of cove.	300'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-36		Small cove south of Baird Cove THU0045 47°-09.57'N 122°-47.93'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-37		Baird Cove THU0047 47°-09.82'N 122°-48.49'W	Exclusion - Keep oil out of cove.	500'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.
SPS-38		Poncin Cove THU0052 47°-10.16'N 122°-48.68'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across the mouth of the cove.	Zittel's Marina or Tolmie State Park.	Access via boat.	Protect bird foraging area, crabs, clams, marsh habitat.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-39		Taylor Bay PIE0249 47°-11.12'N 122°-46.58'W	Exclusion booming - Keep oil out of bay.	1200'	Form chevron - anchor to pilings on north shore and private boat ramp on south shore.	RFK Park - DNR recreation area.	Road access via Whitman Road and Taylor Bay Road.	Shellfish (clams); waterfowl.
SPS-40		Whitman Cove PIE0239 47°-13.25'N 122°-48.33'W	Valve closure - Keep oil out of cove.	100'	Turn off valves to cut off sluice ways (talk to DNR about tide gates). Deploy boom if necessary.	RFK Park - DNR recreation area.	Road access via Bay Road.	Seabird concentrations.
SPS-41		Henderson Inlet THU0104 47°-09.08'N 122°-49.95'W	Exclusion booming - Keep oil out of lower bay and mudflats.	2800'	Deploy boom at an angle across bay, from Cliff Point to the opposite shore.	Boat ramp East shore of Henderson Inlet.	By Boat from Olympia or Tacoma or from I-5 take Sleater Kinney Road NE to Bay Road NE, turn right, proceed to Henderson Road until you see boat launch ramp sign, follow road to boat launch. Johnson Point community boat ramp/private beach, Dr. Gevorian, 822 Libby Road, 4-wheel drive beach access.	Sensitive nesting species; great blue heron; marine mammal haulout, waterfowl concentration.
SPS-42		Chapman Bay THU0093 47°-08.13'N 122°-50.58'W	Exclusion booming - Keep off mud flats and lower bay.	1000'	Boom off mouth of the bay.		Woodard Bay Park; Private boat ramp on 86th (east side of Henderson) will rent out.	Same as above plus seabird concentrations.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-43		Woodard Bay THU0084 47°-07.89'N 122°-50.55'W	Exclusion booming.	400'	Boom off mouth of the bay at the bridge.		Woodard Bay Park; Private boat ramp on 86th (east side of Henderson) will rent out.	Same as above.
SPS-44		Henderson Inlet THU0081 47°-07.20'N 122°-49.95'W	Exclusion - Keep oil out of lower bay and mudflats.	1800'	Deploy boom in a chevron configuration where bay begins to narrow down and get shallow.	Boat ramp East shore of Henderson Inlet.	same as above.	Same as above.
SPS-45		Henderson Inlet "neck" THU0079 47°-06.69'N 122°-49.54'W	Exclusion - Keep oil out of lower bay and mudflats.	900'	Deploy boom across the inlet just north of the portion that becomes a mudflat at low tide.	Zittel's Marina or Tolmie State Park.	Access via boat.	Same as above.
SPS-46		Big Fishtrap THU0111 47°-09.46'N 122°-51.79'W	Exclusion - Keep oil out of the lagoon.	800'	Boom off Lagoon.	Boston Harbor Marina.		
SPS-47		Zangel Cove THU0121 47°-08.64'N 122°-53.48'W	Exclusion booming - Keep oil out of cove.	500'	Boom off cove.	Port of Olympia.	Dirt road access - off Zangel Cove (get address from Don Schluter).	Sensitive nesting species, Great Ble Heron, Marine mammal haulout, waterfowl, and seabird concentrations.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-48		Gull Harbor THU0131 47°-06.75'N 122°-53.46'W	Exclusion booming - Keep oil out of harbor.	400'	Boom off harbor mouth.	Boston Harbor Marina.	Boston Harbor Marina.	Sensitive nesting species, Great Blue Heron, marine mammal haulout, waterfowl, and seabird concentrations, natural undeveloped smelt spawning beaches.
SPS-49		Tykel Cove THU0178 47°-06.01'N 122°-55.91'W	Exclusion booming - Keep oil out of cove.	1800'	Boom off cove.	Port of Olympia.	Port of Olympia boat ramp (East Bay Marina) or Gull Harbor.	Sensitive nesting species, Great Blue Heron, Marine mammal haulout, waterfowl, and seabird concentrations.
SPS-50		Butler Cove THU0172 47°-04.90'N 122°-56.06'W	Exclusion booming - Keep oil out of cove.	500'	Boom off cove.	Port of Olympia.	Port of Olympia boat ramp (East Bay Marina) or Gull Harbor.	Sensitive nesting species, Great Blue Heron, Marine mammal haulout, waterfowl, and seabird concentrations.
SPS-51		Priest Point Park THU0140 47°-04.27'N 122°-53.91'W	Exclusion from Ellis Cove.	400'	Keep oil out of Ellis Cove.	East Bay Marina.	East Bay Marina.	Sensitive cove waterfowl, Osprey nests, Salmon runs, and public recreation area, salt marsh.
SPS-52		East Bay - Budd Inlet THU0149 47°-03.55'N 122°-53.78'W	Containment Booming - Keep oil inside bay if spill at port or I-5.	1600'	Boom off harbor mouth.	East Bay Marina.	East Bay Marina.	Diving ducks, scoters, canvas back, Barrows Goldeneye.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-53		West Bay - Budd Inlet THU0147 47°-03.50'N 122°-54.47'W	Containment Booming - Keep oil inside bay if spill at port or I-5.	2000'	Boom off harbor mouth.	East Bay Marina.	East Bay Marina.	Concentration of diving ducks: scoters, canvasbacks, Barrows goldeneye.
SPS-54		Capitol Lake THU0163 47°-02.62'N 122°-54.48'W	Containment - Keep oil in lake if spill from I-5.	200'	Close dam and bring vac trucks to west shoreline (old swimming beach). Boom off area around tide gate to prevent entrainment.	Capitol Lake parking lot.	5th Avenue.	Puget Sound Resources.
SPS-55		Mouth of Eld Inlet THU0188 47°-08.95'N 122°-55.68'W	Deflection/ Collection - Keep oil out of inlet.	2200'	Boom at 35 degree angle.	Port of Olympia; Frye Cove; Caroline beach.	Sanderson Harbor? shore? for vac trucks, recovery.	
SPS-56		Sanderson Harbor THU0268 47°-08.99'N 122°-56.17'W	Exclusion - Keep oil out of harbor.	300'	Deploy boom across entrance to harbor.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	
SPS-57		Frye Cove THU0258 47°-06.86'N 122°-57.83'W	Exclusion - Keep oil out of cove.	500'	Boom across cove.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	
SPS-58		Green Cove THU0201 47°-05.86'N 122°-56.93'W	Exclusion booming - Keep oil out of cove.	700'	Boom off Green Cove.	Port of Olympia boat ramp East Bay.	Evergreen College boat ramp.	Harbor seal haulout.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-59		Young Cove THU0249 47°-06.14'N 122°-58.82'W	Exclusion - Keep oil out of cove.	800'	Boom across cove.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	Frye Cove Co. Park (restricted boat launch); Keys Ways Marina.	
SPS-60		Perry Creek THU0229 47°-03.16'N 123°-00.02'W	Exclusion - Keep oil out of creek.	100'	Boom across mouth of creek at bridge on Madrona Beach Drive.	Park and ride lot south of bridge.	By land using a small skiff, or by boat from Taylor United and Ellison Oyster Co.	
SPS-61		McLane Creek, ebb tide strategy THU0227 47°-02.82'N 122°-59.27'W	Exclusion/Collection - Keep oil in inlet and out of creek if spill from Hwy 101.	300'	Angle boom from southwest corner of bridge over Mud Bay Road to shoreline northeast of bridge, access for vac trucks on northeast side.	Large parking lot at tavern near bridge, ask permission for use.	By land using a small skiff, or by boat from Taylor United and Ellison Oyster Co.	
SPS-62		McLane Creek, flood tide strategy THU0220 47°-02.71'N 122°-59.35'W	Exclusion/Collection - Keep oil in inlet and out of creek if spill from Hwy 101.	300'	Angle boom from northwest corner of bridges over highway 101 to shoreline southeast of bridges, access for vac trucks on southeast side.	Wide shoulder at highway 101, parking area at southeast corner of bridges.	By land using a small skiff, or by boat from Taylor United and Ellison Oyster Co.	
SPS-63		Squaxin Island, cove south of Polela Bay MAS0280 47°-11.32'N 122°-54.90'W	Exclusion - Keep oil out of cove.	600'	Deploy boom across mouth of cove.	Boston Harbor marina.	Boston Harbor Marina, Carlyon Beach boat ramp (private).	
SPS-64		Squaxin Island, Polela Bay MAS0275 47°-11.65'N 122°-55.19'W	Exclusion - Keep oil out of bay.	1500'	Deploy boom across mouth of bay.	Boston Harbor marina.	Boston Harbor Marina, Carlyon Beach boat ramp (private).	

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-65		Hope Island to Carlyon Beach 47°-10.95'N 122°-56.00'W	Exclusion	1800'	Deploy boom from the south end of Hope Island (MAS0260) to Carlyon Beach (THU0279).	Boston Harbor marina.	Boston Harbor Marina, Carlyon Beach boat ramp (private).	Protect fish and wildlife resources in Hammerley and Totten Inlets.
SPS-66		Squaxin Island to Hope Island 47°-11.60'N 122°-55.43'W	Exclusion	1500'	Deploy Boom from Potlatch Point on Squaxin Island (MAS0274) to the north end of Hope Island (MAS0263).	Boston Harbor marina.	Boston Harbor Marina, Carlyon Beach boat ramp (private).	Protect fish and wildlife resources in Hammerley and Totten Inlets.
SPS-67		Squaxin Island Net Pens MAS0299 47°-11.83'N 122°-54.21'W	Exclusion booming - Keep oil away from fish pens.	4800'	Diamond boom around net pens using floats to anchor (pens are comanaged by state and Squaxin Tribe).	Park at Squaxin Island.	Boston Harbor Marina, Carlyon Beach boat ramp (private) - no shoreline access.	Salmon stock. Note - location of high priority stocks changes. Need to get current layout when spill occurs.
SPS-68		Totten Inlet/Gallagher Cove THU0291 47°-08.57'N 122°-58.64'W	Deflection booming - Keep oil out of cove.	1000'	Place boom across mouth of cove.	Boston Harbor marina.	Boston Harbor marina.	Waterfowl, clams & oysters.
SPS-69		Little Skookum Inlet MAS0020 47°-09.22'N 123°-01.08'W	Containment booming - Keep spill out of inlet.	1000'	Boom mouth of inlet from Kamilche Point to Lynch Road.		Lynch Road launch at Arcadia.	
SPS-70		Mill Creek in Hammersley Inlet MAS0068 47°-11.87'N 122°-59.53'W	Exclusion - Keep oil out of Mill Creek.	500'	Boom across Miller Creek.	Small launch - possible.	Carlyon Beach Marina, Olympia or Arcadia launch - Arcadia Point.	Sensitive species nesting in area; fisheries.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-71		Goldsborough Creek MAS0086 47°-12.60'N 123°-05.48'W	Exclusion - Keep oil out of Goldsborough Creek.	100'	Close off entrance to creek.	In Shelton at mill.	In Shelton at Mill.	Salmon Stream.
SPS-72		Chapman Cove MAS0120 47°-13.65'N 123°-02.57'W	Exclusion - Keep oil out of cove.	1800'	Boom off entrance to Chapman Cove.	Sunset Road?	Shelton Launch.	Clams, fish, and archaeological sites.
SPS-73		Oakland Bay MAS0113 47°-12.60'N 123°-03.00'W	Exclusion booming.	1500'	Close off inlet at Golf Course to Daniels Road.	Golf Course and Highway 3.	Boat launch at Shelton. Highway 3 near Bay Shore golf course.	Mudflats, marine mammal haulouts.
SPS-74		Cove west of Salmon Point on west shore of Pickering Passage MAS0156 47°-13.47'N 122°-56.28'W	Exclusion - Keep oil out of cove.	600'	Deploy boom across mouth of cove.	Public boat ramp at bridge to Hartstene Island.	Access via boat.	
SPS-75		Small channel to cove in SPS-74 MAS0159 47°-14.01'N 122°-56.00'W	Exclusion - Keep oil out of cove.	100'	Deploy boom across channel.	Public boat ramp at bridge to Hartstene Island.	Access via boat.	

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-76		Cove just north and west of Salmon Point on west shore of Pickering Passage MAS0160 47°-14.13'N 122°-56.08'W	Exclusion - Keep oil out of cove.	200'	Deploy boom across cove at bridge to island.	Public boat ramp at bridge to Hartstene Island.	Access via boat.	
SPS-77		Jones Creek MAS0170 47°-16.03'N 122°-55.67'W	Exclusion - Keep oil out of creek and estuary.	500'	Boom off entrance to cove leading to estuary and creek.	Jarrell Cove State Park or boat ramp at bridge to Hartstene Is.	Access via boat.	
SPS-78		Cove inside Sun Point MAS0177 47°-17.05'N 122°-55.32'W	Exclusion - Keep oil out of cove.	400'	Deploy boom across entrance to cove.	Jarrell Cove State Park.	Access via boat.	
SPS-79		West cove across Pickering Passage from Jarrell Cove MAS0180 47°-17.59'N 122°-54.06'W	Exclusion - Keep oil out of cove.	1000'	West cove, anchor from bulkhead on west side to point, 100# anchor in middle.	Jarrell Cove State Park.	Access via boat.	
SPS-80		Center cove across Pickering Passage from Jarrell Cove MAS0181 47°-17.60'N 122°-53.72'W	Exclusion - Keep oil out of cove.	300'	Center cove, anchor to bluff on west side, 100# anchor in middle.	Jarrell Cove State Park.	Access via boat.	

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-81		Jarrell Cove MAS0372 47°-17.15'N 122°-53.11'W	Exclusion - Keep oil out of cove, protect Jarrell Cove State Park.	1000'	Boom off cove with chevron configuration.	Jarrell Cove State Park.	Carlyon Beach boat ramp (private); full facilities at park.	State Park.
SPS-82		McLane Cove MAS0191 47°-18.59'N 122°-51.76'W	Exclusion Booming - Keep oil out of cove.	2000'	Boom off cove with chevron formation.	Jarrell Cove State Park.	Grapeview Loop Rd./Jarrell Cove State Park.	
SPS-83		Small slough just west of Stretch Island MAS0200 47°-19.40'N 122°-50.38'W	Exclusion - Keep oil out of slough.	200'	Deploy boom across entrance to slough, primarily to north.	Jarrell Cove State Park.	Access via boat.	
SPS-84		Sherwood Creek and estuary MAS0238 47°-22.53'N 122°-50.06'W	Exclusion - Keep oil out of bay/estuary.	500'	Deploy boom across bay at the bridge on Grapeview Loop Road.	Victor and/ or Allyn.	Access via Hwy 302 to both sides of bay. Need shallow draft boats.	Wetlands, mudflats, and Coulter Creek hatchery, winter concentrations of Grebes & Murres.
SPS-85		Case Inlet (North Bay) MAS0241 47°-23.09'N 122°-49.53'W	Deflection/ Collection - Keep oil out of bay.	1000'	Deploy deflection boom at Allyn (angled SE) Collect oil w/ vac trucks.	Victor and/ or Allyn.	Access via Hwy 302 to both sides of bay. Need shallow draft boats.	Wetlands, mudflats, and Coulter Creek hatchery, winter concentrations of Grebes & Murres.
SPS-86		Coulter Creek MAS0249 47°-23.43'N 122°-49.09'W	Exclusion Booming - Keep oil out of creek.	4000'	Deploy boom at the power lines, using the towers as anchor points.	Victor and/ or Allyn.	Access via Hwy 302 to both sides of bay. Need shallow draft boats.	Coho, Chinook & Chum. Winter concentrations of Grebes & Murres.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-87		Case Inlet (North Bay) MAS0254 47°-22.74'N 122°-48.97'W	Deflection/ Collection - Keep oil out of bay.	1000'	Deploy deflection boom at Victor (angled SW) Collect oil w/ vac trucks.	Victor and/ or Allyn.	Access via Hwy 302 to both sides of bay. Need shallow draft boats.	Wetlands, mudflats, and Coulter Creek hatchery, winter concentrations of Grebes & Murres.
SPS-88		Rocky Bay PIE0181 47°-21.67'N 122°-47.26'W	Exclusion Booming - Keep oil out of Bay.	1200'	Chevron from the sand spit to the north and the wooden bulkhead to the south.	Vaughn boat launch area.	Hwy. 302 & Bond Road.	Winter concentrations of Grebes & Murres.
SPS-89		Small creek to south of Rocky Bay PIE0184 47°-21.50'N 122°-47.12'W	Exclusion - Keep oil out of creek.	100'	Deploy boom across small creek to the south of Rocky Bay.	Vaughn boat launch area.	Hwy. 302 & Bond Road.	Winter concentrations of Grebes & Murres.
SPS-90		Vaughn Bay PIE0189 47°-20.58'N 122°-47.12'W	Exclusion Booming - Keep oil out of bay.	500'	Boom off bay by angling boom from pilings to shore.	Vaughn, boat ramp.	Access via boat.	Seabird concentrations.
SPS-91		Dutcher Cove area PIE0206 47°-18.38'N 122°-47.32'W	Exclusion Booming - Keep oil out of stream.	1000'	Boom off cove with chevron formation.	Vaughn, boat ramp.	Access via boat.	Seabird concentrations.
SPS-92		Small Cove South of Dutcher Cove PIE0211 47°-18.02'N 122°-47.18'W	Exclusion Booming - Keep oil out of stream.	100'	Place 100' section across small opening south of cove.	Vaughn, boat ramp.	Access via boat.	Seabird concentrations.

4.3.2 Proposed Booming and Collection Strategies: Matrices

Strategy	Status	Location	Response Strategy	Length of Boom	Strategy Implementation	Staging Area	Site Access	Resources Protected
SPS-93		Herron Bay PIE0217 47°-16.51'N 122°-48.67'W	Exclusion - Keep oil out of bay.	100'	Deploy boom across mouth of bay at bridge.	Parking area at dock for Herron Island.	Road access via North Herron Rd, or via boat.	
SPS-94		Cove north of Whitman Cove and due east of McMicken Is. PIE0232 47°-14.74'N 122°-49.71'W	Exclusion booming - Keep oil out of cove.	100'	Boom off entrance to cove.	RFK Park - DNR recreation area.	Road access via Russell Road.	Salmon stream, wetland habitat, seabird concentrations.
SPS-95		McMicken Island MAS0347 47°-15.00'N 122°-51.89'W	Exclusion booming - Keep oil off island.	2500'	Deploy boom from the north end of the island to the beach to the west.	Zittel's Marina or Johnson Point.	Zittel's Marina or Johnson Point.	Marine mammal haulout; seabird concentrations.
SPS-96		McMicken Island MAS0346 47°-14.71'N 122°-51.92'W	Exclusion booming - Keep oil off island.	1700'	Deploy boom from the south end of the island to the beach to the southwest.	Zittel's Marina or Johnson Point.	Zittel's Marina or Johnson Point.	Marine mammal haulout; seabird concentrations.

5. Shoreline Information

5.1. Shoreline Types and Sensitivity

The type of shoreline, degree of exposure to waves and currents, and biological sensitivity are the main criteria for selecting appropriate treatment techniques. Each shoreline type has particular properties (including vegetation types) which facilitate or resist the penetration and persistence of oil. Areas of comparatively uniform sediment type and grain size experience a deeper penetration of oil. Grain size definitions are:

Mud	<0.0625 mm
Fine Sand	0.0625 - 2 mm
Medium to Coarse Sand	2 -4 mm
Pebble/Cobble	4 - 256 mm

Persistence of oil in a particular area is directly related to the intensity of wave action, tides, and currents. Based on numerous oil spill studies of shoreline characteristics, treatment, and oil impact, the matrices in Chapter 6 were formulated following the basic prototype of the Environmental Sensitivity Index Atlas.

The environmental sensitivity index (ESI) system ranks coastal environments on a scale of 1-10 or 11 (less sensitive to more sensitive) with respect to oil spill sensitivity and potential biological injury is being used for mapping extensive areas of the coastline of the U.S.. Generally speaking, areas exposed to high levels of physical energy, such as wave action and tidal currents, rank low on the scale while sheltered areas have the highest ranking. The shoreline types used in this manual are a combination of the two similar systems used for the Delaware/Pennsylvania/New Jersey ESI Atlas, and the Maryland and Virginia atlases. The numbering system for the Countermeasure Manual Shoreline Types does not correspond exactly to either atlas; however, the corresponding shoreline types can be identified easily from the ESI maps and reassigned the appropriate number (after field verification.) The shoreline ranking system provides a useful first step in the design of contingency plans because it identifies the priority areas that require maximum effort for protection and cleanup. Strike teams and contractors with this document can focus their activities on environmental priorities, particularly during the first few hours and days of the spill.⁶

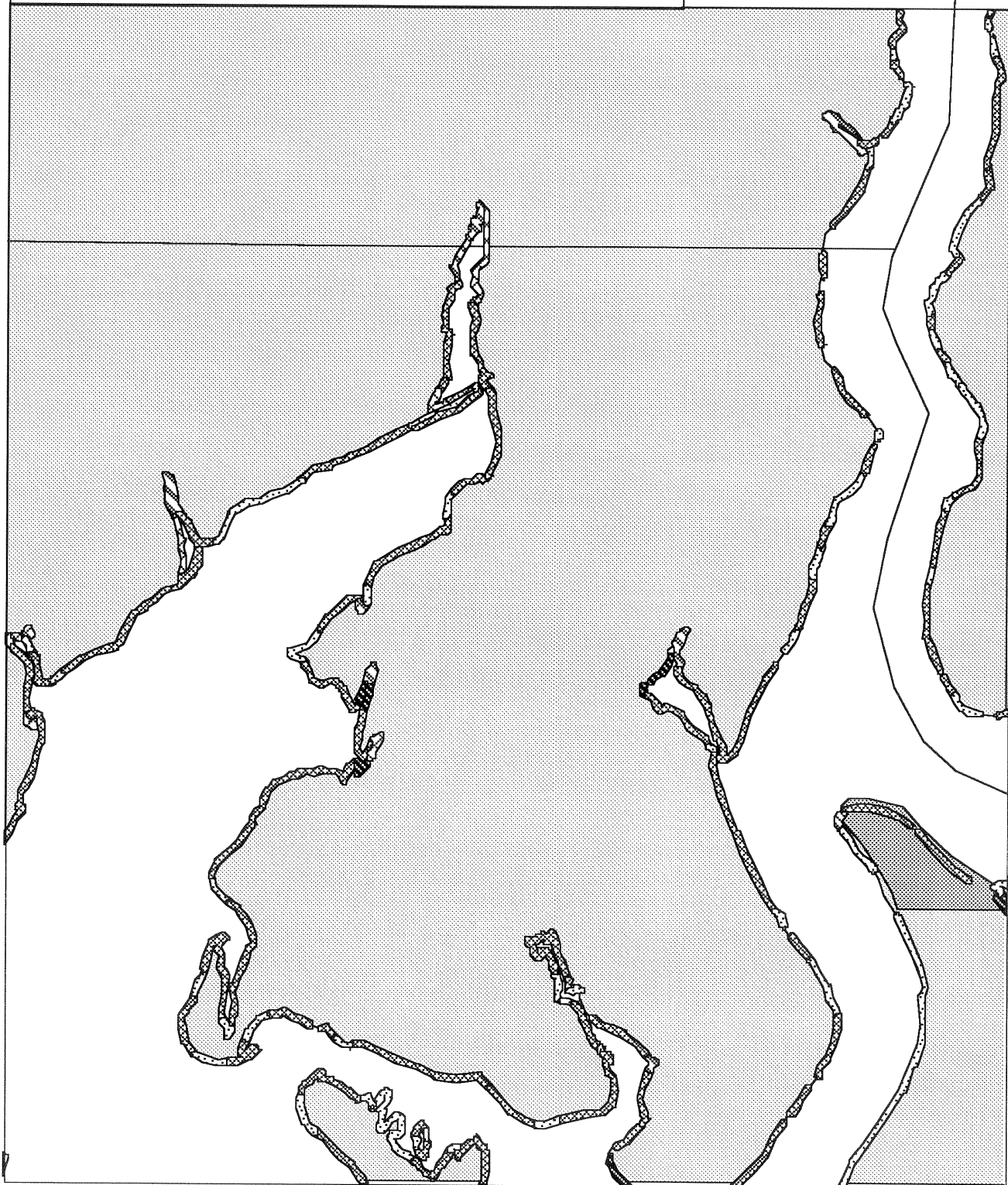
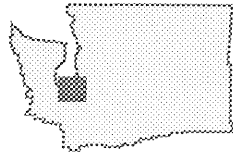
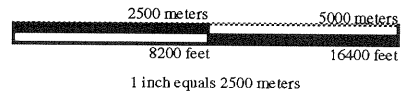
⁶Regional Response Team III. Draft, *Shoreline Countermeasures Manual*. (Department of the Interior, March 22, 1991).

5.2 SHORELINE TYPE MAPS

SOUTH PUGET SOUND GRP

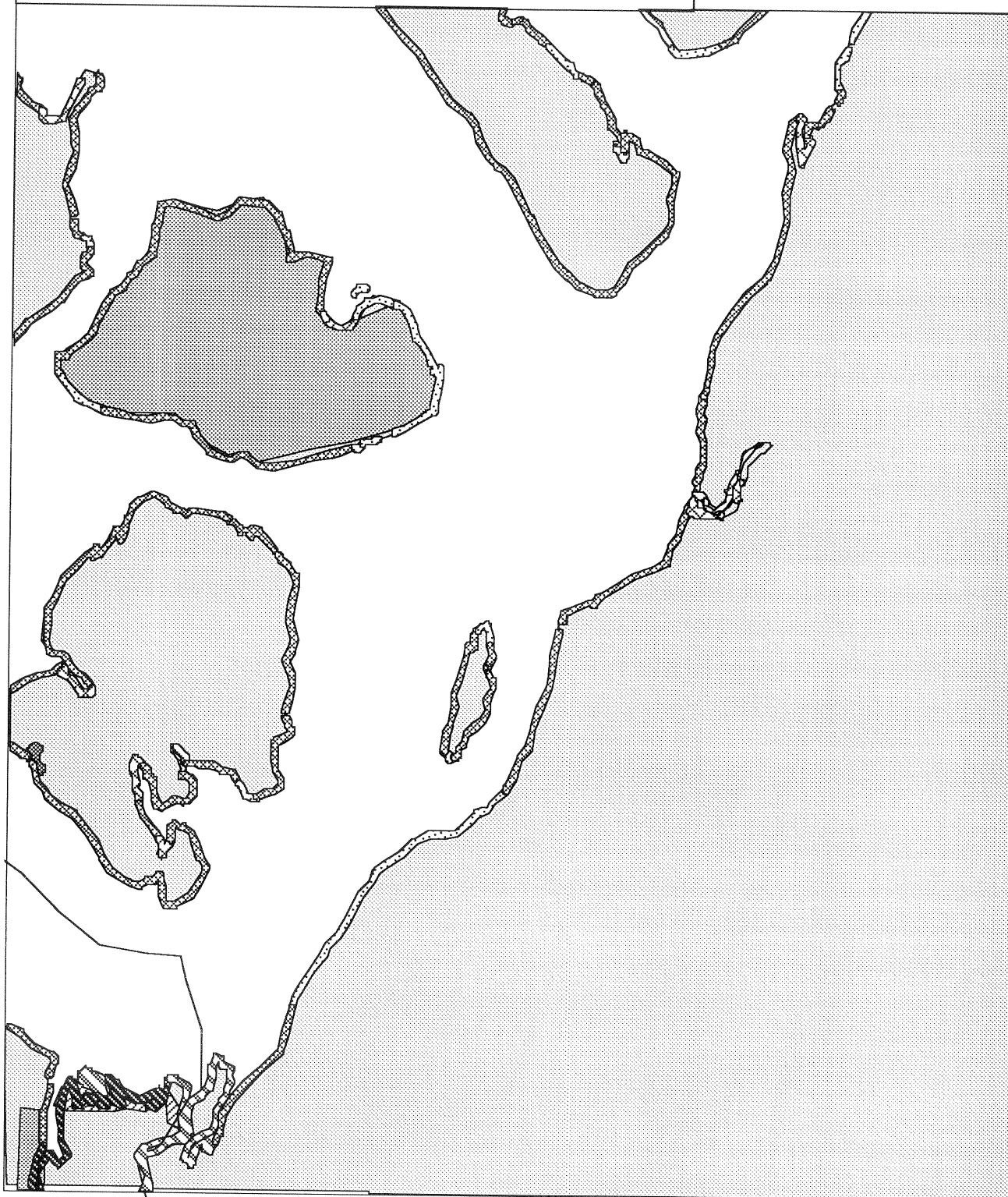
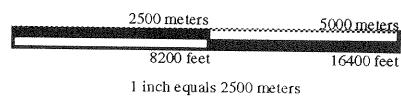
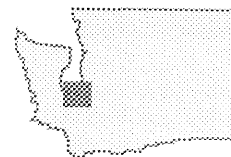
GIG HARBOR SHORELINE TYPES

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



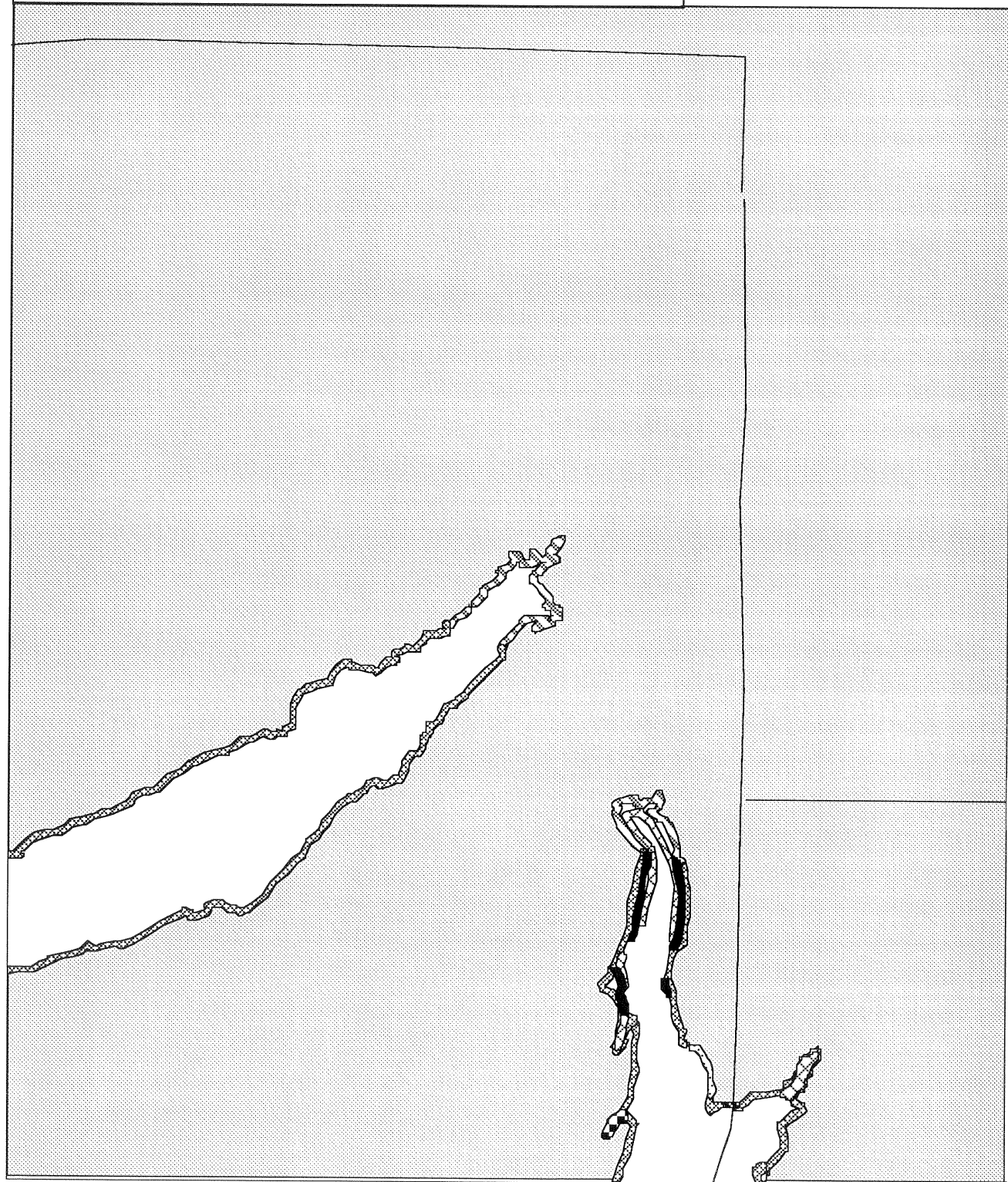
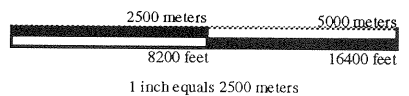
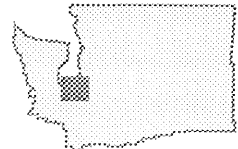
McNEIL ISLAND SHORELINE TYPES

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



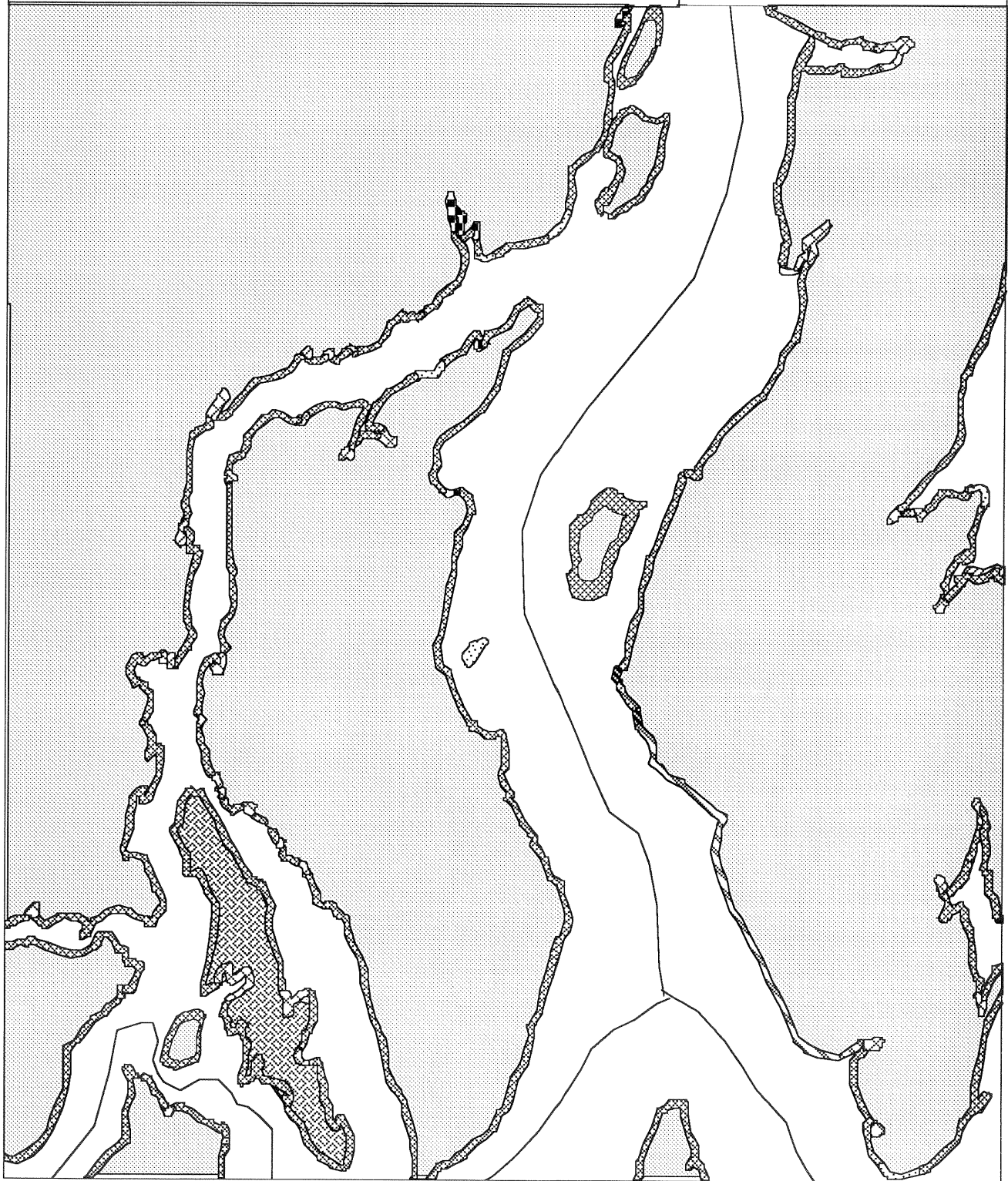
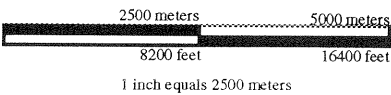
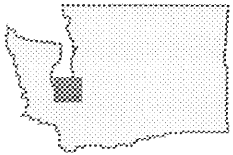
**BELFAIR
SHORELINE TYPES**

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



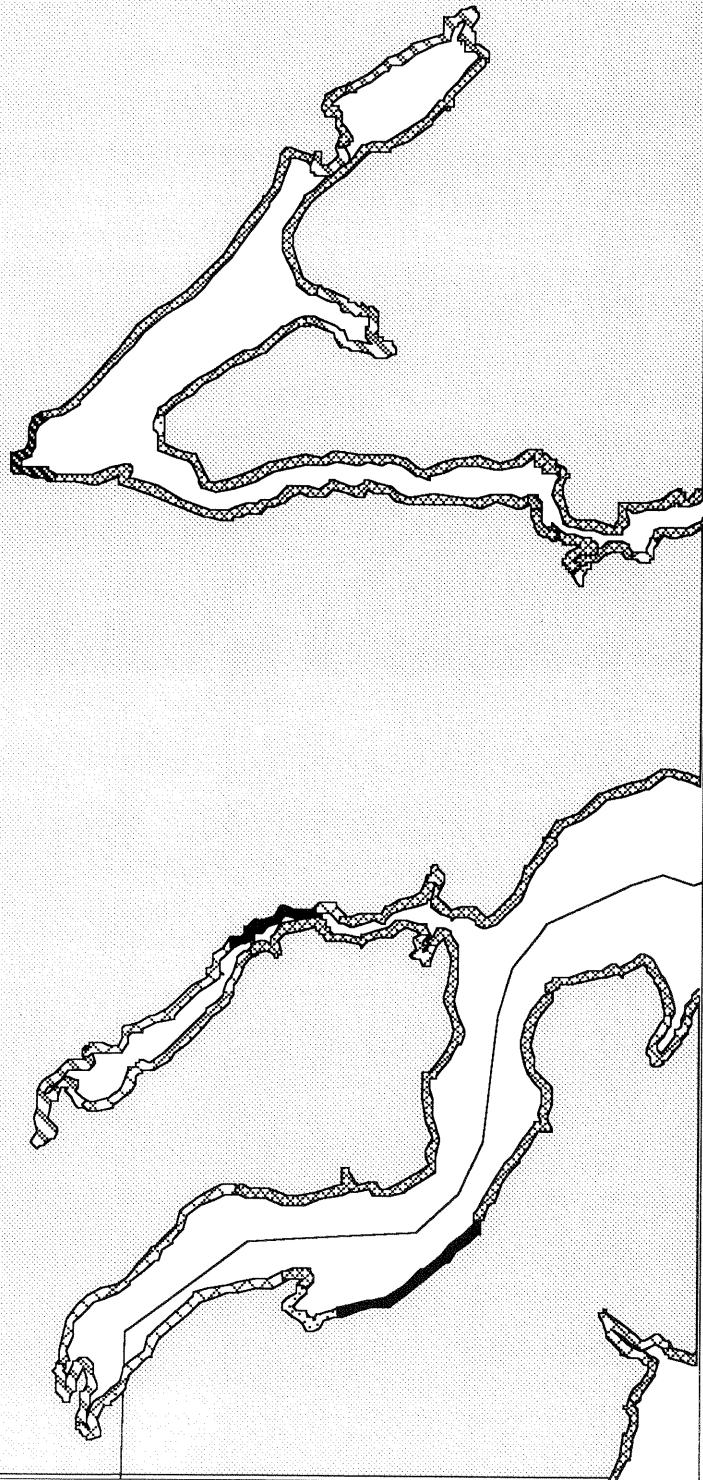
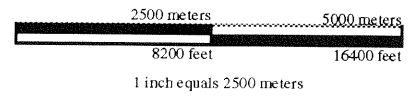
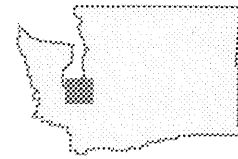
CASE INLET SHORELINE TYPES

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



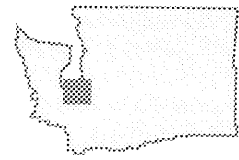
SHELTON SHORELINE TYPES

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



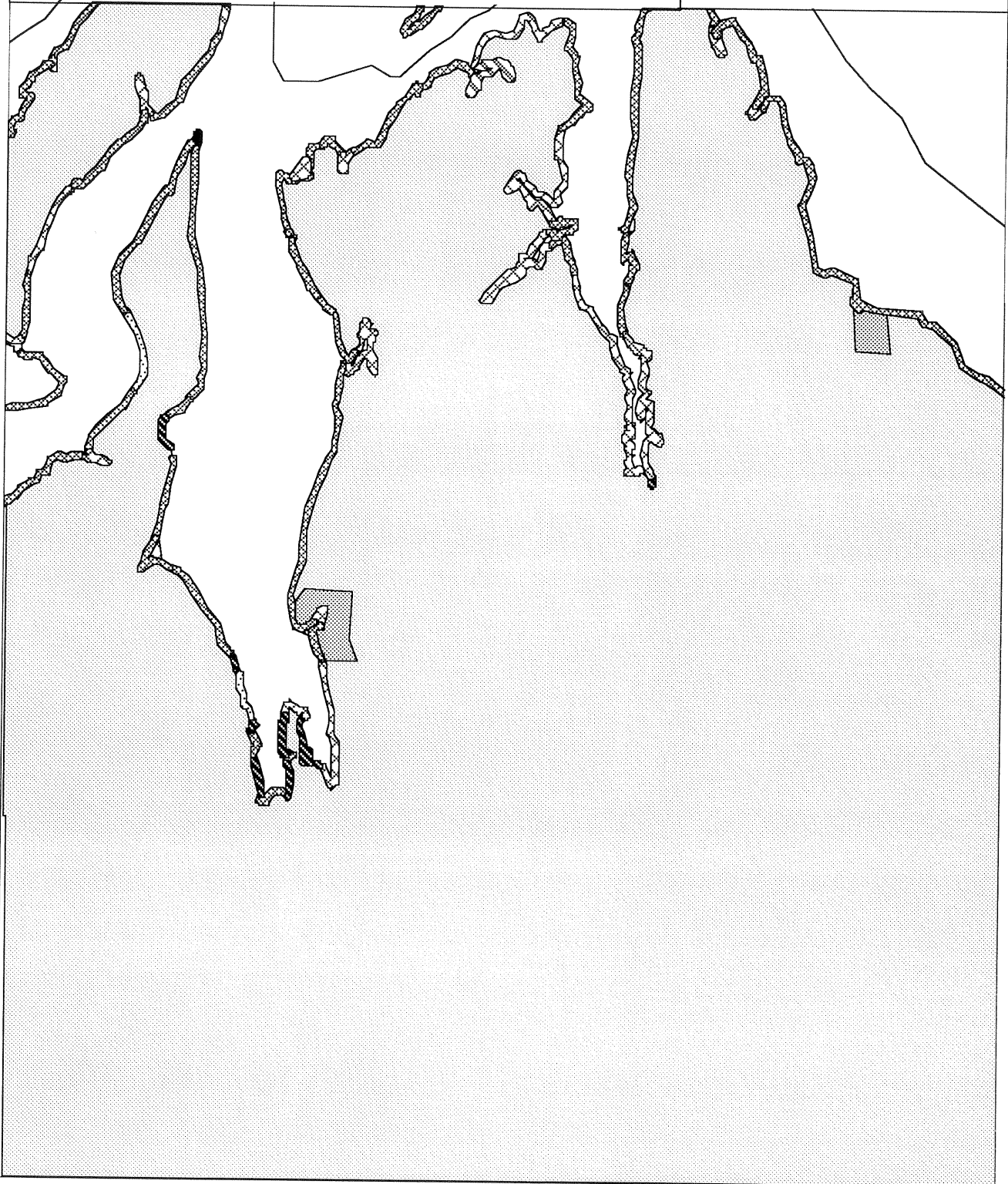
**BUDD INLET
SHORELINE TYPES**

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	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



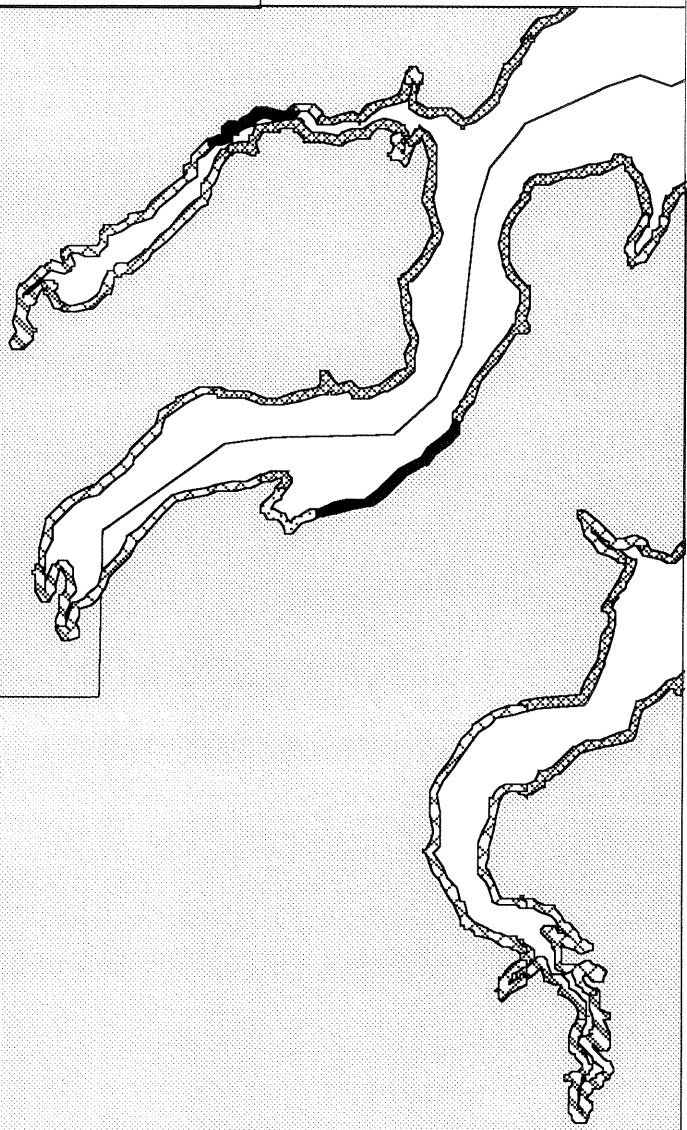
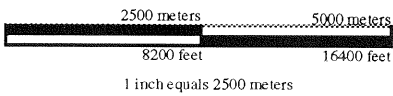
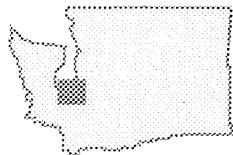
2500 meters 5000 meters
8200 feet 16400 feet

1 inch equals 2500 meters



**TOTTEN INLET
SHORELINE TYPES**

	EXPOSED ROCKY SHORE (OR SEAWALL)		GRAVEL/COBBLE/RIPRAP BEACH
	WAVE-CUT PLATFORM		EXPOSED TIDAL FLAT
	FINE GRAINED BEACH		SHELTERED ROCKY FLAT
	COARSE GRAINED BEACH		SHELTERED TIDAL FLAT
	SAND/GRAVEL BEACH		MARSH



5.3 Shoreline Countermeasure Matrices

The matrices included here show which shoreline countermeasure techniques have been considered for the fourteen shoreline types described in Chapter 2 of the “Shoreline Countermeasures Manual & Matrices”, Northwest Area Plan, Chapter 9650, Page 9-37. Four matrices have been constructed for the major categories of oil (heavy, medium, light, very light).

Countermeasure methods are described in Chapters 3 and 4 of the manual. Countermeasures in Chapter 3 are traditional or conventional techniques that the OSC can use without any additional concurrence. However, the cutting of vegetation countermeasure should be used only during specific seasonal windows under specific conditions and with landowner approval. Countermeasures in Chapter 4 are described under a separate section called “Shoreline Countermeasure Methods Using Alternative Technology” may be useful in certain situations. These methods are considered more experimental and controversial in their application and potential impacts and require more formal review and consultation before implementing. The exact requirements are spelled out in the National Contingency Plan and the Northwest Area Plan. The Shoreline Countermeasures Matrices are a particularly dynamic component of the manual and should continue to be revised as the existing techniques are used and evaluated, and as both old and new techniques are refined.

Each matrix has a written explanation of how it is to be used as a countermeasure advisability matrix. The matrices are only a general guide for removing oil from shoreline substrates. They must be used in conjunction with the entire “Shoreline Countermeasures Manual” plus field observations and scientific advice. The countermeasures listed are not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques (including ones not listed herein). The Federal On-Scene Coordinator (FOSC) or the State OSC operating with the FOSC's authorization has the responsibility for and authority to determine which countermeasure(s) are appropriate for the various situations encountered.

Selection of countermeasure techniques to be used in each spill is based upon the degree of oil contamination, shoreline types, and the presence of sensitive resources. Extremely sensitive areas are generally limited to manual cleanup methods. It is important to note that the primary goal of countermeasure implementation is the removal of oil from the shoreline with no further injury or destruction to the environment. The three categories of guidance used in the matrices are defined as follows:

R	Recommended	May be the preferred method that best achieves the goal of minimizing destruction or injury to the environment
C	Conditional	Viable and possibly useful but may result in limited adverse effects to the environment
	Shaded	Not applicable or not generally recommended.

SHORELINE COUNTERMEASURES MATRIX

Heavy Oil (Heavy Crude Oils, Intermediate Fuel Oils, Bunker C & Heavily Weathered Medium Crudes)

- Heavy oils with little or no evaporation or dissolution
- Water-soluble fraction likely to be <10ppm
- Heavy contamination of intertidal areas likely
- Severe impacts to waterfowl and fur-bearing mammals (coating and ingestion)
- Long-term contamination to sediments possible
- Weathers very slowly
- Dispersion seldom effective
- Shoreline cleanup difficult under all conditions

SHORELINE TYPES CODES

1- Exposed rock shores and vertical, hard man-made structure (e.g. seawalls)	6B - Gravel beaches - cobbles to boulders
2 - Exposed wave-cut platforms	6C - Exposed rip rap
3 - Fine to medium grained sand beaches & steep unvegetated river banks	7 - Exposed tidal flat
4 - Course grained sand beaches	8A- Sheltered vertical rock shores and vertical, hard man-made structures (e.g. seawalls, docks, bulkheads)
5 - Mixed sand and gravel beaches, including artificial fill containing a range of grain size and material	8B - Sheltered rubble slope
6A - Gravel beaches - pebbles to cobble	9A - Sheltered sand and mud flats
	9B - Sheltered vegetated low bank
	10 - Marshes

SHORELINE TYPES

COUNTERMEASURES	1	2	3	4	5	6A	6B	6C	7	8A	8B	9A	9B	10
CONVENTIONAL METHODS														
No action	C	C	C	C	C	C	C	C	R	C	C	R	C	R
Manual removal of oil	C	R	R	R	R	C	C	C		R	R		C	C
Passive collection of oil	R	R	R	R	R	R	R	R	C	R	R	C	R	R
Oiled debris removal	C	R	R	R	R	R	R	R	C	R	R	C	R	C
Trenching/recovery wells			C	C	C									
Oiled sediment removal			C	C	C	C		C					C	
Ambient water flooding (Deluge)			C	C	C	R	R	R		R	R		C	C
Amb water flush <50 psi	C	C			C	R	C	R		C	C		C	C
Amb water flush <100 psi	C	C					C	C		C	C			
Warm water flush <90°F	C						C	C		C				
Hot water flush >90°F	C									C				
Vacuum removal of oil	C	C	C	C	C	C	C	C		C	C		C	C
Sediment reworking			C	C	C	C								
Sediment Removal-cleaning-replacement			C	C	C	C		C						
Cutting oiled vegetation							C	C		C	C		C	C
ALTERNATIVE METHODS*														
In-situ burning on shore														
Chemical stabilization, protection, cleaning														
Nutrient enhancement			C	C	C	C	C	C						C
Microbial addition														

R Recommend - May be Preferred Alternative

C Conditional (Refer to NW Shoreline Countermeasures Manual)

Shaded areas are Not Applicable or Not Generally Recommended

* Follow approved process defined in NCP and NW Area Plan

This countermeasure advisability matrix is only a general guide for removal of oil from shoreline substrates. It must be used in conjunction with the entire Shoreline Countermeasures Manual plus field observations and scientific advice. The countermeasures listed are not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques (including ones not listed herein). The Federal On-Scene Coordinator (FOSC) or the state OSC operating with the FOSC's authorization has the responsibility for and the authority to determine which countermeasure(s) are appropriate for various situations encountered. Selection of countermeasures is based on the degree of oil contamination, the shoreline type, and the presence of sensitive resources.

SHORELINE COUNTERMEASURES MATRIX

Medium Oil (Most Crude Oils & Some Heavily Weathered Light Crudes)

- About 1/3 will evaporate within 24 hours
- Maximum water-soluble fraction is 10-100ppm
- Oil contamination of intertidal areas can be severe and long-term
- Impact to waterfowl and fur-bearing mammals can be severe
- Chemical dispersion is an option within 1-2 days
- Cleanup most effective if conducted quickly

SHORELINE TYPES CODES

1- Exposed rock shores and vertical, hard man-made structure (e.g. seawalls)	6B - Gravel beaches - cobbles to boulders
2 - Exposed wave-cut platforms	6C - Exposed rip rap
3 - Fine to medium grained sand beaches & steep unvegetated river banks	7 - Exposed tidal flat
4 - Course grained sand beaches	8A- Sheltered vertical rock shores and vertical, hard man-made structures (e.g. seawalls, docks, bulkheads)
5 - Mixed sand and gravel beaches, including artificial fill containing a range of grain size and material	8B - Sheltered rubble slope
6A - Gravel beaches - pebbles to cobble	9A - Sheltered sand and mud flats
	9B - Sheltered vegetated low bank
	10 - Marshes

SHORELINE TYPES

COUNTERMEASURES	1	2	3	4	5	6A	6B	6C	7	8A	8B	9A	9B	10
CONVENTIONAL METHODS														
No action	C	C	C	C	C	C	C	C	R	C	C	R	C	R
Manual removal of oil	C	R	R	R	R	C	C	C		R	R		C	C
Passive collection of oil	R	R	R	R	R	R	R	R	C	R	R	R	R	R
Oiled debris removal	C	R	R	R	R	R	R	R	C	R	R	C	R	C
Trenching/recovery wells			C	C	C									
Oiled sediment removal			C	C	C	C							C	
Ambient water flooding (Deluge)			C	C	C	R	R	R		R	R		C	C
Amb water flush <50 psi	C	C			C	R	C	R		R	R		C	C
Amb water flush <100 psi	C	C					C	C		C				
Warm water flush <90°F	C						C	C		C				
Hot water flush >90°F	C									C				
Vacuum removal of oil	C	C	R	R		C	R	R		C	C		C	C
Sediment reworking			C	C	C	C								
Sediment Removal-cleaning-replacement			C	C	C	C		C			C			
Cutting oiled vegetation							C	C		C	C		C	C
ALTERNATIVE METHODS*														
In-situ burning on shore														
Chemical stabilization, protection, cleaning														
Nutrient enhancement			C	C	C	C	C	C			C			C
Microbial addition														

R Recommend - May be Preferred Alternative

C Conditional (Refer to NW Shoreline Countermeasures Manual)

 Shaded areas are Not Applicable or Not Generally Recommended

* Follow approved process defined in NCP and NW Area Plan

This countermeasure advisability matrix is only a general guide for removal of oil from shoreline substrates. It must be used in conjunction with the entire Shoreline Countermeasures Manual plus field observations and scientific advice. The countermeasures listed are not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques (including ones not listed herein). The Federal On-Scene Coordinator (FOSC) or the state OSC operating with the FOSC's authorization has the responsibility for and the authority to determine which countermeasure(s) are appropriate for various situations encountered. Selection of countermeasures is based on the degree of oil contamination, the shoreline type, and the presence of sensitive resources.

SHORELINE COUNTERMEASURES MATRIX

Light Oil (Diesel, No 2 Fuel Oils, Light Crudes)

- Moderately volatile; will leave residue (up to 1/3 of spilled amount)
- Moderate concentrations of toxic (soluble) compounds
- Long-term contamination of intertidal resources possible
- Potential for subtidal impacts (dissolution, mixing, sorption onto suspended sediments)
- No dispersion necessary
- Cleanup can be very effective

SHORELINE TYPES CODES

1- Exposed rock shores and vertical, hard man-made structure (e.g. seawalls)	6B - Gravel beaches - cobbles to boulders
2 - Exposed wave-cut platforms	6C - Exposed rip rap
3 - Fine to medium grained sand beaches & steep unvegetated river banks	7 - Exposed tidal flat
4 - Course grained sand beaches	8A- Sheltered vertical rock shores and vertical, hard man-made structures (e.g. seawalls, docks, bulkheads)
5 - Mixed sand and gravel beaches, including artificial fill containing a range of grain size and material	8B - Sheltered rubble slope
6A - Gravel beaches - pebbles to cobble	9A - Sheltered sand and mud flats
	9B - Sheltered vegetated low bank
	10 - Marshes

SHORELINE TYPES

COUNTERMEASURES	1	2	3	4	5	6A	6B	6C	7	8A	8B	9A	9B	10
CONVENTIONAL METHODS														
No action	R	R	C	C	C	C	C	C	R	C	C	R	C	R
Manual removal of oil			C	C	C	C	C	C		R	R		C	
Passive collection of oil	C	R	R	R	R	R	R	R	C	R	R	C	R	R
Oiled debris removal	C	C	R	R	R	R	R	R	C	R	R	C	C	C
Trenching/recovery wells			C	C	C									
Oiled sediment removal			C	C	C	C								
Ambient water flooding (Deluge)			C	C	C	R	R	R			C			C
Amb water flush <50 psi		C			C	C	C	C		R	C			C
Amb water flush <100 psi														
Warm water flush <90°F														
Hot water flush >90°F														
Vacuum removal of oil							C	C						C
Sediment reworking			C	C	C	C								
Sediment Removal-cleaning-replacement			C	C	C									
Cutting oiled vegetation							C	C		C	C		C	C
ALTERNATIVE METHODS*														
In-situ burning of shore														
Chemical stabilization, protection, cleaning														
Nutrient enhancement			C	C	C	C	C	C						C
Microbial addition														

R Recommend - May be Preferred Alternative

C Conditional (Refer to NW Shoreline Countermeasures Manual)

 Shaded areas are Not Applicable or Not Generally Recommended

***** Follow approved process defined in NCP and NW Area Plan

This countermeasure advisability matrix is only a general guide for removal of oil from shoreline substrates. It must be used in conjunction with the entire Shoreline Countermeasures Manual plus field observations and scientific advice. The countermeasures listed are not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques (including ones not listed herein). The Federal On-Scene Coordinator (FOSC) or the state OSC operating with the FOSC's authorization has the responsibility for and the authority to determine which countermeasure(s) are appropriate for various situations encountered. Selection of countermeasures is based on the degree of oil contamination, the shoreline type, and the presence of sensitive resources.

SHORELINE COUNTERMEASURES MATRIX

Very Light Oil (Jet fuels, Gasoline)

- Highly volatile (should all evaporate within 1-2 days)
- High concentration of toxic (soluble) compounds
- Result: Localized, severe impacts to water column and intertidal resources
- Duration of impact is a function of the resource recovery rate
- No dispersion necessary

SHORELINE TYPES CODES

1- Exposed rock shores and vertical, hard man-made structure (e.g. seawalls)	6B - Gravel beaches - cobbles to boulders
2 - Exposed wave-cut platforms	6C - Exposed rip rap
3 - Fine to medium grained sand beaches & steep unvegetated river banks	7 - Exposed tidal flat
4 - Course grained sand beaches	8A- Sheltered vertical rock shores and vertical, hard man-made structures (e.g. seawalls, docks,
5 - Mixed sand and gravel beaches, including artificial fill containing a range of grain size and material	8B - Sheltered rubble slope
6A - Gravel beaches - pebbles to cobble	9A - Sheltered sand and mud flats
	9B - Sheltered vegetated low bank
	10 - Marshes

SHORELINE TYPES

COUNTERMEASURES	1	2	3	4	5	6A	6B	6C	7	8A	8B	9A	9B	10
CONVENTIONAL METHODS														
No action	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Manual removal of oil														
Passive collection of oil			C	C	C	C	C	C						
Oiled debris removal	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Trenching/recovery wells			C	C	C									
Oiled sediment removal														
Ambient water flooding (Deluge)														C
Amb water flush <50 psi														
Amb water flush <100 psi														
Warm water flush <90°F														
Hot water flush >90°F														
Vacuum removal of oil														
Sediment reworking			C	C	C	C								
Sediment Removal-cleaning-replacement														
Cutting oiled vegetation														
ALTERNATIVE METHODS*														
In-situ burning on shore														
Chemical stabilization, protection, cleaning														
Nutrient enhancement														
Microbial addition														

R Recommend - May be Preferred Alternative

C Conditional (Refer to NW Shoreline Countermeasures Manual)

 Shaded areas are Not Applicable or Not Generally Recommended

***** Follow approved process defined in NCP and NW Area Plan

This countermeasure advisability matrix is only a general guide for removal of oil from shoreline substrates. It must be used in conjunction with the entire Shoreline Countermeasures Manual plus field observations and scientific advice. The countermeasures listed are not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques (including ones not listed herein). The Federal On-Scene Coordinator (FOSC) or the state OSC operating with the FOSC's authorization has the responsibility for and the authority to determine which countermeasure(s) are appropriate for various situations encountered. Selection of countermeasures is based on the degree of oil contamination, the shoreline type, and the presence of sensitive resources.

Purpose of Chapter 6

The information presented in this chapter highlights some of the more significant environmentally sensitive areas within the GRP region that could be impacted as a result of an oil spill. Consistent with the overall purpose of the GRP's, this information is only intended to provide a level of detail required during the initial phase of spill response. During an actual event, additional resource information will be available from the resource trustee agencies supporting the Environmental Unit in the Planning Section. Specific resource concerns for areas that already have designated protection strategies in Chapter 4 of the GRP may be found in the "Resources Protected" column in the matrix describing the individual strategies.

The information provided in Chapter 6 is intended for use in:

- o Preparing an initial ICS 232 form (Resources-at-Risk summary) for Incident Command
- o Identifying those sites where it may be necessary to implement Flight Restriction Zones in order to prevent disturbance/injury to sensitive wildlife species.
- o Identifying sensitive shoreline habitats to assist SCAT teams in their initial assessments and to help personnel in the Environmental Unit in developing appropriate cleanup strategies.

Chapter 6 consists of two sets of maps and tables - one for wildlife and the other for fish, shellfish and selected sensitive marine habitats. These data are presented separately, both for ease of reading and because each of the two data sets has slightly different applications within the context of spill response.

The wildlife maps and tables present information on the location and seasonal sensitivity of key wildlife resources. Types of data included here are concentration areas for waterfowl, marine birds and shorebirds; seabird colonies; nesting areas for sensitive species such as eagles, herons and falcons; and marine mammal haulout sites. This information is intended for the rapid identification of areas where significant wildlife oiling impacts could be anticipated and to denote areas where flight restriction zones may be required to protect sensitive wildlife. Each site depicted on these maps is identified by a unique number in order to facilitate the process of communicating Flight Restriction Zone recommendations to the Operations Section in ICS. The tables accompanying the wildlife maps present information on the season(s) during which sites may be particularly sensitive to disturbance.

The fish/shellfish/marine habitat maps present general information on the location of baitfish spawning beaches, herring spawning areas, streams used by anadromous salmonids, hardshell clam concentrations, and kelp and eelgrass beds. This information will be most useful to personnel involved in assessing initial risks to fish and shellfish resources and to those conducting initial beach reconnaissance, pending availability of more detailed resource information and the formation of SCAT teams.

Because the operational uses of this information differ from those of the wildlife data, individual site identification numbers have not been assigned. Tables associated with these maps will identify the seasonal sensitivity of each resource. In addition, notes accompanying each table will provide information on the general distribution and seasonal sensitivity of those resources that are not mapped but may occur anywhere in the GRP region (ex. juvenile salmonids in shallow nearshore waters).

6. Sensitive Resource Description*

6.1. Marine Mammals

Compared to other parts of Puget Sound, this region supports a rather limited array of marine mammal species, the most common and abundant being the harbor seal. A total of 13 seal haulouts are found in this region, the most significant of these being located at Gertrude Island, Chapman Bay, McMicken Island, and Budd Inlet. Most of these sites are used year-round, with pupping occurring from late June through October. These sites are most sensitive during the pupping season due to the risk of mother/pup pairs being separated due to human disturbance. Small numbers of California sea lions and Steller (Northern) sea lions may be found within this region from late fall through mid-spring, especially in the Toliva Shoals and Nisqually delta areas. Neither of these species breed in Washington. Although relatively few Steller sea lions are found in this area, this species is of special concern because it is federally listed as a threatened species. Other marine mammal species periodically found in south Puget Sound include Dall's porpoise, harbor porpoise, orcas (killer whales), and gray whales.

Although not considered a marine mammal, river otters can be found along virtually any shoreline, but prefer the estuaries.

6.2. Birds

South Puget Sound hosts a large variety of birds throughout the year. Although there are no major seabird colonies in this area, the marbled murrelet and bald eagle, both listed as threatened, breed in the vicinity. The numbers of birds increase dramatically as species that breed far to the north start their southward migration in late summer. While most pass through on their way to southern locations many species winter in the area until the following spring.

Species most likely to be encountered include common, Pacific and red-throated loons, horned, red-necked and western grebes, pelagic and double-crested cormorants, great blue heron, Canada goose, brant, American widgeon, greater scaup, surf and white-winged scoters, common and Barrow's goldeneyes, bufflehead, red-breasted merganser, osprey, Bonaparte's, mew, western and glaucous-winged gulls, Caspian tern, common murre, pigeon guillemot, and rhinoceros auklet.

Although numbers can vary by season, major bird concentration areas include Nisqually delta, Tacoma Narrows, Carr Inlet, Case Inlet, Johnson Point, Burley Lagoon, East Bay and Oyster Bay.

6.3. Flight Restriction Zones

Flight restriction zones have been designated in the GRP to minimize disturbance to certain wildlife species. An identified location could represent a marine mammal haulout site, a seabird or heron colony, or the individual nest of a sensitive species such as bald eagle. While some zones may be restricted year around, others will be in effect only during the months listed in the matrix.

The no-fly bubble is the area within a 1,500 foot radius and below 1,000 feet in altitude around the location.

* Generated for the GRP by the Spill Response and Resource Protection Team of the Washington Department of Fish and Wildlife

All aircraft, including those from the government, contractors or media, are expected to avoid these zones when restrictions are in effect. In the event that one of these zones must be entered during a spill response, clearance must be obtained from the Washington Department of Fish and Wildlife and the United States Fish and Wildlife Service or when marine mammals other than sea otters are concerned, the National Marine Fisheries Service. Sea otters are managed by the United States Fish and Wildlife Service.

During oil spills, pilots are also asked to avoid disturbing any large concentrations of birds and other wildlife. By keeping a safe distance or altitude, pilots can prevent the accidental hazing of unaffected wildlife into oiled areas and minimize the risk of aircraft/ bird collisions.

6.4. Hazing

Hazing or directed harassment, is a method used to drive or herd wildlife out of an area where they are at risk of becoming oiled. Hazing techniques include the use of visual and audio devices, personnel for herding, vessels and aircraft. In the right circumstances it can be an effective tool for protecting some wildlife species. In other cases it can be disastrous as unaffected wildlife can be driven into oiled areas, or forced to abandon nests or young.

National Marine Fisheries Service staff or their designees will perform all hazing of marine mammals other than sea otters. Before hazing can begin for all other species of wildlife, clearance must be obtained from the Washington Department of Fisheries and Wildlife and the United States Fish and Wildlife Service. All hazing efforts during a spill will be directed by these agencies. The deliberate harassment of wildlife without first securing permission from these agencies is a violation of Federal and State laws.

The following information must be provided for a determination on whether hazing might be authorized in a given situation.

1. Description of the situation where hazing authorization is being sought
2. Location to be hazed
3. Species of wildlife to be hazed and number of animals
4. Methods and equipment used
5. Date and time of hazing
6. Name, phone number, radio frequency, pager number and the amount of hazing experience of the individual requesting permission

The responsible agencies will evaluate each request on a case by case basis. All hazing of marine mammals, threatened and endangered species, and all hazing by aircraft will be performed only under authority and general supervision of WDF&W, USFWS, NMFS or persons designated by these agencies. Representatives of these agencies can be contacted through the planning section of the Unified Command System during the spill event.

 Includes half of the month

GIG HARBOR FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

Map Page 18474

Code	Location	Seabird Colony	Seabird Conc.	Waterfowl Conc.	Marine Mammal Haulout	Sensitive Nesting Species	Shorebird Conc.	Flight Exclusion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
WSP-1	Tacoma Narrows		Yes	Yes				No												
WSP-2	Carr Inlet		Yes	Yes				No												
WSP-3	Burley Lagoon			Yes				No												
WSP-4	Rosedale Beach				Yes			Yes												
WSP-5	Cutts Island				Yes			Yes												
WSP-2	Horsehead Bay				Yes			Yes												
WC-35	Colvos Passage		Yes					No												
WC-37	Point Dalco					Yes		Yes												
WC-41	Point Defiance					Yes		Yes												

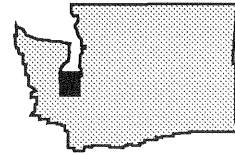
* FLIGHT AND GROUND ENTRY RESTRICTIONS

 Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

 Sensitive season - Minimize overflight disturbance

GIG HARBOR**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

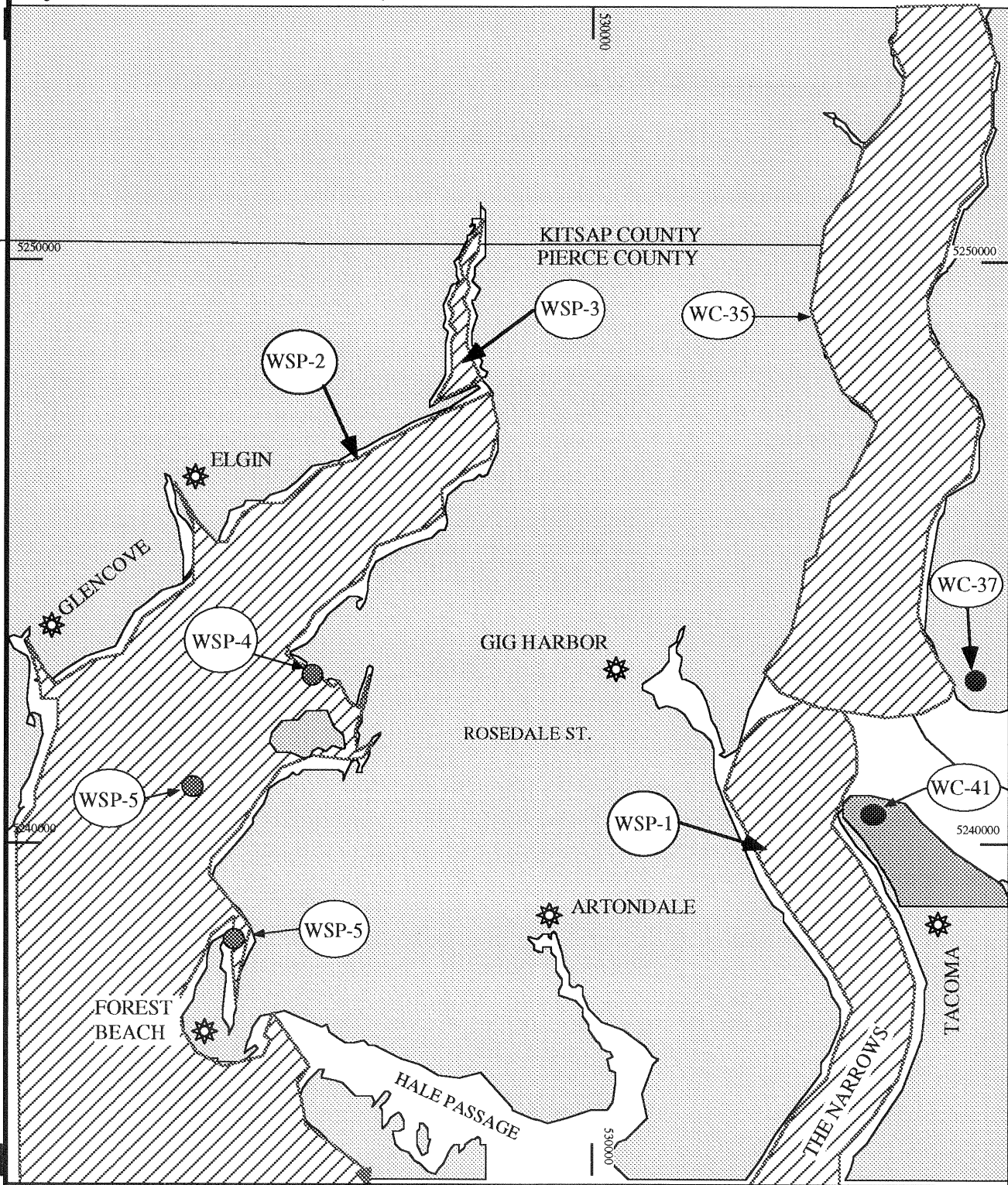


- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⊕ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▨ RESERVATION
- ★ TOWN OR CITY



BIRD CONCENTRATION AREA



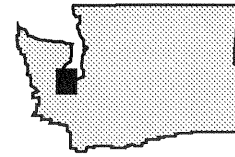
SOUTH PUGET SOUND GRP

McNEIL ISLAND

FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

SOUTH PUGET SOUND GRP

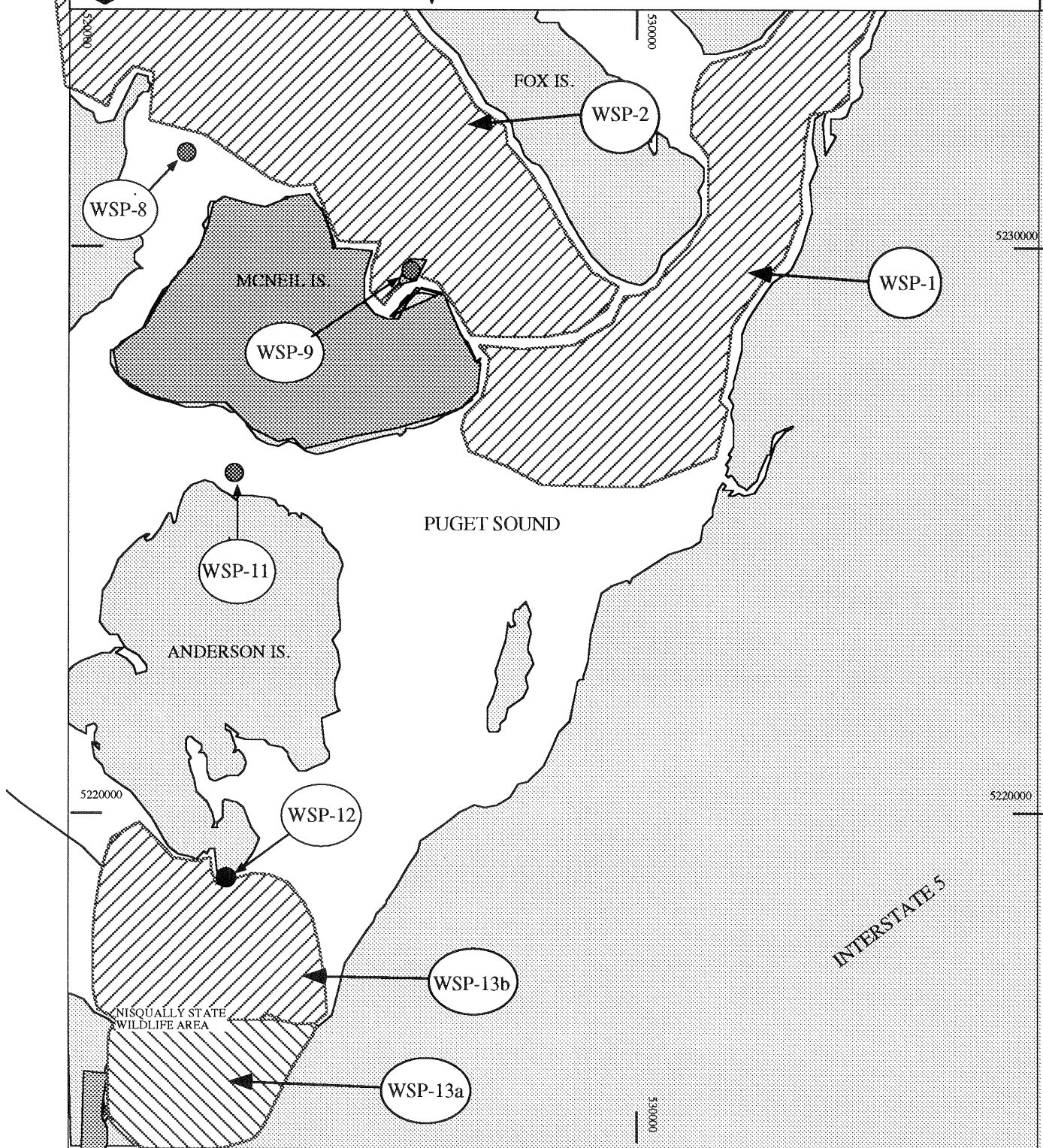


- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⊠ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▨ RESERVATION
- ★ TOWN OR CITY



BIRD CONCENTRATION AREA



BELFAIR FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

									Flight and Ground Entry Restrictions *											
									PERIOD OF SENSITIVITY											
Map Page 18448									Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	Location	Seabird Colony	Seabird Conc	Waterfowl Conc	Marine Mammal Haulout	Sensitive nesting species	Shorebird concentration	Flight Exclusion												
WSP-24	Case Inlet		Yes					No												
WHC-27	Hood Canal - Anna's Bay to Lynch Cove		Yes	Yes			Yes	No												
WHC-28	Lynch Cove			Yes		Yes		No												

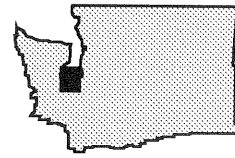
*** FLIGHT AND GROUND ENTRY RESTRICTIONS**

 Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

 Sensitive season - Minimize overflight disturbance

BELFAIR**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

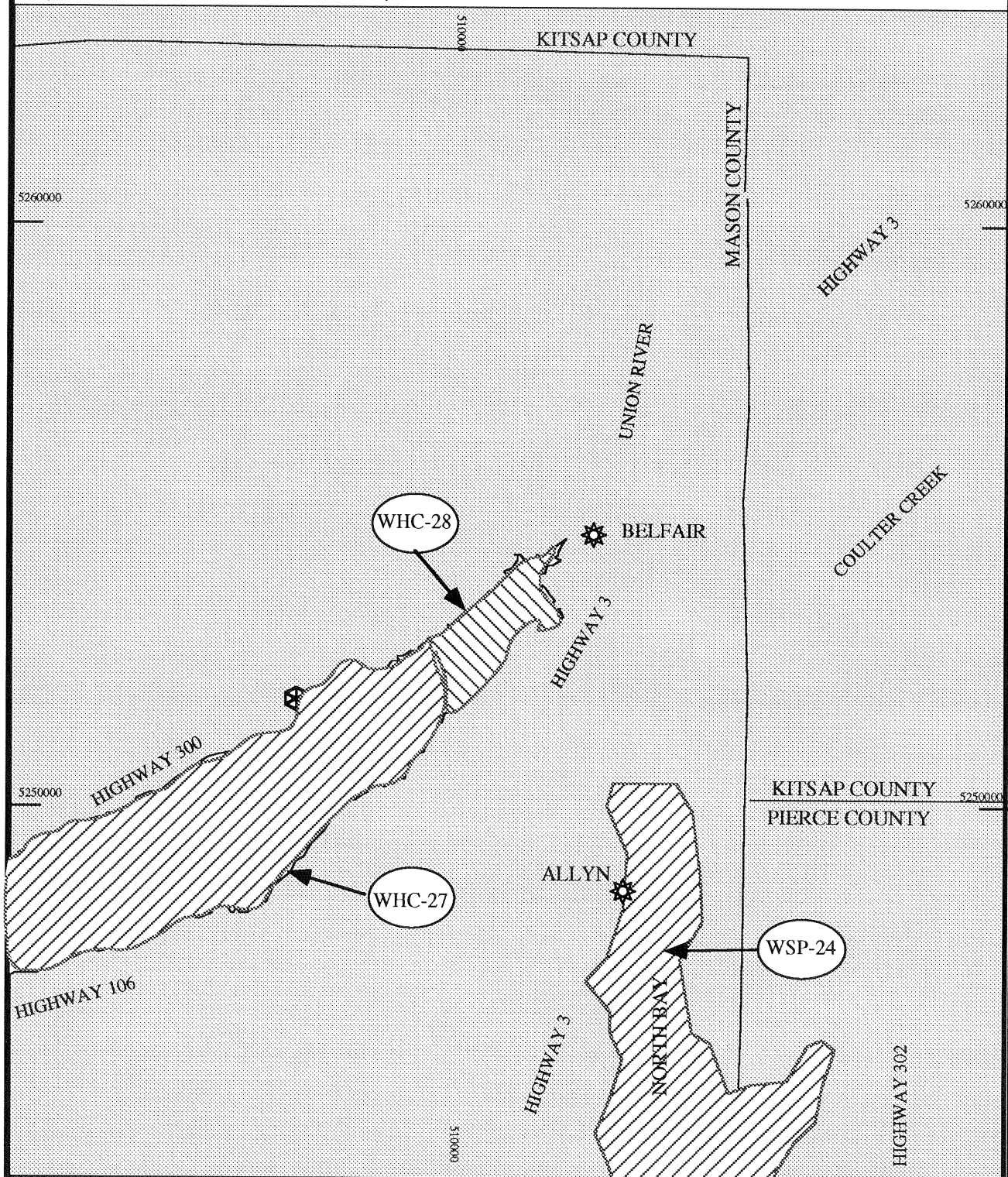


- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⊗ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▨ RESERVATION
- ★ TOWN OR CITY



BIRD CONCENTRATION AREA



 Includes half the month

CASE INLET FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

Map Page 18448

		Seabird	Seabird	Waterfowl	Marine Mammal	Sensitive	Shorebird	Flight	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	Location	Colony	Conc	Conc	Haulout	nesting species	Conc	Exclusion												
WSP-2	Carr Inlet		Yes	Yes				No												
WSP-6	Penrose Point					Yes		Yes												
WSP-10	McDermott Point			Yes				No												
WSP-14	Johnson Pt / Treble Pt		Yes					No												
WSP-15	Devil's Head					Yes		Yes												
WSP-21	Cape Horn					Yes		Yes												
WSP-23	McMicken Island				Yes			Yes												
WSP-24	Case Inlet		Yes					No												

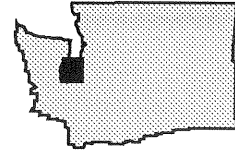
* FLIGHT AND GROUND ENTRY RESTRICTIONS

 Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

 Sensitive season - Minimize overflight disturbance

CASE INLET**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

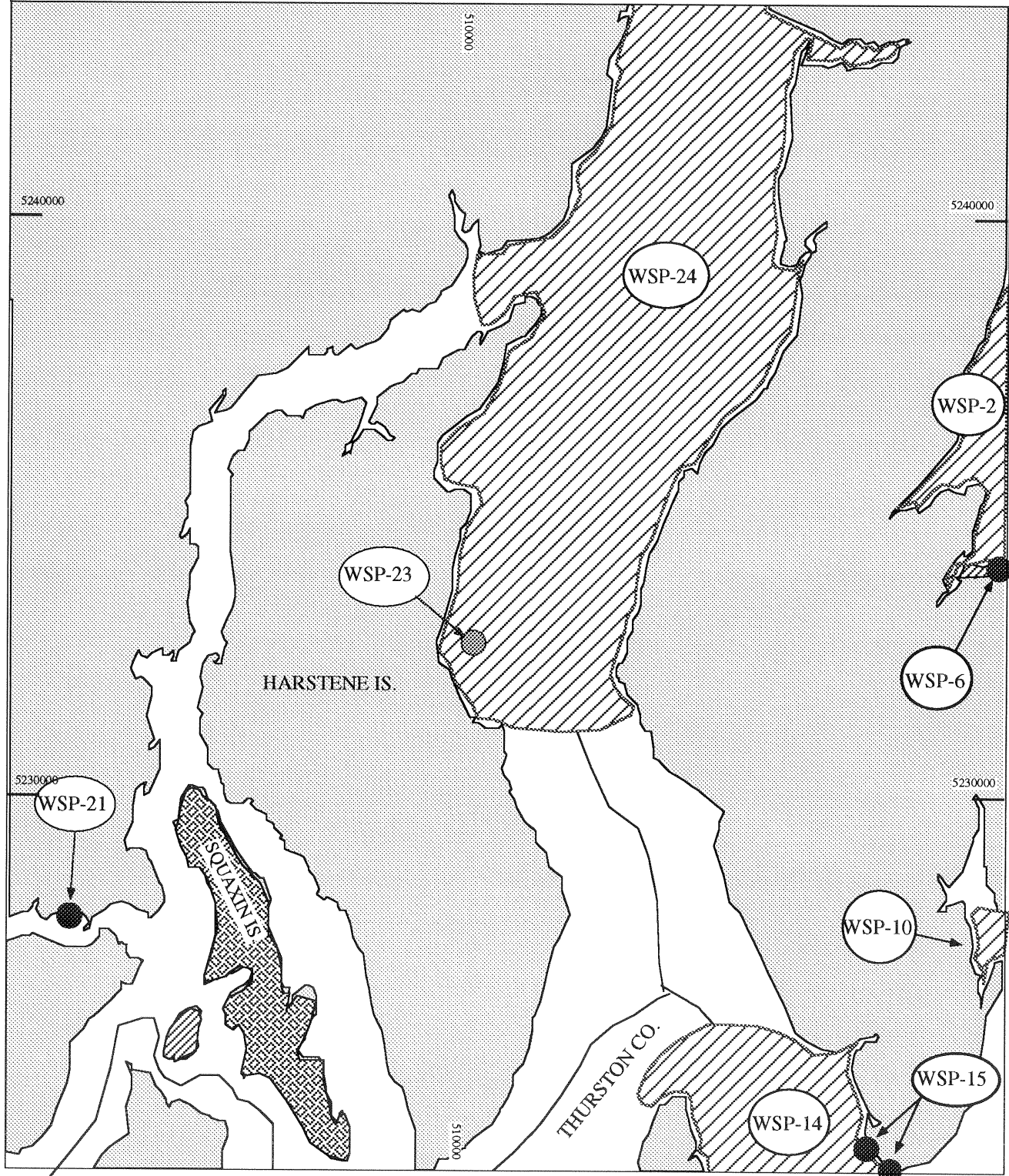


- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⊗ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▩ RESERVATION
- ★ TOWN OR CITY



BIRD CONCENTRATION AREA



Includes half the month

SHELTON FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

Map Page 18448

		Seabird	Seabird	Waterfowl	Marine Mammal	Sensitive	Shorebird	Flight	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	Location	Colony	Conc	Conc	Haulout	nesting species	Conc	Exclusion												
WSP-7	Totten Inlet				Yes		Yes	No												
WSP-20	Oyster Bay			Yes			Yes	No												
WSP-22	Shelton				Yes			No												

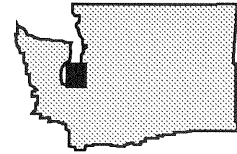
* FLIGHT AND GROUND ENTRY RESTRICTIONS

Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

Sensitive season - Minimize overflight disturbance

SHELTON**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

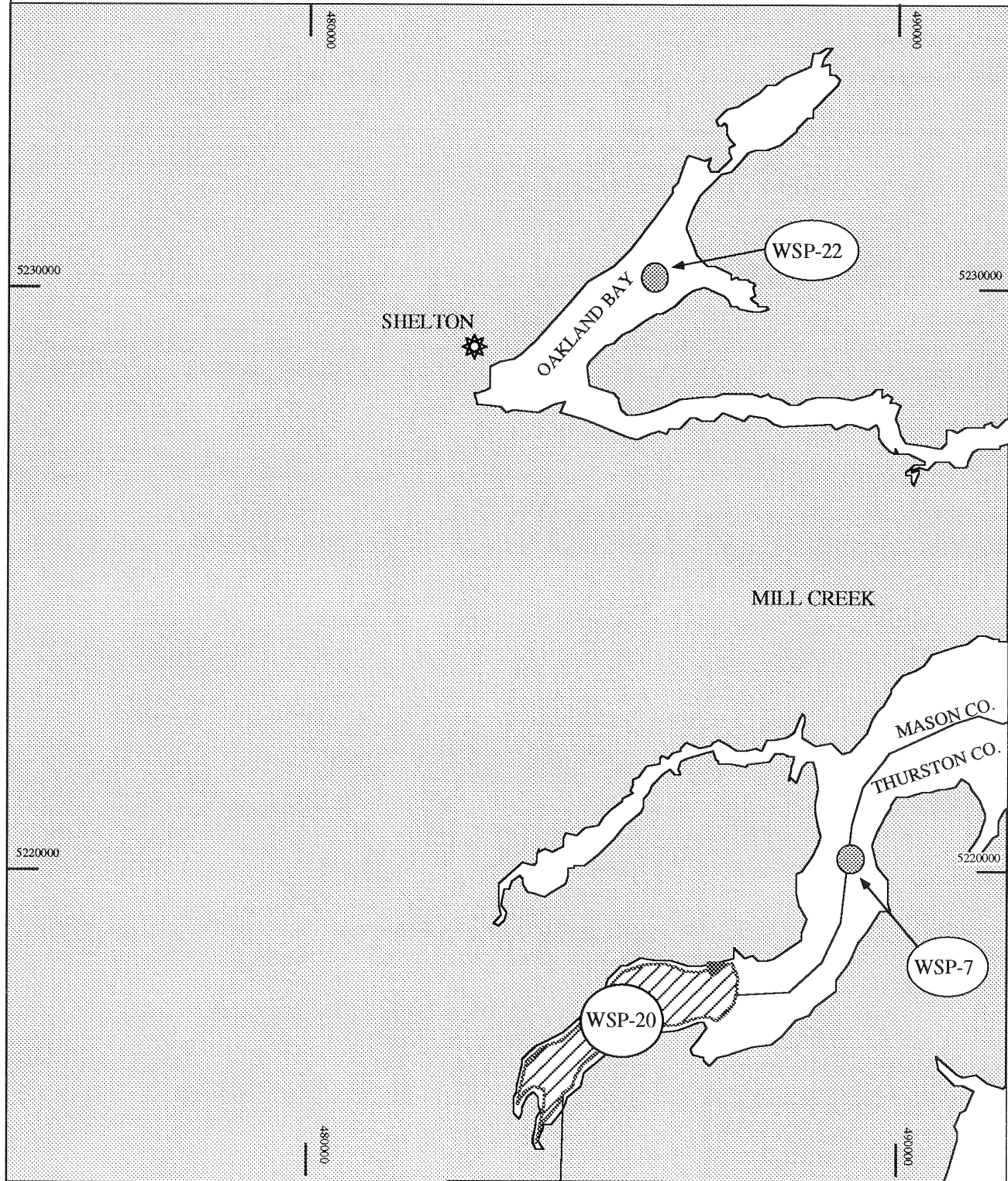


- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⚓ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▨ RESERVATION
- ★ TOWN OR CITY



BIRD CONCENTRATION AREA



Includes half the month

BUDD INLET FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

Map Page 18448

		Seabird	Seabird	Waterfowl	Marine Mammal	Sensitive	Shorebird	Flight	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	Location	Colony	Conc	Conc	Haulout	nesting species	Conc	Exclusion												
WSP-14	Johnson Pt / Treble Pt		Yes					No												
WSP-16	Henderson Inlet			Yes	Yes	Yes		Yes												
WSP-16a	Chapman Bay (include broomsticks of mouth)		Yes	Yes	400+	Yes		Yes												
WSP-16b	Woodard Bay			Yes		Yes		Yes												
WSP-17	East Bay			Yes				No												
WSP-18	Budd Inlet				Yes			Yes												
WSP-19	Eld Inlet				Yes			Yes												

* FLIGHT AND GROUND ENTRY RESTRICTIONS

Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

Sensitive season - Minimize overflight disturbance

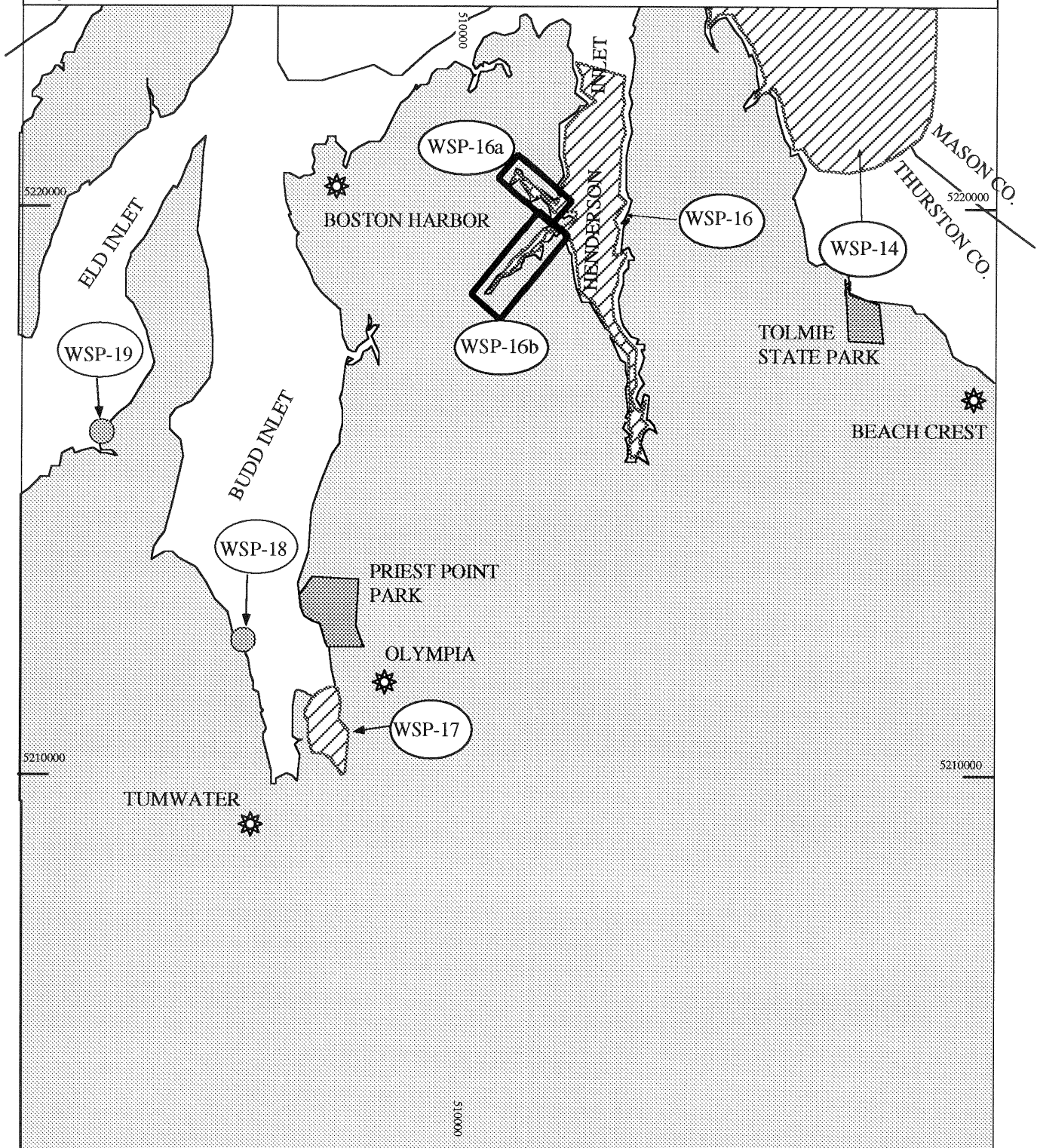
BUDD INLET**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.

- MARINE MAMMAL HAULOUT
- SENSITIVE SPECIES NESTING
- ⚓ BOAT LAUNCH

- ▨ PARK OR PUBLIC LAND
- ▨ RESERVATION
- ★ TOWN OR CITY

- ▨ BIRD CONCENTRATION AREA



Includes half the month

TOTTEN INLET FLIGHT RESTRICTION ZONES / SENSITIVE WILDLIFE

Map Page 18448

Code	Location	Seabird Colony	Seabird Conc	Waterfowl Conc	Marine Mammal Haulout	Sensitive nesting species	Shorebird Conc	Flight Exclusion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WSP-7	Totten Inlet				Yes		Yes	No												
WSP-20	Oyster Bay			Yes			Yes	No												

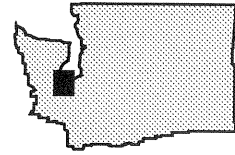
*** FLIGHT AND GROUND ENTRY RESTRICTIONS**

Flights below 1000 feet require clearance: See appendix on Flight Restriction Zones

Sensitive season - Minimize overflight disturbance

TOTTEN INLET**FLIGHT RESTRICTION ZONES FOR SENSITIVE WILDLIFE SPECIES**

1. Pilots refer to the chapter on Flight Restriction Zones.
2. All ground entry within 100 yards of sensitive nesting species is restricted.
3. All boaters are requested to approach no closer than 100 yards to seal and waterfowl concentrations.



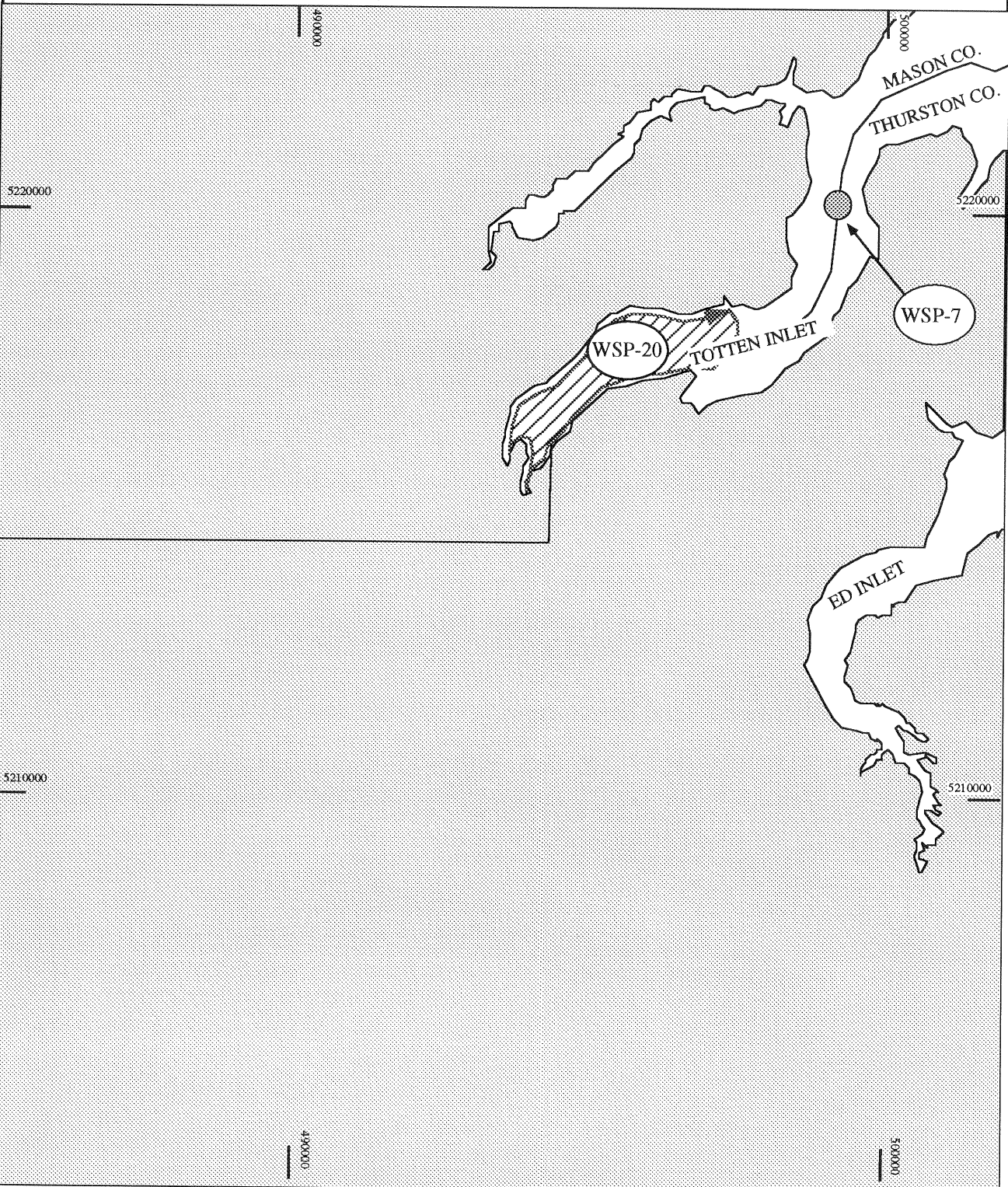
MARINE MAMMAL HAULOUT
SENSITIVE SPECIES NESTING
BOAT LAUNCH



PARK OR PUBLIC LAND
RESERVATION
TOWN OR CITY



BIRD CONCENTRATION AREA



South Puget Sound Geographic Response Plan Workshop

Sensitive Species Information

The following maps (draft) represent the current knowledge of some of Washington Department of Fisheries' (WDF) trust resources. The maps focus on nearshore resources of high commercial, recreational, or ecological value. **Adult and juvenile life stages of a number of ecologically and economically important species including salmon, marine fish, baitfish, and shellfish as well as the plankton community are considered to be ubiquitous in distribution and therefore, are not displayed on maps.** Pertinent information on many of these species can be found in the habitat association and timing tables which include information on temporal and spatial distribution, preferred habitat, and relative abundance of various life history stages. This information must be considered in resource protection and damage assessments efforts.

Additional areas of resource occurrence are continually being documented. The extent of intertidal spawning habitat represented in the baitfish maps for surf smelt and Pacific sand lance is updated annually as new spawning areas are documented.

The shellfish maps do not offer complete information on intertidal and subtidal shellfish resources. Surveys run by WDF have been oriented to locating beds that could be commercially harvested. Many intertidal areas are privately owned tidelands upon which WDF has not undertaken a comprehensive inventory of the naturally produced or cultured shellfish resources. No attempt has been made on these maps to differentiate between areas which have not been surveyed and those in which shellfish were not found in commercial quantities.

Due to a combination of new data and incomplete data it is not safe to assume that blank areas on the maps are not of concern. If you have any questions regarding this information please contact the WDF Spill Response and Damage Prevention Unit at 206-902-2570.

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Pacific Herring (*Clupea harengus pallasi*)

Resource Information Mapped: Adult prespawning holding areas and spawning areas.

Resource Use: Human; sport bait fishery targets juvenile fish. Non-human; one of the most important components of the marine food chain; they provide the link between primary production and upper level predators. All life history stages utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location or Habitat Association: Adult prespawning holding areas are located in the Tacoma Narrows, Carr Inlet, Hale Pass, Drayton Pass, Nisqually Reach, Case Inlet, and the entrance to Budd Inlet. In this region herring spawning occurs in Mayo Cove, Squaxin Passage, Hammersley Inlet, Totten Inlet, and Skookum Inlet. Herring deposit their eggs on marine vegetation, such as eel grass or algae, within the shallow subtidal and intertidal zones.

Seasonal Sensitivity or Occurrence: Adult herring congregate in relatively distinct areas during December through June prior to spawning. Exposure of pre-spawning adults to oil can result in the accumulation of hydrocarbon compounds in the yolk of maturing eggs. Metabolism of these compounds during embryonic and larval stages can result in lethal and sublethal genetic, cellular and morphological injuries. Spawning occurs from January through March. Eggs hatch after approximately 10 days. Larvae and subsequent juvenile fish are found in nearshore areas throughout the following summer. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Utilize open water and nearshore containment and collection techniques to keep oil off of the spawning substrate throughout the region. Use exclusion boom where feasible (Mayo Cove, Skookum Inlet).

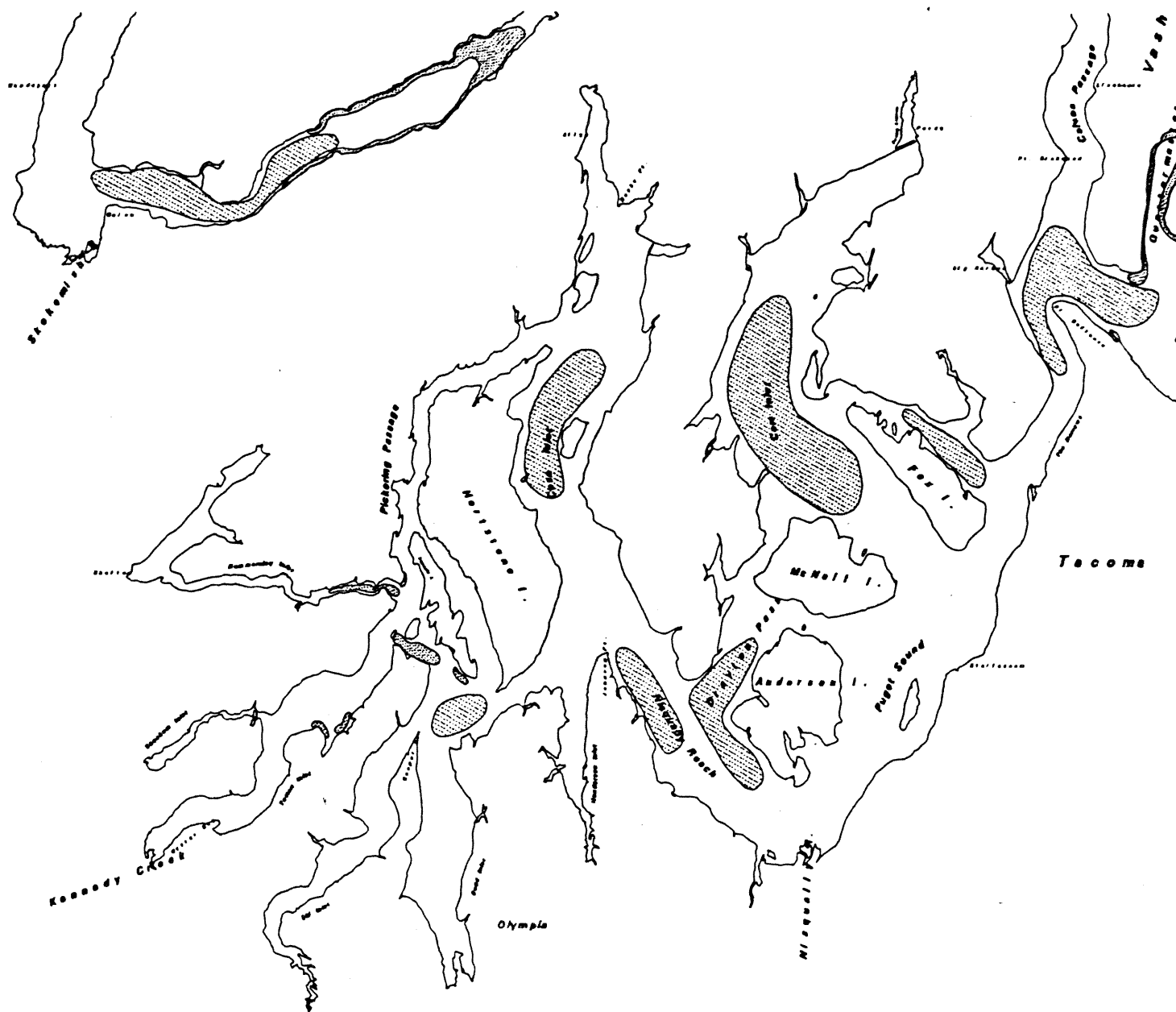
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Fish Resources



Herring Spawning



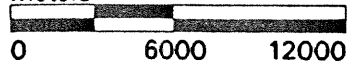
Herring Holding



USGS Shoreline



Meters



Source: Washington Department of Fisheries
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Surf Smelt (*Hypomesus pretiosus*)

Resource Information Mapped: Intertidal surf smelt spawning areas.

Resource Use: Human - commercial and recreational harvest. Non-human - important component of the marine food chain; smelt provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location of Sensitive Resource: Surf smelt deposit their eggs in the uppermost intertidal zone on gravel generally having a grain size from 1 to 7 mm. Incubation takes 2 - 4 weeks. Larvae are found in adjacent nearshore surface waters for several weeks following hatching. Spawning areas exist throughout the region with extensive contiguous stretches in Henderson, Budd, Eld, and Totten Inlets. Other undocumented spawning areas are suspected in the region.

Seasonal Sensitivity or Occurrence: Surf smelt spawning occurs in this region from July through March. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Keep oil off of spawning beaches regardless of season. Utilize aggressive open water and nearshore containment and collection techniques to keep oil off of the spawning substrate. Use protection or exclusion boom where feasible.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Fish Resources



Smelt Spawning



USGS Shoreline



Meters



Source: Washington Department of Fisheries
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

6-23

December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Pacific Sand Lance (*Ammodytes hexapterus*)

Resource Information Mapped: Documented intertidal spawning areas and larval rearing areas.

Resource Use: Human - sand lance are used as bait by recreation fishers. Non-human - important component of the marine food chain; sand lance provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

General Location or Habitat Association of Resource: Pacific sand lance spawn from November through February and deposit their eggs on upper intertidal sandy-gravel beaches. Documented spawning areas are widely scattered throughout the region with the highest concentration in the Tacoma Narrows and Hale Pass. Sand lance larvae are widespread in the regions near-surface waters from January through March. It is suspected that additional spawning and larval habitat exists within the region. Adult sand lance are found in nearshore habitats throughout the region.

Seasonal Sensitivity: The highest sensitivity is during the spawning and larval stages from October through March. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Keep oil off of spawning beaches regardless of season. Utilize aggressive open water and nearshore containment and collection techniques to keep oil off of the spawning substrate. Use protection or exclusion boom where feasible.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Fish Resources

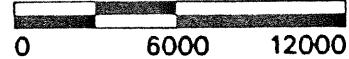


Sand Lance Spawning

Sand Lance Larvae

USGS Shoreline

Meters



Source: Washington Department of Fisheries
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.
 6-25 December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Rock Sole (*lepidopsetta bilineata*)

Resource Information Mapped: Rock sole spawning habitat.

Resource Use: Human; Commercial and recreational harvest.

General Location or Habitat Association of Resource: Rock sole deposit their eggs in the uppermost intertidal zone on gravel generally having a grain size from 1 to 7 mm. Incubation takes 2 - 3 weeks. Spawning areas within the region include Mayo Cove, Filucy Bay, Dickenson Point, Hope Island, Hunter Point, Sandy Point, Boston Harbor, and other isolated spots. Additional undocumented spawning areas are suspected in the region.

Seasonal Sensitivity or Occurrence: Rock sole spawning occurs in this region from mid-December through mid-March. Eggs are highly susceptible to injury (lethal) from oil exposure.

Recommended Protection Strategy: Keep oil off of spawning beaches regardless of season. Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

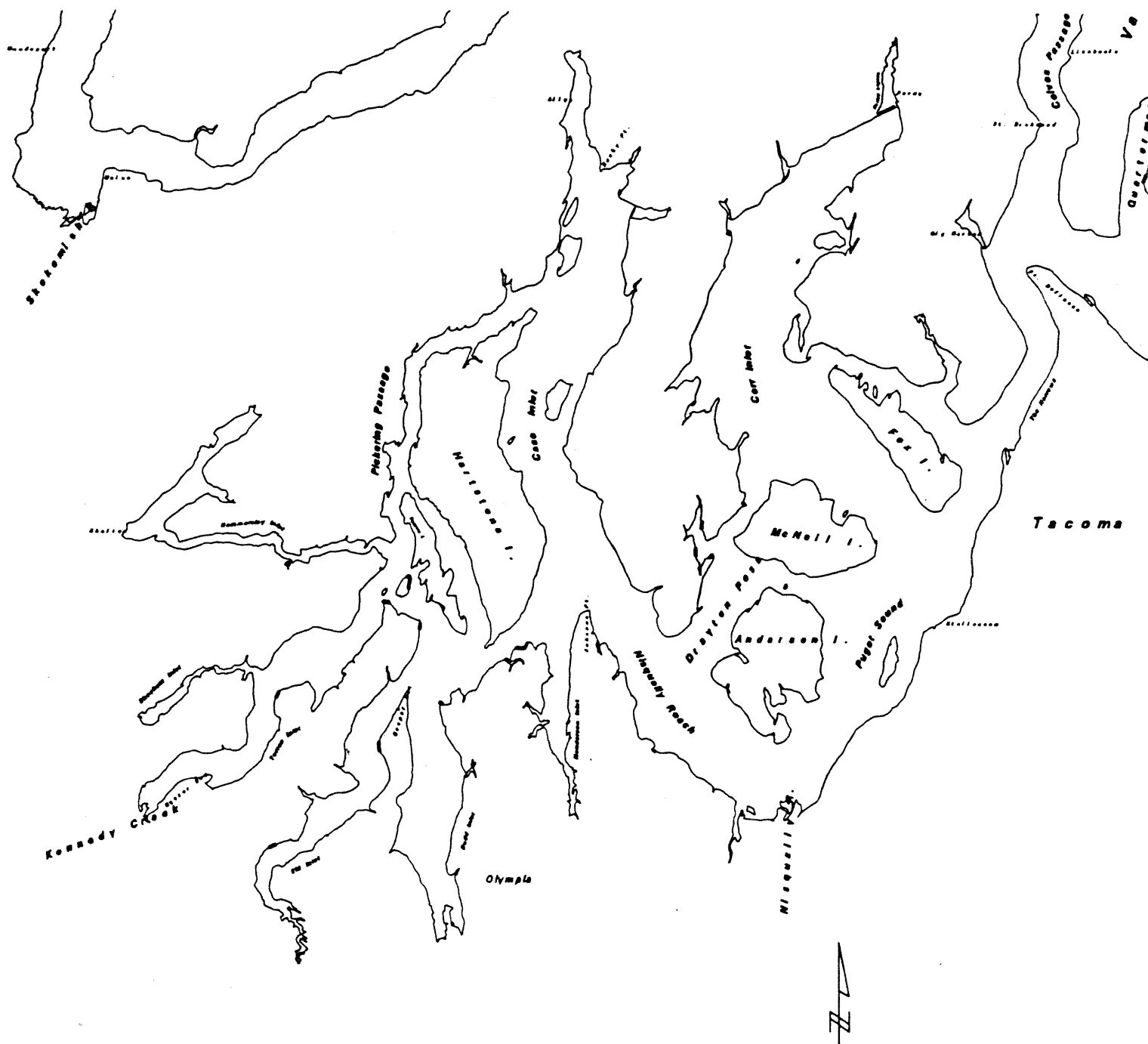
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Hart, J.L. 1973. Pacific Fishes of Canada. Fish. Res. Bd. Canada. Bull. 180. 740 pp.

WDF Baitfish Unit, unpublished data.

South Puget Sound Fish Resources



Rocksole Spawning

USGS Shoreline

Source: Washington Department of Fisheries
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

South Puget Sound Geographic Response Plan Workshop Data Recording Sheet

Resource: Pacific Salmon

Resource Information Mapped: Anadromous streams and rivers utilized by one or more of the following species for spawning and rearing: chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), chum (*O. keta*), pink (*O. gorbuscha*), and steelhead (*O. mykiss*). A map is also provided show the location of salmon culture facilities.

Resource Use: Human; extensive commercial and recreational fisheries. Non-human; the list of predators on the various life history stages of salmon is extensive and includes several species of birds (bald eagle), fish, marine mammals, and terrestrial mammals.

General Location or Habitat Association of Resource: Salmon spawn and rear in all major Washington watersheds and in many of the smaller tributaries. Two major river systems drain into this region, the Nisqually River and the Deschutes River. Numerous salmon culture facilities are located in the region. Salmon are anadromous in that they begin life in fresh water, spend the largest portion of their life in salt water, then return to fresh water to spawn. There is a broad range of life history types both between and within the species. Both juvenile and adult salmon are present year round throughout this region.

Seasonal Sensitivity: Varies with species, stock, and river system. See habitat association and timing table.

Stock Sensitivity: White River spring chinook, which are listed by the State as critical, are resident throughout the region. The Minter Creek Hatchery and Squaxin Island net pens are used in the White River spring chinook rebuilding program.

Recommended Protection Strategy: In the estuaries contain and recover oil in the main channels as close to the entrances as possible or divert to shore based recovery points. Keep oil off of the intertidal flats. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum or transport it into the lower intertidal or subtidal zones. Boom the river and stream mouths where extensive tidal influence is present.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

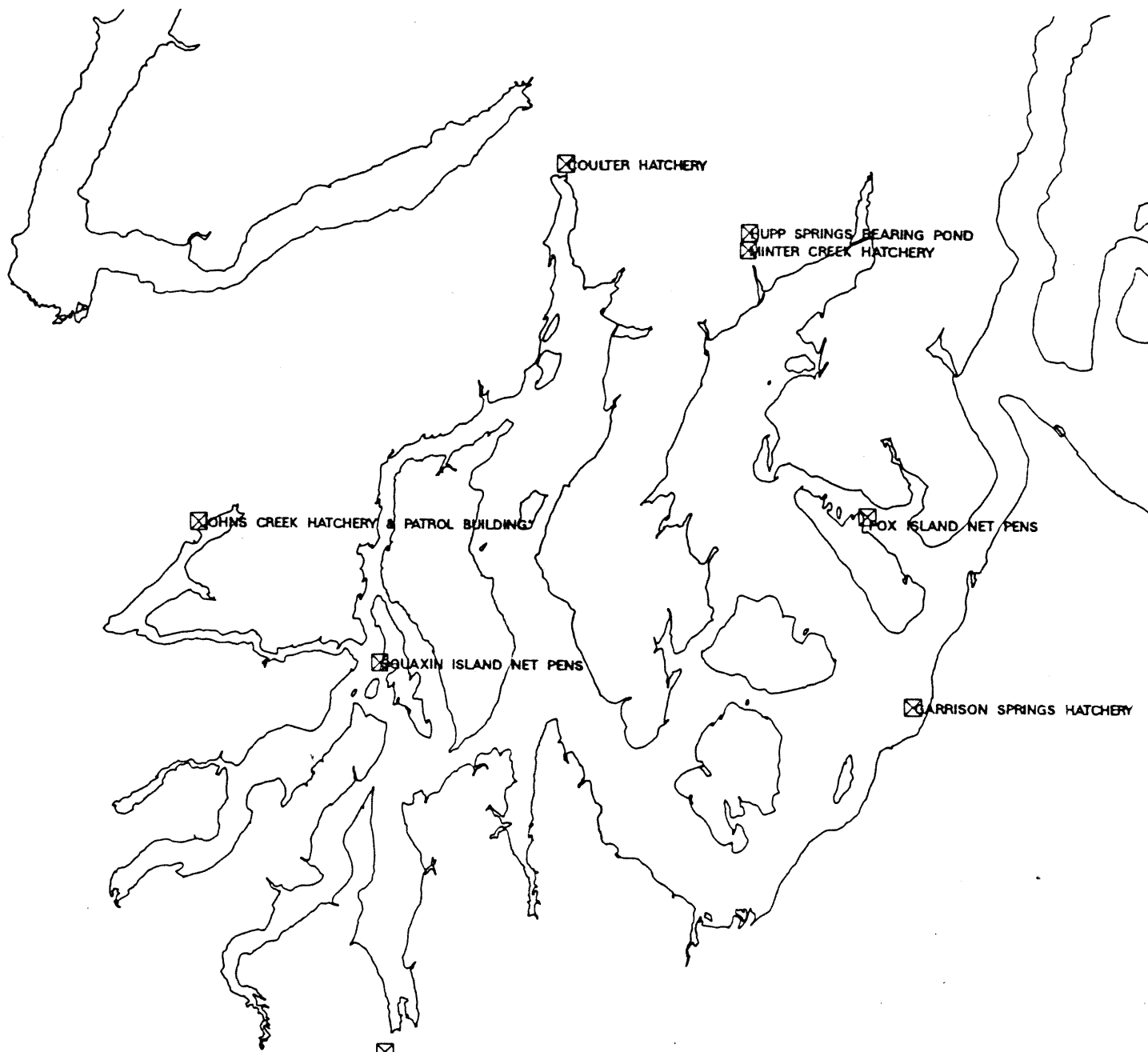
References:

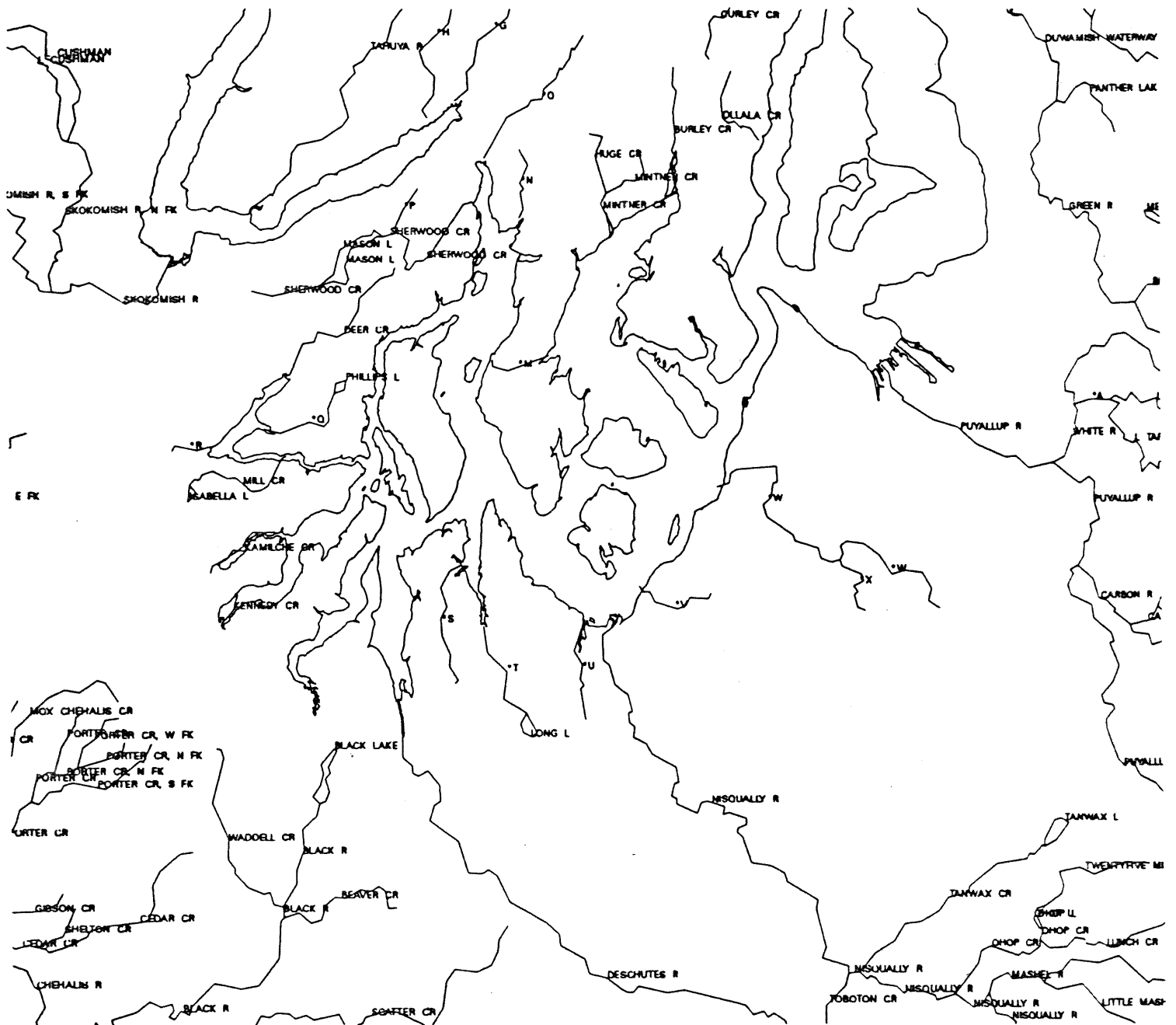
Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Olympia, Washington. 212 pp.

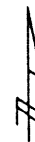
South Puget Sound Salmon Culture Facilities





Major Rivers

USGS Shoreline



Meters



Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Cancer Crab

Resource Information Mapped: Dungeness (*Cancer magister*) and red rock (*C. productus*) crab distribution. Map depicts primarily adults but does cover some juvenile areas.

Resource Use: Human - large commercial and recreational harvest. Non-human - all life history phases are utilized as food by numerous fish species (eg. Pacific herring, lingcod, rockfish, coho and chinook salmon, halibut, English sole and cabezon), octopus, sea otters, harbor seals, sea lions, and gulls.

General Location or Habitat Association of Resource: Cancer crab are found in Hale Pass and on the Nisqually River delta. Around the Nisqually River the distribution extends to Steilacoom on the east side and to Johnson Point on the west side. Adults are found from the intertidal to -90 m MLLW and prefer sandy substrates. Juveniles are found intertidally and typically associated with eelgrass, ulva, bivalve shells, or some form of cover, from +3 to -15 m MLLW. Larvae and megalopae are planktonic. Megalopae are typically found in nearshore waters where they settle to the bottom and metamorphose into juveniles during summer. Females carry incubating eggs beginning in the fall and hatching occurs between February and April.

Seasonal Sensitivity: Larvae/megalopae - planktonic - March through July. Juveniles - epibenthic intertidal - year-round.

Recommended Protection Strategy: Protect nearshore juvenile habitat, particularly eelgrass beds. Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Shellfish Resources

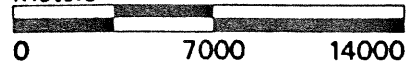
SOUTH PUGET SOUND GRP



Cancer Crab

USGS Shoreline

Meters



Source: Washington Department of Fisheries
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

6-33

December 7, 1994

Draft - November 30, 1993

South Puget Sound Geographic Response Plan Workshop Data Recording Sheet

Resource: Intertidal and subtidal hardshell clams and intertidal softshell clams.

Resource Information Mapped: Hardshell species include the native littleneck (*Protothaca staminea*), the Manila littleneck (*Tapes philippinarum*), butter clams (*Saxidomus giganteus*), piddock clams (*Zirfaea pilsbryi*), horse clams (*Tresus capax* and *T. nuttallii*), and cockles (*Clinocardium nuttali*). The only softshell species is the eastern softshell clam (*Mya arenaria*).

Resource Use: Human; commercial and recreational harvest. Non human; as a group clams are feed upon by a wide variety of organisms including snails, sea stars, Dungeness and rock crabs, several species of commercially and recreationally import fish, sea otters, raccoons, scoters and other birds.

General Location or Habitat Association of Resource: Clams are found throughout the region with higher concentrations around Hartstene and Squaxin Islands, Totten Inlet, and Oakland Bay. Clams are found from approximately +2 m MLLW in the intertidal zone to subtidal depths of -21 m MLLW.

Seasonal Sensitivity: Due to their sessile lifestyle in the intertidal zone clams are at high risk of exposure throughout the year. Sensitivity would be elevated during the spawning and larval period which can extend from April through October.

Recommended Protection Strategy: Utilize protective booming where possible and aggressive open water collection techniques elsewhere. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum.

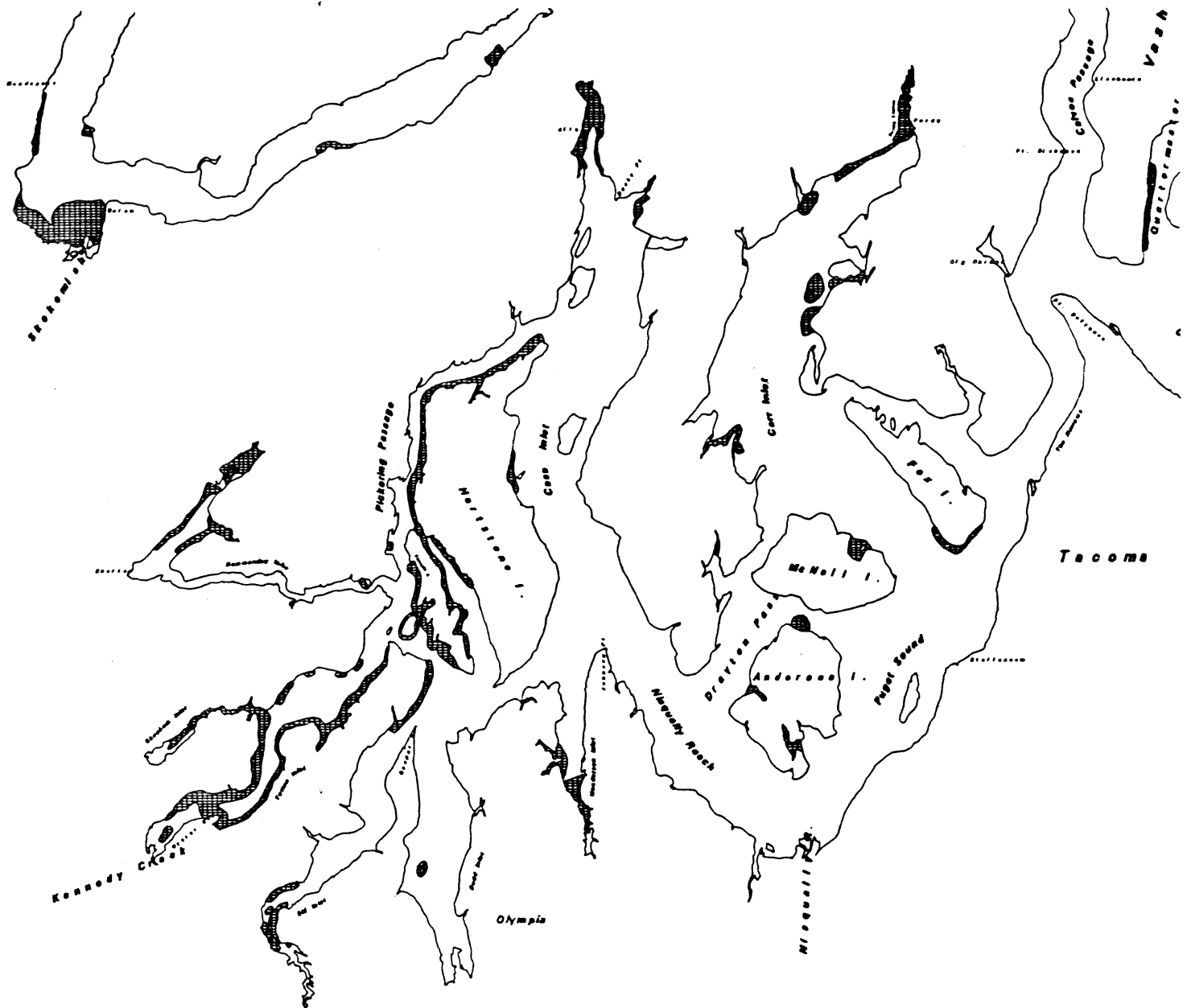
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Shellfish Resources



Softshell Clams
 Subtidal Clam
 Intertidal Hardshell Clams
 USGS Shoreline

Meters
 0 6000 12000

Source: Washington Department of Fisheries
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Geoduck Clams (*Panope abrupta*)

Resource Information Mapped: Geoduck clam distribution (commercial quantities).

Resource Use: Human; Geoducks support a large commercial and recreational fisheries. Non human; Geoducks are fed upon by snails, pandalid shrimp, rock crab, English sole, sand sole, rock sole, starry flounder, starfish, and sea otters.

General Location or Habitat Association of Resource: High concentrations of geoducks are found throughout the region. They inhabit depths from +1 to -110 m MLLW and prefer a stable mud and sand substrate.

Seasonal Sensitivity: Sensitivity would be highest during the spawning and larval period from April through August (peak May - July).

Recommended Protection Strategy: Utilize beach clean up techniques which do not transport oil into the subtidal zone.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

- Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.
- Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.



USGS Shoreline

Family Type	Approximate Count
No children	12000
1 child	8000
2 children	6000
3 children	4000
4 children	2000
5 children	1000

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December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Pacific Oyster (*Crassostrea gigas*)

Resource Information Mapped: Oyster beds, primarily cultured.

Resource Use: Human - recreational and commercial harvest.
Non-human - Oyster beds provide important habitat for juvenile dungeness crab. Juvenile and adult oysters are preyed upon by dungeness and red rock crab, several starfish species, and surf and white-winged scoters.

General Location or Habitat Association of Resource: Pacific oysters are found in the lower intertidal and shallow subtidal zones in Henderson, Totten, Skookum, and Hammersley Inlets, and Oakland Bay.

Seasonal Sensitivity: Due to their sessile lifestyle in the intertidal zone oysters are at high risk of exposure throughout the year. Relative to their habitat function for juvenile dungeness crab the most sensitive period would be June through December.

Recommended Protection Strategy: Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

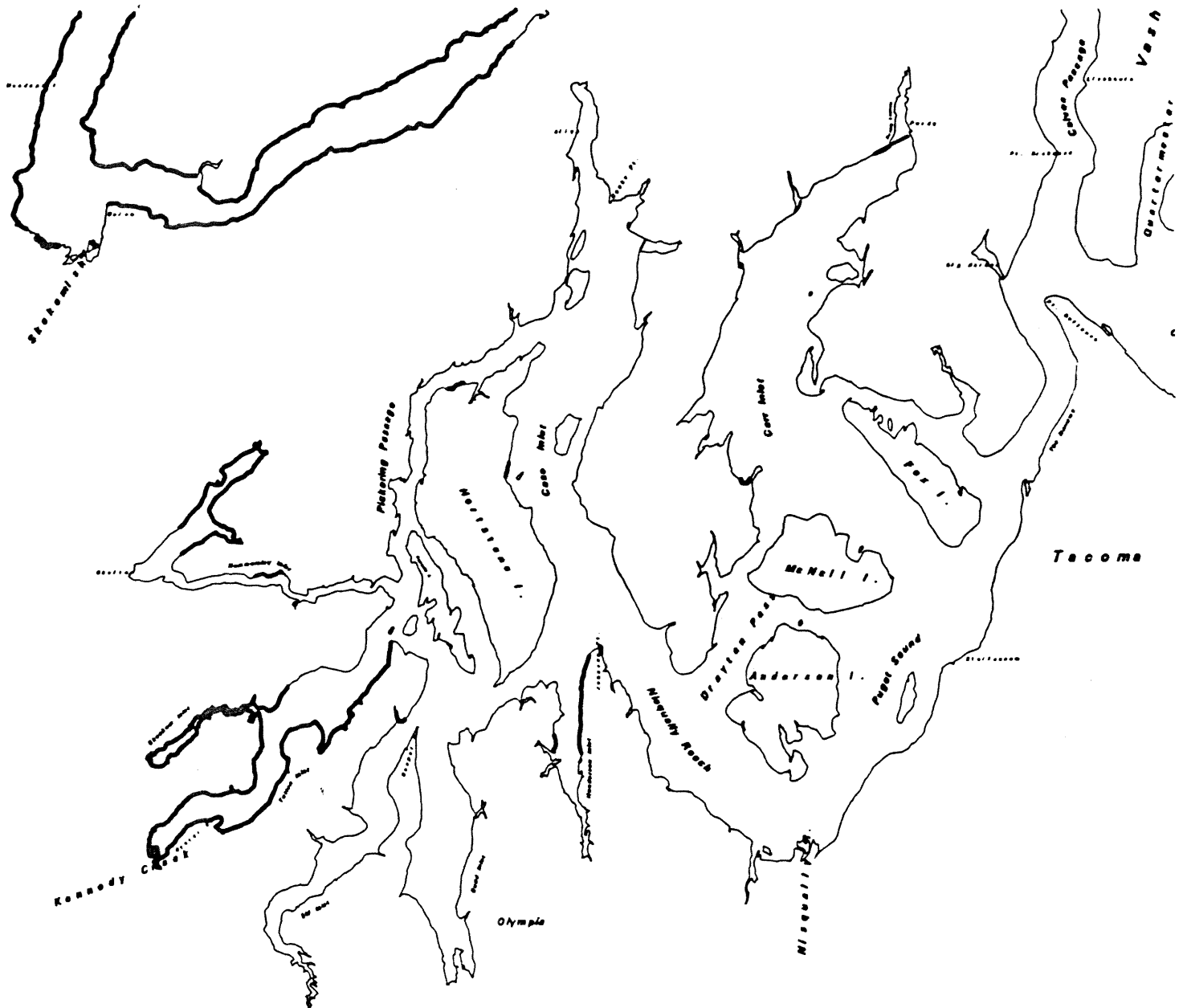
Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Shellfish Resources



Oyster



USGS Shoreline



Meters



Source: Washington Department of Fisheries
 This map does not offer complete information on fish
 and shellfish resource distribution. Comprehensive surveys
 have not been conducted along all shorelines.

6-39

December 7, 1994

Draft - November 30, 1993

South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet

Resource: Blue Mussel (*Mytilus trossolus*)

Resource Information Mapped: Areas of mussel culture.

Resource Use: Human; mussels are commercially cultured and harvested as well as being recreationally harvested. Non-human; mussels are preyed upon by pile and striped perch, crabs (*Cancer* sp.), starfish, and scoters. Larvae are eaten by planktivorous fish and invertebrates.

General Location or Habitat Association of Resource: The blue mussel is found between +1.2 m and +3.4 m MLLW attached to rocks, gravel, shell, docks, pilings, and other man-made materials. Mussels are tolerant to a wide range of temperature and salinity. Commercial mussel culture occurs in Totten Inlet. Naturally occurring mussels are found throughout the region.

Seasonal Sensitivity: Due to their sessile lifestyle in the intertidal zone mussels are at high risk of exposure throughout the year. Sensitivity would be elevated during the spawning and larval period which extends from spring through mid-summer.

Recommended Protection Strategy: For culture operations - exclusion booming. For natural populations - utilize protective booming where possible and aggressive open water and nearshore collection techniques elsewhere. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

- Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.
- Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

South Puget Sound Shellfish Resources

SOUTH PUGET SOUND GRP



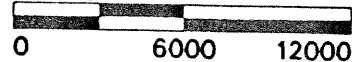
Mussel Culture



USGS Shoreline



Meters



Source: Washington Department of Fisheries
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Sea Urchin

Resource Information Mapped: Commercial quantities of adult sea urchins, primarily the red sea urchin (*Strongylocentrotus franciscanus*).

Resource Use: Human - commercial fishery. Non-human - dominant organism in rocky nearshore communities, responsible for shaping the character of the habitat through their grazing activities. Important prey item for wolf eels and sea otters.

General Location or Habitat Association of Resource: Sea urchins are found in the Tacoma Narrows. Urchins are found from the lower intertidal to depths of 125 m but the highest densities are found at depths less than 30 m. Juveniles are found in adult habitat and require the adults presence to survive.

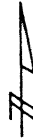
Seasonal Sensitivity: Spawning occurs during the spring followed by a planktonic larval phase that lasts from 60 to 130 days. Adults are susceptible to oil exposure via ingestion of contaminated marine algae, particularly kelp. Highest risk of this type of exposure is from April to November.

Recommended Protection Strategy: Prevent oil from contaminating nearshore kelp beds. Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.



Number of children	Frequency (approx.)
1 child	7000
2 children	14000
3 children	14000
4 children	14000
5 children	14000
6 children	14000

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December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop
Data Recording Sheet**

Resource: Pandalid Shrimp

Resource Information Mapped: Harvest areas for four species of shrimp including; pink (*Pandalus jordani* and *P. borealis*), coonstripe (*P. danae*), and spot prawn (*P. platyceros*).

Resource Use: Human - commercial and recreational fisheries. Non-human - food organism for many fish species including rockfish, cabezon, and perch.

General Location or Habitat Association of Resource: Most harvest occurs in waters 100 to 220 m deep, however, the coonstripe and spot prawn are found as shallow as the lower intertidal zone. The primary harvest areas in this region Nisqually Reach and Carr Inlet.

Seasonal Sensitivity: Planktonic larval phase from February through July.

Recommended Protection Strategy: Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

Information Recorder: WDF - Oil Spill Response and Damage Prevention Unit

References:

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

Hueckel, G.J. 1980. Foraging on an artificial reef by three Puget Sound fish species. Wa. Dept. Fish. Tech. Rpt. 53. 110 p.

South Puget Sound Shellfish Resources



Pandalid Shrimp



USGS Shoreline



Meters



Source: Washington Department of Fisheries
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Puget Sound Fish and Shellfish Habitat Association Table - Key

Life Stages -
eggs
larvae
juveniles
spawners/spawning
parturition (birth)
adults

Timing -
--- common
+++ abundant
*** highly abundant

6-46 Salinity Range -
tidal fresh 0.0 - 0.5 ppt
mixing 0.5 - 25.0 ppt
seawater >25.0 ppt

Habitats -
intertidal 0-3 m
subtidal 3-10m

Data Source -
Monaco, M.E. et al. 1990. Distribution and abundance of fishes and invertebrates in west coast estuaries. Vol. I: Data summaries. ELMR Rept. 4. Strategic Assessment Branch, NOS/NOAA, Rockville, MD
Emmett, R.L. et al. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries. Vol. II: Species Life History Summaries. ELMR Rept. 8. Strategic Assessment Branch, NOS/NOAA, Rockville, MD

December 7, 1994

SOUTH PUGET SOUND GRP

DRAFT

Fish Habitat Association in Puget Sound

Species	Timing	Salinity Range			Substrate Preference									Habitats							
														Type			Area				
		Tidal	Fresh	Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Spring Chinook Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+++++	X	X	X		X	X	X								X	X	X	X	X
	adults	--+++++	X	X	X		X	X	X								X	X	X	X	X
Fall Chinook Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+++++	X	X	X		X	X	X								X	X	X	X	X
	adults	-----+++++	X	X	X		X	X	X								X	X	X	X	X
Sockeye Salmon	J F M A M J J A S O N D																				
	Juveniles	----+-----	X	X	X									X			X	X	X	X	X
	adults	--++++-	X	X	X		X	X									X	X	X	X	X
Coho Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+	X	X	X		X	X									X	X	X	X	X
	adults	----+-----	X	X	X		X	X									X	X	X	X	X
Chum Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+	X	X	X									X			X	X	X	X	X
	adults	++-----+-----	X	X	X		X	X									X	X	X	X	X

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December 7, 1994

SOUTH PUGET SOUND GRP

DRAFT

Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference									Habitats						
														Type			Area			
		Tidal	Fresh	Salinity	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Pink Salmon		J F M A M J J A S O N D																		
	Juveniles	++++*****+-----	X	X	X								X			X	X	X	X	X
	adults	--++++*+--	X	X	X		X	X								X	X	X	X	X
Surf Smelt		J F M A M J J A S O N D																		
	eggs	*****		X	X		X							X						
	larvae	+++++++ ++++++		X	X		X							X						
	Juveniles	+++++++ ++++++		X	X							X				X	X	X	X	X
	spawners	*****		X	X		X							X						
	adults	+++++++ ++++++		X	X							X				X	X	X	X	X
Herring		J F M A M J J A S O N D																		
	eggs	*****		X	X						X	X		X	X					X
	larvae	*****+---		X	X							X				X	X	X	X	X
	Juveniles	+++++++ ++++++		X	X							X				X	X	X	X	X
	spawners	*****		X	X						X	X		X	X					X
	adults	*****		X	X							X				X	X	X	X	

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December 7, 1994

SOUTH PUGET SOUND GRP

DRAFT

Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference										Habitats						
															Type			Area			
		Tidal	Fresh		Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat	
Longfin Smelt	J F M A M J J A S O N D																				
	eggs					X											X				
	larvae	-----	X	X	X		X									X	X	X	X		
	Juveniles	-----		X	X							X				X	X	X	X		
	adults	-----	X	X	X							X				X	X	X	X		
Anchovy	J F M A M J J A S O N D																				
	eggs	--		X	X							X				X					
	larvae	----		X	X							X				X	X	X	X		
	Juveniles	-----		X	X							X				X	X	X	X		
	spawners	----		X	X							X				X					
	adults	-----		X	X							X				X	X	X	X		
Sand Lance	J F M A M J J A S O N D																				
	eggs	++++++		X	X		X								X	X	X	X			
	larvae	+++++		X	X		X									X	X				
	Juveniles	+++++		X	X		X								X	X	X	X			
	spawners	+++++		X	X		X								X	X	X	X			
	adults	-----		X	X		X								X	X	X	X			

Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference									Habitats									
														Type			Area						
		Tidal	Fresh		Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat	
Shiner Perch	J F M A M J J A S O N D																						
	juveniles	+++++*****	X			X	X	X	X					X		X		X	X	X	X	X	X
	parturition	---++++--				X		X	X					X		X			X	X	X	X	X
	adults	*****				X	X	X	X					X		X		X	X	X	X	X	X
Perch	J F M A M J J A S O N D																						
	juveniles	+++++*****	X			X	X	X	X					X				X	X	X	X	X	X
	parturition	---++++--				X		X	X					X					X	X	X	X	X
	adults	---+++++---				X	X	X	X					X				X	X	X	X	X	X
Pacific Tomcod	J F M A M J J A S O N D																						
	larvae	-----				X	X							X				X	X	X			
	juveniles	-----+*****				X	X	X	X					X	X			X	X	X			
	adults	*****				X	X	X	X									X		X	X	X	

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December 7, 1994

SOUTH PUGET SOUND GRP

DRAFT

Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference										Habitats						
		Tidal	Fresh	Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Type			Area			
															Dentic	Bentic	Pelagic	Mainstem	Subsidiary	Channel	Intertidal
English Sole		J	F	M	A	M	J	J	A	S	O	N	D								
	eggs	*****			X									X							
	larvae	+++++++		X	X	X								X			X	X	X		
	juveniles	*****		X	X	X	X					X	X		X	X		X	X	X	X
	spawning	+++++++		X	X	X	X									X					
	adults	+++++++		X	X	X	X					X	X			X		X			
Starry Flounder		J	F	M	A	M	J	J	A	S	O	N	D								
	eggs	-----			X									X			X				
	larvae	-----		X	X									X			X	X			
	juveniles	-----	X	X	X	X	X					X	X		X	X		X	X	X	X
	spawning	-----			X		X														
	adults	+++++++		X	X	X	X					X	X		X	X		X	X		
Ling Cod		J	F	M	A	M	J	J	A	S	O	N	D								
	eggs	-----			X				X	X					X	X					
	larvae	-----		X	X								X				X				
	juveniles	-----		X	X	X	X		X	X	X	X			X	X		X	X	X	
	spawning	-----			X				X	X					X	X					
	adults	-----			X				X	X		X			X	X					

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December 7, 1994

LEWIS

SOUTH PUGET SOUND GRP

Shellfish Habitat Association in Puget Sound

Species	Timing	Salinity Range			Substrate Preference									Habitats							
														Type			Area				
		Tidal Fresh	Mixing	Sea water	Mud / Silt / Clay	Sand / Gravel	Pebble	Cobble	Boulder / Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat	
Dungeness Crab	J F M A M J J A S O N D																				
eggs	-----																				
larvae	-----		X	X								X			X	X	X				
Juveniles	-----+*****+---		X	X	X	X	X				X			X	X		X	X	X		
mating	-----													X	X						
adults	+++++		X	X	X	X	X							X	X		X	X	X		
Blue Mussel	J F M A M J J A S O N D																				
eggs	++++*****+		X	X								X			X	X	X	X	X		
larvae	++++*****+		X	X								X			X	X	X	X	X		
Juveniles	*****		X	X				X	X	X				X	X		X	X	X		
spawning	++++*****+		X	X								X		X	X		X	X	X		
adults	*****		X	X				X	X	X				X	X		X	X	X		
Softshell Clam	J F M A M J J A S O N D																				
eggs	+++++++		X	X								X			X	X	X	X	X		
larvae	+++++++		X	X								X			X	X	X	X	X		
Juvenile	+++++		X	X	X	X								X	X		X	X	X		
spawning	+++++++		X	X								X		X	X		X	X	X		
adults	+++++		X	X	X	X								X	X		X	X	X		

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December 7, 1994

LEAF

SOUTH PUGET SOUND GRP

Shellfish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference										Habitats						
		Tidal	Fresh	Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Rippap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Type			Area			
															Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Pacific Gaper Clam	J F M A M J J A S O N D																				
eggs	+++++			X	X									X			X	X	X	X	X
larvae	+++++			X	X									X			X	X	X	X	X
juvenile	+++++			X	X	X	X								X	X		X	X	X	X
spawning	+++++			X	X										X	X		X	X	X	X
adults	+++++			X	X	X	X								X	X		X	X	X	X
Horse Clam	J F M A M J J A S O N D																				
eggs	-----													X			X	X	X	X	X
larvae	-----			X	X									X			X	X	X	X	X
juvenile	+++++			X	X	X	X								X	X		X	X	X	X
spawning	-----														X	X		X	X	X	X
adults	+++++			X	X	X	X								X	X		X	X	X	X
Little Neck Clam	J F M A M J J A S O N D																				
eggs	*****												X				X	X	X	X	X
larvae	*****												X				X	X	X	X	X
juveniles	*****			X	X	X	X	X	X						X	X		X	X	X	X
spawning	*****													X	X	X		X	X	X	X
adults	*****			X	X	X	X	X	X						X	X		X	X	X	X

FOR

SOUTH PUGET SOUND GRP

7. Logistical Information

The following is not a complete list of logistical resources - for more information please refer to the Area Contingency Plan, Summary of Area Resources Chapter 6. The subject headings which have an asterisk (*) are being developed; please consult local DEM officials (phone numbers listed on pages 6-53 to 6-55 of the ACP) for specific information.

To submit data for this section, please use Comments/ Corrections/ Suggestions (Appendix C).

7.1. Logistical Support

Subject	Name	Characteristics	Contact	Phone #
Command Posts *				
Communications				
See ACP Pages 6-41 to 6-42				
Equipment Cache Locations				
See ACP Pages 6-2 to 6-45				
Inventory of Local Support Equipment *				
Helicopter Support/Air Support	Chehalis-Centralia Airport	Lewis County	900 NW Airport Road Chehalis, WA 98532	(206) 748-0035
	Olympia Airport	Thurston County	Olympia, WA 98507	(206) 586-6164
	Pierce County Airport / Thun Field	Pierce County	9112 Lakewood DR SW / Tacoma, WA 98499	(206) 593-4698
	Sanderson Field	Mason County	Shelton, WA 98584	(206) 426-1151
Access Points *				
Property Access Information and Contacts *				
Staging Areas *				
Recreational Activities which could interfere *				
Tribal Resources	Chehalis Business Council	Grays Harbor County	Oakville, WA 98568	(206) 273-5911
	Nisqually Indian Community Council	Thurston County	4820 She-Nah-Num Dr SE / Olympia, WA 98503	(206) 456-5221
	Native American Spill & Environmental Protection	King County	7575 44th Ave. SW / Seattle, WA 98136	(206) 938-3550
	Northwest Indian Fisheries Commission	Thurston County	6730 Martin Way East Olympia, WA 98506	(206) 438-1180

Subject	Name	Characteristics	Contact	Phone #
Tribal Resources (continued)	Skokomish Tribal Council	Mason County	North 80 Tribal Center Road Shelton, WA 98584	(206) 426-4232
	Squaxin Island Tribal Council	Mason County	West 81, Hiway 108 Shelton, WA 98584	(206) 426-9781
Key Local Elected Officials*				
Fire Department				
See ACP Pages 6-60 to 6-66				
Local Support Personnel	Olympia City Hall	Thurston County	Olympia, WA 98507	(206) 753-8325
	Olympia City Police	Thurston County	Olympia, WA 98507	(206) 753-8300
	Mason County DEM	Mason County	Mason County Courthouse Shelton, WA 98548	
	Thurston County DEM	Thurston County	2000 Lakeridge Dr, County Courthouse Bldg 3 / Olympia, WA 98501	(206) 786-5535
	Thurston County Sheriff	Thurston County	2000 Lakeridge Dr Olympia, WA 98501	(206) 786-5500
Volunteers *				
Wildlife Rehab Facilities	St. Edward State Park	King County	14445 Juanita Dr. NE/ Bothell	Joe Pillers @ (206) 823-2992 or Don Simmons @ (206) 931-3907
Marinas/Port Docks	East Bay Marina	Thurston County	Downtown Olympia	
	Boston Harbor Ramp	Thurston County	Boston Harbor , north of Olympia	
	Arcadia Point Public Ramp	Mason County	On Totten Inlet, across from Squaxin Island	
	Young Cove Ramp	Thurston County	Young Cove on Eld Inlet	
	Miller Point Ramp	Mason County	West of Shelton on Hammersly Inlet	
	Latimer's Landing	Mason County	West end of Hartstene Island Bridge / Pickering Passage	
	Zittel's Marina	Thurston County	9144 Gallea St / Olympia	
	Puget Marina	Thurston County	Southeast of Johnson Point / Olympia	
	Nisqually Beach Ramp	Thurston County	Luhr Beach / Olympia	
	Steilacoom Launching Ramp	Pierce County	Downtown Steilacoom	
	Home Public Access	Pierce County	"A" St in Home on Carr Inlet	
	Longbranch Public Access	Pierce County	72nd St in Longbranch	

Subject	Name	Characteristics	Contact	Phone #
Marinas/Port Docks (continued)	Lakebay Marina Ramp	Pierce County	On Mayo Cove near Lakebay	
	Port of Grapeview Ramp	Mason County	One mile north of Grapeview	
	Allyn Waterfront Ramps	Mason County	On North Bay in Allyn	
Housing/Feeding/Response Community Support	Airlift Northwest	King County	6987 Perimeter Road/ Seattle	1-800-426-2430
	Capital Medical Center	Thurston County	3900 Capital Mall Dr. SW / Olympia	(206) 754-5858
Interim Storage/Permits *				
Fishing Fleets & Affiliated Organizations	Puget Sound Gillnetters Assoc.	King County	Fisherman's Terminal/ Seattle	
Boat Cleaning Capability	Airo Services	Pierce County	4110 East 11th St./ Tacoma	(206)383-4916 24 hr. number
	Foss Environmental	King County	660 West Ewing St./ Seattle	1-800-337-7455 24 hr. number
Safe Havens *				

* Subject headings are being developed; please consult local DEM officials (phone numbers listed on pages 6-53 to 6-55 of the ACP) for specific information.

APPENDICES

Appendix A: Summary of Protection Techniques

Protection Techniques	Description	Primary Logistical Requirements	Limitations
ONSHORE			
Beach Berms	A berm is constructed along the top of the mid-inter tidal zone from sediments excavated along the downgradient side. The berm should be covered with plastic or geo-textile sheeting to minimize wave erosion.	• Bulldozer/Motor grader -1 • Personnel - equipment operator & 1 worker • Misc. - plastic or geotextile sheeting	• High wave energy • Large tidal range • Strong along shore currents
Geotextiles	A roll of geotextile, plastic sheeting, or other impermeable material is spread along the bottom of the supra-tidal zone & fastened to the underlying logs or stakes placed in the ground.	• Geotextile - 3 m wide rolls • Personnel - 5 • Misc. - stakes or tie-down cord	• Low sloped shoreline • High spring tides • Large storms
Sorbent Barriers	A barrier is constructed by installing two parallel lines of stakes across a channel, fastening wire mesh to the stakes & filling the space between with loose sorbents.	Per 30 meters of barrier • Wire mesh - 70 m x 2 m • Stakes - 20 • Sorbents - 30 m² • Personnel - 2 • Misc. - fasteners, support lines, additional stakes, etc.	• Waves > 25 cm • Currents > 0.5 m/s • Tidal range > 2 m
Inlet Dams	A dam is constructed across the channel using local soil or beach sediments to exclude oil from entering channel.	• Loader - 1 • Personnel - equipment operator & 1 worker or several workers w/shovels	• Waves > 25 cm • Tidal range exceeding dam height • Freshwater outflow

NEARSHORE			
Containment Booming	Boom is deployed in a "U" shape in front of the oncoming slick. The ends of the booms are anchored by work boats or drogues. The oil is contained within the "U" & prevented from reaching the shore.	For 150 meters Slick: • Boom - 280 m • Boats - 2 • Personnel - boat crews & 4 boom tenders • Misc. - tow lines, drogues, connectors, etc.	• High winds • Swells > 2 m • Breaking waves > 50 cm • Currents > 1.0 m/s
Exclusion Booming	Boom is deployed across or around sensitive areas & anchored in place. Approaching oil is deflected or contained by boom.	Per 300 meters of Boom • Boats - 1 • Personnel - boat crew & 3 boom tenders • Misc.- 6 anchors, anchor line, buoys, etc.	• Currents > 0.5 m/s • Breaking waves > 50 cm • Water depth > 20 m
Deflection Booming	Boom is deployed from the shoreline away from the approaching slick & anchored or held in place with a work boat. Oil is deflected away from shoreline.	Single Boom, 0.75 m/s knot current • Boom - 60 m • Boats - 1 • Personnel - boat crew + 3 • Misc. - 3 anchors, line, buoys, recovery unit	• Currents > 1.0 m/s • Breaking waves > 50 cm
Diversion Booming	Boom is deployed from the shoreline at an angle towards the approaching slick & anchored or held in place with a work boat. Oil is diverted towards the shoreline for recovery.	Single Boom, 0.75 m/s knot current • Boom - 60 m • boats - 1 • Personnel - boat crew + 3 • Misc. - 3 anchors, line, buoys, recovery unit	• Currents > 1.0 m/s • Breaking waves > 50 cm
Skimming	Self-propelled skimmers work back & forth along the leading edge of a windrow to recover the oil. Booms may be deployed from the front of a skimmer in a "V" configuration to increase sweep width. Portable skimmers are placed within containment booms in the area of heaviest oil concentration.	Self-propelled (None) Towed • Boom - 200 m • Boats - 2 • Personnel - boat crews & 4 boom tenders • Misc. - tow lines, bridles, connectors, etc. Portable • Hoses - 30 m discharge • Oil storage - 2000 liters	• High winds • Swells > 2 m • Breaking waves > 50 cm • Currents > 1.0 m/s

Source is R. Miller of Clean Sound Cooperative.

Appendix B: Original Geographic Response Plan Contributors

Local Representatives

Byron Haley, Metro Park District Tacoma
Ed Bruett, Kitsap Co. DEM
Richard Lawson, Tacoma Fire Dept.
John Komorita, King County
Bill Lokey, Pierce County DEM
Shad Burcham, King County DEM

Industry and Response Contractors

Ruel Harder, Seattle Steam Co.
 Bob Wiechert, Clean Sound Cooperative
 Mike Kelley, Clean Sound Cooperative
 Mac McCarthy, Clean Sound Cooperative
 John Waters, Clean Sound Cooperative
 Bob Bunton, ARCO
 Svenk Eklof, PWES
 John Murphy, GENWEST SYS.
 John Crawford, FOSS
 Steve Collar, Crowley Marine
 Greg Narum, Simpson Tacoma Kraft Co.
 Bill Park, MSRC
 Mike LaTorre, MSRC
 Dru Wojtanik, Ecology and Environment
 Tim Clark, Clean Sound Cooperative
 Thom Davis, Global Environmental
 Ron Larsen, Global Environmental
 Gary Putnam, Shell Oil
 Aaron Anderson, Olympus Enviro.
 Edward Traina, Shell Oil Co.
 Donald Johnson, Shell Oil Co.
 Karen Grein-Nagle, Olympic Pipeline
 Mike Mattingly, AIRO Services
 Ray Burke, Sound Refining
 Mike Brady, Riedel Environmental Services
 Trygve Enger, Foss Environmental
 Trip Ellison, Riedel Environmental Services
 Jim Riedel, Riedel Environmental Services
 Dick Shabro, Olympus Enviro
 Harold Haskins, U.S. Oil
 Harry Hutchins, Marine Exchange
 Mike Vomund, Chevron
 Global Diving and Salvage

Federal Representatives

U.S. Coast Guard

Curtis Shaw
 Bill Edgar

Environmental Protection Agency

Carl Kitz

U.S. Navy

Greg Conner
 Bob Cairns
 Donald Dodds

NOAA

Sharon Christopherson
 George Galasso

U.S. Fish and Wildlife Service

Curtis Shaw
 Jeff Momot

State Representatives

Office of Archeology & Historic Preservation
 Rob Whitlam

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Paul O'Brien
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 Karen Rennaker
 David Mora
 Bridget Hoover
 Shari Harris-Dunning

Washington Department of Fish and Wildlife

Brian Benson
 Bill Graeber
 Barry Troutman
 Jeff Skriletz
 Sara LaBorde

Office of Marine Safety

Roy Robertson

Washington State Maritime Commission

Bob Dorn

Washington Department of Natural Resources

Dave Jamison

Parks and Recreation Commission

Mike Ramsey

Other

Susan Berta, WSU Island Co. Beach Watchers
 Richard Shafer
 Shirley Flies, Puget Sound Alliance
 Ken Moser, Puget Soundkeeper

Appendix C: Geographic Response Plan Comments/Corrections/Suggestions

If you have any questions regarding this document or find any errors, please notify one of the following agencies: or use tear out sheet (page C-3)

- Washington Department of Ecology, SPPR program, Natural Resources Unit
- USCG Marine Safety Office Puget Sound, Planning Department
- USCG Marine Safety Office Portland
- Oregon Department of Environmental Quality
- Idaho Emergency Response Commission
- Environmental Protection Agency Region 10

Phone Numbers:

Washington DOE	(360) 407-6972
USCG MSO Puget Sound	(206) 217-6213
USCG MSO Portland	(503) 240-9307
Oregon DEQ	(503) 229-5774
Idaho ERC	(208) 334-3263
EPA	(206) 553-6901

Bulletin Board System (BBS):

USCG MSO Puget Sound	(206) 217-6216
USCG MSO Portland	(503) 240-9308

Internet/E-mail Address:

WADOE	dald461@ecy.wa.gov
OR DEQ	WYLIE.Jack@deq.state.or.us
USCG MSO Puget Sound	jlehto@pacnorwest.uscg.mil
USCG MSO Portland	mwilcox@pacnorwest.uscg.mil
USEPA	sheldrake.beth@epamail.epa.gov

Address:

Commanding Officer United States Coast Guard MSO Puget Sound Planning Department 1519 Alaskan Way South Seattle, WA 98134-1192	Washington Department Of Ecology SPPR Program Natural Resources Unit P.O. Box 47600 Olympia, WA 98504-7600	Office Of The Governor Idaho Emergency Response Commission 1109 Main Statehouse Boise, ID 83720-7000
Commanding Officer United States Coast Guard Planning Department MSO Portland 6767 North Basin Ave Portland, OR 97217-3992	Oregon Department of Environmental Quality Water Quality Division 811 SW Sixth Avenue Portland, OR 97204	Environmental Protection Agency Emergency Response Branch 1200 Sixth Avenue Seattle, WA 98101

Geographic Response Plan**Comments/Corrections/Suggestions****Directions:**

Fill in your name, address, agency, and phone number. Fill in the blanks regarding the location of information in the plan being commented on. Make comments in the space provided. Add extra sheets as necessary. Submit to: Dale Davis

Department of Ecology
Spills Program
300 Desmond Drive
P.O. Box 47600
Olympia, WA 98504-7600
dald461@ecy.wa.gov

Name: _____	Title: _____	Agency: _____
Address: _____		
City: _____	State/Province: _____	Zip/Postal Code: _____
Phone: (____) _____	E-Mail: _____	

GRP: _____	Page Number: _____
Location on page (chapter, section, paragraph) (e.g. 2.1, paragraph 3): _____	

Comments: _____

Northwest Area Committee
c/o Washington Department of Ecology
Spills Program
Natural Resources Unit - GRP Corrections
P.O. Box 47600
Olympia, WA 98504-7600