NATURAL RESOURCES

Habitat Conservation Plan for Washington Department of Natural Resources' Geoduck Fishery

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Aquatic Resources Program

WASHINGTON STATE DEPARTMENT OF
Natural Resources
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1. Introduction and Background

The Washington Department of Natural Resources (DNR) has developed this Wild Stock Geoduck Fishery Habitat Conservation Plan (Geoduck HCP) in response to the federal listings of certain fish and wildlife species under the Endangered Species Act. This Geoduck HCP only considers the geoduck fishery that is administered and managed by the State.

Washington DNR is seeking authorization for incidental take of certain ESA-listed species under Section 10 of the ESA. Such authorization is gained through the development of this Geoduck HCP and the subsequent issuance of Incidental Take Permits under Section 10 of the ESA from both U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

1-1 Background

The Washington State Department of Natural Resources manages over 2.4 million acres of state-owned aquatic lands and their associated biota in marine and freshwater environments. These are submerged marine and freshwater bedlands, marine tidelands, and freshwater shorelands that contain a variety of aquatic plants and algae, numerous animals living on or within the substrate, and other valuable materials in and on the substrate.

The geoduck clam (*Panopea abrupta*) is one infaunal species that occurs on state-owned subtidal bedlands and tidelands and is managed by DNR. A commercial fishery on the geoducks has occurred for over 35 years and is the subject of this HCP.

1-1.1 Aquatic Land Management, RCWs

As the proprietary manager of state-owned aquatic lands, DNR has unique obligations. State law recognizes aquatic lands to be a finite natural resource, and charges DNR with managing the land for the benefit of the public (Revised Code of Washington [RCW] 79.105.010). In RCW 79.105.030, the legislature has directed DNR to endeavor to provide a balance of public benefits that include:

- Encouraging direct public use and access;
- Fostering water-dependent uses;
- Ensuring environmental protection;

- Utilizing renewable resources; and
- Generating revenue in a manner consistent with the other defined benefits.

There are a number of state laws in the RCW and rules in the Washington Administrative Code (WAC) specifically guiding the use of state-owned aquatic land for geoduck harvest and specifying certain management parameters of the fishery (Appendix A).

1-1.2 History of the Geoduck Fishery

In 1967, the agency that is now the Washington Department of Fish and Wildlife (WDFW) began conducting subtidal surveys to determine if the geoduck resource could support commercial harvest. The geoduck resource of Puget Sound and the Strait of Juan de Fuca was found to have sufficient biomass to support a commercial fishery. In l969, DNR and WDFW jointly petitioned the Legislature to open a commercial geoduck fishery. The Legislature created statute to control harvest, and directed DNR and WDFW to manage the fishery cooperatively.

In 1970, the first harvesting contract was offered for sale. Demand for geoducks was limited initially, but by the mid-1970s, it grew significantly when the industry found a market for geoducks in Japan. In the first five years of the fishery (1970-1974), the average annual harvest was about 491,000 pounds. From 2000 to 2004 it was about 4,130,000 pounds (This is the total harvest; tribal and state). The fishery has grown to be a large and economically important clam fishery on the west coast of North America.

1-1.3 How the Fishery is Managed

Washington's geoduck fishery is jointly managed by Washington Department of Natural Resources, the Washington Department of Fish and Wildlife (WDFW), and the sixteen tribes that have a right to up to 50 percent of the harvestable surplus of geoducks (as affirmed in United States v. Washington, 873 F. Supp. 1422 W.D. Wash. 1994 and United States v. Washington, 898 F. Supp. 1453 W.D. Wash. 1995). The state agencies and the tribes are jointly responsible for estimating population size, determining sustainable yield, and ensuring that adverse effects to the environment are kept to a minimum.

The commercial geoduck fishery is managed on a sustainable basis and at a conservative level. Management of the geoduck resource is designed to be responsive to changes in market demand, resource economics, and new information on geoduck biology and population dynamics.

Washington DNR has proprietary rights over the state's harvest opportunity on half of the harvestable geoducks and offers the right to harvest specific quantities in specific areas to private companies and individuals. The terms of harvest are stipulated in a harvesting agreement, which is a legally binding contract between the state and each private harvest company that participates in the fishery (Appendix B).

Washington Department of Fish and Wildlife is the manager of the biological aspects of the fishery and has licensing and enforcement responsibilities for the geoduck fishery. It manages the fishery as part of its larger authority under RCW's 77.65, 77.12.043 and 77.12.047.

Although each state agency has separate and distinct responsibilities, DNR and WDFW share enforcement responsibility for Washington State laws, regulations, and harvesting agreement conditions as appropriate within the responsibilities and mandates of each agency. For example DNR is responsible for on-tract compliance of geoduck harvest and WDFW is responsible for general off-tract enforcement (e.g., poaching curtailment).

1-2 Permit Duration

Washington Department of Natural Resources is requesting Incidental Take Permits for 50 years. Geoduck harvest has been occurring for over 35 years, and has been occurring at about the same levels since the late 1990's; about 7 years. The fishery is managed using a sustainable harvest rate model and it is expected to continue in the future at a similar harvest level.

1-3 Plan Area

The Geoduck HCP plan area occurs within the submerged lands of Puget Sound, the Strait of Juan de Fuca and areas north to the Canadian border (Figure 1, which also shows management regions, discussed in Chapter 3). Within this broad area, commercial geoduck harvest occurs subtidally in areas that have been surveyed between depth contours of –18 and –70 feet (corrected to mean lower low water [MLLW]) and found to contain geoducks at sufficient densities (Figure 2). Following environmental and health review, specific areas (tracts) are identified as appropriate for commercial harvest. Details of harvest locations and activities are in Chapter 3.

1-4 Species to be Covered

Washington Department of Natural Resources is requesting coverage under Incidental Take Permits for seven species currently federally listed as threatened or endangered, and another eight species with some other listing status (Table 1.1). Throughout the remainder of this document, the term "covered species" refers to all listed and unlisted species included in the HCP and listed in Table 1.1.

Table 1.1. Species for which DNR is requesting coverage in Incidental Take Permits.

Common Name	*Scientific Name*	*Federal Status*	*State Status*
Birds			
Bald eagle	*Haliaeetus leucocephalus*	De-listed	Threatened
California brown pelican	*Pelecanus occidentalis*	Endangered	Endangered
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Threatened
Tufted puffin	*Fratercula cirrhata*	Species of Concern	Candidate
Fish			
Bull trout	*Salvelinus confluentus*	Threatened	Candidate
Chinook salmon	*Oncorhynchus tshawytscha*	Endangered/ Threatened	Candidate
Chum salmon	*Oncorhynchus keta*	Threatened	Candidate
Coastal cutthroat trout	*Oncorhynchus clarki clarki*	Species of Concern	None
Coho salmon	*Oncorhynchus kisutch*	Concern/Candidate	Not Listed
Pink salmon	*Oncorhynchus gorbuscha*	None	None
Pacific herring	*Clupea harengus pallasi*	Candidate	Candidate
Steelhead	*Oncorhynchus mykiss*	Threatened	Candidate
Marine Mammals			
Southern resident orca	*Orcinus orca*	Endangered	Endangered
Invertebrates			
Pinto abalone	*Haliotis kamtschatkana*	Candidate	Candidate
Olympia oyster	*Ostrea conchaphila*	None	Candidate

Figure 1: Six Current Geoduck Management Regions in Washington

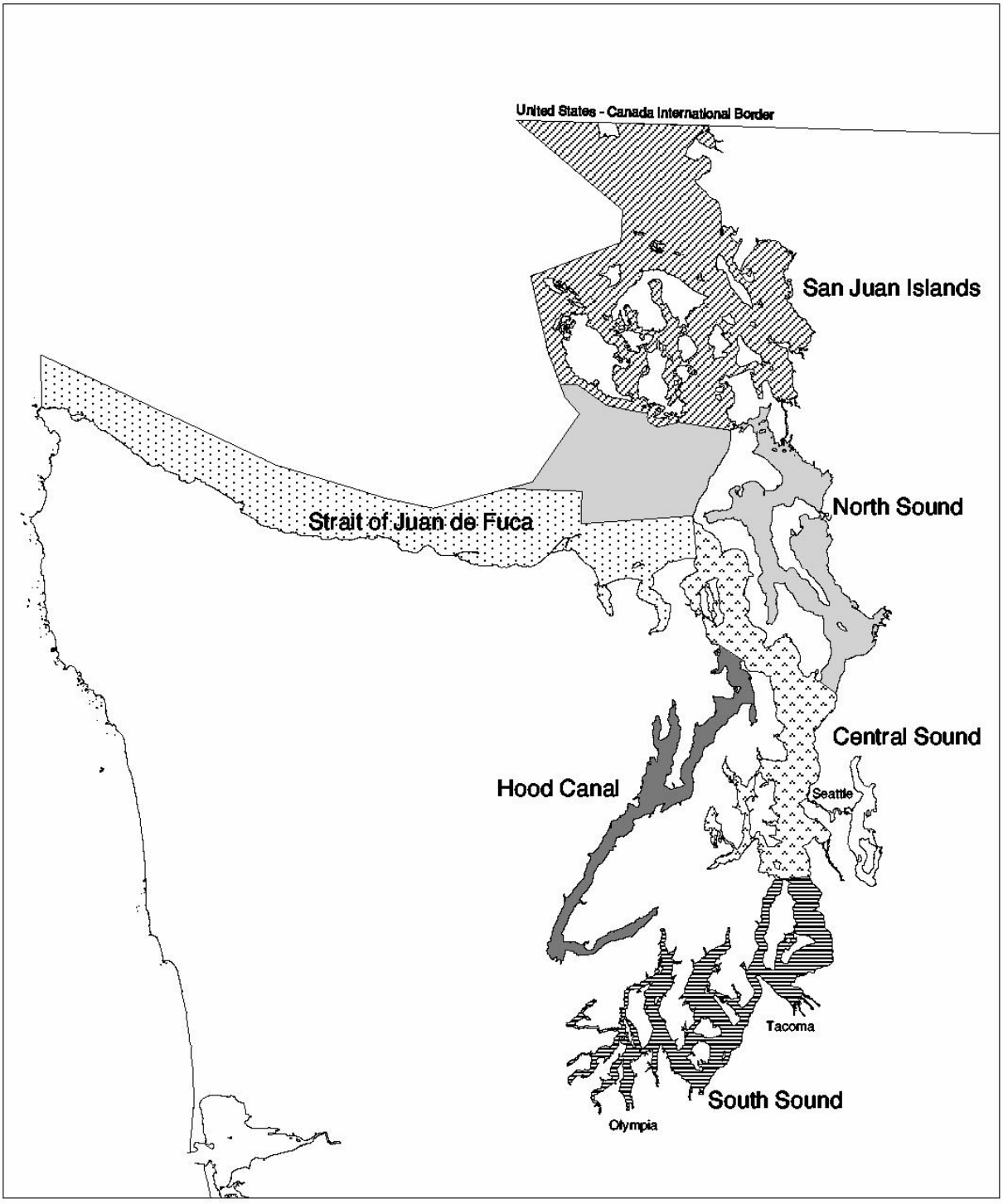
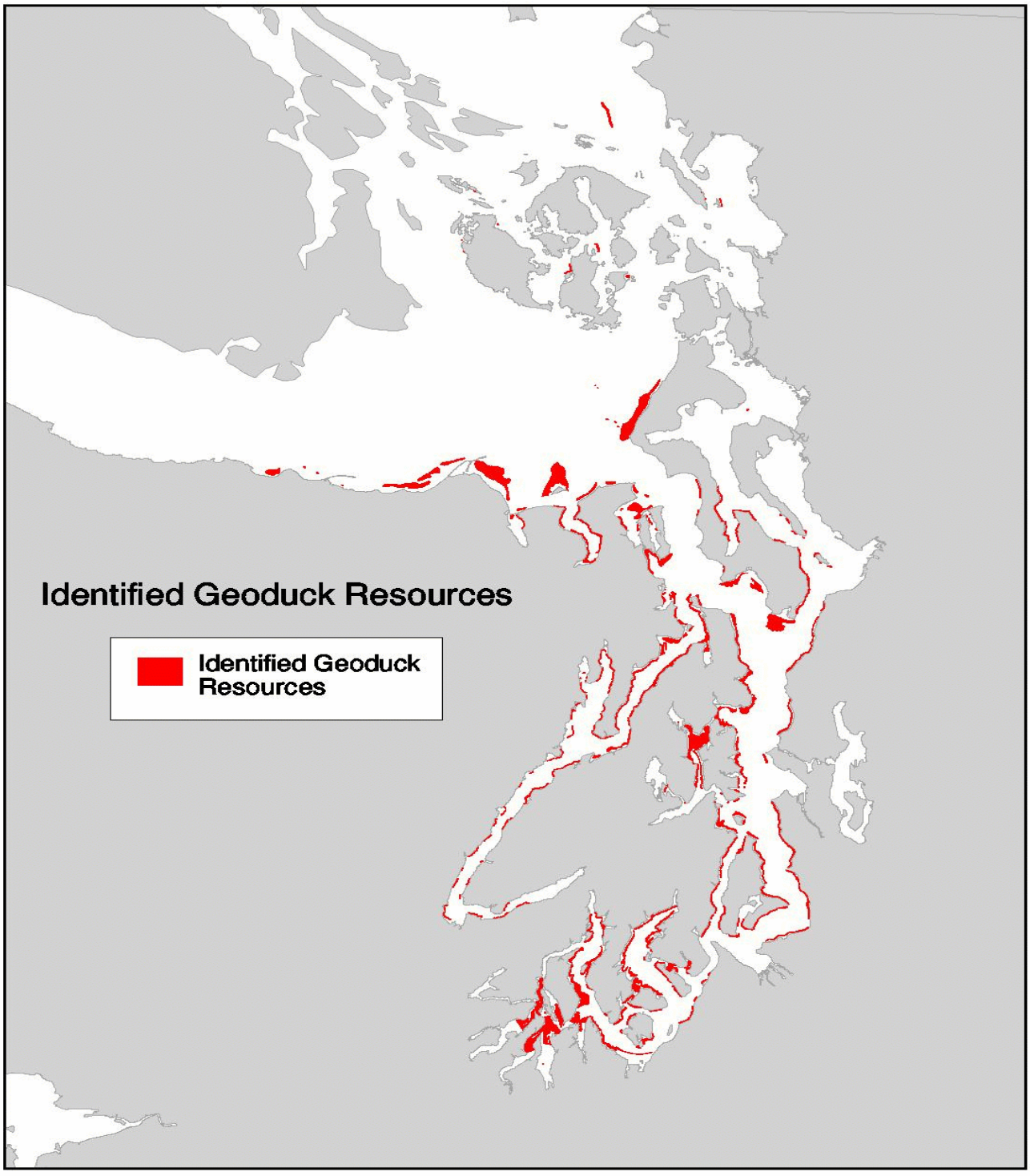


Figure 2: Map of Identified Geoduck Tracts in Washington



1-5 Regulatory and Legal Framework

1-5.1 Endangered Species Act and Assurances

Initially passed in 1973, the Endangered Species Act (16 U.S.C. § 1531-1544, 87 Stat. 884, as amended), provides for the special designation and protection of invertebrates, wildlife, fish and plant species that are in danger of becoming extinct. A fundamental purpose of the ESA is to protect and recover endangered and threatened species and to provide a means to conserve the ecosystems on which they depend.

The ESA defines an *endangered* species as any species that is in danger of becoming extinct throughout all or a significant portion of its range (16 U.S.C. § 1532(6)). A *threatened* species is one that is likely to become endangered in the foreseeable future (16 U.S.C. § 1532(20)).

The U.S. Fish and Wildlife Service, housed within the Department of the Interior, and the National Marine Fisheries Service, housed within the Department of Commerce, share responsibility in administering the ESA. Generally, the USFWS is responsible for terrestrial species and freshwater aquatic species and the NMFS is responsible for marine mammals, anadromous fish and other marine species.

Section 9 of the ESA makes it unlawful to "take" a species that is listed as endangered. The term "take" under the ESA is defined as: "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. § 1532 (19)). By federal regulation, the take prohibitions can be extended to species listed as threatened as well (16 U.S.C. § 1538(a)).

Section 10 of the ESA provides an exception to the Section 9 take prohibition. It states that the Secretary of the Interior or the Secretary of Commerce (depending on the species involved) may permit any taking otherwise prohibited by Section 9, if such taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity (16 U.S.C. § 1539(a). A landowner can obtain an Incidental Take Permit under this provision if they submit a conservation plan (i.e., an HCP) that meets certain requirements.

The plan must specify:

- The impact which will likely result from the take;
- What steps the applicant will take to monitor, minimize and mitigate such impacts; the funding available to implement such steps; and as well as the procedures to be used to deal with changed and unforeseen circumstances;
- What alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and
- Other measures that the Secretary of the Interior and/or Commerce may require as being necessary or appropriate for purposes of the plan. (16 U.S.C. 1539(a)(2)(A))

1-5.2 Issuance Criteria

When the USFWS and NMFS determine that all criteria for a habitat conservation plan have been met, and after an opportunity for public comment, an Incidental Take Permit must be issued if the agencies find that:

- The taking will be incidental;
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
- The applicant will ensure that adequate funding for the plan will be provided;
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
- Such measures that the secretaries of the Interior and Commerce may require as being necessary or appropriate for the purposes of the plan will be met. (16 U.S.C. 1539(a)(2)(B)):

1-5.3 Section 7 Consultation

Section 7(a)(2) of the ESA requires Federal agencies in consultation with, and with the assistance of, the Secretary to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat. The issuance of an Incidental Take Permit requires an analysis under Section 7 of the ESA. The Section 7 implementing regulations (50 CFR Part 402) require, among other things, analysis of the direct and indirect effects of a proposed action, the cumulative effects of other activities on listed species, and effects of the action on critical habitat, if applicable. Consultation under Section 7 of the ESA is the responsibility of the Federal agencies. However, DNR's Geoduck HCP is designed to assist the Services in addressing potential effects from geoduck harvest in their Section 7 consultation process.

2. Environmental Setting

2-1 Overview

Commercial geoduck harvest occurs within specific water depth boundaries in Puget Sound and the Strait of Juan de Fuca. Future harvest will occur to the north, in the vicinity of the San Juan archipelago (Figures 1 and 2).

2-1.1 The Nearshore

The nearshore environment is considered to encompass the shoreline area from extreme high water seaward to the 66-foot (20 m) bathymetric contour. This encompasses the area of intertidal and subtidal marine bedlands that receive enough sunlight to (potentially) support the growth of attached algae (Redman et al. 2005). The –18 to –70 foot water depths where geoduck harvest takes place occur within the subtidal portion of the nearshore environment.

Within Puget Sound, the Strait of Juan de Fuca and the San Juan archipelago, nearshore environments play a critical role in the life history of many organisms. Nearshore marine waters are important for juvenile and adult food production and serve as critical areas for salmon migration, nursery areas, residence, and refugia (Mavros and Brennan 2001; Williams et al. 2001; Brennan et al. 2004). These areas are rich, complex, and important parts of the ecosystem. Kelp beds, eelgrass meadows, salt marshes, rocky shores, beaches and tidal flats are important nearshore environments. They support populations of shellfish, salmon, groundfish, seabirds, and marine mammals.

2-1.2 Eelgrass

Eelgrass is a flowering plant that grows primarily in the shallow, subtidal areas of the nearshore on sandy or muddy substrate. The plant spreads by rhizomes or rootstock. Expanses of eelgrass meadows expand during spring and summer then decline in the fall and winter. Multiple environmental factors influence the distribution of eelgrass, including light, substrata type, salinity, and wave action (Thom et al. 1998).

Eelgrass is an important component of the nearshore environment. Eelgrass meadows cushion the impact of waves and currents, preventing erosion. The rhizomes and roots of the plants hold sediments in place, which helps preserve the highly productive bacteria in the sediments. These bacteria in turn nourish large numbers of invertebrates such as isopods, amphipods, polychaete worms, brittle stars, and some clams. The abundance of invertebrates makes eelgrass meadows excellent foraging areas for fish and marine birds. Some species of birds, snails, and crabs feed directly on the leaves of eelgrass as well. Others species (e.g., urchins) feed on detritus from decaying eelgrass plants.

During low tides, eelgrass provides shelter from direct sunlight and extreme temperatures for small animals and plants (Phillips 1984; Hemminga and Duarte 2000; Blackmon et al. 2006).

Eelgrass beds of two species (*Zostera marina* and *Zostera japonica*) occur along 37 percent of Washington's shorelines. The distribution of *Z. marina* (the native species) in Puget Sound is highly aggregated with about 27% of the total located in Padilla and Samish Bays. Eelgrass has not been observed in the extreme southern reaches of the Sound such as Budd Inlet, Eld Inlet and Totten Inlet (Dowty et al. 2005).

Eelgrass is light limited and in Puget Sound rarely occurs deeper than –18 feet MLLW. It can occur deeper where clearer waters allow a greater depth of light penetration.

Data collected from 2002-2004 were used to assess the depth distribution of eelgrass in Puget Sound. *Z. marina*, at the sound-wide scale, is most frequently found (measured in hectares) from 0 ft (MLLW) to –5 ft (MLLW) in depth. In the San Juan area, a substantially greater proportion of total *Z. marina* is found below –10 ft (MLLW) (Selleck et al. 2005).

Ultimately, because of the role of eelgrass as the basic energy source for a variety of food web interactions, and because of the other functions it provides, the covered species use, or benefit in some manner from eelgrass.

2-1.3 Other Vegetation

Kelp beds are important to fish, invertebrates, marine mammals and marine birds dependent on nearshore habitats. Floating kelp is most common in rocky, high-energy environments. For example, floating kelp is common along the rocky outer coast headlands and along the north coast of the Olympic Peninsula (e.g., around Port Townsend), but it is rare in Hood Canal. Floating kelp abundance decreases gradually as energy decreases and rocky habitat is less common. Floating kelp is rare in lower energy waters that have predominantly sand and mud shallow subtidal substrate. Like floating kelp, non-floating kelp is most common in areas with relatively high energy rocky shorelines. Non-floating kelp, principally *Laminaria saccharina*, occurs in protected, lower energy areas and embayments.

Seaweeds occur throughout the marine nearshore where the water is saline and there is adequate light to support their growth. Most grow attached to consolidated substrata, but some green seaweeds can grow without being attached to the bottom. Rocky shores along the Strait of Juan de Fuca and rocky outcrops on Washington's outer coast support hundreds of species of seaweed. In central Puget Sound, the occurrence of intertidal seaweed at five beaches was surveyed and 157 species identified (Thom et al. 1976).

Common macroalgae in Puget Sound include *Laminaria, Alaria, Gracilaria, Desmarestia*, and *Neoagardhiella* species. They need hard substrate for attachment and are found in rocky areas and consolidated substrate. Smaller species such as sea lettuce (*Ulva sp.)* occur as well. Numerous foliose red algae species are common, and articulated coraline red algae species occur in the Strait of Juan de Fuca and the San Juan Island area.

Phytoplankton is an important food source for suspension feeders. In Puget Sound, phytoplankton concentrations generally exceed 0.2 mg chlorophyll-a/cubic meter (m^3) throughout the year—one of the highest concentrations found in saltwater environments (Strickland 1983).

2-1.4 Substrate

Substrate composition in the nearshore is mud, sand, harder consolidated material (clay) gravel, cobble and boulders. Solid rock outcrops can occur as well.

Unconsolidated sediments play an important role in Puget Sound, harboring microorganisms and invertebrates important in nutrient cycling and in the food web. They are the ultimate repository of both natural changes (e.g., grain size changes due to fluvial input) and human caused contaminants entering the Sound through both point and nonpoint sources. Sediment quality, in terms of contamination levels, differs dramatically around Puget Sound. Certain regions in the Sound have degraded conditions as a result of pollution, while other regions are uncontaminated.

Environmental variables, both natural and human caused, influence sediment conditions, and sediment-dwelling biota. These include the level of dissolved oxygen present in the sediments, concentrations of nutrients in the sediments and their movement between the sediment bed and water column, unregulated pollutants including the newly emerging pollutants of concern such as polybrominated diphenyl ethers (PBDEs) and endocrine disruptors, effects of reproduction and recruitment of infaunal species, and effects of predation and oceanographic conditions. The effects of these environmental variables play a large role in influencing the quality of sediments throughout Puget Sound (Partridge et al. 2005).

2-1.5 Benthic Invertebrates

A wide variety of animals that are either buried or partly buried in the substrate occur in the nearshore, and others live on the substrate or are free-living in the waters above the substrate. These include clam species, anemones, polychaete tube worms, flat worms, ribbon worms, peanut worms, crustaceans and others. Small isopods, amphipods, and copepods are also common within and on the substrate. These are an important food source for higher trophic level fish and animals. The structure of benthic infaunal communities is largely dependent on sediment composition and hydrographic conditions (i.e. depth, current velocity) so that the abundance and diversity of species found is not consistent across the substrate.

A number of crab species are common on the substrate in the nearshore. The large Dungeness crab is particularly abundant in Puget Sound waters north of Vashon Island. Dungeness crabs are often associated with sand/silt substrate, especially near eelgrass beds. Like most crabs, Dungeness crabs are benthic predators and scavengers. The graceful crab is also abundant, particularly in southern Puget Sound (Goodwin and Pease 1987).

Red rock crabs are another species widely distributed across Puget Sound. A variety of smaller crabs such as the kelp crab can also be found in the nearshore.

Various pandalid shrimp are present in waters of the nearshore. Common species include ocean pink shrimp, northern pink shrimp, spot shrimp, and coonstripe shrimp.

Several species of epibenthic mollusks are associated with sandy or muddy substrate, including the stubby squid, opalescent squid, snails and nudibranchs.

Where boulders, rock outcrops, or objects discarded by humans occur, the large gumboot chiton and octopus may occasionally be found.

Sea cucumbers are common on silt/sand substrate. Sea stars are also common. Herbivores such as the green sea urchin can also occasionally be found in nearshore environments.

2-1.6 Geoduck Biology and Habitats

Geoducks are burrowing clams that are found throughout Puget Sound, the Strait of Juan de Fuca, and the San Juan archipelago. They are abundant in subtidal substrate, but their distribution is contagious and is affected by water depth, substrate type and predation. Although they can occur intertidally, they are more common below extreme low tide and have been found at depths as great as 360 feet (Goodwin and Pease 1991).

Geoducks live in soft mud, sand, and pea gravel or gravel substrate (Goodwin and Pease 1989) and are abundant in mud, sand, and mixed mud and sand substrate. In Puget Sound, geoduck densities were higher in substrate of mud-sand or sand, compared to mud or pea gravel or gravel substrate (Goodwin and Pease 1987). Clay, shell and rock can also be found in the substrate in areas inhabited by geoducks, though hard substrate may affect recruitment and digging ability of this burrowing clam.

Geoducks cannot completely withdraw their siphon and mantle within their shell, nor can adults dig within the substrate to avoid predation. Their siphons are long, however, and can be withdrawn beneath the surface of the seabed throughout their life. In the early stages of their life cycle, they can eventually burrow into the softer seabed substrate to depths down to three feet.

Geoducks reach a harvestable size of 1.5 pounds in four to five years, with maximum growth attained in fifteen to twenty-five years (Hoffmann et al. 2000). In Puget Sound individual geoducks on average weigh around 2 pounds. The largest geoduck recorded during dig samples from 1973 and 1985 weighed 7.15 pounds (Goodwin and Pease 1991).

2-1.7 Environment of Geoduck Tracts

Commercial harvest occurs in specific areas called tracts. The topography of the tracts varies, but most are relatively flat or are gently sloping. Some tracts have as much as a 30-degree slope in places.

When initially considering a tract for geoduck harvest, biological surveys are conducted for geoducks by WDFW divers along standard belt transects. Divers conducting the surveys also note the most obvious and common animals and plants that are encountered. To gain a general understanding of the fauna on geoduck harvest tracts, transect data from 2001-2006 surveys were summarized for each management region. For each animal

noted in the transect surveys, the total number of transects where it was seen was tallied. Using the total number of transects surveyed by region, across the 2001-2006 timeframe, the percentage of transects on which the animal was seen out of the total transects surveyed was calculated. The most common and obvious animals seen and noted in at least 50 percent of the surveyed transects in each region were sea pens, tubeworms, hermit crabs, horse clams, anemones, and sea star species; and Dungeness and graceful crabs (Appendix C).

Because divers note presence of animals only, these data cannot be used to quantify the abundance of one species, only the relative distribution of a species across the surveyed areas.

Commercial geoduck tracts more commonly encompass soft sand or sand and silt substrate where the larger geoducks and the higher densities occur. Compact substrate, for example those containing clay, or substrate with large amounts of shell and rock are difficult to extract geoducks from and harvest cannot occur in such areas efficiently. Geoducks wedged into shell or gravel deposits can be extremely difficult to remove.

Substrate surfaces are often rippled by the action of waves and currents and non-compacted sediments sometimes form mobile sedimentary bedforms (sandwaves, sand and gravel ribbons) that can be several feet thick. As these bedforms move slowly across the tracts (sediment transport), they may smother geoducks and other benthic organisms (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001).

Relatively few species of submerged aquatic vegetation or macroalgae grow in abundance on the sand and silt substrate common in commercial geoduck tracts. These plants generally need a hard substrate to attach to. Smaller vegetation species such as sea lettuce are often seen both attached and floating within geoduck tracts, along with other detached algae deposited by water currents (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001). When plants were observed by divers during geoduck surveys, they were most often brown algae (*Laminaria sp*.), red algae (*Desmarestia sp*.), and green algae (sea lettuce, *Ulva sp*.) (Appendix C).

Horse Clams

Horse clams are large bivalves that can grow to over 2.2 pounds (Campbell et al. 1990; Breed-Willeke and Hancock 1980). They are typically found buried in the substrate to depths of 1.6 feet, but have been found in Puget Sound as deep as 4.2 feet below the substrate surface (Goodwin and Shaul 1978). Horse clams have been recorded during geoduck pre-harvest surveys but they prefer coarser substrate (pea gravel/gravel/shell) than geoducks, with lesser amounts of sand and silt (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001).

Other Bivalves

Butter clams and native littleneck clams can be found in geoduck tracts with gravel patches. *Macoma inconspicua* and *Transennella tantilla* are more difficult for divers to identify due to their size. Cockles, mya clams, and false geoduck clams may also be present.

Polychaetes

The most abundant group of infauna found in geoduck tracts by Goodwin and Pease (1987) were polychaete tube worms. Polychaetes live in long, jointed tubes less than four hundredths of an inch (1 millimeter) in diameter and form dense root like mats in the sediments, with the mats sometimes used as spawning substrate by herring (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001). Several other worms are found in the substrate in less abundance on geoduck tracts, including ribbon worms and peanut worms (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001). Many of these worms feed on organic material in the sediments, while others feed on food particles in the water. Several species are carnivorous, often feeding on other worms.

Cnidarians

Sea pens are the most common cnidarian in geoduck tracts with sandy substrate. Sea pens are suspension feeders and live partially buried in the sediments utilizing their polyps to filter plankton from the water. On muddier substrate, burrowing anemones, plumose anemones, and sea-whips are more common (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001).

Shrimp

Ghost shrimp are common infauna on geoduck tracts, particularly in Hood Canal. Ghost shrimp feed on organic detritus, building tunnels in the substrate that are used as habitat by a variety of small crabs, worms, and fish (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001). In dense populations, their burrowing can increase turbidity to levels that limit the distribution of bivalves (Posey 1986; Posey et al. 1991).

Burrowing Sea Cucumber

The burrowing sea cucumber is sometimes found on geoduck tracts and attains a length of 2.4 inches.

Crabs

Dungeness crabs are often associated with sand/silt substrate and are common in geoduck tracts, especially near eelgrass beds. Due to their preference for rock and gravel substrate, red rock crabs tend to be less common within commercial geoduck tracts, but are widely distributed throughout Puget Sound.

2-2 Species of Concern in the Plan Area

Many species of birds, fish, mammals, and invertebrates are expected to occur in the vicinity of geoduck harvest activities and within harvest tracts because they move freely across a larger area than that where harvest occurs.

2-2.1 Birds

Many species of sea birds and migratory birds occur across Puget Sound, the Strait of Juan de Fuca and in the vicinity of the San Juan archipelago, adjacent to geoduck tracts.

Species include bald eagle, marbled murrelet, common loon, and common murre. Puget Sound also provides important over-wintering habitat for a number of waterfowl species.

2-2.2 Fish

This nearshore environment provides habitat for marine and anadromous fish species. This habitat provides food resources and foraging areas, refuge (from predation, seasonal high flows, winter storms, etc.), and migratory corridors.

Salmon, trout and char species use nearshore habitats and may be in the vicinity of geoduck tracts during juvenile rearing and out-migration times, as well as during adult migration to and from their spawning grounds.

The principal fishes in nearshore waters are flatfish such as flounder and sole. Fish species seen in geoduck tracts during geoduck surveys include sanddab, sculpins, flatfish and flounder, and others (Appendix C).

2-2.3 Marine Mammals

Several species of marine mammals are found in the waters of Puget Sound, the Strait of Juan de Fuca and the San Juan archipelago. These include harbor seals, California sea lions, orcas, river otters, and gray whales. Less frequently observed species include Dall's porpoise and the harbor porpoise.

2-3 Covered Species

2-3.1 Birds

BALD EAGLES

In Washington State, bald eagle nests are most numerous near marine shorelines but also occur near the state's lakes, rivers, and reservoirs. In the Puget Sound area, the birds nest and roost in trees along shorelines and forage in nearby waters. Eagles are present year-round in Western Washington (Stinson et al. 2001), and can be roosting, foraging, and nesting in the vicinity of geoduck harvest activities.

In western Washington, most eagles are incubating eggs by the third week in March. The young hatch by late April (Watson and Pierce 1998). Adults are feeding young from the time they hatch to fledging, which occurs about mid-July.

Bald eagles are opportunistic feeders and eat fishes, waterfowl and seabirds, mammals, and carrion (NatureServe 2003a). Feeding behaviors include hunting live prey, scavenging, and pirating food from other birds such as osprey. Watson and Pierce (1998) observed nesting eagles in Puget Sound capturing fish (78%), birds (19%), and mammals (3%). Invertebrates (mollusks and crustaceans) were found in prey remains. Other studies found different relative abundances of prey types, reflecting the opportunistic nature of eagle feeding (Stinson et al. 2001).

In two studies cited by Stinson et al (2001), many fish species occurred in eagle diets including flounder, plainfin midshipman, dogfish shark, sculpin, rockfish, ling-cod, walleye pollock, Pacific hake, Pacific cod, cabezon, red Irish lord, and salmonid species (unidentified).

CALIFORNIA BROWN PELICAN

The California brown pelican is one of six recognized subspecies of brown pelican. Nesting by this subspecies does not occur in Washington and is restricted to islands in the Gulf of California and along the outer coast of California. Non-breeding California brown pelicans range northward along the Pacific Coast as far as Washington and into southern British Columbia.

Important roosting sites include offshore rocks and islands, river mouths with sand bars, breakwaters, pilings, and jetties along the Pacific Coast. Feeding occurs primarily in shallow estuarine waters with the birds seldom venturing more than 20 miles out to sea. Sand spits and offshore sand bars are used extensively as daily loafing and nocturnal roost areas.

California brown pelicans feed mainly on surface-schooling fish (NatureServe 2006) in shallow estuarine and inshore waters and may dive for their prey.

MARBLED MURRELET

Marbled murrelets are small, diving seabirds that live in coastal forests and nearshore marine environments (McShane et al. 2004). Murrelets generally select old-growth forests for nesting, within 37 miles of the coast. They can be found foraging in waters throughout Puget Sound, the Strait of Juan de Fuca and the San Juan archipelago. Their distribution varies spatially and temporally and their overall pattern of abundance (density) and occurrence in the marine habitats of Puget Sound is best characterized as variable (Speich and Wahl 1995).

Field observations in Puget Sound, during the course of formal censuses and other informal observations, suggest that the foraging distribution of marbled murrelets is closely linked to tidal patterns, in particular to specific locations when tidal flows are clearly evident. However, tidal activity occurs throughout Puget Sound and is likely the single dominant and persistent physical process there. More analysis at a detailed level may give insight into the relative importance of tidal activity in determining the movements and foraging areas of marbled murrelets (Speich and Wahl 1995).

Marbled murrelets are opportunistic feeders. Small schooling fish and pelagic crustaceans are important prey items. Pacific sand lance, Pacific herring, capelin, and smelt have been documented as common prey species (McShane et al. 2004). The birds dive to catch prey and for the most part forage in relatively shallow nearshore waters (<98 feet deep). They have been documented diving for foraging purposes as deep as 16 feet, and may even dive deeper than this (McShane et al. 2004).

TUFTED PUFFIN

Tufted puffins spend most of their lives over offshore marine waters, only returning to land to nest. Tufted puffins are found primarily off the western Pacific coast of

Washington, but can occur along the northern coast of the Olympic peninsula and around the San Juan Islands. The birds arrive at their nesting colonies in early spring and nest in ground burrows or under piles of rocks (NatureServe 2003b).

Specifically within Washington's inland waters, Protection Island in the Strait of Juan de Fuca and Tatoosh Island, off the northwestern tip of the Olympic Peninsula, provide most of the nesting habitat for puffins (West 1997). Protection Island is a National Wildlife Refuge and contains the 48-acre Zella M. Schultz Seabird Sanctuary. A 600-foot buffer around the island is closed year-round to protect wildlife resources.

Breeding numbers of puffins have fallen. West (1997) reported 13 pairs in the Strait of Juan de Fuca. Their breeding colonies in Washington's inland waters are now restricted primarily to Protection Island.

Breeding occurs from late April to June, with the eggs and young tended by both parents. Eggs hatch within 42 to 53 days, with the chicks remaining in the nest for a similar time span (NatureServe 2003b). Birds stay at the nesting colonies until mid-September (Piatt and Kitaysky 2002; Speich and Wahl 1989). After fledging, adults and the young return to the open ocean.

Tufted puffins feed on fish, preferring smelts, herring and other small surface-schooling fish, as well as sea urchins and mollusks. They are diving birds and feed in offshore waters with tidal upwellings that push prey to the surface (NatureServe 2003b). In Washington, Haro Strait, San Juan Passage and Rosario Strait are important feeding areas (Angell and Balcomb 1982).

2-3.2 Fish

Marine fish and anadromous salmonid species depend on intertidal and shallow subtidal nearshore environments for refuge, food, and migration. Juveniles use marine shoreline riparian vegetation for shading and cooler water temperatures, as well as a source of food from terrestrial insects associated with the vegetation. Nearshore vegetative communities such as eelgrass meadows provide refuge and prey items in the form of smaller fish and crustaceans, as well as larvae and larger zooplankton. Nearshore areas also provide foraging areas and migration routes for returning adults.

Where depths were reported in studies of juvenile Chinook, pink, coho, and chum salmon, the fish were generally found within the top 10-20 feet of the water column, along shorelines (Weitkamp 2000, citing others). Salmonid fry tended to school along shorelines and move offshore as they grew larger. The juvenile salmonids tended to be near the water surface, at least during the day.

PACIFIC HERRING

Pacific herring are pelagic schooling fish that depend heavily on the nearshore environment for the spawning and rearing portions of their lifecycle. They are ubiquitous in Washington's marine waters, but separate stocks exist and spawn in specific areas.

Herring spawning grounds are well documented and stocks show strong fidelity to their particular spawning areas. Pacific herring spawn at eighteen to twenty sites throughout Puget Sound and the Strait of Juan de Fuca including Squaxin Pass, Cherry Point,

Quartermaster Harbor, Port Orchard/Port Madison, South Hood Canal, Port Gamble, Kilisut Harbor, the San Juan Islands, and Quilcene, Skagit, Fidalgo, Samish-Portage, Semiahmoo, Discovery and Dungeness Bay (Bargman 2001). In addition to specific spawning sites, each stock has specific growth rates, age structures, spawning timing, and pre-spawner holding areas (Lemberg et al. 1997).

Most herring stocks in Washington spawn from late January through early April. The Cherry Point stock spawns later, from early April through early June (WDFW 1997a). The time of year that spawning occurs is very specific and seldom varies by more than seven days from year to year (WDFW 2000).

Puget Sound herring spawn in vegetated areas of semi-protected intertidal and shallow subtidal zones. They generally spawn between 0 and –10 feet, but eggs may be deposited from the upper limits of high tide to as deep as – 40 feet (WDFW 1997a). Eggs are deposited on eelgrass and marine algae (WDFW 1997a) and other substrate such as tube worm mats.

Eggs hatch after about ten to fourteen days. The larval herring are about ½ inch long and drift in currents for roughly 3 months before metamorphosing into their juvenile and finally adult forms (WDFW 1997a). Juvenile herring form schools and remain in the nearshore environment until they migrate to the open ocean during the fall of their second year, although some herring spend their entire lives within Puget Sound (McCrae 1994; WDFW 2000). Herring become sexually mature at two to four years of age and return then to their natal spawning grounds (Bargman 2001).

Fresh et al. (1981) analyzed stomach contents of juvenile herring caught in shallow, sublittoral habitats, and nearshore pelagic habitats in Puget Sound. The relative abundance of dietary components differed with fish size, the habitat sampled, and sampling method (beach seine, tow net, purse seine), but calanoid copepods, decapod crab larvae, chaetognaths, cyclopoid and harpacticoid copepods, euphausiids and brachyuran crab larvae were important prey species.

Herring at all life stages are an important prey item for seabirds, marine mammals and other fishes (WDFW 1997a). Deposited eggs are consumed by gulls and diving ducks, and larval-stage herring are eaten by fish, amphipods and jellyfish. Based on studies in British Columbia waters, juvenile and adult herring are important prey items for Pacific cod, Pacific whiting, lingcod, halibut, coho salmon, Chinook salmon, and harbor seals (Lemberg 1997 citing Environment Canada (1994)). West (1997) additionally lists rockfishes, hake, tufted puffins, marbled murrelets, and other fish and bird species as predators of herring.

COASTAL CUTTHROAT TROUT

Cutthroat trout prefer coastal habitats and can generally be found within 90 miles of shore (Wydoski and Whitney 2003). They are found throughout Puget Sound and are common in Hood Canal and the Strait of Juan de Fuca (Wydoski and Whitney 2003).

Puget Sound cutthroat rear in freshwater for one to six years before outmigrating, although most reach estuaries at two to three years of age. Outmigration occurs from March through June, with a peak in mid-May (Johnson et al. 1999). Puget Sound smolts generally make their first migration at age two and spend the summer close to shore in

water less than 10 feet deep (Johnson et al. 1999). Juveniles stay within 31 miles of their natal stream throughout their marine existence, returning to fresh water after only a few months (Thorpe 1994). Their preferred marine habitat is gravel beaches that are vegetated above the high tide mark and gravel spits created by tidal currents. Puget Sound resident cutthroat are typically not found in areas where there is silt, mud, or solid rock substrate (Hickman and Raleigh 1982) and return to freshwater to feed and seek refuge during the winter (Johnson et al. 1999). In general, coastal cutthroat do not make long ocean migrations and they rarely overwinter at sea, instead returning to nearby streams for the winter.

In estuaries, both juveniles and adults are highly piscivorous (predators of fish) with euphasiids and decapod larvae of secondary importance. In the ocean, adults eat northern anchovy, kelp greenling, scorpaenids, salmonids, euphausiids, mysids, and crab megalapae (Emmett et al. 1991). Larger and presumably mature trout consume almost exclusively other fish (Brodeur 1990).

A study in South Puget Sound (Jauquet 2003) found that by weight, the overall diet of coastal cutthroat trout was dominated by salmon eggs and chum salmon fry (46%), followed by non-salmonid fish (23%), polychaetes (12%), other invertebrates (i.e. amphipods, isopods, shrimp and clam necks) (17%), and other items (2%). In this study, apparently cutthroat consumed salmon eggs and chum salmon fry when they were available in the estuary and shifted to alternative food items when they were absent. In descending order, by weight, the most important non-salmonid fishes in the diet were shiner perch, Pacific herring, Pacific sand lance and arrow goby. The most important invertebrates by weight were gammarid amphipods, shrimp, isopods, and clam necks.

BULL TROUT

Anadromous bull trout juveniles and adults forage and mature in nearshore marine habitats on the Washington coast, Strait of Juan de Fuca, and in Puget Sound and are found throughout accessible estuarine and nearshore areas. In Puget Sound the distribution of bull trout in nearshore waters has been hypothesized to be correlated to the nearshore distribution of forage species such as sand lance, surf smelt, and Pacific herring. Foraging bull trout may tend to seasonally concentrate in the spawning areas of forage fish.

Juvenile bull trout feed primarily on aquatic and terrestrial insects, as well as small crustaceans. Larger juveniles and adults are generally piscivorous. Field observations found surf smelt, Pacific herring, Pacific sand lance, pink salmon, chum salmon, and a number of invertebrates to be important prey species for bull trout (Kraemer 1994). Bull trout at different life stages may target different marine prey species. For example, younger bull trout (age one to three) that move to marine waters appear to select smaller prey items, such as shrimp. By age four, the diet of anadromous bull trout has shifted largely to fish.

Information provided by bull trout acoustic radio telemetry and habitat study projects indicates that bull trout in marine waters are more active at night than during the day, may prefer deeper nearshore habitat than shallow nearshore habitat, and can be found at depths as great as 246 feet.

Bull trout from different freshwater populations may overlap in their use of marine and estuarine waters. Although bull trout are likely to be found in nearshore marine waters year-round, the period of greatest use of nearshore habitat is March through July (Goetz and Jeanes 2004).

STEELHEAD TROUT

Puget Sound steelhead can be found from the Strait of Juan de Fuca east, including river basins as far west as the Elwha River and as far north as the Nooksack River (Busby et al. 1996).

Out-migrating smolts typically leave their natal streams between 2 and 4 years of age (Groot and Margolis 1991) traveling through most, if not all, of the marine environments, including estuaries, nearshore habitat and the open ocean. Steelhead juveniles spend very little time in estuaries and are rarely found along shoreline areas.

Adults spend one to five years at sea before returning to their natal stream to spawn and typically live from six to eight years (Wydoski and Whitney 2003, Emmett et al. 1991).

Adults are generally piscivorous (Wydoski and Whitney 2003), feeding on juvenile rockfish, sand lance, sculpin, and greenlings. They also feed on invertebrates, especially euphausiids, amphipods, copepods and squid (Groot and Margolis 1991).

CHINOOK SALMON

Juvenile and adult Chinook salmon of different runs and life-history types can be found in the waters of Puget Sound, including Hood Canal, the Strait of Juan de Fuca and around the San Juan Islands. Juveniles use estuarine and nearshore areas throughout Puget Sound for rearing. Adults move through these areas on their migrations to the ocean. Because of their different life-history types and lifestages, Chinook salmon can be found throughout the nearshore marine environment year-round.

Both ocean- and stream-type Chinook salmon exhibit extensive off-shore ocean migration, with stream-type fish entering freshwater to spawn in early spring or summer (National Marine Fisheries Service 2004, Myers et al. 1998) and ocean-type returning from spring to winter.

After moving into salt water, Puget Sound Chinook generally migrate north along the Canadian coast, although some fall Chinook spend their entire marine residence within Puget Sound. Ocean-type Chinook generally remain at sea from one to six years before they mature, with most spending two to four years in the ocean before returning to their natal streams to spawn (Wydoski and Whitney 2003).

Ocean-type Chinook are dependent on estuarine habitat, feeding and rearing within the top 6 to 10 feet of the water column for extended periods before moving to pelagic marine habitats (Williams and Thom 2001). Recreational catch statistics suggest that smaller juveniles use shoreline areas, while larger juveniles prefer deeper water areas (Shepard 1981). After juvenile Chinook salmon reach a size of about 2 ½ inches, they are large enough to avoid predators and forage for food in offshore areas.

In coastal marine and estuarine environments juvenile Chinook primarily feed on gammarid amphipods, euphausiids, insects, harpacticoid copepods, mysids, decapod

larvae and fish. Adults feed primarily on bait fish (herring, sand lance, smelt), euphausiids, decapod larvae, squid, and other invertebrates (Emmett et al. 1991).

Stomach analysis of juvenile Chinook salmon caught in Puget Sound by tow net in nearshore pelagic habitats (< 70 feet depth) included euphausiids, decapod larvae, fish, and polychaetes, with insects dominating in late summer. The prey base of Chinook salmon collected by purse seine in offshore pelagic habitats (> 70 feet depth) in February and May was primarily herring, along with some sand lance and crustaceans. Fish were the major prey species of adult Chinook caught in Puget Sound, with some studies showing both sub-adults and adults to be primarily piscivorous (Fresh et al. 1981).

Collections with beach seines suggest that juvenile Chinook salmon are oriented to shallow water habitat located close to shore, and are most abundant in intertidal flats and shallow subtidal channels near estuarine and tidal marshes and eelgrass meadows (Williams et al. 2001; Toft et al. 2004).

CHUM SALMON

This species can be found at various life stages throughout Puget Sound, the Strait of Juan de Fuca, and areas north. Chum salmon exhibit a variety of life history strategies and regional differences in age and size at maturity and so they can occur in these areas year-round.

Emergent chum salmon have a limited freshwater residence period and an extensive nearshore and estuarine rearing period. Fry beginning their downstream migration shortly after hatching. The fish rear in productive, shallow eelgrass beds until they reach 1.8 to 2.4 inches in length and move offshore (Simenstad et al. 1982). Juvenile chum salmon reside in estuaries longer than most other anadromous salmon species (Wydoski and Whitney 2003; Quinn 2005).

Chum fry spend an average of ten weeks in sub-littoral habitats near their natal stream (Wydoski and Whitney 2003), generally occupying the water column at depths of –5 to –16 feet in or near eelgrass beds that connect to sub-estuary deltas (Tynan 1997). Eelgrass beds are extremely important for rearing chum salmon, with two species of copepods that make up a large portion of juvenile's diets found in eelgrass (Simenstad et al. 1988). During this transition period, kelp, other macroalgae and mud and sand flats serve as migratory corridors between deltas (Simenstad 1998).

Chum salmon rear in the ocean for the majority of their adult lives until they reach maturity (Groot and Margolis 1991; Wydoski and Whitney 2003). Chum salmon mature between the ages of 2 and 6, with adults having an average lifespan of 4 years (Wydoski and Whitney 2003). Migration into the Strait of Juan de Fuca begins in mid-July and continues through early September, with adults entering Hood Canal from early August through late September (Tynan 1997).

Most summer-run chum juveniles remain nearshore, rapidly out-migrating along the eastern shore of Hood Canal from June to early August (Wydoski and Whitney 2003).

Generally, juvenile chum salmon feed on epibenthic crustaceans, with larger juveniles preying on terrestrial insects, copepods, amphipods and other zooplankton (Simenstad et al. 1982). Chum salmon are discriminate feeders and Fresh et al. (1981) found that the

primary prey of juveniles caught in the shallow sublittoral zone in Puget Sound included calanoids in March, harpacticoids in April, euphausiids in May, calanoids in June, decapods and larvaceans in July, and myodocopa in August. Limitations in shallow water food supplies may cause juveniles to move to deeper waters in search of prey (Emmett et al. 1991). The rapid seaward migration of summer-run chum is thought to be influenced by low food availability, as well predator avoidance, and/or accelerated surface water flow from prevailing south winds (Bax et al. 1978; Bax 1982; Bax 1983; Simenstad et al. 1980).

COHO SALMON

Coho salmon occur in drainages throughout Puget Sound, Hood Canal, the Straits of Juan de Fuca, the Olympic Peninsula and Columbia River tributaries (Wydoski and Whitney 2003). Coho juveniles move rapidly through estuaries and out to sea. As smolts begin the ocean phase of their life, they travel through marine environments, including estuaries, nearshore habitat, and open ocean.

Most coho salmon in Washington spend the first year of their lives in freshwater, outmigrating from March to June (Wydoski and Whitney 2003). Adults generally return to spawn in their third year, although some precocious males (jacks) return at age two (Wydoski and Whitney 2003). The Puget Sound spawning migration begins in August, with spawning generally occurring from September through January (Weitkamp et al. 1995).

Smolts are believed to prefer pelagic conditions, but utilize intertidal and subtidal habitats as well (Emmett et al. 1991, Wynoski and Whitney 2003). Most coho juveniles leave Puget Sound and enter the coastal ocean from April to May (Emmett and Schiewe 1997).

In estuaries coho salmon diets consists primarily of large planktonic or small nektonic animals (amphipods, insects, mysids, decapods and fish larvae) and other juvenile fish. As with all salmonids, coho are piscivorous and are considered important predators on chum and pink salmon fry (Emmett et al. 1991). Other documented prey include Pacific sand lance, surf smelt, anchovy, and a variety of crab larvae. Adult coho feed on invertebrates but become more piscivorous as they grow larger commonly eating sand lance, sticklebacks, crab larvae and small herring (Groot and Margolis 1991).

PINK SALMON

Pink salmon occur in northern Puget Sound, southern Puget Sound, Hood Canal and the Strait of Juan de Fuca (Wydoski and Whitney 2003.) Some Puget Sound populations spend their entire marine life in marine nearshore habitats (Hard et al. 1996).

Pink salmon migrate downstream almost immediately after emergence and if the distance to saltwater is short, the migration may occur in one night (Groot and Margolis 1991). The species spends very little time in estuarine environments, moving quickly to marine nearshore habitats where they grow rapidly. Juveniles rear in estuaries from March until June, schooling in nearshore areas for two to three months before beginning their migration to the open ocean (Wydoski and Whitney 2003, Hard et al. 1996).

Pink salmon fry feed primarily on zooplankton as they move to the open ocean (Thorpe, 1994). In nearshore areas juveniles consume epibenthic prey such as harpacticoid

copepods, pelagic zooplankton and other invertebrate larvae. Prey may be benthic or pelagic in nature, though foraging usually occurs in the water column in nearshore areas, along beaches or shorelines with complexity (Groot and Margolis 1991).

Pink salmon, the smallest of the Pacific salmon, mature and spawn on a two-year cycle. In Washington, pink salmon spawn in odd years except for the Snohomish River, which has both odd and even-year spawners (Wydoski and Whitney 2003).

This species is an opportunistic, generalized feeder, foraging on a variety of fish (herring, sand lance), crustaceans (crab larvae, copepods, amphipods, euphausiids), ichthyoplankton and zooplankton (Groot and Margolis 1991). Adults spend a little over a year in the open ocean before returning to spawn.

2-3.3. Marine Mammals

SOUTHERN RESIDENT ORCAS

Resident orcas (*Orcinus orca*) can occur throughout Washington's marine waters. The southern resident population in particular resides for part of the year (mostly spring, summer and fall) in the inland waterways of the Strait of Georgia, Strait of Juan de Fuca, and Puget Sound (Wiles 2004). Some movement occurs to the outer coasts of Washington and to southern Vancouver Island. The movements of each pod of the southern resident population (J, K, L) vary (Wiles 2004; Krahn et al. 2004). The total population of the three southern resident pods combined fluctuates but has been less than 100 animals since 1995.

The orca's position as a top-level predator makes the species vulnerable to changes in prey abundance. Orcas feed on a variety of organisms ranging from marine mammals to squid to fish, but the southern resident population appears to have a specialized diet with salmon being the preferred prey.

Existing dietary data are preliminary and come mostly from one study that focused on northern residents, but included a small number of observations from southern residents. Salmon made up 96 percent of the prey during spring, summer and fall, and Chinook salmon seemed to be selected over other salmon prey species, comprising 65 percent of the salmonids taken (Wiles 2004). Toxicology analyses seem to bear this out; Krahn et al. (2002) determined that the ratios of DDT and its metabolites to various PCB compounds in the orcas correspond with those of Puget Sound salmon rather than those of other fish. Rockfish, halibut, lingcod and herring are also eaten, but less frequently than salmon.

The movements of southern resident orcas relate to those of the preferred salmon prey. Pods commonly seek out and forage in areas where salmon occur, especially areas associated with migrating salmon (Heimlich-Boran 1986, 1988; Nichol and Shackleton 1996).

2-3.4 Invertebrates

PINTO ABALONE

In Washington waters, this benthic marine gastropod occurs in the Strait of Juan de Fuca and the San Juan archipelago. It is found on shallow, rocky substrate and feeds mostly on

seaweeds. NOAA (2004) reports typical depth ranges from the low intertidal to –30 feet but with occurrences to –330 feet. West (1997) reports that in Washington waters the species occurs on substrate less than 65 feet deep. Adults attach to rocks mostly within kelp forests and forage over a relatively small range, or remain stationary (West 1997). Generally some level of water current is preferred. Surveys in the San Juan Islands by WDFW demonstrate that numbers of abalone are declining in that area. Abalone have not been encountered in geoduck harvest areas.

OLYMPIA OYSTER

The Olympia oyster (*Ostrea conchaphila=Ostrea lurida*) is also referred to as "native oyster" and is currently found throughout its documented historical range within Puget Sound. Within Hood Canal, south Puget Sound and central Puget Sound the native oyster is a commonly observed species in the intertidal zone. Scattered intertidal occurrences are observed in north Puget Sound (WDFW unpublished).

Ranson (1951) postulated that beds of oysters of the genus *Ostrea* could not persist in the intertidal zone, due to the inability of these oysters to survive the wide range of temperatures to which they would be exposed. Based on more recent field observations, and literature review, this claim may not be entirely true for the Olympia oyster in Puget Sound. *O. conchaphila* may be found in the intertidal zone from extreme low to plus 2 meters (6 ½ feet) (Baker 1995). In Puget Sound this species has been observed in dikes, tide pools and lagoons at that upper extreme (pers. obs., B. Blake, WDFW). Subtidally they have been found as deep as 50 meters (164 feet) (Bernard 1983) and 71 meters (233 feet) (Hertlein 1959) outside of Washington waters. A single specimen was recently recovered from a depth of approximately 40 feet in Hood Canal (pers. comm., Mark Millard, WDFW). Currently there are relatively few known historic or contemporary occurrences subtidally in Puget Sound in areas with known intertidal occurrences. Baker (1995) notes that the native oyster is only rarely reported in benthic invertebrate surveys of waters more than a few meters deep. The absence of the species from subtidal biological surveys and collections from Puget Sound is particularly notable. WDFW has not observed any Olympia oysters during geoduck surveys conducted between the –18 foot and –70 foot water depth contour (corrected to mean lower low water) since 1969 (pers. comm., B. Sizemore, WDFW). WDFW has in recent years discovered several occurrences where Olympia oysters exist in functionally subtidal habitats in lagoons in the upper tidal ranges. Whether or not this present tidal distribution is representative of historical distribution or a result of subtidal habitat alterations (such as siltation from upland or nearshore practices) is a matter of contention amongst those currently involved in management, conservation and restoration of the species in Puget Sound.

Olympia oyster larvae are free swimming from three to eight weeks before settlement (Baker 1995; Breese 1953). The larvae require hard substrate to settle on, but this substrate can range widely from small bits of shell, gravel, rocks, boulders, Pacific oysters, pilings, floating piers, tin, concrete, tires, battery cases and wood (Baker et al. 1999; Baker 1995; pers. obs. B. Blake, WDFW). They are intolerant of siltation and conditions of high turbidity (Couch and Hassler 1989). WDFW staff has not observed tidal flow as a factor affecting abundance of Olympia oysters. The maximum size attained by Olympia oysters, as reported by Hertlein (1959), is 75 mm and WDFW staff has observed this size to be reached in 3 years.

2-4 Food Web Interactions

The waters, substrate, and associated fauna that occur where geoduck harvest occurs, along with the covered species, are elements of complex interactions of nearshore marine ecosystems. Plants and animals here are part of trophic cycles, transferring energy and nutrients from one or more organisms to others in the nearshore ecosystem.

2-4.1 Forage Fish

Fish are a significant component in the diet of many birds, marine mammals, and fish in Puget Sound. Common forage fish are Pacific herring, surf smelt, and Pacific sand lance. Salmonid species are also food for birds, orcas, and other fish. These species and others play an important role as food for some of the species covered in this HCP. Nearshore habitats provide spawning areas for forage fish including Pacific herring, salmon species, Pacific sand lance, and surf smelt.

Pacific herring and salmon species that are prey for birds, marine mammals, and other fish and are discussed in Section 2-3.2.

PACIFIC SAND LANCE

Pacific sand lance are widely distributed and common in Puget Sound, the Straits of Juan de Fuca and Washington's coastal estuaries. They are commonly found in localized areas such as the eastern Strait and Admiralty Inlet. WDFW surveys have documented spawning activity on about 130 miles of Puget Sound shoreline (Lemberg et al. 1997; WDFW 1997b). Spawning activity appears to be distributed on shorelines throughout Puget Sound (Lemberg et al. 1997).

Sand lance spawn on intertidal beaches. In Puget Sound they are thought to prefer beaches with freshwater seeps, and spawn in upper intertidal areas at tidal elevations of plus 7 feet to the mean higher-high water line on sand and gravel, or sandy beaches (Lemberg et al. 1997; WDFW 1997b).

Little is known about sand lance life history. Spawning occurs from November through February and the eggs incubate for about thirty days. Eggs are dispersed by wave action over a broad area of the intertidal zone (Lemberg et al. 1997). After hatching, the sand lance larvae (about 2/10 inch long) disperse throughout the top 70 feet of the water column (WDFW 1997b) and appear to spend daylight hours near the bottom, moving up through the water column at night (Emmett et al. 1991). They move passively with local currents and tides until they are nearly an inch long at which time they form schools.

Schooling sand lance are concentrated in nearshore areas of embayments around the Sound (WDFW 1997b). Both adults and juveniles burrow into the substrate at night, which protects them from predation. Burrowing areas need to be clean unconsolidated sand with sufficient oxygen. Such areas generally occur where high bottom water velocities exist, such as the mouths of estuaries (Emmett et al. 1991). Adults are inactive during winter, and except when spawning, remain buried (Emmett et al. 1991).

All lifestages of sand lance are planktivorous carnivores. Smaller larvae consume diatoms and dinoflagellates, while larger larvae consume copepods. Juveniles and adults feed primarily on copepods and utilize other plankton as a supplementary source of food (Emmett et al. 1991; Fresh et al. 1981). Sand lance stomach samples analyzed by Fresh et al. (1981) found calanoids to be the most important prey item.

Sand lance are an important trophic link between zooplankton and larger predators in local food webs. This species seems to be especially important in the diets of juvenile salmon. Sixty percent of juvenile Chinook salmon diets can be sand lance (WDFW 1997b). Pacific cod, Pacific hake, and dogfish also feed heavily on both juvenile and adult sand lance.

SURF SMELT

Surf smelt are a pelagic, schooling fish. They occur in abundance throughout Washington's marine waters, including Puget Sound (WDFW 1997c). Although their movements within the Sound are unknown, a number of genetically distinct stocks are thought to occur, based on geographic and temporal distinctions in use of spawning grounds.

Spawning occurs throughout the year in Puget Sound on intertidal beaches of mixed sand and gravel. Surf smelt appear to have rather specific spawning habitat types. Penttila (1978) found that the frequency and intensity with which a spawning site would be used was largely influenced by tidal elevation. In Puget Sound, incubating spawn is generally found less than 30 feet waterward from mean higher high water. Eggs are deposited near the water's edge where water is just a few inches deep, on beaches with various substrate types often containing a mixture of coarse sand and fine gravel (mostly .04 - .27 inch). Fertilized eggs adhere to grains of sand for two to four weeks, with hatching time influenced by temperature and wave energy.

Surf smelt larvae are planktonic and are about 1/10 of an inch long just after hatching. They assume their adult body type after about three months and are just over 1 inch long by this time. Juveniles continue to rear and school in nearshore areas. Most will mature and return to the beaches to spawn in their second year but a small portion spawn after one year (WDFW 1997c; Lemberg et al. 1997; Penttila 1978).

Fresh et al. (1981) analyzed the stomach contents of surf smelt captured in beach seines. These fish ate primarily pelagic prey such as calanoids, urochordates, carideans, and euphausiids. Small numbers of harpacticoids in a large number of the sampled fish suggested surf smelt are also epibenthic feeders.

This species is used as a food source at all life stages (WDFW 1997c). Marine mammals, birds and other fish prey on surf smelt eggs, juveniles and adults.

2-5 Existing Land Use

Recreational boating on the waters surrounding commercial geoduck tracts is common. Other uses that can occur in areas near geoduck harvest activities include other commercial fisheries such as those for Dungeness crab and salmon, commercial navigation, and recreational crabbing and clamming and fishing. At a broader scale, aquatic lands are used for other purposes such as port operations and shipping, anchoring and mooring of recreational vessels, log storage and aquaculture. However due to water depth restrictions geoduck tracts rarely, if ever, encroach on commercial traffic lanes.

Geoduck harvest occurs in an environment that has been, and will continue to be influenced by many factors that are, for the most part, related to increases in human population in the surrounding lands. Geoduck beds offshore of urban areas (towns, marinas, industries) are often subject to pollution from the adjacent uplands, rendering the geoduck beds non-commercial for health reasons, therefore closed to harvest.

3. Project Description and Covered Activities

3-1 Project Description

The project encompasses the commercial harvest of geoducks as administered by DNR and for which DNR has proprietary rights. Removal of geoducks for research and health sampling, when performed by DNR or under contract with DNR is included as well.

A final Supplemental Environmental Impact Statement (Washington Department of Natural Resources and Washington Department of Fish and Wildlife 2001) and the 2001 Geoduck Fishery Management Plan (Washington Department of Natural Resources 2001) provide details on the fishery and an environmental analysis and are incorporated here by reference. As such, they become part of this HCP. Future changes to the 2001 Geoduck Fishery Management Plan will be anticipated and discussed with the Services at yearly meetings (see Section 8.1) to determine the need for amending this HCP.

This HCP was written to address DNR activities, but management of the fishery is complex, requiring constant coordination and negotiation between DNR, WDFW and the treaty tribes that are involved in geoduck harvest. Input from county governments, the Washington Department of Health and other agencies also factors into the management of the fishery.

Some of the parameters within which harvest activities occur are specified in state laws and rules (Appendix A).

3-1.1 Location

Commercial geoduck harvest occurs in western Washington in the general areas of Puget Sound and the Strait of Juan de Fuca. Future harvest will continue to occur here, and harvest activities will expand north to areas in the general vicinity of the San Juan Islands.

MANAGEMENT REGIONS

For management purposes, the waters of Puget Sound, the Strait of Juan de Fuca and the San Juan Islands are divided into six management regions (Figure 1 in Chapter 1). The extent of surveyed geoduck resources potentially available for harvest across all management regions is in Figure 2 in Chapter 1.

Straight of Juan De Fuca

The Strait of Juan de Fuca management region encompasses waters east of a line projected true north from Cape Flattery to the international boundary line; and those waters west and south of a line projected from Point Wilson to Partridge Point, Whidbey Island, then westerly to the vessel traffic service buoy "S", north of Dungeness Spit, then north to the vessel traffic service buoy "R", then due west to the international boundary line, then westerly along the international boundary line to a point where the international boundary line intersects the line projected from Observatory Point. This management region covers about 449,700 acres. The Strait of Juan de Fuca Region has 5,572 acres of commercially available geoduck tracts, estimated to contain 12,070,000 geoducks, weighing an estimated total of 21,271,000 pounds. The average density on commercial tracts in the Strait of Juan de Fuca management region is 0.06 geoducks per square foot. The average geoduck weight is 2.3 pounds (WDFW 2004).

North Sound

The North Sound management region encompasses waters east of Whidbey Island north of a line projected from Possession Point, Whidbey Island to Picnic Point on the mainland; south of the railroad bridges at Swinomish channel; and east of the Deception Pass bridge. Those waters west of Whidbey Island and north of a line projected from Partridge Point, Whidbey Island westerly to vessel traffic service buoy “S”, north of Dungeness Spit, then north to the vessel service buoy “R”, then due west to the international boundary line; and south of a line projected due east from the international boundary line to a point one nautical mile west of Pile Point, San Juan Island, then southeasterly along a line one nautical mile from the southern shores of San Juan Island and Lopez Island to Davidson Rock near Point Colville, then easterly to a point one nautical mile south of the buoy at Lawson Reef and then due east to Whidbey Island. This management region covers about 356,900 acres. The North Sound Region has 1,515 acres of commercially available geoduck tracts, estimated to contain 1,079,000 geoducks, weighing an estimated total of 4,254,000 pounds. The average density on commercial tracts in the North Sound management region is 0.032 geoducks per square foot. The average geoduck weight is 2.06 pounds (WDFW 2004).

Central Sound

The Central Sound management region encompasses waters north of a line projected from the ferry dock at Point Southworth to Brace Point, not including the waters of Hood Canal; northeasterly of a line projected from Olele Point to Foulweather Bluff; easterly of a line projected from Point Wilson to Partridge Point, Whidbey Island; and southerly of a line projected easterly from Possession Point, Whidbey Island to Picnic Point on the mainland. This management region covers about 231,700 acres. Central Sound has 8,968 acres of commercially available geoduck tracts, estimated to contain 27,040,000 geoducks, weighing an estimated total of 53,899,000 pounds. The average density on commercial tracts in the Central Sound management region is 0.09 geoducks per square foot. The average weight is 2.11 pounds (WDFW 2004).

Hood Canal

The Hood Canal management region encompasses waters south of a line projected from Olele Point to Foulweather bluff including the area described as Dabob Bay. This management region covers about 100,400 acres. The Hood Canal management region has 5,165 acres of commercially available geoduck tracts, estimated to contain 26,894,000

geoducks, weighing an estimated total of 47,019,000 pounds. The average density on commercial tracts in the Hood Canal management region is 0.11 geoducks per square foot. The average geoduck weight is 2.28 pounds (WDFW 2004).

South Sound

The South Sound management region encompasses waters south of a line projected from the ferry dock at Point Southworth to Brace Point, except waters of Hood Canal. This management region covers about 172,100 acres. The South Sound Region has 8,688 acres of commercially available geoduck tracts, estimated to contain 42,554,000 geoducks, weighing an estimated total of 91,472,000 pounds. The average density on commercial tracts in the South Sound management region is 0.12 geoducks per square foot. The average geoduck weight is 2.29 pounds (WDFW 2004).

San Juan Islands

The San Juan Islands management region encompasses waters north of a line projected due east from the international boundary line to a point one nautical mile west of Pile Point, San Juan Island, then southeasterly along a line one nautical mile from the southern shores of San Juan Island and Lopez Island to Davidson Rock near Point Colville, then easterly to a point one nautical mile south of the buoy at Lawson Reef and then due east to Whidbey Island; and north of the railroad bridge at Swinomish Channel; and west of the Deception Pass bridge; and south and east of the international boundary line. This management region covers about 518,100 acres. The San Juan Islands management region has geoduck beds identified, but most have not been surveyed and do not have biomass estimates (These are referred to as X-beds.) No commercial harvest is currently allowed in the San Juan management region, but it is included in this HCP because harvest will occur there at some point in the future.

GEODUCK TRACTS AND THE GEODUCK ATLAS

A geoduck tract is any subtidal area with well-defined boundaries which has been surveyed and found to contain geoducks of commercial quantity and quality. The tract boundaries are artificial and not tied solely to biological criteria. Geoduck tracts have been identified by WDFW, DNR, and the Tribes within each of the six management regions across the extent of the inventoried resource shown in Figure 2. The total acreage of surveyed tracts (i.e., the entire extent of the surveyed resource) fluctuates some, but is about 30,000 acres. Future surveys could identify additional commercial tracts. The total acreage fluctuates because newly discovered beds are added, or the status of an existing tract is changed. The commercial status of a tract can change if a tract is rendered unharvestable by pollution, a tract gets fished down to where it is put into recovery status, or geoduck densities are too low for a viable commercial fishery.

The State of Washington Geoduck Atlas is a tract-specific compilation and update of information on geoduck tracts based on annual dive surveys performed by WDFW. For each tract, the Geoduck Atlas states the estimated tract size in acres (from GIS data), estimated number of geoducks and biomass (in pounds), average geoduck density (number of geoducks per square foot) and average weight (in pounds) of geoducks on the tract.

The Geoduck Atlas also documents other features or conditions of the tract noted during the survey such as the presence of eelgrass, known water quality issues, the presence of

herring spawning areas and other information important in assessing the suitability of the tract for commercial harvest. The Geoduck Atlas is updated each year by WDFW (accessible online at http://www.wdfw.wa.gov/fish/shelfish/geoduck/index.htm).

There are nearly 400 individual geoduck tracts identified (384 in the 2004 Geoduck Atlas). Sometimes large areas are divided into several tracts. Data from the 2004 Geoduck Atlas show individual tracts ranging in size from 4 acres to 1197 acres, but most (more than 60 percent) are less than 200 acres in size and only 18 tracts are 300 acres or bigger.

Surveys conducted for assessing tracts for inclusion in the Geoduck Atlas are only performed within a narrow bathymetric band. Shoreward, the boundary is at the –18 ft line (corrected to the mean lower low water [MLLW] level). Seaward, surveys stop at the – 70 ft depth, adjusted to MLLW, because this is the limit at which divers can most efficiently survey the resource using compressed air SCUBA and the Navy dive table. Geoducks occur across a broader range, both deeper and shallower, than the current commercial tract depth limits.

UPPER AND LOWER SUBTIDAL HARVEST BOUNDARIES

Commercial harvest is limited to areas that have been surveyed, and is confined to suitable subtidal tracts located within a narrow bathymetric band. Shoreward, the harvest tract boundary is at the –18 ft line (corrected to the mean-lower-low water [MLLW] level) or deeper. Harvest boats must stay 200 yards (600 feet) seaward from the line of ordinary high tide, but divers can venture further shoreward, within the constraints of their dive equipment, but cannot harvest shoreward of the –18 foot boundary. The shoreward boundary acts to protect geoducks closer to shore, eelgrass beds, and other nearshore habitats and their inhabitants (e.g., juvenile fish). Seaward, no harvest occurs deeper than –70 feet. As with survey boundary, the seaward, deep-water boundary is the limit at which harvest divers can efficiently operate for workable periods.

The –18 foot shoreward boundary is not absolute. The shoreward boundary is adjusted deeper to avoid eelgrass (for example), to eliminate rocky areas from the tract, to avoid conflicts with areas such as aquatic lands adjoining state parks, or for other reasons.

The –70 foot depth boundary is stated in WAC 220-52-019(11). This rule was recently changed (effective September 2006) to allow the –70 foot boundary to be corrected to MLLW. Previously, the –70 foot depth contour that establishes this boundary was uncorrected, meaning it was dependent on the tidal cycle; it would fluctuate with the tide up to a distance of 4.5 feet. The changed rule clearly identifies a fixed boundary for harvest tracts that is consistent with the boundary of surveyed areas. Some existing harvest agreements are still operating under the previous rule language because it is specified in shoreline permits issued to DNR for geoduck harvest. The shoreline permits are good for five years. Once they expire and new ones are obtained, harvest agreements will be issued with language reflecting the updated rule. Not all counties require DNR to obtain shoreline permits. Only those tracts where shoreline permits are required, and have been issued with restricted shoreline permit language will be under the old rule.

COMMERCIAL HARVEST

Commercial harvest occurs year-round on a small portion of the subtidal geoduck tracts identified jointly by WDFW, DNR, Dept. of Health, and the Tribes as able to support commercial harvest. Harvest areas are rotated within regions according to harvest agreements between the state and tribes. Commercial harvest is managed so that it occurs within one management region at a time, and usually on one tract at a time. However situations can arise that cause harvest to occur in more than one management region at a time. This is driven by circumstances outside DNR's control, such as PSP occurrences forcing closure of a tract. In order to keep harvesters fishing, some boats may be moved to a tract in another region. This is a temporary situation and not desirable from a management and compliance enforcement standpoint, partly because two compliance boats must be maintained and fully staffed at two different locations.

Harvest sometimes occurs from more than one tract but only when the tracts are close enough to each other to allow DNR compliance staff to oversee both harvest operations.

Commercial harvest occurs in those tracts which are shown to have geoducks in commercial quantities (normally more than 0.04 geoducks per ft^2), contain market-quality geoducks, present no practical difficulties for harvest, and do not conflict with existing uses such as ferry routes. The tracts also must be certified by the Washington Department of Health as meeting state and national health standards. This information is gathered annually via surveys and is summarized in the Geoduck Atlas.

Currently, tracts that are identified as commercial are in nearshore substrate adjacent to nine counties (Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, Snohomish and Thurston). Surveys may result in additional tracts being designated commercial. Future surveys or changes in tract status could result in some currently identified commercial tracts being removed from the list. Based on changes in the status of commercial harvest tracts and the number of identified commercial tracts, the actual amount of harvest varies and is limited by the equilibrium harvest rate to assure a sustainable fishery.

Prior to harvest activities, DNR marks the boundary limits delineating the tract. Shore markers and buoys are used. Harvest areas define the boundaries for the purposes of administering and enforcing harvesting agreements (see Section 3-1.2 below). Tract boundaries are established to exclude important habitats such as eelgrass beds and herring spawning areas.

CHARACTERISTICS OF GEODUCK HABITAT AND TRACTS

Commercial harvest activities occur mostly in mud-sand and sand substrate because this is where geoducks tend to have higher average density and better market quality. A particular tract might contain rocky areas, but these are either eliminated from the harvest area, or are avoided by harvesters because they are not conducive to harvest. Geoduck clams occur in low densities or are absent from these habitats.

3-1.2 Geoduck Fishery Management

The commercial geoduck fishery is co-managed by state and tribal entities and there is joint responsibility for the scientific oversight of the fishery. Washington Department of Fish and Wildlife and the tribes perform surveys to support the scientific oversight of the

fishery. WDFW sets the sustainable level of harvest each year. Based on data gathered during pre-harvest surveys, the state and tribes agree on stipulations for harvest boundaries and conditions to protect fish and wildlife habitat.

INTERAGENCY AGREEMENT – WDFW AND DNR

A lot of the preliminary work that goes into assessing a geoduck tract as being suitable for commercial harvest is performed by WDFW and the information is provided to DNR. WDFW performs studies related to the fishery and biological survey work including geoduck population density estimates. An interagency agreement specifies the funding and expectations for field surveys, management studies, collection of biological data, and analytical work that is needed to support the management of the commercial fishery (Appendix D). This is a biennial, contractual agreement between the two agencies. Funding for WDFW's survey work is provided by DNR (from revenue generated by the geoduck harvest program) under these interagency agreements. The dollar amount dedicated to these contracts has increased for the last three biennia (Table 3.1).

Table 3.1. Dollar amount of biennial contracts with WDFW.

Biennium	Amount of Contract Agreement
2001-2003	$276,000
2003-2005	$300,000
2005-2007	$371,816

PRE-HARVEST ENVIRONMENTAL ASSESSMENTS

Tract-specific Environmental Assessments (EAs) are performed and documented on all tracts proposed for harvest. The assessments describe specific tract boundaries, geoduck densities, and information on substrate, water quality, and biota on the tract (Example in Appendix E).

The EA is compiled and written by staff at WDFW and incorporates input from researchers; Federal, state (DNR, WDFW, Dept. of Health, Dept. of Ecology), and county governments; and the participating Tribes. The process of soliciting input consists of sending a scoping e-mail requesting comments to WDFW specialists (e.g., marine fish biologist, habitat biologist, bald eagle biologist, WDFW's threatened and endangered species biologist), county biologists, Tribes and others. The mailing list is modified based on the location of the tract so that appropriate people for that area are contacted. The e-mail briefly describes the tract, pre-harvest survey results and special conditions (such as the presence of eelgrass), and the dates of proposed harvest. A general vicinity map showing the tract location is attached as well. Potential threats to important species or their habitat are identified through this review and language added to the EA to address them. For example, a 0.25 mile bald eagle nest buffer was recommended in the vicinity of the Siebert Creek tract in the Strait of Juan de Fuca Region and the recommended buffer included and mapped in the EA for that tract. In addition to input solicited through the e-mail scoping, the NMFS Northwest Region's marine mammal biologist is contacted to solicit any concerns related to marine mammals.

Data from the pre-harvest surveys and language addressing concerns and recommendations received as a result of scoping are added to the EA. The EA also contains background information on the site and defines the harvest conditions and harvestable area for the tract. In addition to establishing limits for the biomass of geoduck to be harvested and restrictions on time, place, and manner of harvest; the EA serves as a baseline for identifying harvest effects and potential long-term impacts.

A Global Positioning System (GPS) is used to plot survey data, depth contours, encroaching shoreline structures, and tract boundaries.

The EA lists the most common and obvious aquatic flora and fauna observed during surveys including invertebrates, fish, eelgrass and algae. It also notes the birds and marine mammals that are observed, or may occur in the harvest area. It identifies features such as herring spawning and holding areas, and sand lance and surf smelt occurrences, and displays the information on maps in relation to the potential harvest tract. The EA notes the locations of eelgrass in relation to the tract and identifies harvest restrictions necessary to protect eelgrass or other important species and habitats. It identifies what measures will be needed for management of that tract, such as timing restrictions to avoid herring spawning, and boundary restrictions to avoid spawning areas and eelgrass beds.

STATE ENVIRONMENTAL POLICY ACT - SEPA

DNR's administration of the geoduck fishery must follow the legal requirements under the State Environmental Policy Act (SEPA) (RCW 43.21C and WAC 197-11), as well as DNR's Policies and Procedures rules (WAC 332-41).

After completion of the pre-harvest sampling and surveys and the Environmental Assessment for a tract, each proposed auction of geoduck harvest quotas on that tract undergoes an established SEPA process. DNR must also receive all required state and local permits before the harvest quotas can be offered. Local permitting requirements vary by county.

Each time DNR prepares to auction geoduck harvest quotas on specific tracts, the agency issues a DS (Determination of Significance) and adopts the Final SEIS and the 2001 Fishery Management Plan under the DS. In doing this, DNR can incorporate all of the mitigation from the Final SEIS and the 2001 Fishery Management Plan into harvest activities associated with the quotas for a given tract, reducing any potential significant adverse impacts to below a level of significance. Issuing a DS as opposed to issuing a determination of non-significance is the procedure that allows DNR to reference and incorporate mitigation from the Final SEIS and 2001 Fishery Management Plan.

Notification of an upcoming auction of harvest quotas for a tract and the SEPA documentation is sent primarily to the appropriate Tribes and local governments in the area. State and federal agencies with management or regulatory authority in the area where harvest will occur are also notified. The SEPA documentation provided consists of:

- a **cover memo** advising interested parties of DNR's lead agency status, the determination of significance and adoption of an existing environmental document (the SEIS);

a **threshold determination** that also states the determination of significance and adoption of an existing environmental document (the Final SEIS), identifies where the SEIS is available for interested parties to review, and provides contact information; and

the **Environmental Assessments** for the tracts where harvest quotas will be offered.

These documents are also posted on DNR's external website.

It takes two to seven years to set up a tract, perform all the surveys and assessments, and obtain permits to qualify a geoduck tract for harvest.

During the period that a tract is under contract for harvest, the Environmental Assessment is reviewed by WDFW and DNR prior to each harvest period or as specific situations arise that require documentation or a change in harvest parameters.

POST-HARVEST SURVEYS

Tracts that are eligible for post-harvest surveys are identified jointly by WDFW and DNR. To be eligible the tract must be fished down to a minimum level of at least 65% of the pre-harvest biomass estimate. Tracts eligible for post-harvest surveys are placed in recovery status and may not be fished again until pre-fishing geoduck densities are achieved, as determined through post-harvest surveys. The intent of post-harvest surveys is to measure the recovery of the geoduck population but, as with the pre-harvest surveys, divers also note the most obvious and common animals and plants that are encountered along the surveyed transects. The same methodology and the same intensity of survey are performed during pre-and post-harvest surveys, with a few exceptions (Appendix D). In addition to an initial post-harvest survey of a tract, a series of additional surveys are performed to determine rates of geoduck recovery.

HARVESTING AGREEMENTS

Washington DNR auctions the right to harvest geoducks from state owned aquatic lands. Quotas of harvest pounds are awarded to "purchaser" companies that are the highest responsible bidders at the auctions. About four auctions are held each year. The quotas are managed under harvesting agreements between DNR and purchaser companies (Appendix B) which are legally-binding contracts.

The terms under which successful bidders are required to operate are incorporated in the legally binding harvesting agreement and in specific state laws and regulations. It is through the harvesting agreement that DNR regulates geoduck harvest. A harvesting agreement is typically awarded for two to four months for a certain amount (quota in pounds) of geoducks allowed to be harvested. Washington DNR has the ability, through authority of the harvesting agreement, to terminate harvest at any time at the agency's discretion and can implement a closure within a day.

The harvesting agreement establishes the harvest area boundaries and identifies harvest ceilings, measured in pounds. It also establishes the duration of harvest and specifies harvest times (days and hours of operations).

Through the harvesting agreement, DNR can change the harvest dates or duration of harvest and can increase or decrease the harvest ceiling for a harvest area at any time during the harvest agreement period.

The harvesting agreement also sets conditions for vessel use, the number of vessels, noise restrictions, number of divers, and other aspects of harvest activities (Appendix B).

Site-specific restrictions or harvest considerations identified in the Environmental Assessment are incorporated into the harvesting agreement, although these are often dealt with prior to this through the site selection and boundaries established for the tract and harvest timing. Specific, unique considerations for a tract can be included in the harvesting agreement, beyond those already addressed in the EA or state law.

Commercial geoduck harvest is carried out by dive harvesters, licensed by WDFW, who are hired by the purchaser companies.

PLAN OF OPERATIONS

The harvesting agreement requires submission of a Plan of Operations by the successful bidder. DNR requires the Plan of Operations to include:

(1) Source and identity of divers, vessel operators, tenders, packers, shippers, harvest vessels, and other harvest equipment.

(2) Legal relationship between purchaser, divers, vessel operators, and tenders;

(3) The identity of any other subcontractors Purchaser will use in engaging work under the contract;

(4) Location and moorage site of vessel(s); and

(5) The identity of all vehicles used to transport harvested geoducks from the approved off load site; and

(6) Steps purchaser will take to ensure compliance with this contract by purchaser, Purchaser's employees, and subcontractors.

3-2 Activities Covered by Permit

3-2.1 Timing

Commercial geoduck harvest administered by DNR occurs year-round. Harvest is allowed Monday through Friday, from 8:00 a.m. to 4:30 p.m. and does not occur on State holidays or weekends. Each harvester operates during the period specified in their harvesting agreement (generally 2-4 months). It takes several years, and even up to seven years, to complete harvest on one commercial geoduck tract over the course of several harvest cycles. About 70 percent of the geoduck biomass is removed then the tract is allowed to recover to the pre-harvest biomass.

3-2.2 Access to Commercial Tracts – Vessels

Commercial geoduck tracts are accessed via boat. The boats range from 25 to 70 feet long and are anchored during harvest activities. Harvest boats anchor and sit with idling engines for most of the day. A boat might re-anchor two to three times a day as it repositions on the tract being harvested. Boats cannot enter the tract boundary prior to the harvest start time each day and they are not legally allowed to stay on the tracts after the daily harvest.

Onboard compressors provide air for the divers via hoses about 300 feet long. Onboard pumps deliver pressurized water for the water jet nozzles used to remove the geoducks. Dive boats can, and usually do, maintain two divers in the water at a time. A third person (tender) stays on board to monitor equipment and to bring harvested geoducks onboard. The tender and divers stay in constant verbal contact using a surface-to-diver communication system.

Through contract management, DNR limits the number of boats actively harvesting at one time and place. Typically eight to ten boats are in operation at one time.

Harvesting agreements require vessels to operate at surface noise levels less than 50 decibels measured at 200 yards (600 feet) from the source; a level less than the state standard.

DNR'S COMPLIANCE BOAT

DNR maintains a commercial dive team whose primary responsibility is the daily on-water management, enforcement and harvesting agreement compliance of the tract harvest. Dive team members are skilled in scuba and surfaced-supplied diving techniques, investigative procedures and boat handling. DNR's compliance staff has a boat on the tract at all times during harvest. The compliance boat contains spill containment materials and can respond to fuel spills and other emergencies.

In addition to ensuring that all harvest restrictions, state fishery laws and regulations, and harvesting agreement conditions are followed, DNR maintains oversight of the condition and operation of harvest vessels.

See Fishery Enforcement activities, Section 3-4 below.

3-2.3 Harvest Methods and Equipment

Geoducks are harvested individually by divers using hand operated water jets. The water jet is a pipe about 18 to 24 inches long with a nozzle on the end which releases water at a pressure of about 40 to 60 psi – about the same pressure as that from a standard garden hose. The size of the nozzle on the water jets is limited to a maximum inside tip diameter of 5/8 inch (by WDFW via WAC 220-52-019(2a)). The water jet is controlled by the diver. It is inserted in the substrate next to the exposed geoduck siphon or in the hole left when the siphon is retracted. By discharging pressurized water around the clam the sediment is loosened and the clam is removed by hand.

Each diver carries a mesh bag to collect the harvested geoducks. The bag holds about 180 pounds, or 50-80 clams. Divers periodically surface to unload their bags.

A diver can harvest about 800 geoducks per day on a high-density commercial tract with good digging conditions.

Intakes for supplying water to the onboard pumps are positioned about 10 to 20 feet below the water surface. Intake openings are 4-6 inches in diameter and are screened to prevent debris from stalling the pump. The pump delivers pressurized water to the water jet.

After the geoducks are brought onboard they are weighed and fish receiving tickets (issued by WDFW) are filled out in the presence of, and authenticated by, DNR compliance staff. After being unloaded at a pre-approved marina or boat ramp, the geoducks are transported to a wholesaler or directly to market.

3-2.4 Harvest

The geoduck fishery is an efficient fishery in the locations where it occurs because one specific area is very intensively fished and also intensively managed.

Tracts selected for harvest are generally concentrated in a single geographic area to make enforcement easier, allow efficiency in survey efforts, and to more easily identify and address local concerns.

The fishery operates year-round, but harvest activities on a particular tract do not occur year-round because harvest is intentionally rotated around the different regions. In addition, water quality deterioration or PSP occurrence can cause termination or suspension of harvest on a specific tract. Harvest stops when the tract has been "fished down" to the thresholds identified in annual management plans; generally about 30 percent of the estimated pre-harvest tract density. Tribal sharing agreements can limit the biomass taken from a given tract. Harvest on a particular tract can be suspended or terminated for other reasons as well.

3-2.5 Extent of Harvest and Limits for the HCP

Prior harvest can be used to understand the fishery rotation from year to year and the extent of harvest activities (Table 3.2).

Table 3.2. Annual harvest by state fishery.

Mgmt. Region	Tract Name	Pounds harvested[1]	Tract size (acres)	Area harvested (acres)[2]
2001				
Strait of Juan de Fuca	Jamestown 1	128,240	331	27
	Protection Island	136,994	256	13
Central Sound	Olele Point	383,047	225	43
South Sound	Pt. Heyer	582	137	.05
	Mahnckes 2-4	393,922	149	16
	Treble Point	62,619	40	4

Mgmt. Region	Tract Name	Pounds harvested[1]	Tract size (acres)	Area harvested (acres)[2]
	Sandy Pt./Big slough	161,108	185	11
Hood Canal	Hood Head E	66,298	33	3
	Hood Head S	66,300	40	3
	Sisters/Shine	397,204	459	51
2001 Total		**1,796,314**	**1855**	**171.05**
2002				
Strait of Juan de Fuca	Jamestown 1	164,227	331	34
	Protection Island	156,351	256	17
Central Sound	Olele Point	268,751	225	43
	Austin	268,845	94	35
	Double Bluff	232,940	73	27
South Sound	Mahnckes 2-4	385,439	149	19
	Sandy Pt./Big slough	117,750	185	9
Hood Canal	Hood Head S	94,529	40	5
	Sisters/Shine	421,822	459	54
2002 Total		**2,110,654**	**1812**	**243**
2003				
Strait of Juan de Fuca	Jamestown 1	160,155	331	42
	Protection Island	123,853	256	15
Central Sound	Austin	242,355	94	51
	Double Bluff	226,714	73	42
South Sound	Mahnckes 2-4	220,029	149	14
	Sandy Pt./Big slough	423,430	185	35
Hood Canal	Hood Head S	42,716	40	2
	Sisters/Shine	494,514	459	81
2003 Total		**1,933,766**	**1732**	**282**
2004				
Strait of Juan de Fuca	Freshwater Bay	282,789	510	58
Central Sound	Skiff Point	143,221	126	17

Mgmt. Region	Tract Name	Pounds harvested[1]	Tract size (acres)	Area harvested (acres)[2]
	Murden Cove	71,692	222	13
South Sound	Point Heyer	470,342	582	54
	Mahnckes 2-4	462,904	149	49
	Sandy Pt. Big slough	186,530	185	21
Hood Canal	Hood Head S	97,191	40	7
	Lofall	422,705	170	73
2004 Total		**2,137,374**	**1984**	**292**
2005				
Strait of Juan de Fuca	Freshwater Bay	226,731	510	54
Central Sound	Port Madison	683,728	311	83
	Skiff Point	122,966	126	14
	Murden Cove	93,292	222	20
South Sound	Point Heyer	34,894	582	12
	Mahnckes 2-4	82,027	149	10
	Sandy Pt. Big slough	314,405	185	45
Hood Canal	Hood Head S.	153,431	40	16
	Vinland	412,765	100	16
	Hamma Hamma	1740	14	0.7
North Sound	Point Partridge	26,320	586	9
2005 Total		**2,152,299**	**2825**	**279.7**

[1] Includes test harvest and PSP testing.
[2] A calculated estimate, using the number of geoducks harvested and the average density of geoducks on the tract.

Based on the 2001 – 2005 data above, in one year harvest typically occurs on eight to twelve tracts with a combined acreage of 1732-2825 acres (Table 3.2). This harvest acreage is between 5.8 and 9.4 percent of the 30,000 acres of inventoried geoduck tract.

Harvest does not occur across an entire tract in one year; instead harvest activities focus on smaller areas within the tract. For example, in Table 3.2, 128,240 pounds of geoduck were harvested from the Jamestown 1 tract in 2001. The average weight of individual geoducks on this tract is 2.2 pounds (from WDFW survey data), so a calculated 58,291 geoducks were harvested from the tract in 2001 (128,240 ÷2.2). The density of geoducks on this tract is .05 geoducks per ft^2 (from WDFW survey data). Assuming an even distribution of geoducks across the tract, an area of 1,165,818 ft^2 (or 27 acres) would have theoretically been harvested to remove the 58,291 geoducks (58,291÷.05).

The above calculation assumes an even distribution of geoducks across the entire tract. In reality, geoducks are commonly concentrated in patches, and the actual area where harvest occurs is primarily in these patches; an area smaller than that shown in the last column of Table 3.2., but more widely distributed across the tract. The area harvested on each tract is likely somewhere between the acreages in the last two columns of Table 3.2. Note that harvesters return to the same tracts for several years; harvest does not occur on entirely new tracts each year.

When harvest quotas are offered in the San Juan management region, the total acres across which harvest occurs will increase because that region will be assigned a total allowable catch (see Section 3-3 below). The scope of harvest will be similar to that in the other regions.

The biomass harvested each year fluctuates but remains within the amount allowed to sustain the geoduck resource. The management of the fishery at conservative, sustainable biomass levels limits the amount of harvest allowed each year and limits DNR's ability to expand the fishery.

ACREAGE LIMITS

For the purposes of this HCP, DNR is proposing a 6000 acre maximum tract acreage from which harvest would occur annually, considering the 50-year timeframe for this HCP. This is the combined tract sizes on which harvest activity would occur; as described above the actual amount of tract area experiencing harvest would be less than the 6000 acre total.

The 6000 acre maximum was arrived at by considering the sum total of the two largest tracts in each management region (Table 3.3). Should harvest in one year occur on these tracts, the total acreage would be 6286. In practice, this would not occur because in any one year a given tract may be non-commercial because of low geoduck densities, pollution, land use conflicts or for other reasons. The logistics or need to harvest from this large of an area in one year also precludes this scenario in reality. However this exercise is useful in establishing a maximum upper limit of tract acres from which harvest would occur for the purposes of this HCP, and is plausible given the 50-year timeframe of the HCP.

Table 3.3. Two largest tracts in each management region.

Region	Size (acres)	Tract Number	Tract Name
Strait of Juan de Fuca	1197	00300	Siebert Creek
	728	00350	Dungeness spit
Central Sound	723	07000	Battle Point North
	700	04100	Port Townsend
South Sound	461	17400	Salom Point
	310	17700	Windy Point
Hood Canal	459	20300	Sisters/Shine

	421	21450	Warrenville
North Sound	586	03100	Point Partridge
	301	03900	Randall Point
Total – all currently harvested regions	**5886**		
San Juan *	200	NA	NA
	200	NA	NA
Total – all regions	**6286**		

* The San Juan management region is a different situation because even though geoduck beds have been identified, commercial tracts and geoduck biomass have not been quantified. Over the course of the 50-year span of this HCP, harvest could occur here. Based on the currently identified extent of geoduck beds in that region compared to that of the other regions (Figures 1 and 2), an estimate for this exercise of maximum acres is two tracts of 200 acres each.

3-2.6 Geoduck Research and Sampling

In addition to the sampling done to ensure water quality and shellfish safety prior to and during harvest, sampling occurs throughout the year for a variety of research efforts including stock assessment, geoduck aging and geoduck genetics. Samples are collected throughout the six management regions within the depths utilized for commercial harvest. Health-related sampling is done within commercial tracts as is most research sampling. When performed or managed by DNR, these activities will follow the same restrictions as those for commercial harvest.

3-2.7 Other Practices

SOUTHERN RESIDENT ORCA

In order to comply with the Marine Mammal Protection Act, DNR has developed a "diver recall" system capable of getting all divers out of the water when orcas are sighted on the tract being harvested. DNR divers and harvesters remain out of the water until all marine mammals have left the area. Vessel engines remain switched off until that time.

3-3 Determining TAC and Managing Geoduck Tracts

An annual harvest quota for geoduck clams is calculated for each management region by multiplying the current regional commercial biomass estimate by a sustainable harvest rate (2.7 percent). The sustainable harvest rate is derived from a deterministic age-based equilibrium model (Bradbury and Tagart 2000) and a risk-adverse (F40) fishing strategy selected by geoduck managers. In Washington, the annual quota has been termed "Total Allowable Catch, or TAC. The TAC is calculated by WDFW.

Total population biomass is the sum of all known wild stock geoducks measured in pounds. *Commercially available biomass* is the estimated poundage available for commercial harvest and is estimated from survey data (see Calculating Harvest, Section 3-3.1 below). Tracts closed due to sediment or water quality impairments, are *not* included in the commercial biomass; neither are those areas or tracts where densities of geoducks have not been quantified (X-beds). Recovery beds (those in recovery from past harvest) are included.

Tracts that have been fished down to about 30 percent of the pre-fishing density and placed into recovery status are not fished again until a new survey demonstrates that the average geoduck tract density has reached or exceeded the previous pre-fishing density. At this point the tract is considered "recovered" and again made available for commercial harvest.

Based on an equilibrium yield model (see Section 3-3.1 below), currently 2.7 percent of the commercial biomass in each of the five management regions is allocated for total fishing effort each year. (The San Juan management region currently does not have identified commercial biomass.) This is the TAC and it is split equally between the state and tribes, so the State's share of the TAC is half of the 2.7 percent, or 1.35 percent of the commercial biomass. In order to protect the resource further, the State reduces its share by 2 percent to allow for the potential of unreported harvest mortalities.

After taking the 2 percent reduction, DNR makes the remaining 98 percent of the State's share of the annual TAC for each management region available for harvest opportunity at auction each year, i.e., the State auctions 1.32 percent of the commercial biomass.

Closures of tracts for health reasons, market conditions, weather concerns, time constraints and delays in obtaining shoreline permits can result in underharvest of the TAC. Unharvested portions from one year's TAC are not carried forward or added to the next year's TAC.

By management agreement, overharvest of a party's share of the TAC will result in a reduction of the following year's TAC for that party.

3-3.1 Calculating Harvest Amounts

Commercial biomass for a tract is the product of geoduck density, weight and tract area estimates. Geoduck density in a tract is estimated by establishing belt transects in the tract, and counting the number of siphons seen by divers along the transects. Geoduck counts are corrected with a daily 'siphon show' factor that adjusts for the variability in actual siphons visible compared to the total number of geoducks. The tract weight estimate is made by removing and weighing ten geoducks from every sixth survey transect and pooling the samples to calculate an average geoduck weight. The tract area estimate is made using NOAA water depth contours between –18 and –70 feet (corrected to MLLW) and subtracting areas that cannot be harvested due to health, ecological, statutory, substrate or conflicting use constraints. ArcGIS is used to estimate tract area. (Water surface area is used as a proxy for benthic surface area.)

REGIONAL HARVEST CALCULATIONS

Regional commercial biomass estimates are the sum of all commercially harvestable tracts surveyed within one management region. Tract biomass estimates are adjusted up or down. Harvestable biomass is added when a tract is surveyed and additional biomass is found. Biomass is subtracted after geoduck harvest has occurred or a survey indicates reduced biomass. Biomass is either added or subtracted when a tract's health classification has been changed by the Department of Health, depending on whether the status is changed to approved, conditionally approved, restricted, or prohibited.

EQUILIBRIUM YIELD MODEL

Washington's geoduck fishery uses an age-based model with a F40 % fishing strategy to provide an equilibrium harvest rate. A predictive mathematical yield model forecasts the effect of various harvest rates on wild stock geoduck populations (Bradbury and Tagart, 2000). This model relies on estimates of growth, natural mortality, sexual maturity, harvest selectivity and other life history parameters. Based on the current model, an equilibrium rate of 2.7 percent was calculated and agreed to by both State and Tribal managers in 1997. The 2.7 percent harvest rate is predicted to preserve 40 percent of the un-fished spawning biomass of wild stock geoduck populations (Bradbury et al. 2000).

3-4 Fishery Enforcement Activities

Commercial tracts selected for harvest are concentrated in a single geographic area of each management region to facilitate fishery enforcement. DNR's commercial dive team is present on the tracts undergoing harvest each day that geoduck harvest operations are being conducted. DNR has the authority to cancel a harvest day if weather conditions present a safety hazard or for other reasons.

At least two compliance staff, one of whom is an enforcement officer, are present on the compliance vessel, on the tract being harvested. This ensures compliance with the specified harvest conditions and restrictions. They have a number of responsibilities which include:

- setting and checking tract boundaries and marker buoys;
- identifying and documenting the dive harvest vessels and onboard harvest divers and tenders;
- documenting the vessel harvest location with GPS coordinates;
- collecting weekly samples of geoduck for testing by Dept. of Health to ensure the product is safe for human consumption and assisting Dept. of Health in routinely scheduled water sampling activities;
- conducting random vessel inspections to ensure no unreported catch is onboard and to assess diving safety and vessel safety conditions including any potential discharges of hazardous materials such as fuel or hydraulic fluids;

- performing investigative dives and video camera drops to monitor harvest activity and ensure sound environmental practices are being followed, ensure harvest is within tract boundaries, and verify that no unreported harvest mortality is occurring;
- authenticating weigh-out of harvested geoduck at the end of each day;
- monitoring noise levels by using a sound meter and taking sound readings at 200 yards from vessels, and monitoring harvest vessel distances from shore using an electronic distance measuring device;
- identifying and removing environmental hazards such as derelict fishing nets or other fishing gear that may be present on a tract and constitute a threat to divers and marine fauna;
- utilizing a diver recall system and engine-off policy for emergency situations and marine mammal presence/protection;
- operating onboard communications systems with the shore and responding to questions or concerns from the public related to geoduck harvest activities; and,
- working cooperatively with WDFW enforcement to investigate reports of illegal harvest and WDFW biologists to collect information for research and fishery management purposes.

Vessel inspections occur at random. If the number of inspections was to be averaged it would be about 1 per day. In practice, one vessel could be inspected or four inspected on any given day. The same vessel could be inspected several times in a row. Inspections are noted in daily compliance logs maintained by DNR. These inspections are carried out continually during the course of the fishery.

The main intent of vessel inspections is to check for unreported geoducks but the general condition of the boat and its operating equipment, as well as the equipment used to conduct harvest operations is noted as well (E.g., vessel-diver communications, nozzle sizes, scales for weighing product, etc.).

Compliance dives are conducted randomly at a frequency of about one or two dives per week or in some cases dives occur two or three times per week. Dives are performed on tracts after harvesters have worked on them and also in areas that are actively being harvested. Underwater video camera viewing also occurs but gives a more limited view of the tract and harvest activities. The type of underwater inspection done (free dives, tethered dives, video camera drop) depends on the number of DNR compliance staff working that day, weather conditions, tract location and other variables.

Noise level checks are done on an as needed basis. In harvest areas off shore of shoreline homes, more noise level checks are done than when harvest occurs in more remote areas. Situations have occurred where background noise (e.g., from waves hitting the compliance boat, upland noises, wind hitting the microphone used to measure noise levels) is loud enough to interfere with the ability to get a reading on the noise coming from a particular harvest boat.

4. Potential Biological Impacts and Take Assessment

4-1 Direct and Indirect Effects

Geoduck harvest activities, and thus related effects, are localized, meaning that at one time, harvest activities are occurring on one tract, or sometimes on more than one tract within one management region. Effects are limited to the tract area and its immediate vicinity. Geoduck harvest activities could potentially directly disturb individuals of the covered species. Substrate and water are temporarily affected by disturbance of bottom sediments and suspension of fine sediments during geoduck harvest. Other benthic organisms (besides geoducks) within harvest tracts may be inadvertently removed and damaged during harvest and their abundance temporarily reduced within the tract boundary. The use of motorized boats and mechanized equipment create a risk of introductions of toxic materials to the water which could impact individuals of the covered species, and damage habitat, should a spill occur. The noise and general activity of harvest can also potentially disturb the covered species.

4-1.1 Surface Effects

VESSELS

Harvest vessels and DNR compliance vessels are on the water during harvest operations. Their movement and presence could potentially disturb birds and marine mammals. Vessels pose a risk of fuel spills or spills of other hazardous materials that could damage habitat or kill individuals, eggs, or larvae. These risks are reduced through the following means.

Fuel spill and similar risks are managed through DNR compliance staff which require harvest vessels in danger of capsizing, or with obvious leaks of toxic or hazardous materials to move out of the harvest area and return to the docks for necessary repairs before they can return to the harvest tract.

Harvesters are required, in the harvesting agreement (Appendix B) to comply with all federal, state, and local laws and regulations concerning the use and disposal of hazardous, toxic or harmful substances. They are also required to notify the DNR of any release of hazardous, toxic or harmful substances.

Harvesters are required to provide DNR the right to enter and inspect any harvest vessel operating under the harvesting agreement. Since 2003, all harvest vessels are required to carry pollution liability insurance to provide funds in the event of a spill.

A Vessel Spill Contingency Plan (Appendix F) provides guidance to DNR compliance staff in the event of a spill and instructs them to immediately report observed oil sheens or slicks to Washington State Department of Ecology and the United States Coast Guard.

Noise

Noise from boat operations and dive support equipment could disturb birds and marine mammals. Geoduck harvest operations generate noise from three sources: the vessel engine, the pump or compressor engines powering the water jets and diver air supply, and the two-way diver communication system. Communication between the vessel and divers is electronic, via their umbilical. Engine noise increases when boats reposition on the tract.

On-site measurements found maximum surface noise levels of 61 to 58 dBA at a distance of 100 feet where auxiliary equipment was housed on deck and 55 to 53 dBA where equipment was housed below deck (Table 4.1).

Sound intensity levels drop off rapidly in air. The inverse square law of sound behavior says that, in situations where sound is from a stationary or point source with negligible obstacles or boundaries on the sound, it will decrease 6 decibels with each doubling of distance from the source. Using this law and the above measured noise levels, noise levels at other distances can be calculated (Table 4.1).

Table 4.1. Measured and calculated noise levels above water at various distances.

Distance (ft)	Predicted surface noise levels (dBA)	
	Equipment on deck	Equipment below deck
100	61-58 (measured)	55-53 (measured)
200	55-52 *	49-47 *
400	49-46 *	43-41 *
800	43-40 *	37-35 *

*calculated

Noise levels are enforced at less than 50 decibels measured at a distance of 200 yards (600 feet) from each vessel. Calculated levels in Table 4.1 above indicate noise from geoduck boats will usually be below this level. Effects from noise are reduced through these limits imposed on harvest vessels.

Noise levels are measured by compliance staff. Vessels found to be out of compliance are not allowed to participate in harvest activities until violations are remedied. Noise levels from harvest activities might cause individuals of the covered species to avoid the harvest tract and immediate vicinity but are not expected to be great enough to result in impacts beyond this.

4-1.2 Benthic Environment Effects

Harvest activities, particularly the use of water jets when harvesting, and to a lesser degree vessel anchoring, diver movement and the dragging of hoses and collection bags,

temporarily disturb bottom sediments and unintentionally remove and damage organisms on and in the substrate in the vicinity of the harvest, and may temporarily reduce their abundance. Suspension of fine sediments temporarily causes turbidity. These effects are not expected to be great enough to impact the covered species or their habitat.

The disturbance to the substrate and subsequent turbidity caused by resuspended fine sediment is reduced through the use of selective, hand held harvest equipment that only disturbs the immediate harvest vicinity (dig hole). Disturbance is limited to the proportionally small area that is harvested each year (1732 – 2825 acres), compared to the extent of the known commercial resource that has been inventoried between depth contours of –18 and –70 (about 30,000 acres).

VESSEL ANCHORAGE

Vessel anchorage may cause bottom scour and disturb vegetation, if present, and benthic organisms. These effects are limited to the swing radius of the weighted portion of vessel's anchor line (usually a heavy chain near the anchor itself). Effects to the bottom substrate would be temporary; based on comparisons of plants and animals before and after harvest, these areas recover through recolonization from surrounding areas. Effects from anchoring on eelgrass are avoided by the establishment of nearshore depth restrictions of –18 feet MLLW and 2-foot vertical harvest buffers around eelgrass beds.

HARVEST ACTIVITIES

Extracting geoducks mixes surface sediments with material found deeper in the geoduck hole. Harvest activities also temporarily suspend sediment causing localized turbidity within or near the harvest tract. Coarser sediments tend to fall out of suspension quickly, while fine particles may remain suspended in the water column until they are re-deposited away from the hole. As the suspended sediments settle they are redistributed in the vicinity of the harvest activities and may form a thin layer on the seafloor. The fate of particles put into suspension depends on particle size and water currents. The harvest activity does not introduce new sediment into the environment from external sources.

The use of hand-held harvesting equipment limits the area disturbed and therefore sediment disturbance and turbidity to the area where geoducks are extracted.

Benthic Fauna

Soft-bodied animals may be inadvertently damaged and displaced from within the substrate by the water jets and those brought to the surface are exposed to predation by fish, crab, and other predators and scavengers. Tubeworms may be broken apart, while very small animals may be suspended and carried away by currents.

The majority of infauna reside within the top 12 inches of the benthos and are likely to be directly affected by both mobilization of, and temporary changes in, the granular matrix of the sediments in harvest areas (Coull 1988; Somerfield et al. 1995). However, unlike larger scale disturbances that may have prolonged consequences (Morton 1977; van Dalfsen et al. 2000), small-scale disturbances of seabed sediments and morphology are likely to result in short-term effects on the benthic community.

Because harvest only affects a portion of the geoduck tract, recolonization of most marine organisms from surrounding sources within and adjacent to the tract is expected to occur

in a short time. For comparison, monitoring of a small maintenance dredging operation found that the infauna re-adjusted to pre-dredging conditions within 28 days in the dredged area (McCaully et al. 1977). Based on studies of benthic recolonization related to dredging and sediment cap placements, the substrate on geoduck tracts is expected to be quickly recolonized after harvest activities (McCaully et al. 1977; Richardson et al. 1977; Romberg et al. 1995; Wilson and Romberg 1995) and the fauna are expected to be similar to the existing nearby benthic community. Geoduck harvest methods are less impactive than dredging, so the recolonization is expected to be similar, or occur faster than that indicated in studies involving dredging.

More invasive methods for harvesting other bivalves have documented temporary impacts to the surrounding communities. Kaiser et al. (1996) found that the infaunal community was restored within 7 months after suction harvesting Manila clams in coarse sediments and Spencer et al. (1998) found that the benthic community was restored within 9 to 12 months after suction harvesting in fine muddy sand substrate. Coen (1995) found that harvesting clams using a mechanical hydraulic dredge causes some mortality of infaunal and epifaunal organisms directly in its path. However, the community effect was found to be short term because many of the small benthic organisms regenerate rapidly, recolonize quickly and have high fecundity.

The effects of geoduck harvest methods on the abundance and diversity of animals associated with the substrate were assessed by Goodwin (1978). He reported that total biomass of the infauna in study plots in Hood Canal (excluding geoducks) seven months after geoduck harvest showed no statistically significant changes over that of pre-harvest levels. Assessing changes attributable to harvest was complicated by the patchy distribution and natural variability in abundance of benthic animals. In this study, seasonal variation may have been an uncontrolled factor. Pre-harvest samples were collected in November, 1975 and the post-harvest samples were collected in the summer of 1976. Increases seen in the numbers and weights of benthic animals were likely attributable to natural seasonal variability. Goodwin noted that: 1) Increases in the benthos were not as pronounced in the treatment plot as those in the control plot, and 2) geoduck harvest did not create dramatic decreases in standing crops of the major benthic organisms for which data were collected.

Breen and Shields (1983) also looked at benthic fauna in their study of geoduck harvest effects at five sites off Vancouver Island, British Columbia. They collected core samples from control and treatment sites and separated out infaunal organisms. Some species increased in abundance after the harvest treatment, and some decreased. Changes were not statistically significant. A greater diversity of species was seen in the more recently disturbed plot. Only one animal taxon (Harpacticoid copepods) was significantly affected and its presence increased significantly following geoduck harvest. The authors noted that the harvest treatments used in this study were more destructive than those used during commercial geoduck harvests because their treatment attempted to remove every geoduck.

Substrate Alterations

Goodwin (1978) conducted a study in northern Hood Canal to determine (in part) the effects of geoduck harvest on substrate particle size. Overall, sediment particle size distribution appeared to be minimally affected by geoduck harvest; Goodwin (1978)

found no statistical difference in the average median sediment grain size between core samples from test plots (where harvest occurred) and those from control plots. The average percentage of silt and clay in the core samples from test and control cores was also not significantly different.

Breen and Shields (1983) also assessed the effects of geoduck harvest on sediment composition. They found no difference in sediment structure, as measured by particle size, in samples taken at three plots; one an undisturbed control and two that had previously been completely harvested. The authors noted that the harvest treatments used in this study were more destructive than those used during commercial geoduck harvests because their treatment attempted to remove every geoduck.

Harvest Holes

Harvesting geoducks temporarily leaves behind a series of depressions, or holes where the clams are extracted, sediments displaced, and fine particles suspended. The number of depressions created across a harvested area in a tract depends on the density of geoducks. The fate of these depressions, in terms of the time to refill, depends on the substrate composition and tidal currents. The time for them to refill can range from several days to 5-7 months (Goodwin 1978).

Most of the material removed during the harvesting of a geoduck ends up falling back into the hole or forming berms around the holes. The berms eventually erode back into the harvest holes as a result of grain settling, water current, wave energy and animal activity (Goodwin 1978).

A decrease in the percentage of fines and coarse sediments was measured by Goodwin (1978) in the holes after harvest, compared to adjacent, undisturbed sites. Fines suspended by the water jet harvest did not re-settle in the depression made by harvest.

The average dimensions of the harvest holes measured immediately after harvest by Goodwin (1978) were 14.7 inches wide and 3.2 inches deep. The depth to which disturbance occurred in removing the geoduck was 18 inches (averaged). Goodwin calculated an average hole volume of about 0.32 ft^3, or about 2 ½ gallons of material displaced.

Turbidity

Harvesting geoducks results in temporary, localized increases in turbidity levels. The level of turbidity depends on the type of substrate that harvest is occurring in. Water currents also play a role in turbidity, affecting the time for dispersal and distance of suspended material.

Heavier particles (sand) will settle faster than finer ones (silt or mud). Turbidity plumes could last for hours, or days and could result in short-term (hours to days) reduction in habitat quality for some benthic species, as well as smothering, or burying primary producers (diatoms, aquatic vegetation) and consumers (epibenthic organisms) as the material settles back to the bottom.

Short and Walton (1992) examined total suspended solids (TSS) in plumes generated by geoduck harvest, in the field and in modeled experiments. They found that at low current speeds, most material put into suspension settles within the harvest area.

Studies by Tarr (1977) of plumes down current from a hydraulic clam harvester found no significant effect on dissolved oxygen, organic and inorganic phosphates, suspended solids, or turbidity beyond 450 feet. The major effect noted was the suspension of fine material, which increased turbidity down-current 300 feet by an average of 1 mg/L above the background range of 8 to 25 mg/L. While research indicates that increased turbidity may increase mortality and decrease growth rates of bivalves (Table 4.2), the increases attributable to Washington's commercial geoduck harvest appear to be well below effect thresholds summarized in Table 4.2.

Table 4.2 - Impacts of increased turbidity on bivalves.

Species	Impact	Reference
Quahog clam (*Mercenaria mercenaria)* eggs	Increased abnormal development above 750 mg/L	Davis (1960)
Mercenaria mercenaria larvae	No effect on growth at 750 mg/L; increased growth below 750 mg/L	Davis (1960)
Mercenaria mercenaria juvenile	Growth reduced at 44 mg/L; no effect at 25 mg/L	Bricelj et al. (1984)
Eastern Oyster (*Crassostrea virginica)* eggs	25 percent mortality of eggs at 250 mg/L	Loosanoff and Davis (1963)
	Adverse effects at 188 mg/L	Davis and Hidu (1969)
Crassostrea virginica larvae	Decreased growth at levels above 705 mg/L	Loosanoff and Davis (1963)
Mediterranean mussel *(Mytilus galloprovincialis)* larvae	Increased growth up to 500 mg/L; decreased growth at high concentrations	Seaman et al. (1991)

Sediment Deposition

Sediment suspended by water jets is dispersed down-current in the vicinity of harvest activity and eventually settles back out of the water column in calm areas and may form a thin film on the seafloor. The fate of sediments disturbed by harvest will vary depending on the substrate composition of the particular harvest tract, and current direction and speed.

Short and Walton (1992) estimated that the average cumulative thickness of all grain sizes suspended during a normal commercial geoduck harvest settling on one acre would be 0.16 inches, while Goodwin (1978) estimated deposition for fines at 0.08 inches. By comparison, Brundage (1960) measured natural sedimentation deposition rates of .67 inches/year in the Nisqually River delta in south Puget Sound.

Short and Walton (1992) estimated that if all grain sizes put in suspension by commercial geoduck harvest were to settle on the harvested tract (a conservative scenario) the deposition would range from 7.9 to 8.83 kg/m^2/year. This is within the natural background range 2.6 to 12.0 kg/m^2/year for Puget Sound as a whole (Lavelle et al. 1986).

Short and Walton (1992) tracked and quantified suspended sediment down-current from geoduck harvest in the Nisqually Reach tract, off the Nisqually River delta. They also developed a numerical particle tracking model, calibrated with field data, to augment

observational data. Using the model, they assessed the transport and fate of suspended sediment under various conditions within the range of conditions typically encountered on commercial geoduck harvest tracts. Even when scaled upward to approximate the harvesting intensity that occurs on one area in a year, the cumulative thickness of material deposited was calculated to be 0.16 inches.

The average settled sediment thickness at different current speeds was found to be extremely small for the study simulations (25 holes dug in 20 minutes), measuring in thousandths of an inch. Long-term cumulative sedimentation effects scaled to typical annual harvest were also small. Their conclusion was that deposition of suspended material would be inconsequentially small, even when extrapolated over a year.

Short and Walton (1992) also demonstrated that even under worst case conditions of direct onshore transport , the resulting thickness of material deposited in the intertidal zone, per hour of harvesting, is extremely small (thousandths of an inch). They demonstrated that deposition of fine sediment on beaches is unlikely to occur because of the presence of wave energy. Short and Walton (1992) used their model to calculate the potential for sediment suspended by geoduck harvest to accumulate onshore. This model estimated that harvest of 75 geoducks 656 feet from shore could result in a maximum of 0.0004 cm of material accumulating on shore. Many beaches along Puget Sound are composed of sand or gravel, suggesting that typical wave and current conditions do not allow the deposition and retention of fines.

4-1.3 Summary

The transport and deposition of sediment put into suspension by harvest activities will have minimal impacts on the physical environment within the tract and adjacent areas. The amount of sediment resuspended by harvest activities is negligible and not expected to impact the covered species or their habitats. Substrate disturbance, subsequent sediment suspension and eventual deposition, and impacts to fauna on the tracts cause temporary, local (confined to the tract and immediate vicinity) effects. The effects are measurably small on the tract and nearly immeasurable further away. No significant effects on dissolved oxygen, organic and inorganic phosphates, suspended solids, or turbidity are expected.

EFFECTS OF GEODUCK REMOVAL

It has been suggested that geoducks act to filter suspended particulate matter from the water, providing a perceived benefit to local environmental conditions. In some coastal systems, dense bivalve populations exert a strong influence on suspended particulate matter including phytoplankton, zooplankton, and detritus by clearing particles from the surrounding water (Dame 1996). Transformation and translocation of matter by bivalves also appears to exert a controlling influence on nitrogen concentrations in some coastal regions (Dame et al. 1991) and can provide a means of retaining nutrients, while the removal of bivalves reduces the rate of nutrient cycling (Jordan and Valiela 1982). A strong indication that bivalve filter feeders are able to control suspended particulate matter in some coastal systems comes from documented ecosystem changes that occurred after large biomass variations in natural and cultured bivalve populations. Population explosions of introduced bivalve species in San Francisco Bay and dramatic reductions in oyster populations in Chesapeake Bay have also been implicated as the cause of large

changes in phytoplankton biomass and production experienced in these systems (Alpine and Cloern 1992; Newell 1988; Nichols 1985; Nichols et al. 1990; Ulanowicz and Tuttle 1992). However, a loss of biological filtering capacity due to the removal of geoducks from Puget Sound are localized and likely insignificant because of low harvest rates within a geographic area and the small proportion of the geoduck population that is actually harvested. As an example, geoduck filtration rates were estimated for DNR in a laboratory experiment in 2004 by Taylor Shellfish Farms of Shelton, Washington. Filtration rates under laboratory conditions ranged from 72 to 240 liters per day (20 to 63 gallons), per geoduck. Using these rough estimates, it was calculated that the geoducks harvested by the state in Hood Canal would filter only 0.4 percent of Hood Canal's waters each year (Washington Department of Natural Resources 2004).

4-1.4 Scope and Intensity of Effects

Presently, harvest activities and associated effects occur on a relatively small portion of the commercial tracts each year. For example, from 2001 – 2005 geoducks were harvested from individual tracts ranging in size from 14 to 459 acres (Table 3.2). The largest tract listed in the 2004 Geoduck Atlas is 1197 acres. Annually, based on 2001 – 2005 data, geoducks are harvested from a total of about 1732 – 2825 acres of commercial tracts, spread out across the five regions that currently have commercial tracts identified. This is between 5.8 and 9.4 percent of the total commercial tract acreage of about 30,000 acres. The actual area experiencing harvest activities is smaller than the sum of the tract acreages (See Section 3-2.5).

At the maximum acreage level proposed for this HCP, harvest would occur annually from tracts totaling 6000 acres spread across the five regions that currently have commercial tracts identified, and the San Juan management region. This is 20% of the total commercial tract acreage of about 30,000 acres. The actual area from which geoducks would be harvested would be smaller than the 6000 acres (See Section 3-2.5).

The number of boats participating in the State-administered portion of the geoduck fishery at one time ranges between eight and ten.

When DNR offers harvest quotas in the San Juan region, the total acres across which harvest occurs will increase because that region will be assigned a TAC. This is already included in the 6000 acre total tract acreage.

4-2 Impacts to Covered Species

Inadvertent and infrequent encounters between the covered species and geoduck harvest activities could temporarily disrupt normal feeding, roosting and other behaviors. This would occur locally, in the immediate vicinity of the harvest operations. Known sensitive habitats, primarily fish spawning habitats but also bird nesting sites, are avoided by harvest managers so that impacts from harvest activities are reduced or completely avoided.

There are predator-prey interactions between the covered species, and also between the covered species and other forage fish species. Habitat for forage fish species, especially spawning habitat, is generally closer to shore than nearshore boundaries of geoduck tracts. Known spawning areas are avoided so that impacts to forage fish are reduced or eliminated.

It should not be assumed that the described impacts could potentially occur from harvest on each and every tract. For example there are not eagle nests near every tract, nor are there herring spawning areas, or eelgrass beds near every tract.

Potential impacts to covered species are actively researched and assessed prior to harvest, to avoid and eliminate potential impacts.

4-2.1 Birds

Boat movement and anchored boats could temporarily alter movements of individual birds in the vicinity of harvest activities. Harvest activities occur in the vicinity of forage fish species use by the covered bird species, and forage fish habitat. Impacts to forage fish, should they cause a decrease in abundance, could affect the covered bird species.

BALD EAGLE

Geoduck harvest, which occurs year-round, may be coincident with bald eagle foraging and nesting periods. The presence and operation of boats could temporarily disrupt foraging by individual eagles, at the specific locations where harvest was occurring. Moving vessels could disrupt foraging activity and stationary boats could cause displacement of individual eagles. These effects would be temporary and limited to the area near the harvest tract. Because eagles are opportunistic feeders that prey on a variety of species, and obtain food in a number of ways (hunting live prey, scavenging, and pirating food) it is unlikely that inadvertent disturbance by harvest activities would have an impact on them.

Watson et al. (1995) investigated responses of bald eagles within nesting territories to geoduck harvest activities in Puget Sound in two separate years and found that nesting bald eagles showed little indication of disturbance from boats involved in the geoduck fishery. They concluded that harvest activities were unlikely to result in long-term adverse effects to eagle productivity, but could result in short-term changes in eagle behavior.

In the study areas, all nests were located less than 984 feet from the Sound. Because harvest is not allowed on weekends, Watson et al. (1995) were able to study eagle responses in the presence and absence of harvest activity. Other potential disturbances from recreational boating activity, pedestrian activity, aircraft activity, noise from other sources (construction, chainsaws, lawnmowers) and automobiles occurred in the study area as well but the authors surmised that comparisons of eagle behavior between non-harvest and harvest days reflected actual effects of geoduck harvest activities.

There was a slight trend of reduced foraging attempts by eagles on harvest days compared to non-harvest days but the difference was not significant. Eagles made about one less attempt to capture prey during 20 hours of observation time when geoduck harvest was occurring (Watson et al. 1995).

No correlation was found between foraging attempts and time of day on harvest days; foraging attempts were equitably distributed throughout the observation period on days when harvest was occurring.

Harvest activities did not appear to affect the spatial distribution of foraging attempts.

For all human activities identified in the study area, only 4 percent resulted in flushing of eagles and the geoduck harvest activity was an insignificant source of disturbance (1 of 34 flushes). The amount of time that boats were in transit from docks to harvest sites was small compared to the total time that boats were on the water and no eagles were seen responding to the moving boats.

Anchored harvest boats are most likely to change the behavior of nesting bald eagles when harvest occurs within core foraging areas, and during the most intense daily foraging period (before 10:00 am).

Harvest could potentially affect bald eagle forage fish species (see Sections 4-2.2 and 4-2.5 below) but this is not expected to cause reductions in overall prey abundance for bald eagle. Eagles eat a variety of prey types. Potential impacts to forage fish will be avoided and minimized.

Mechanisms are in place through the Environmental Review process and the delineation of tract boundaries to identify eagle nests and maintain distance from eagle nests near shores adjacent to tracts, reducing potential disturbance. Because of restrictions for other reasons, harvest boats will always be at least 200 yards (600 feet) from shore, so would be this distance or farther from any nearby eagle nest. Possible disturbance of eagles from harvest activity is limited to the area near the tract being harvested and is not spread across a large area.

CALIFORNIA BROWN PELICAN

Individual pelicans could be temporarily displaced from roosting and foraging areas should these overlap with geoduck harvest activities. This disturbance would be temporary and would only affect the occasional pelican, should it encounter harvest activities. Possible disturbance of pelicans is limited to the area near the tract being harvested and is not spread across a large area.

Harvest activities could potentially affect brown pelican forage fish species (see Section 4-2.2 and 4-2.5 below) but not to the extent that the abundance of forage fish would be reduced. Potential impacts to forage fish will be avoided and minimized.

MARBLED MURRELET

Individual murrelets could be temporarily displaced while foraging, should they overlap with geoduck harvest activities. This disturbance is expected to be temporary and only affect the occasional murrelet, should it encounter harvest activities. Possible disturbance of murrelets is limited to the area near the tract being harvested and not spread across a large area.

Harvest activities could potentially affect marbled murrelet forage fish species (see Sections 4-2.2 and 4-2.5 below) but not to the extent that the abundance of forage fish would be reduced. Potential impacts to forage fish will be avoided and minimized.

TUFTED PUFFIN

Individual puffins could be temporarily displaced while foraging, should they overlap with geoduck harvest activities. This disturbance is expected to be temporary and only affect the occasional puffin, should it encounter harvest activities. Possible disturbance of puffins is likely limited to the vicinity of two tracts near Protection Island, where a nesting colony exists.

Harvest activities on tracts in the vicinity of Protection Island could disturb nesting and foraging tufted puffins there. The 600-foot buffer around the island provides protection, and the closest harvestable geoduck tract is about 1320 feet (0.25 mile) offshore, with the shoreward harvest boundary for the tract set at –31 feet MLLW so disturbance of nesting birds is unlikely.

Mechanisms are in place through the established 600-foot buffer around Protection Island, and the Environmental Review process to identify puffin nesting colonies and maintain distance from them, reducing potential disturbance. Because nesting colony locations are known, they will be avoided.

Harvest activities could potentially affect tufted puffin forage fish species (see Sections 4-2.2 and 4-2.5 below) but not to the extent that the abundance of forage fish would be reduced. Potential impacts to forage fish will be avoided and minimized.

4-2.2 Fish

The covered fish species spend time as juveniles and adults in the nearshore and rely on this environment for food and cover, and spawning in the case of Pacific herring. Geoduck harvest activities occur in the vicinity of juvenile and adult fishes of all the covered fish species. Generally the fishes occupy nearshore waters and those waters shallower than the –18 foot shoreward boundary of geoduck tracts. This limits potential disturbance to fish from harvest activities. Generally, juveniles would be more vulnerable to effects from increased turbidity than migrating adults due to their dependence on nearshore environments.

Effects from harvest activities such as sediment suspension and turbidity that could potentially impact fish species would be temporary and localized, and would affect fish that moved into the vicinity of harvest activities. Possible disturbance of fish species is limited to the area near the tract being harvested and not spread across a large area.

Young fish generally occupy shallow areas where vegetation provides cover. Older juveniles and adults that could occur in deeper waters are more mobile and can avoid and move away from areas of increased turbidity. Should fish encounter harvest activities and associated suspended sediments they are not expected to be impacted because concentrations of suspended sediment are below levels that cause harm.

Fishes that live as adults in the open ocean are less likely to be disturbed by harvest activities because their distribution would only potentially overlap with harvest locations when they are migrating to or from the ocean.

The possibility of suspended material smothering prey and/or damaging eelgrass is reduced by the temporary, localized nature of harvest; use of selective harvest equipment;

the low levels of sediment suspended and deposited; and buffers between harvest locations and important nearshore habitats.

The potential for harvest activities to impact the foraging and migrating behavior, and foraging opportunities of the covered fish species is negligible due to the low levels of sedimentation (100 mg/L at the densest portion of the plume) generated by geoduck harvest, the relatively small areas harvested, and restrictions on harvest in the nearshore areas used by juvenile fishes. The potential for suspended sediment to affect the physiology of the fishes is likewise low.

Injury to gills can occur from increased levels of suspended sediment. Short and Walton (1992) measured total suspended solid levels immediately surrounding the geoduck dig hole at 100 mg/L above background levels; well below the levels that caused damage. Lake and Hinch (1999) found that TSS >40,000 mg/L elicited a stress response that is correlated to gill damage in coho salmon, with mortalities of 20 percent at TSS concentrations of 100,000 mg/L. TSS concentrations >4,000 mg/L resulted in erosion of gill filament tips from both angular and rounded sediment (Nightingale and Simenstad 2001). In laboratory experiments, sockeye smolts exposed to suspended sediment levels of 14,400 mg/L caused a decrease in body moisture compared to a control group. However, plasma chloride levels, which indicated a reduction in osmoregulatory capacity of the smolts, never reached acute stress levels. In laboratory experiments, Gregory (1988) concluded that elevated turbidity levels > 200 mg/L have a negative effect on juvenile Chinook foraging rates.

PACIFIC HERRING

Juvenile and adult herring that encountered geoduck harvest activities would likely move away from the area. Spawning adults and spawning habitat are avoided through seasonal harvest closures and minimum depth restrictions.

There are commercial geoduck tracts adjacent to, or coincident with, areas where Pacific herring spawn. Geoduck harvest could disrupt spawning behavior and impact spawning habitat and deposited eggs. These impacts are avoided by adjusting tract boundaries to avoid herring spawning areas, establishing harvest depth buffers in the vicinity of documented herring spawning habitat, and imposing timing restrictions to avoid geoduck harvest during spawning times. Critical herring spawning times and locations will be avoided for documented herring stocks.

The Geoduck Atlas identifies which tracts occur adjacent to herring spawning areas as well as specifying fishing restrictions during herring spawning times. In addition, herring spawning or holding areas noted in tract-specific Environmental Assessments will lead to additional harvest restrictions.

Commercial geoduck harvest in tracts adjacent to herring spawning areas is restricted to waters deeper than –35 feet MLLW during spawning season and –25 feet during the remainder of the year. This avoids the 0 to –10 foot depths where most herring spawning occurs.

Deposited herring eggs could potentially by impacted by sediment settling out from harvest operations, but the likelihood of this is very low, based on available sediment studies (see Section 4-1.2).

The low level of sediment disturbance and harvest restrictions to avoid herring spawning areas, and seasonal restrictions during spawning periods act to reduce potential impacts on herring.

COASTAL CUTTHROAT TROUT

Impacts to coastal cutthroat would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Potential interactions between this species and harvest activities are not likely because cutthroat prefer habitats not generally coincident with those in harvest tracts. Fish could avoid disturbing activities.

Cutthroat prey items include other fish species that are addressed here (salmon, sand lance, herring). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

BULL TROUT

Impacts to bull trout would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Potential interactions between this species and harvest activities are not likely because they generally inhabit areas closer to shore. Fish could avoid disturbing activities.

Bull trout prey items include other fish species that are addressed here (salmon, surf smelt, sand lance, herring). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

STEELHEAD TROUT

Impacts to steelhead would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Potential interactions between this species and harvest activities are not likely because of their limited use of nearshore environments. Fish could avoid disturbing activities.

Steelhead prey items include other fish species that are addressed here (sand lance). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

CHINOOK SALMON

Impacts to Chinook salmon would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Potential interactions between juveniles and harvest activities are not likely because they generally inhabit or emigrate in areas closer to shore. Fish could avoid disturbing activities.

Chinook salmon prey items include other fish species that are addressed here (surf smelt, sand lance, herring). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

Vegetated nearshore areas used by Chinook salmon are avoided during geoduck harvest and would not be affected.

CHUM SALMON

Impacts to chum salmon would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Potential interactions between juveniles and harvest activities are not likely because they generally inhabit or emigrate in areas closer to shore. Fish could avoid disturbing activities.

Salo et al. (1980) studied effects of suspended sediments on juvenile chum salmon from dredging at the U.S. Navy's Bangor facility in Hood Canal. About 224,000 cubic yards of bottom sediments were dredged. They found that suspended solids in the dredge area were not lethal and did not increase the incidence of disease. There was evidence of avoidance of suspended solids by outmigrating salmon. Juvenile chum are also considered turbidity tolerant compared to other fishes due to their reliance on nearshore habitat, which typically have high natural turbidity levels (Nightingale and Simenstad, 2001).

Chum salmon prey items include other fish species that are addressed here. Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

Vegetated nearshore areas used by chum salmon are avoided during geoduck harvest and would not be affected.

COHO SALMON

Impacts to coho salmon would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Fish could avoid disturbing activities.

Coho salmon prey items include other species that are addressed here (salmon species, surf smelt, sand lance, herring). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

Vegetated nearshore areas used by coho salmon are avoided during geoduck harvest and would not be affected.

PINK SALMON

Impacts to pink salmon would be in the form of disturbance if the fish encountered harvest activities. Disturbance would be localized, in the vicinity of harvest activities occurring on a given tract, and temporary. Fish could avoid disturbing activities.

Pink salmon prey items include other species that are addressed here (sand lance, herring). Impacts to these species are avoided and minimized and are not expected to occur at a level where their abundance is reduced.

Vegetated nearshore areas are avoided during geoduck harvest and would not be affected.

4-2.3 Marine Mammals

SOUTHERN RESIDENT ORCAS

Impacts are not expected to orcas because of the low likelihood for interaction between the species and harvest activities. Possible interaction with orcas is limited to the area near the tract being harvested. If orcas encountered harvest activities they would likely continue their activities.

Though the geoduck fishery is not specifically mentioned, it falls within the "Dive, hand/mechanical collection" fishery group in the NMFS final List of Fisheries for 2005, as required by the Marine Mammal Protection Act (FR Vol. 71 No. 162. 2006). This fishery group has a Category III designation under the Marine Mammal Authorization Program for Commercial Fisheries. Category III fisheries are those that have no more than a "remote" likelihood of a take of marine mammals, defined as "highly unlikely that any marine mammal will be incidentally taken by a randomly selected vessel in the fishery in a 20-day period" (50 CFR 229.3(b)(3)).

Harvest activities could potentially affect the prey base of southern resident orcas, which is generally accepted to be mostly salmon but could included other fish species. Effects to orca forage species would be those described above for the salmon species or below for forage fish. Geoduck harvest is not expected to impact these forage species to the point where it would cause a decrease in the orca prey base because of avoidance and minimization measures for the forage species and their habitat.

Sounds emanating from engines and air compressors on geoduck harvest vessels may impair the ability of marine mammals to communicate and echolocate. Harvest vessels can produce sound at levels comparable to slow moving vessels. Slow moving vessels are likely to be audible to orcas at distances of 0.6 miles (1 km), cause behavioral reactions at distances of 164 feet (50 m), and result in temporary hearing loss at distances of 65 feet (20 m) from the vessels (Richardson et al. 1995). Temporary hearing loss and noticeable behavioral changes are unlikely to result from harvest support activities because the vessels are stationary with engines idling during harvest.

Orcas have been observed during harvest operations. In order to comply with the Marine Mammal Protection Act, DNR has implemented a "diver recall" system capable of getting all divers out of the water when marine mammals are sighted on the tract being harvested. Implementing the "diver recall" system will lessen the potential for interactions between people and orcas by reducing noise (boat engines are shut off) and having divers out of the water.

4-2.4 Invertebrates

PINTO ABALONE

No impacts will occur to pinto abalone or its habitat because it occupies rocky substrate that would not be targeted for geoduck harvest.

OLYMPIA OYSTER

Temporary degradation of water quality in the form of suspended sediment could occur in the vicinity of oysters. Effects from geoduck harvest activities are not expected to impact Olympia oysters because of the limited, localized areas across which harvest occurs. Although Olympia oysters may theoretically exist at depths where commercial geoduck harvest occurs in Puget Sound, it likely to be a rare occurrence based on current information and observations.

4-2.5 Forage Species Impacts

A number of nearshore species that occur in the vicinity of geoduck harvest areas are prey resources for the covered species. This includes surf smelt, sand lance, Pacific herring, salmon, and certain invertebrates. Pacific herring and salmon are discussed separately above. Effects from geoduck harvest would be those described above and will not occur at a level where the abundance of these species would be reduced. Impacts to forage species are reduced because harvest activities do not overlap spatially with spawning habitats. Generally sand lance and surf smelt spawn on beaches and high in the intertidal zone, not within subtidal areas where harvest activities occur.

PACIFIC SAND LANCE

Impacts to sand lance would be in the form of disturbance when adult fish are encountered during harvest activities or if harvesters inadvertently removed buried fish from the substrate. Disturbance would be localized, in and around the area of harvest activities occurring on a given tract. Spawning areas and areas used for burrowing by sand lance are closer to shore than geoduck harvest tracts, and are often in areas near freshwater inputs, so do not generally overlap with harvest tracts. In the water column, sand lance can move away from disturbances created by harvest activities. Buried sand lance would not move away until disturbed by digging where they were buried, or near to locations where they were buried. Important nearshore areas used by sand lance are avoided during geoduck harvest and would not be affected.

WDFW biologists note the occurrence of adult and juvenile sand lance seen during the tract surveys. Sand lance can apparently detect the presence of divers, as they have been observed leaving the substrate and swimming away when divers approach (pers. comm. WDFW 2005). In 355 surveyed transects from 2001-2006 in the Strait of Juan de Fuca region, sand lance were noted in 9 transects; in 129 surveyed transects in the North Sound region, they were noted in 2 transects. Sand lance were not observed in the other regions during surveys (Appendix C, note caveats to this data).

Turbidity and deposited sediment could potentially impact sand lance larvae and eggs. This is reduced by the localized nature of the harvest, through the use of the least disruptive harvest method available resulting in a small amount of sediment suspended

and redeposited, and by the distance between harvest activities and shallower spawning habitats. The amount of sediment suspended and deposited is insignificant and not expected to impact larvae and eggs.

SURF SMELT

Impacts to surf smelt spawning habitat would not occur because they spawn in higher intertidal areas and beaches that do not overlap with geoduck harvest areas. In the open water, mobile juveniles and adults could avoid disturbances from harvest activities.

Turbidity and deposited sediment could potentially impact larvae and eggs. This is reduced by the localized nature of the harvest, through the use of the least disruptive harvest method available resulting in a small amount of sediment suspended and redeposited, and by the distance between harvest activities and shallower habitats. The amount of sediment suspended and deposited is insignificant and not expected to impact larvae and eggs.

4-3 Cumulative Impacts

There are sixteen treaty tribes that also harvest geoducks. Each Tribe is responsible for managing its own geoduck fishery including the fishery's schedule, monitoring, and enforcement. Through annual state-Tribal geoduck harvest plans, the Tribes have obligated themselves to set and follow environmentally based provisions to conserve elements of the geoduck's natural environment. For instance, the Tribes have agreed to impose a two-foot vertical buffer around eelgrass to protect this habitat. The participating Tribes also consented to comply with the Department of Health's restrictions imposed for public health safety. However, because the Tribes are sovereign entities, they are not bound by existing Federal, state, city or county laws in the exercise of their treaty fishing rights.

Geoduck tracts proposed for harvest are jointly selected by the treaty tribes, WDFW, and DNR. Depending on the particular management agreement negotiated between the State and the tribes that harvest in a management region, some tracts may be fished by both state and tribal operations during the year. In other cases, harvest occurs on separate tracts. The treaty tribes harvest an amount of geoducks consistent with half of the TAC annually.

The tribal harvest cumulatively contributes to the effects described above because it occurs in the same way, but sometimes in different areas.

5. Conservation Strategy

DNR's conservation strategy consists of integrating specific avoidance and minimization measures into management of the geoduck fishery. Conservation measures will be carried out through DNR's administration of the geoduck wild stock fishery as specified in the objectives and strategies below and as described in Chapter 3.

5-1 Goal for Conservation Purposes

DNR's goal is to avoid direct impacts to covered species, and minimize and avoid possible effects to the habitat for covered species. To achieve this goal, DNR has developed the following objectives and strategies.

5-1.1 Objectives and Strategies

1. Avoid disturbing nesting bald eagles and reduce or eliminate the possibility of disturbing foraging bald eagles during nesting periods.

Strategies:

a) DNR will adjust harvesting times and shoreward tract boundaries as needed when harvest is proposed in the vicinity of bald eagle nests. Setback distances from nests will vary on a site-specific basis but harvest boats will always be at least 600 feet from shorelines.

b) Individual tracts will be assessed to determine the need to adjust the tract boundary or timing of harvest in relation to eagle nests and nesting periods. DNR will obtain information from WDFW staff to determine locations of eagle nests, the need for setbacks from eagle nests, setback distances, and adjustments to harvest timing.

2. Avoid disturbing tufted puffins at nesting locations and reduce or eliminate the possibility of disturbing foraging tufted puffins during nesting periods.

Strategies:

a) DNR will adjust the shoreward tract boundary when harvest is proposed in the vicinity of puffin nesting colonies. Established setbacks for National Bird Sanctuaries such as those on Protection Island will be

recognized and no harvest activity will occur within these setback areas. Harvest boats will always be at least 600 feet from shorelines.

b) Prior to harvesting from tracts in the vicinity of National Wildlife Refuges, National Bird Sanctuaries (e.g., Protection Island and Smith Island), or other discovered puffin nesting colonies, DNR will coordinate with appropriate USFWS staff to verify setback distances and address other concerns. This will occur each time these tracts are harvested so that new information and science as to nesting locations can be considered in establishing setbacks prior to harvest activity on the tract.

3. Reduce or eliminate the possibility of disturbing Southern Resident orcas.

Strategy:

a) DNR will avoid potential interactions between orcas, people, and harvest activities by invoking the "diver recall" system to get divers out of the water when orcas are sighted near the tract being harvested. DNR divers and harvesters will remain out of the water, and vessel engines will be turned off and will remain off until all orcas have left the area.

4. Minimize possible disruptions to the covered species from noise related to geoduck harvest.

Strategy:

a) DNR will reduce the likelihood of disturbing species vulnerable to surface noise by limiting surface noise levels to 50 decibels at a distance of 200 yards (600 feet) from each vessel.

5. Protect the nearshore prey base of species covered in this HCP. Protect nearshore habitats that support forage fish, thereby protecting this source of food for the covered fish species, bird species, and orcas.

Strategy:

a) DNR will protect eelgrass beds adjacent to geoduck harvest tracts by establishing a 2-foot vertical or 180-foot horizontal (on very gradual slopes) buffer between geoduck tracts and the deepest occurrence of eelgrass.

b) DNR will protect herring spawning habitat and macroalgae habitat that may provide cover for other fish, and avoid disturbing herring during spawning times by establishing seasonal shoreward harvest boundaries. On tracts adjacent to documented herring spawning areas (eelgrass, macroalgae, or other substrate), the shoreward harvest boundary will be restricted to waters deeper than –35 feet MLLW during spawning season and deeper than –25 feet during the remainder of the year.

c) Within one year after obtaining the Incidental Take Permits, DNR will contact appropriate WDFW and Tribal biologists and arrange a meeting for the purposes of assessing and reaffirming that the above buffers are adequate to protect nearshore environments, eelgrass, and herring spawning areas. Results and recommendations from the meeting will be reported to the Services at annual meetings.

6. Minimize impacts to covered species caused by disturbances to benthic sediment and benthic flora and fauna, and caused by turbidity.

Strategy:

a) DNR will limit the area impacted by harvest activities by limiting harvest to designated tracts and enforcing the conditions stated in harvesting agreements for the tracts.

b) DNR will protect nearshore habitats by locating the closest shoreward harvest boundary at or deeper than the –18 foot MLLW water depth contour on all tracts.

c) DNR will restrict the harvest method to the removal of individual geoducks using hand-operated water jets as stipulated in WAC 220-52-019(2a).

d) DNR will limit annual harvest to the State's half of a TAC of 2.7 percent of the commercial biomass in each region, which is 2 to 3 million pounds. The total tract area from which annual harvest occurs will be no more than 6000 acres.

7. Protect the covered species from direct mortality associated with toxic spills; protect habitats from habitat damage associated with toxic spills.

Strategy:

a) DNR will employ specific measures (see Section 5-2.5 below) to reduce the risk of a spill, and to lessen the effects of a spill, should one occur.

5-2 Mechanisms to Meet the Objectives and Strategies

Washington DNR makes the following commitments in order to achieve the conservation goal, objectives, and strategies stated in Section 5-1 above. The mechanisms to implement the objectives and strategies exist within DNR's geoduck fishery management structure. This section attempts to display the strategies from the above section in the context of how the fishery program is managed.

5-2.1 Administration

All strategies from Section 5-1 will be met to by administering the Geoduck Fishery HCP. Washington DNR will continue to use contractual harvesting agreements (described in Section 3-1.2, example at Appendix B) to conduct the fishery within the legal requirements and to stipulate harvest parameters that implement the HCP.

Washington DNR has the ability to condition harvesting agreements on a site-specific basis for each harvest tract. Some harvest parameters are stipulated in Washington law and rule.

SITE-SPECIFIC ENVIRONMENTAL ASSESSMENTS

DNR will avoid and minimize potential harvest-related effects by employing protective measures when establishing tract boundaries and during harvest activities. Tract boundaries and protective measures are determined through tract-specific Environmental Assessments (See Section 3-1.2 and example at Appendix E).

DNR will continue to provide funds for biennial interagency agreements with WDFW (described in Section 3-1.2, example at Appendix D) that require pre- and post-harvest tract surveys and Environmental Assessments of tracts to be performed by WDFW in support of management of the geoduck fishery. This allows species and habitat concerns to be identified and documented on a tract-specific basis so that the objectives and strategies in Section 5-1 can be met.

PRE- AND POST HARVEST SURVEYS

DNR will continue to provide funds for biennial interagency agreements with WDFW (described in Section 3-1.2, example at Appendix D) that require pre- and post-harvest tract surveys to be performed by WDFW in support of management of the geoduck fishery. This allows collection of data on the most common and obvious animals and plants encountered along the surveyed transects before a tract is harvested and after the tract has been fished down.

5-2.2 Harvest Levels

Strategy 6e will be met by managing harvest levels. DNR will limit effects on the substrate, benthic organisms, and local water quality (turbidity) to the areas where harvest occurs on discrete tracts, and will limit the potential for impacts to covered species by maintaining harvest within certain levels.

DNR will auction harvest quotas within a range consistent with past harvest levels and within the State's half of the calculated TAC of 2.7 percent of commercial biomass in each management region. A calculated sustainable yield will dictate the specific amount (biomass) of geoducks to be offered for harvest. Annual harvested biomass will be in the range of 2-3 million pounds. The sum of the tract area in acres from which harvest occurs will likely be similar to that shown in Table 3.2, but will not exceed 6000 in any year.

5-2.3 Harvest Methods

Strategy 6d will be met by enforcing legal harvest methods. DNR will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum by restricting the harvest method to the removal of individual geoducks using hand-operated water jets as stipulated in WAC 220-52-019(2a). This selective harvest method creates the lowest levels of disturbance for this type of harvest (commercial, benthic, bivalves).

5-2.4 Harvest Activity Restrictions

All strategies, with the exception of 7a will be addressed through site-specific restrictions appropriate for a specific tract. The following general operating measures apply to all tracts. DNR will incorporate these into the harvest management of individual tracts. These measures will vary depending on the nature and situation of each tract and restrictions will be established based on tract-specific surveys documented in Environmental Assessments performed by WDFW under contract with DNR (See example at Appendix D and E). Harvest restrictions will be implemented by establishing tract boundaries and adding appropriate language to harvesting agreements. These restrictions include:

GENERAL OPERATING MEASURES

DNR will minimize the area impacted by harvest activities by permitting harvest only from tracts designated through contract by DNR.

DNR will minimize the area impacted by harvest activities by clearly marking tracts with easily identifiable stakes and/or buoys, and recording latitude and longitude positions on all markers.

TRACT BOUNDARY RESTRICTIONS

Nearshore buffers – DNR will protect nearshore habitats from geoduck harvest activities by locating the closest shoreward harvest boundary at or deeper than the –18 foot MLLW water depth contour. This protects nearshore habitats where younger juvenile salmonids and forage species are generally found and where forage fish species spawn. It also prevents disturbance of migrating adult salmonids.

Eelgrass buffers – DNR will avoid and protect eelgrass by establishing a 2-foot vertical or 180-foot horizontal (on very gradual slopes) buffer between geoduck tracts adjacent to eelgrass beds and the deepest occurrence of eelgrass.

This will protect habitat used by the covered fish species for refuge, and will protect habitat used for spawning and refuge by forage fish species important as prey to the covered species.

Herring spawning area buffer – DNR will protect herring spawning habitat and macroalgae habitat that may provide cover for other fish, and avoid disturbing herring during spawning times by establishing shoreward harvest boundaries. On tracts adjacent to documented herring spawning areas (eelgrass, macroalgae, or other substrate), the shoreward harvest boundary will be restricted to waters deeper than

–35 feet MLLW during spawning season and deeper than –25 feet during the remainder of the year.

Within one year after obtaining the Incidental Take Permits, DNR will contact appropriate WDFW and Tribal biologists and arrange a meeting for the purposes of assessing and reaffirming that the above buffers are adequate to protect nearshore environments, eelgrass, and herring spawning areas.

OTHER RESTRICTIONS

Eagle nesting restrictions – DNR will avoid nesting eagles and reduce the possibility of disturbing nesting and foraging eagles by adjusting harvesting times and tract boundary setbacks, if needed, in the vicinity of eagle nests.

Setback distances from nests will vary on a site-specific basis but harvest boats will always be at least 600 feet from shore.

Individual tracts will be assessed to determine the need to adjust the tract boundary or timing of harvest in relation to eagle nests and nesting periods. DNR will obtain information from WDFW staff to determine the need for setbacks for eagle nests, setback distances, and adjustments to harvest timing.

Puffin nesting area restrictions – DNR will reduce the possibility of disturbing nesting and foraging tufted puffins by assessing the need to adjust the shoreward tract boundary to avoid disturbing birds at nesting colonies. Established setbacks for National Bird Sanctuaries such as those on Protection Island and other nesting locations will be recognized and no harvest activity will occur within these setback areas. Harvest boats will always be at least 600 feet from shore.

When performing Environmental Assessments for tracts in the vicinity of National Wildlife Refuges or National Bird Sanctuaries, or other areas that may be used for nesting by tufted puffins (e.g., Protection Island and Smith Island), DNR will coordinate with appropriate USFWS staff to verify setback distances and address other concerns. This will occur each time these tracts are harvested so that new information and science as to nesting locations can be considered in establishing setbacks.

Diver recall system - DNR will avoid potential interactions between orcas, people, and harvest activities by invoking the “diver recall” system to get divers out of the water when orcas are sighted near the tract being harvested. DNR divers and harvesters will remain out of the water, and vessel engines will be turned off and will remain off until all orcas have left the area.

Noise restrictions – DNR will reduce the likelihood of disturbing species vulnerable to surface noise disruptions by limiting surface noise levels to 50 decibels at a distance of 200 yards (600 feet) from each vessel.

5-2.5 Fuel Spill Risk Management

Strategy 7a will be met by employing the following measures to reduce the risk of a spill, and to lessen the effects of a spill, should one occur:

- Fuel spills and similar risks will be managed by DNR compliance staff in cooperation with harvesters.
- Harvest vessels in danger of capsizing, or with obvious leaks of toxic or hazardous materials will be required to stay out of the harvest area and return to the docks for necessary repairs before they can return to the harvest tract.
- The harvesting agreement will require purchasers and their subcontractors to comply with all Federal, state, and local laws and regulations concerning the use and disposal of hazardous, toxic or harmful substances.
- Harvesters will be required to notify DNR of any release of hazardous, toxic or harmful substances.
- Harvest vessels will carry pollution liability insurance to provide funds in the event of a spill.
- A Vessel Spill Contingency Plan will provide guidance to DNR compliance staff in the event of a spill and instruct compliance staff to immediately report observed oil sheens or slicks to Washington State Department of Ecology and the United States Coast Guard.

5-2.6 Harvest Compliance

Washington DNR will provide assurance that harvest occurs in accordance with all protective and avoidance measures in the HCP by having compliance staff aboard vessels on harvest tracts each day that commercial geoduck harvest occurs. Compliance staff will maintain direct oversight of the fishery, and perform enforcement activities as described in Section 3-4. A DNR enforcement vessel will be on the tract or within visual distance of the tract daily (except for emergency and operational requirements). Enforcement staff will ensure that WDFW laws and regulations, DNR contract conditions, and the conservation measures in this HCP are followed. Results of this compliance monitoring will be reported to the Services at annual meetings (See Section 8-1).

5-3 Covered Species

5-3.1 Birds

BALD EAGLES

The assessment of tracts on a site-specific basis as to their location in relation to nesting eagles will allow avoidance and minimization measures to be incorporated into harvest management of the tract.

On tracts near eagle nests, disturbance of nesting and foraging eagles is reduced by maintaining distances of at least 600 feet between harvest boats and shorelines.

Harvesting on one or two tracts at a time reduces the likelihood of disturbing eagles. Only those in the vicinity of the tract being harvested would potentially be disturbed.

Potential disturbance of eagles due to noise from harvest vessels is minimized by the established noise restrictions and tract boundary setbacks from eagle nests.

Implementation of measures to avoid and minimize effects to eagles is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (see Sections 5-3.2 and 5-3.5 below). These will reduce potential impacts to eagles resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

CALIFORNIA BROWN PELICAN

Harvesting on one or two tracts at a time reduces the likelihood of disturbing pelicans. Only those in the vicinity of the tract being harvested would potentially be disturbed.

Potential disturbance of pelicans due to noise from harvest vessels is minimized by the established noise restrictions.

Implementation of the above measures to avoid and minimize effects to pelicans is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (see Sections 5-3.2 and 5-3.5 below). These will reduce potential impacts to pelicans resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

MARBLED MURRELET

Harvesting on one or two tracts at a time reduces the likelihood of disturbing murrelets. Only those in the vicinity of the tract being harvested would potentially be disturbed.

Potential disturbance of murrelets due to noise from harvest vessels is minimized by the established noise restrictions.

Implementation of the above measures to avoid and minimize effects to murrelets is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (see Sections 5-3.2 and 5-3.5 below). These will reduce potential impacts to murrelets resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

TUFTED PUFFIN

The assessment of tracts on a site-specific basis as to their location in relation to puffin nesting colonies will allow avoidance and minimization measures to be incorporated into harvest management of the tract. The occurrence of tufted puffins nesting colonies will be

noted when Environmental Assessments are prepared for harvest tracts. Presently, only two existing harvest tracts are in the vicinity of one known nesting colony but other colonies could be discovered.

Disturbance of nesting and foraging tufted puffins is avoided by maintaining distances of at least 600 feet between harvest boats and shorelines and following setback requirements of bird sanctuaries.

Harvesting on one or two tracts at a time reduces the likelihood of disturbing puffins. Only those in the vicinity of the tract being harvested would potentially be disturbed.

Potential disturbance of puffins due to noise from harvest vessels is minimized by the established noise restrictions.

Implementation of measures to avoid and minimize effects to tufted puffins is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (see Sections 5-3.2 and 5-3.5 below). These will reduce potential impacts to puffins resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

5-3.2 Fish

PACIFIC HERRING

The assessment of tracts on a site-specific basis as to their location in relation to herring spawning areas will allow avoidance and minimization measures to be incorporated into harvest management of the tract.

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of herring. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated fauna, and keep turbidity to a minimum. This will reduce associated impacts to herring in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by herring for spawning and rearing. This habitat includes eelgrass, macroalgae, and other substrate.

Buffers around eelgrass and other herring spawning vegetation protect them from disturbance. Deeper water restrictions during spawning times (–35 feet) avoids disturbing herring during spawning times. Buffers of – 25 feet MLLW protect potential herring spawning habitat during other times of the year.

Implementation of measures to avoid and minimize effects to herring is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

COASTAL CUTTHROAT TROUT

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of cutthroat trout. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated fauna, and keep turbidity to a minimum. This will reduce associated impacts to coastal cutthroat in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protects shallow nearshore habitats used by coastal cutthroat trout for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources for cutthroat trout.

Implementation of measures to avoid and minimize effects to coastal cutthroat is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to coastal cutthroat resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

BULL TROUT

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of bull trout. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to bull trout in the vicinity of the tract.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by bull trout for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources for bull trout.

Implementation of measures to avoid and minimize effects to bull trout is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to bull trout resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

STEELHEAD TROUT

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of steelhead trout. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to steelhead trout in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats potentially used by steelhead trout for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources for steelhead.

Implementation of measures to avoid and minimize effects to steelhead is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to steelhead resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

CHINOOK SALMON

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of Chinook salmon. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to Chinook salmon in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by Chinook salmon for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Implementation of measures to avoid and minimize effects to Chinook salmon is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to Chinook salmon resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

CHUM SALMON

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of chum salmon. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to chum salmon in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by chum salmon for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Implementation of measures to avoid and minimize effects to chum salmon is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to chum resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

COHO SALMON

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of coho salmon. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to coho salmon in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by coho salmon for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Implementation of measures to avoid and minimize effects to coho salmon is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to coho salmon resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

PINK SALMON

Harvesting on one or two tracts at a time reduces the likelihood of disturbing a large number of pink salmon. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to pink salmon in the vicinity.

Shoreward tract boundaries along the –18 foot MLLW depth contour protect shallow nearshore habitats used by pink salmon for foraging and rearing. This habitat includes eelgrass, macroalgae, and other vegetation.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Implementation of measures to avoid and minimize effects to pink salmon is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

Other measures address potential effects to forage fish species (below). These will reduce potential impacts to pink salmon resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

5-3.3 Marine Mammals

SOUTHERN RESIDENT ORCAS

Potential interactions between orcas and harvest activities will be avoided by having divers out of the water and boat engines shut off when orcas are present.

Other measures address potential effects to forage fish species, including salmon. These measures will reduce potential impacts to orcas resulting from reductions in their prey base because the abundance of forage species will not be reduced by geoduck harvest activities.

5-3.4 Invertebrates

PINTO ABALONE

Because the rocky habitat used by pinto abalone does not overlap with that used by geoduck, no specific conservation measures are proposed.

OLYMPIA OYSTER

Geoduck harvest levels, locations, and methods reduce the potential for effects to Olympia oysters.

5-3.5 Forage Fish

PACIFIC HERRING (discussed above)

SALMON SPECIES (discussed above)

PACIFIC SAND LANCE

Shoreward tract boundaries along the –18 foot MLLW depth contour protect intertidal habitats used by sand lance, and spawning areas. This habitat includes eelgrass, macroalgae, other vegetation and beaches.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Harvesting on one or two tracts at a time reduces the number of sand lance potentially disturbed. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using selective, hand-operated water jets will minimize disturbance to buried sand lance and the substrate and associated flora and fauna. Turbidity is also kept to a minimum. This will reduce impacts to sand lance and their habitat in the harvest vicinity.

Implementation of measures to avoid and minimize effects to sand lance is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

SURF SMELT

Shoreward tract boundaries along the –18 foot MLLW depth contour protect intertidal habitats used by surf smelt, and spawning areas. This habitat includes eelgrass, macroalgae, other vegetation and beaches.

Buffers around eelgrass and other vegetation protect these potential cover and food sources.

Harvesting on one or two tracts at a time reduces the number of surf smelt potentially disturbed. Only those in the vicinity of the tract being harvested would potentially be disturbed.

The removal of individual geoducks using selective, hand-operated water jets will minimize disturbance to the substrate and associated flora and fauna, and keep turbidity to a minimum. This will reduce associated impacts to surf smelt in the vicinity.

Implementation of measures to avoid and minimize effects to surf smelt lance is assured through the daily presence of compliance staff on the tract monitoring harvest activities.

5-4 Measures to Mitigate Unavoidable Impacts

The effects of DNR's commercial geoduck harvest are reduced through the above avoidance and minimization measures. Below are additional environmentally beneficial activities that are able to occur through revenue generated by the geoduck fishery:

- Cleanup and restoration of contaminated sediment in Puget Sound
- Inventory of nearshore aquatic habitat in Puget Sound
- Control of invasive *Spartina*
- Salmon enhancement projects
- WDFW and DNR aquatic enforcement work other than that related to the geoduck fishery
- Grants to local governments for the purchase, conservation and restoration of aquatic lands for public access and habitat restoration
- Establishing aquatic reserves

- Creating a programmatic HCP for state-owned aquatic lands

The money generated from the sale of geoduck harvest rights is split equally between two accounts— the Resource Management Cost Account-Aquatics (RMCA-Aquatics) and the Aquatic Lands Enhancement Account (ALEA). The RMCA-Aquatics account is used to fund DNR's management of state-owned aquatic lands, including management of the commercial geoduck fishery (See Chapter 6). Money from the ALEA account is used by a number of state agencies to fund management and protection of state aquatic resources.

Average geoduck revenue is around $6 million annually. The 2003-2005 Biennium breakdown of the distribution of funds was:

WA Department of Natural Resources 58%:

Geoduck fishery management, enforcement and research; aquatic land management; *Spartina* and invasive species control

WA Department of Fish and Wildlife 13%:

Geoduck fishery management, enforcement and research; salmon recovery; shellfish enhancement projects

WA State Interagency Committee for Outdoor Recreation 24%:

ALEA Public Access and habitat restoration grants (state, tribal and local governments); habitat acquisition and public access projects

WA Department of Agriculture 4%:

Spartina and invasive species control

WA State Parks 1%:

Boating safety

5-5 Monitoring

5-5.1 Compliance Monitoring

Monitoring the implementation of the requirements of this HCP is assured because DNR compliance staff will be on site each day that harvest is occurring, monitoring harvest activities. Avoidance and minimization measures for a particular tract that have been incorporated through tract boundary delineation and through specific harvest stipulations will be monitored for compliance. Daily monitoring and compliance enforcement will be performed by DNR compliance staff as described in Section 3-4.

Commercial tracts selected for harvest will be concentrated in a single geographic area to facilitate fishery enforcement. DNR's commercial dive team will be present on the tracts undergoing harvest each day that geoduck harvest operations are being conducted, and at

least one enforcement officer will be present onboard the compliance vessel. They will perform a number of tasks which include:

- setting and checking tract boundaries and marker buoys;
- identifying and documenting the dive harvest vessels and onboard harvest divers and tenders;
- documenting the vessel harvest location with GPS coordinates;
- collecting weekly samples of geoduck for testing by the Dept. of Health to ensure the product is safe for human consumption and assisting the Dept.of Health in routinely scheduled water sampling activities;
- conducting random vessel inspections to ensure no unreported catch is onboard and to assess diving safety and vessel safety conditions including any potential discharges of hazardous materials such as fuel or hydraulic fluids;
- performing investigative dives and video camera drops to monitor harvest activity and ensure sound environmental practices are being followed, ensure harvest is within tract boundaries, and verify that no unreported harvest mortality is occurring;
- authenticating weigh-out of harvested geoduck at the end of each day;
- monitoring noise levels by using a sound meter and taking sound readings at 200 yards from vessels, and monitoring harvest vessel distances from shore using an electronic distance measuring device
- identifying and removing environmental hazards such as derelict fishing nets or other fishing gear that may be present on a tract and constitute a threat to divers and marine fauna;
- utilizing a diver recall system and engine-off policy for emergency situations and marine mammal presence/protection;
- operating onboard communications systems with the shore and responding to questions or concerns from the public related to geoduck harvest activities; and,
- working cooperatively with WDFW enforcement to investigate reports of illegal harvest and WDFW biologists to collect information for research and fishery management purposes.

Vessel inspections, underwater monitoring and noise monitoring will occur as described in Section 3-4.

5-5.2 Eelgrass Surveys

DNR will contract with WDFW for eelgrass surveys through interagency agreements (See Section 3-1.2 and example at Appendix D). These surveys will be done as part of pre-fishing surveys. The entire shoreward boundary will be examined in the vicinity of the –16-foot (MLLW) water depth contour.

If eelgrass is discovered, surveyors will define the deepest seaward extension of eelgrass. The shoreward boundary of the harvest tract will then be established two vertical feet deeper than the deepest and most seaward occurrence of rooted eelgrass, or 180 horizontal feet on very gradual slopes.

5-5.3 Geoduck Resource Surveys

DNR will contract with WDFW for geoduck resource surveys through interagency agreements (Section 3-1.2 and example at Appendix D). These pre-fishing surveys will establish belt transects and will systematically collect data on the tract area between the –18 to –70 foot (MLLW) water depth contour.

Data collected will include geoduck counts, water depth, GPS position, substrate types, and associated macroscopic flora and fauna (Example of flora and fauna data at Appendix C).

5-5.4 Bald Eagles

While on the water during harvest times, DNR compliance staff will note the presence of bald eagle nests within site distance of the tract being harvested. They will note if the nest is occupied and if eagles appear to leave the nest in response to harvest activities.

5-5.5 Tufted Puffins

While on the water during harvest times on tracts offshore of puffin nesting areas, DNR compliance staff will note any occurrences of tufted puffins. They will note if the birds appear to change their behavior in response to harvest activities.

5-5.6 Other Covered Species

While on the water during harvest times DNR compliance staff will note the presence of other species covered in this HCP.

5-5.7 Reporting

DNR will submit reports on the above monitoring items to the Services at yearly meetings (see Section 8.1)

6. Funding

6-1 Sources of Funding and Plan Costs

DNR commits to funding the proposed HCP conservation strategy. The source of funds to implement this HCP will come from revenue generated by the commercial geoduck fishery that is appropriated and allotted to the geoduck fishery program from the RMCA-Aquatics account.

The commercial geoduck fishery generates revenue through the public auction of harvest quotas. The amount fluctuates, but is in the range of $6-10 million annually. Beyond funding the management of the fishery, this revenue pays for other aspects of the management and protection of state-owned aquatic lands and resources. Half the revenue goes to programs and projects paid for by the Aquatic Lands Enhancement Account (ALEA) (see Section 5-4). The other half goes into the RMCA-Aquatics account.

The geoduck fishery has been able to generate revenue to support the management of the fishery, scientific studies related to geoduck harvest, and provide funds for other programs and activities. The annual amount of revenue dedicated to management of the geoduck fishery fluctuates, but in recent years has been between $850,000 and $1.2 million (Table 6.1). Funding of the HCP is assured because the conservation measures will be integrated into the fishery through existing management mechanisms, and essentially already are.

Table 6.1. Amount budgeted for management of the geoduck wild stock fishery.

Biennium	Fiscal Year *	Annual Amount
2001-2003	2002	$ 846,260
	2003	870,600
2003-2005	2004	1,080,500
	2005	1,107,100
2005-2007	2006	1,160,700
	2007	1,193,100

* Fiscal years for Washington State government begin on July 1 and end on June 30. For example, FY 2006 runs July 1, 2005 through June 30, 2006.

Implementation of this HCP and its Conservation Objectives and Strategies (Section 5-1) will be funded through the annual RMCA-Aquatics allotment to DNR for management of the geoduck fishery program. No additional funds are anticipated to be needed to implement the HCP because mechanisms are in place within the existing management structure to implement the plan. Specific costs of implementing the objectives and strategies in the HCP cannot be separated from the costs of managing the geoduck fishery.

ADMINISTRATION OF THE FISHERY PROGRAM

Administering the program includes holding auctions for harvest quotas at a level consistent with that described in Section 5-2.2. It includes establishing contractual harvest agreements with purchasers that incorporate necessary restrictions to meet HCP requirements.

BIENNIAL INTERAGENCY AGREEMENTS WITH WDFW.

These agreements are described in Sections 3-1.2, 5-2.1 and Appendix D. Through these agreements, tract-specific Environmental Assessments, eelgrass surveys and tract resource inventories will be carried out by WDFW through funding from DNR.

DNR will fund the interagency agreements that require Environmental Assessments, eelgrass surveys and tract resource inventories to be performed. This will contribute to implementation of Objectives 1, 2, 5, and 6c.

HARVEST METHODS

See Section 5-2.3. No new funding is needed to continue using the harvest method established in WAC 220-52-019(2a). Using the established legal harvest method meets Objective 6d.

HARVEST ACTIVITY RESTRICTIONS

See Section 5-2.4. DNR will fund management of the fishery, which includes establishing general operating restrictions, establishing tract boundaries, avoidance measures for eagles, tufted puffins, and orcas, and noise restrictions. Restrictions needed to meet the requirements of the HCP will be incorporated into the management of individual tracts. This will allow implementation of the Conservation Objectives in the HCP

FUEL SPILL RISK MANAGEMENT

See Section 5-2.5. These practices will occur within the existing funded program.

DNR will fund general administration of the fishery, including funding for compliance staff that will manage fuel spill risk on the tracts. This provides the means to implement Objective 7 of the HCP.

HARVEST COMPLIANCE

See Section 5-2.6. DNR's compliance staff and their duties are funded as part of the geoduck fishery program. DNR will fund compliance staff so that the Objectives in the HCP are implemented daily during harvest operations.

7. Alternatives

7-1 Alternative 1. Discontinue Harvest

This alternative would consist of the state discontinuing harvest of its share of geoduck resources. This would eliminate potential take of covered species associated with the State's participation in the fishery. This alternative would not affect the Treaty Tribes' rights to harvest up to 50 percent of the geoduck TAC nor would it affect tracts harvested by the Treaty Tribes. The tribes could also pursue the unharvested portion through legal venues.

This alternative was not selected because it is not an economically viable alternative for DNR, nor does it support certain aspects of long-term environmental protection of aquatic lands. Revenue from geoduck harvest quotas funds the management of state-owned aquatic land, and funds programs that protect, conserve and restore aquatic habitat statewide and increase and improve public access to the waterfront. These funds also enable the study and control of invasive species and the cleanup of contaminated sediments. Opportunities to conduct biological surveys and research as part of the geoduck fishery management process would not occur, because they are also funded through geoduck harvest quotas. Information about geoduck populations and associated species would not be collected.

7-2 Alternative 2. Different Harvest Methods

One alternative is the use of different harvest methods that are currently available in the clam harvest industry. This alternative was not selected because these methods are more disruptive to the substrate and are not considered to reduce the potential for environmental effects. Employing different harvest methods would require a change in law and additional permitting requirements. Such methods include mechanical suction dredges such as the hydraulic escalator harvester used for clam harvesting on the Atlantic coast, and hand-held suction devices. The hydraulic escalator harvester operates by loosening the sediment in its path down to the depth of the clam and separating the clam from the sediment, while the handheld suction harvester vacuums all the sediment from around the clam and the clam itself. A reduction in the level of take associated with either of these methods was not evaluated but they would result in more substrate disturbance and greater elevated turbidity levels than the water jets presently used for harvest, so would not meet the intent of a reduction in potential impacts.

No other alternatives are known that would result in a decreased level of potential take.

8. Plan Implementation, Changed and Unforeseen Circumstances

8-1 Plan Implementation

Washington DNR will implement this HCP through the agency's existing geoduck fishery management program housed in the Aquatics Division. Mechanisms to implement the HCP such as agreements with WDFW to perform surveys and write Environmental Assessments; legally-binding harvest agreements; and deployment of compliance staff and staff to establish tract boundaries are currently in place to ensure compliance with this HCP.

Washington DNR is not requesting an Implementing Agreement, and understands that it is responsible for implementing this HCP in accordance with the specifications for conservation strategies, monitoring, reporting, and funding described herein and will perform all obligations assigned to it in the Section 10 permit and the HCP.

8-1.1 Annual Appraisal with NMFS and USFWS

Washington DNR and the Services have agreed to a process of regular, annual meetings and reporting requirements to assess the implementation and effectiveness of the HCP. This will provide a forum for reporting on compliance with the HCP and for discussing appropriate adjustments to the conservation strategies and mechanisms.

ANNUAL MEETINGS

DNR will arrange annual meetings with the Services at which time DNR will disseminate reports and other information pertinent to implementing the HCP. The first such meeting will be scheduled for summer (between June and August) of 2008.

The geoduck harvest season runs from April 1st to March 31st each year; harvest management occurs in this timeframe. However data on the fishery are collected, analyzed, and reported for the calendar year. DNR will report on results from the previous calendar year, and will also report on the ongoing operations of the current harvest season.

ANNUAL REPORTING REQUIREMENTS

DNR will provide documentation of the following to the Services at the annual meetings:

- The biomass harvested the previous year. Annual harvest amounts (biomass measured in pounds) are not static but are determined by the State's half of the

calculated 2.7 percent TAC of each region's commercial biomass. A range of 2-3 million pounds is expected to be harvested annually under the current 2.7 percent TAC and would not be considered to exceed the scope of this HCP.

- The tracts and tract sizes (acreage) from which geoducks were harvested the previous year.
- Compliance monitoring from the previous year. This is the daily tract monitoring performed by DNR compliance staff and documented in compliance logs. This will include notes taken in the field on occurrences of covered species observed in the vicinity of tracts during harvest.
- Anticipated current harvest season tracts to be harvested and harvest quotas to be offered.
- Copies of the Environmental Assessments for each tract from which harvest is occurring or proposed, for the current harvest season.
- Data collected during post-harvest tract surveys performed the previous year.
- Copies of the most recent region-specific harvest management plans.

DNR will provide and consider additional information pertinent to implementing this HCP, including:

- New information and new science, such as:
  - ❖ Recommended changes in eelgrass and herring spawning vegetation buffer distances based on input from WDFW and Tribal biologists as a result of meeting with them to reassess the buffers,
  - ❖ Results of new studies regarding benthic community structure and changes attributable to the geoduck fishery.
  - ❖ Climate change—Information indicating that climate change is detectable in Puget Sound and is manifesting in a way that potentially would change the way the geoduck fishery occurs.
  - ❖ Discovery of new tufted puffin nesting colonies.
- Proposed revisions and updates to the 2001 Commercial Geoduck Fishery Management Plan.
- Information that updates the geoduck atlas. For example increases in the acres of geoduck tracts determined to be commercial and available for harvest.
- With 30 days advance notice, DNR will provide the opportunity for site visits by Services staff to observe the fishery in action.
- DNR will use the annual meetings to keep the Services informed about intentions to harvest in the San Juan management region. DNR will inform the Services at least one year before offering harvest quotas in the San Juan management region

and provide Environmental Assessments for the tracts from which harvest will occur in that Region.

Information on these topics and others pertinent to the fishery will be assessed with the Services at the annual meetings to ensure that the operating conservation strategies and mechanisms are still valid.

DNR will arrange additional meetings if reporting information affecting implementation of the HCP cannot be postponed until the next yearly meeting.

DNR and the Services will jointly determine a schedule for subsequent annual meetings and assess the need to meet annually.

8-2 No Surprises Policy

The purpose of the No Surprises policy (63 FR 8859) is to provide assurances to landowners such as Washington State that are participating in the ESA Section 10 HCP process. Specifically, the policy provides regulatory assurances to the holder of an Incidental Take Permit issued under Section 10(a) of the ESA that no additional land use restrictions or financial compensation will be required of the permit holder with respect to species covered by the permit, even if unforeseen circumstances arise after the permit is issued indicating that additional mitigation is needed for a species covered by the Incidental Take Permit.

Essentially, under this policy, DNR is assured that if unforeseen circumstances arise, the Services will not require the commitment of additional land or financial compensation or additional restrictions on the use of land or other natural resources beyond the level otherwise agreed to in this HCP, without the consent of DNR. The Services will honor these assurances as long as DNR is implementing the conservation strategy in this HCP and the Incidental Take Permits in good faith.

The No Surprises Policy provides economic and regulatory certainty to DNR regarding the overall cost of species conservation and mitigation, provided that the affected species are adequately covered by a properly functioning HCP, and DNR is properly implementing the HCP and complying with the terms and conditions of the Incidental Take Permits.

The No Surprises policy speaks to two types of events – “changed circumstances” and “unforeseen circumstances.” Each type of circumstance is handled differently under the No Surprises Policy and the HCP must address both types of events.

8-2.1 Changed Circumstances

Changed circumstances are those affecting a species or the geographic area covered by this HCP that can reasonably be anticipated and that were planned for by DNR and the Services during the course of developing this HCP. Changed circumstances are not uncommon and will not require changes to management of the geoduck fishery. DNR and the Services foresee the possibility that circumstances surrounding harvest and

management of the wild stock geoduck resource could change during the term of this HCP. The Incidental Take Permits will authorize the incidental take of covered species under ordinary circumstances as well as changed circumstances, as long as DNR is operating in compliance with this HCP and the Incidental Take Permits. Washington DNR and the Services anticipate that circumstances could change during the term of the HCP, by reason of:

CLIMATE CHANGE

Compelling evidence of global climate change has been documented by a large body of research. The primary conclusion is that documented increases in globally averaged temperature in the past 30-50 years are largely due to increasing concentrations of greenhouse gases (mostly CO_2) in the atmosphere. In addition to increased air temperatures, climate change manifests in the form of melting glaciers, increases in sea levels, changes in hydrologic regimes, and other environmental trends and events. Mote et al. (2005) examined climate change implications specifically for Puget Sound, but recognized that the consequences to various features of the Sound could not be determined. Changes that Mote et al. found to be most likely were an increase in air temperature by at least 0.5 ^{o}F per decade, increases in water temperature, reduced summer freshwater inflow, increases in flood events, a sea level rise of at least 1.6 inches per decade, and changes in species composition in many ecosystems.

The environment of Puget Sound could conceivably be altered as a result of progressing climate change over the next 50 years, affecting the environment of the covered species, and the environment in which geoduck harvest occurs. This in turn could cause DNR to adjust fishery operations and could potentially result in operating outside the scope of this HCP and its conservation measures. Annually, at meetings with the Services, this scenario will be assessed to verify that the operating conservation plan is still valid (see Section 8.1 above). DNR, in consultation with the Services, will assess and modify the HCP's conservation strategies and mechanisms in order to continue meeting the goals and objectives of the conservation plan.

INCREASES IN COMMERCIAL TRACT ACREAGE

Continuing surveys and assessments of the geoduck resource, along with environmental influences may result in adjustments to the total tract acreage available for commercial harvest. Potential increases in the amount of commercial tract acreage are considered a changed circumstance. Annually, at meetings with the Services, DNR will report on any increases in the acres of geoduck tracts determined to be commercial and available for harvest. DNR, in consultation with the Services, will assess and modify the HCP's conservation strategies and mechanisms in order to continue meeting the goals and objectives of the conservation plan.

EXPANSION OF THE FISHERY

If annual harvest exceeds the 2-3 million pound range, it would likely be because a new yield model is adopted for management or the existing yield model is substantially re-parameterized, thus increasing the harvest rate above 2.7 percent, or because of a large increase in the commercially available biomass. If, in the future, DNR considers offering harvest quotas exceeding 3 million pounds per year because of an increase in the harvest

rate or an increase in commercially available biomass, it would be addressed as a changed circumstance.

The desire to continue operating a sustainable fishery presently holds harvest levels within a certain range. If in the future DNR considers offering harvest quotas exceeding those within the present range they will contact the Services and assess potential additional impacts. DNR, in consultation with the Services, will assess and modify the HCP's conservation strategies and mechanisms in order to continue meeting the goals and objectives of the conservation plan.

HARVEST OUTSIDE –18 TO –70 FOOT BOUNDARIES

Currently, survey data to estimate geoduck biomass and determine the TAC are not collected outside the – 18 to – 70 foot boundaries. Expanding the survey boundaries, and thus the potential commercial harvest area is considered a changed circumstance. Should DNR want to expand harvestable areas to include those outside of the present boundaries, they will contact the Services and amend this HCP to address impacts and create additional, commensurate conservation measures if determined to be necessary. DNR, in consultation with the Services, will assess and modify the HCP's conservation strategies and mechanisms in order to continue meeting the goals and objectives of the conservation plan.

Harvesting deeper than –70 feet would require a change in WAC 220-52-019(11), which stipulates the –70 foot depth. Harvesting shallower than –18 feet MLLW would require a change to RCW 77.60.070, which stipulates this depth.

CHANGES IN THE STATUS OF COVERED SPECIES

The Services may list additional species under the ESA as threatened or endangered, or de-list species that are currently listed.

New Listings of Species Covered by the ITP

All species covered by this HCP have been addressed as though they are listed. The ITP covers several species that currently are not listed as threatened or endangered under the ESA. Subject to compliance with all other terms of this HCP, no additional conservation measures will be required should species be listed under the ESA that are addressed in the HCP and ITP.

New Listings of Species Not Covered by the ITP

If a species that is present or potentially present in the HCP area becomes listed under the ESA, the Services will determine if there is a potential for incidental take of the species from commercial geoduck harvest activities, as they are described in this HCP. If so, DNR will either implement measures to avoid incidental take of the species, or request the Services add the newly listed species to the ITP in accordance with the provisions in the HCP, and in compliance with the provisions of Section 10 of the ESA. If DNR chooses to pursue incidental take coverage for the species, they will amend this HCP or prepare a separate HCP. All parties (DNR, USFWS, NMFS) will enter into discussions to develop the necessary measures to meet ESA Section 10(a) requirements for incidental take coverage.

8-2.2 Unforeseen Circumstances

Unforeseen circumstances would be those affecting a species or the geographic area covered by this HCP that were not, or could not reasonably have been anticipated by DNR and the Services at the time of developing and negotiating this HCP, *and* that result in a substantial and adverse change in the status of a covered species. The burden of demonstrating that unforeseen circumstances exist falls to the Services.

If additional conservation and mitigation measures are required in response to an unforeseen event during the life of the HCP, the Services may require additional measures from DNR where the HCP is being properly implemented. These measures would be limited to modifications within the HCP area or to the conservation plan for the species, maintaining the original terms of the HCP to the maximum extent possible.

The Services would not require commitments of additional land, additional funds, or additional restrictions on the use of the land or resources beyond the level agreed on for the species in the HCP, without the consent of DNR.

Unforeseen circumstances include:

CHANGES IN THE LAWS OR RULES GOVERNING THE FISHERY

In addition to those stipulating harvest depths, some of the measures presented in this HCP exist as laws in the Revised Code of Washington and as rules in the Washington Administrative Code. Should a change be proposed to the laws or rules governing harvest, DNR, in consultation with the Services, will assess and modify the HCP's conservation strategies and mechanisms in order to continue meeting the goals and objectives of the conservation plan.

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List of Appendices

Appendix A. Pertinent RCW's and WAC's

RCW 77.60.070 ***- Geoduck Clams, Commercial Harvesting, Unauthorized acts, Gear requirements***

(1) The director may not authorize a person to take geoduck clams for commercial purposes outside the harvest area designated in a current department of natural resources geoduck harvesting agreement issued under RCW 79.135.210. The director may not authorize commercial harvest of geoduck clams from bottoms that are shallower than eighteen feet below mean lower low water (0.0. ft.). Vessels conducting harvest operations must remain seaward of a line two hundred yards seaward from and parallel to the line of ordinary high tide. This section does not apply to the harvest of private sector cultured aquatic products as defined in RCW 15.85.020.

(2) Commercial geoduck harvesting shall be done with a hand-held, manually operated water jet or suction device guided and controlled from under water by a diver. Periodically, the director shall determine the effect of each type or unit of gear upon the geoduck population or the substrate they inhabit. The director may require modification of the gear or stop its use if it is being operated in a wasteful or destructive manner or if its operation may cause permanent damage to the bottom or adjacent shellfish populations.

RCW 77.65.010 ***- Commercial licenses and permits required — Exemption***

1) Except as otherwise provided by this title, a person may not engage in any of the following activities without a license or permit issued by the director:

(a) Commercially fish for or take food fish or shellfish;

(b) Deliver from a commercial fishing vessel food fish or shellfish taken for commercial purposes in offshore waters. As used in this subsection, "deliver" means arrival at a place or port, and includes arrivals from offshore waters to waters within the state and arrivals from state or offshore waters;

(c) Operate a charter boat or commercial fishing vessel engaged in a fishery;

(d) Engage in processing or wholesaling food fish or shellfish; or

(e) Act as a guide for salmon for personal use in freshwater rivers and streams, other than that part of the Columbia river below the bridge at Longview.

(2) No person may engage in the activities described in subsection (1) of this section unless the licenses or permits required by this title are in the person's possession, and the person is the named license holder or an alternate operator designated on the license and the person's license is not suspended.

(3) A valid Oregon license that is equivalent to a license under this title is valid in the concurrent waters of the Columbia river if the state of Oregon recognizes as valid the equivalent Washington license. The director may identify by rule what Oregon licenses are equivalent.

(4) No license or permit is required for the production or harvesting of private sector cultured aquatic products as defined in RCW 15.85.020 or for the delivery, processing, or wholesaling of such aquatic products. However, if a means of identifying such products is required by rules adopted under RCW 15.85.060, the exemption from licensing or permit requirements established by this subsection applies only if the aquatic products are identified in conformance with those rules.

RCW 77.65.410 ***- Geoduck Diver License***

Every diver engaged in the commercial harvest of geoduck clams shall obtain a nontransferable geoduck diver license.

RCW 77.70.220 ***- Geoduck Fishery License***

(1) A person shall not harvest geoduck clams commercially without a geoduck fishery license. This section does not apply to the harvest of private sector cultured aquatic products as defined in RCW 15.85.020.

(2) Only a person who has entered into a geoduck harvesting agreement with the department of natural resources under *RCW 79.96.080 may hold a geoduck fishery license.

(3) A geoduck fishery license authorizes no taking of geoducks outside the boundaries of the public lands designated in the underlying harvesting agreement, or beyond the harvest ceiling set in the underlying harvesting agreement.

(4) A geoduck fishery license expires when the underlying geoduck harvesting agreement terminates.

(5) The director shall determine the number of geoduck fishery licenses that may be issued for each geoduck harvesting agreement, the number of units of gear whose use the license authorizes, and the type of gear that may be used, subject to RCW 77.60.070. In making those determinations, the director shall seek to conserve the geoduck resource and prevent damage to its habitat.

(6) The holder of a geoduck fishery license and the holder's agents and representatives shall comply with all applicable commercial diving safety regulations adopted by the federal occupational safety and health administration established under the federal occupational safety and health act of 1970 as such law exists on May 8, 1979, 84 Stat. 1590 et seq.; 29 U.S.C. Sec. 651 et seq. A violation of those regulations is a violation of this subsection. For the purposes of this section, persons who dive for geoducks are "employees" as defined by the federal occupational safety and health act. A violation of this subsection is grounds for suspension or revocation of a geoduck fishery license following a hearing under the procedures of chapter 34.05 RCW. The director shall not suspend or revoke a geoduck fishery license if the violation has been corrected within ten days of the date the license holder receives written notice of the violation. If there is a substantial probability that a violation of the commercial diving standards could result in death or serious physical harm to a person engaged in harvesting geoduck clams, the director shall suspend the license immediately until the violation has been corrected. If the license holder is not the operator of the harvest vessel and has contracted with another person for the harvesting of geoducks, the director shall not suspend or revoke the license if the license holder terminates its business relationship with that person until compliance with this subsection is secured.

RCW 79.135.210 ***- Geoduck Harvesting -- Agreements, Regulation***

(1) Except as provided in RCW 79.135.040, geoducks shall be sold as valuable materials under the provisions of *chapter 79.90 RCW. After confirmation of the sale, the department may enter into an agreement with the purchaser for the harvesting of geoducks. The department may place terms and conditions in the harvesting agreements as the department deems necessary. The department may enforce the provisions of any harvesting agreement by suspending or canceling the harvesting agreement or through any other means contained in the harvesting agreement. Any geoduck harvester may terminate a harvesting agreement entered into pursuant to this subsection if actions of a governmental agency, beyond the control of the harvester, its agents, or its employees, prohibit harvesting, for a period exceeding thirty days during the term of the harvesting agreement, except as provided within the agreement. Upon termination of the agreement by the harvester, the harvester shall be reimbursed by the department for the cost paid to the department on the agreement, less the value of the harvest already accomplished by the harvester under the agreement.

(2) Harvesting agreements under this title for the purpose of harvesting geoducks shall require the harvester and the harvester's agent or representatives to comply with all applicable commercial diving safety standards and regulations promulgated and implemented by the federal occupational safety and health administration established under the federal occupational safety and health act of 1970 as the law exists or as amended (84 Stat. 1590 et seq.; 29 U.S.C. Sec. 651 et seq.). However, for the purposes of this section and RCW 77.60.070, all persons who dive for geoducks are deemed to be employees as defined by the federal occupational safety and health act. All harvesting agreements shall provide that failure to comply with these standards is cause for suspension or cancellation of the harvesting agreement. Further, for the purposes of this subsection if the harvester contracts with another person or entity for the harvesting of geoducks, the harvesting agreement shall not be suspended or canceled if the harvester terminates its business relationship with such an entity until compliance with this subsection is secured.

RCW 79.135.220 ***- Geoduck Harvesting -- Designation of Aquatic Lands***

The department shall designate the areas of state-owned aquatic lands that are available for geoduck harvesting by licensed geoduck harvesters in accordance with *chapter 79.90 RCW.

RCW 79.140.150 - ***Sale of Rock, Gravel, Silt and Other Valuable Materials***

The department, upon application by any person or when determined by the department to be in the best interest of the state, may enter into a contract or lease providing for the removal and sale of rock, gravel, sand, and silt, or other valuable materials located within or upon beds of navigable waters, or upon any state-owned tidelands or shorelands and providing for payment to be made by such royalty as the department may fix, by negotiation, by sealed bid, or at public auction. If application is made for the

purchase of any valuable material situated within or upon state-owned aquatic lands the department shall inspect and appraise the value of the material in the application.

WAC 220.52.019 - *Geoduck clams – Gear and unlawful acts*

(1) It is unlawful to take, fish for or possess geoduck clams taken for commercial purposes from any of the beds of navigable waters of the state of Washington except as provided in RCW 75.24.100 and rules of the director.

(2)(a) Only a manually operated water jet, the nozzle of which shall not exceed 5/8 inch inside diameter may be used to commercially harvest geoduck clams. Use of any other gear requires a permit from the director.

(b) It is unlawful in the commercial harvest of geoducks for through-hull fittings for water discharge hoses connected to the harvest gear to be below the surface of the water. Any through-hull fitting connected to the harvest gear which is above the surface of the water must be visible at all times.

(3) It is unlawful to take or fish for geoduck clams taken for commercial purposes between one-half hour before official sunset or 7:00 p.m. whichever is earlier and 7:00 a.m. No geoduck harvest vessel may be on a geoduck tract or harvest area after 7:30 p.m. or before 6:30 a.m. It is unlawful to take or fish for geoduck clams on Sundays or on state holidays as defined by the office of financial management. It is unlawful to possess geoduck clams taken in violation of this section.

(4) It is unlawful to harvest geoduck clams with any instrument that penetrates the skin, neck or body of the geoduck.

(5) It is unlawful to possess only the siphon or neck portion of a geoduck clam aboard a geoduck harvest vessel, except when a geoduck is incidentally damaged during harvest and must be reported under a department of natural resources harvest agreement.

(6) It is unlawful to retain any food fish or shellfish other than geoduck clams during geoduck harvesting operations, except for horse clams (*Tresus capax and Tresus nuttallii*) when horse clam harvest is provided for under a department of natural resources harvest agreement.

(7) It is unlawful for more than two divers from any one geoduck harvest vessel to be in the water at any one time.

(8) The following documents must be on board the geoduck harvesting vessel at all times during geoduck operations:

(a) A copy of the department of natural resources geoduck harvesting agreement for the tract or area where harvesting is occurring;

(b) A map of the geoduck tract or harvest area and complete tract or harvest area boundary identification documents or photographs issued by the department of natural resources for the tract or harvest area;

(c) A geoduck diver license for each diver on board the harvest vessel or in the water; and

(d) A geoduck fishery license as described in WAC 220-52-01901.

(9) It is unlawful to process geoducks on board any harvest vessel.

(10) It is unlawful to take or fish for geoduck clams for commercial purposes outside the tract or harvest area designated in the department of natural resources geoduck harvesting agreement required by subsection (8)(a) of this section. It is unlawful to possess geoduck clams taken in violation of this subsection.

(11) It is unlawful to harvest geoduck clams in areas deeper than seventy feet below mean lower low water (0.0 ft.).

(12) Holders of geoduck fishery licenses shall comply with all applicable commercial diving safety regulations adopted by the Federal Occupational Safety and Health Administration established under the Federal Occupational Safety and Health Act of 1970, 29 U.S.C. 651 et seq. Some of those regulations appear at 29 C.F.R. Part 1910, Subpart T.

WAC 220.52.01901 - *Geoduck licenses*

(1) A geoduck fishery license issued by the director is required for the commercial harvest of geoduck clams. Geoduck fishery licenses were previously called "geoduck validations."

(2) Only persons holding current geoduck harvest agreements from the department of natural resources or their agents may apply for geoduck fishery licenses. An application for a geoduck fishery license must be on a form provided by the department, must be complete, and must be accompanied by a copy of the geoduck harvest agreement for which the license is sought.

(3) Each geoduck fishery license authorizes the use of two water jets or other units of geoduck harvest gear. Gear must meet the requirements of WAC 220-52-019(2). A geoduck fishery license card is a "license card" under WAC 220-69-270.

(4) The director may suspend or revoke a geoduck license used in violation of commercial diving

safety regulations, including 29 C.F.R. Part 1910, Subpart T, adopted under the Occupational Safety and Health Act of 1970. The procedures of chapter 34.05 RCW apply to such suspensions or revocations. If there is a substantial probability that a violation of commercial diving safety regulations could result in death or serious physical harm to a person engaged in harvesting geoduck clams, the director may suspend the license immediately until the violation has been corrected. The director shall not revoke a geoduck license if the holder of the harvesting agreement corrects the violation within ten days of receiving written notice of the violation.

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES
DOUG SUTHERLAND
Commissioner of Public Lands
Olympia, Washington 98504-7001

GEODUCK HARVESTING AGREEMENT AND CONTRACT OF SALE

HARVESTING AGREEMENT NO «Agree_Num» (Quota Number «Quota_Num»)

Table of Contents

The State of Washington, DEPARTMENT OF NATURAL RESOURCES ("DNR") and «Purchaser» ("Purchaser") agree as follows:

1. INTRODUCTION

Chapter 79.140 RCW and RCW 79.135.210 authorize DNR to sell geoducks from state-owned aquatic lands and enter into Harvesting Agreements with geoduck Purchasers. Purchaser was a successful bidder for a nonexclusive right to enter upon the Property described in Clause 3 for the purpose of commercially harvesting geoducks, as described in Clause 2. The sale of the geoducks was confirmed on «Confirmation_Date».

2. VALUABLE MATERIALS SOLD: HARVEST CEILING

DNR agrees to sell to Purchaser, and Purchaser agrees to purchase and remove geoducks from the Property described in Clause 3. The Property consists of one or more area(s) in which harvesting may take place (the "Harvest Area(s)"). Within each Harvest Area, Purchaser may harvest no more than the number of pounds of geoducks identified as the "Harvest Ceiling" for that area in Exhibit A. Geoduck weights shall be determined as provided in Clause 12. DNR reserves the right to change the harvest dates or duration of harvest and the right to increase or decrease the Harvest Ceiling for a Harvest Area at any time during the Harvest Agreement. Purchaser will be notified in writing of any changes in the harvest dates and any additions or subtractions to the number of pounds in the Harvest Ceiling. In the event that DNR reduces the total number of harvest days, identified in accordance with Clause 5 and Subclause 13(a), by more than twenty-five percent (25%), or unilaterally reduces the volume of geoducks available for harvest under this contract below the original level identified in the bid offering, Purchaser's rights shall be limited to those specified in Clause 11.

3. PROPERTY

(a) The DNR agrees to grant to the Purchaser a nonexclusive right to commercially harvest geoducks from bedlands owned by the State of Washington in the County(ies) listed in Exhibit A. An approximate description of the bedlands is set forth in Exhibit B. The right granted includes the right to occupy the water column and surface above the Property, but includes no right to take from the Property any valuable materials other than geoducks.

(b) Sideline Boundaries. Before Purchaser's rights under this contract commence, the DNR shall mark the sideline limits and other boundary limits of the Harvest Area(s) by placing either markers on the shore and/or buoys in the water. The parties agree that the line projected by those markers and buoys shall be the Harvest Area boundary for all purposes under this contact. If the markers or buoys disappear or if DNR believes they have been moved, DNR shall reset the markers and/or buoys. The reset projected line shall thereafter be the Harvest Area boundary for all purposes under this contract.

(c) Shoreward Boundary. Purchaser shall harvest no geoducks in areas shallower than the depths below mean lower low water set forth in Exhibit A for the respective Harvest Area(s). Regardless of any depth restrictions, Purchaser shall harvest no geoducks from any area that lies shoreward from a line 200 yards seaward from and parallel to the line of ordinary high tide.

(d) Maximum Depth Boundary. Purchaser shall harvest no geoducks located deeper than 70 feet below the water surface, unadjusted for tides.

(e) Off-tract Harvesting. Purchaser shall take no geoducks from state-owned aquatic lands outside the boundaries of the Harvest Area(s).

4. PAYMENT

(a) Contract Price Per Pound. Purchaser shall pay the DNR the contract price shown on Exhibit A for each pound of geoducks that Purchaser harvests from a Harvest Area. In the event that DNR increases the original Harvest Ceiling for any Harvest Area shown on Exhibit A, Purchaser shall pay the DNR the contract price for added pounds shown on Exhibit A for each pound of geoduck that Purchaser harvests from a Harvest Area in excess of the original Harvest Ceiling for such Harvest Area.

(b) Billing and Payment. At the end of each two (2) week period, using the daily weight forms that Purchaser submits pursuant to Clause 12, DNR shall calculate Purchaser's total geoduck harvest for that two (2) week period and shall bill Purchaser the Contract Price Per Pound for each pound of geoducks harvested. When the total value of geoduck harvested, plus any amounts previously billed under this Clause and not paid, equal or exceed the amount of the Bond required in Clause 21, Purchaser shall provide an additional Bond of security totaling the value due to the DNR. Purchaser shall pay any amount billed within ten (10) business days of the date of the bill.

After receiving payment, DNR shall reconcile its records and adjust Purchaser's account accordingly. DNR shall deduct any overpayments or charges for any geoducks not previously paid for in its next bill to Purchaser.

(c) Interest for Past-Due Sums Owed. The Purchaser shall pay interest at the rate of one percent (1%) per month (or at such higher rate as may be authorized by statute subsequent to the Commencement Date hereof), until paid, on sums owing under the terms of this contract commencing on the next day after the date such sum is due and payable. In the event DNR pays any sum or incurs any expense, which the Purchaser is obligated to pay under this contract, or which is made on behalf of the Purchaser, DNR shall be entitled to receive reimbursement thereof from the Purchaser upon demand, together with interest thereon from the date of expenditure at the rate stated above.

(d) Payment Address. All payments required under this Clause shall be made to the Department of Natural Resources, Financial Management Division, 1111 Washington St. SE, P.O. Box 47041, Olympia, Washington 98504-7041. All payments shall reference Harvesting Agreement No. «Agree_Num».

(e) Bonus Bid. At the time of bid opening, Purchaser made a Bonus Bid of $«Bonus_Bid».00 for the right to commercially harvest geoducks from the Property. That Bonus Bid is nonrefundable, except as defined under Subclauses 11(c) and 17(c).

5. CONTRACT PERIOD

Purchaser's rights under this contract shall commence on «Start_Date». Purchaser's right to harvest geoducks under this contract shall terminate on «End_Date». The specific dates for each Harvest Area are shown on Exhibit A.

6. DEPARTMENT OF NATURAL RESOURCES WARRANTY DISCLAIMERS

There are no warranties that extend beyond the description on the face of this contract. **The DNR does not warrant the following:**

(a) The **merchantability of** the geoducks;

(b) The **fitness** of the geoducks for Purchaser's purpose;

(c) The **condition** of the geoducks. The DNR conveys the geoducks "as is";

(d) The **volume, quality or grade** of the geoducks. The description of the geoducks in this contract is an estimate made only for the purpose of identification;

(e) The **accuracy of any pre-bid volume estimates, appraisals, investigations or any other pre-bid documents** prepared by or for DNR. Those documents were prepared for appraisal purposes only. In entering into this contract, Purchaser relies on its own full inspection of the Property and the geoducks therein. Purchaser enters into this contract without reliance on any State agency's volume estimate, appraisal, pre-bid documents or other representations;

(f) The **accuracy of any acreage estimates** for the Property that may appear in this contract or in any pre-bid documents. The boundaries of the Harvest Area(s) shall be those described in Clause 3; and

(g) The **condition of the substrate and the ease or difficulty of geoduck harvest.**

7. TITLE AND RISK OF LOSS

Title to the geoducks identified in Clause 2 and the risk of loss passes to the Purchaser when the Purchaser severs the geoducks from the Property. Purchaser shall pay the DNR the Contract Price Per Pound for any geoducks that Purchaser destroys, damages or loses in severing the geoducks from the Property, and for any geoducks destroyed, damaged, lost or stolen after Purchaser severs the geoducks from the Property.

8. PLAN OF OPERATION

(a) As a precondition to confirmation as a responsible bidder, Purchaser shall have completed and submitted, and DNR shall have approved, a Plan of Operation form supplied by DNR. The Plan of Operation shall include the following information:

(1) Source and identity of divers, vessel operators, tenders, packers, shippers, harvest vessels, and other harvest equipment. As used in this Clause, "harvest vessel" means any vessel that Purchaser uses to harvest geoducks from the Property, to transport geoducks harvested from the Property, or to perform Purchaser's duties under this contract;

(2) Legal relationship between Purchaser, divers, vessel operators, and tenders;

(3) The identity of any other subcontractors Purchaser will use in engaging work under this contract;

(4) Location and moorage site of vessel(s); and

(5) The identity of all vehicles used to transport harvested geoducks from the approved off load site; and

(6) Steps Purchaser will take to ensure compliance with this contract by Purchaser, Purchaser's employees, and subcontractors.

(b) Purchaser shall conform to the Plan of Operation; and

(c) Unless Purchaser obtains DNR's prior written consent, Purchaser shall make no substitution or additions to the divers, vessel operator, harvest vessels or subcontractors identified in the Plan of Operation, and shall not otherwise materially change or materially deviate from the Plan of Operation. In determining whether to consent to proposed substitutions, additions, or changes to the Plan of Operation, DNR may consider the items listed in RCW 79.140.060(l) (responsible bidder statute). DNR may withhold its consent to any changes to the Plan of Operations and may insist upon harvesting that conforms to the original approved Plan of Operations.

9. PURCHASER'S RESPONSIBILITY TO INFORM AGENTS

Purchaser shall inform each of the following entities of, and shall require each to comply with, the terms and conditions of this contract:

(a) Purchaser's employees, agents, partners, parent entities, subsidiaries, related entities, joint venturers, assignees, contractors, and subcontractors; and

(b) Any entity in which Purchaser has control, or power to control, or a substantial financial interest, or which has control, or power to control, or a substantial financial interest in Purchaser.

If any of the above entities fails to comply with Clauses 3, 8, 10, 11, 12, 13, or 14 twice during the contract period, Purchaser shall prohibit the entity from working on the Property for the remainder of the contract period.

Purchaser shall assume liability for the failure of any of the above entities to comply with the terms and conditions of this contract. A breach of this contract by any of the above entities is a breach by Purchaser.

10. COMPLIANCE WITH ALL LAWS

(a) Applicable Laws. In carrying out Purchaser's duties under this contract, Purchaser shall comply with all statutes, rules, and laws that apply to this contract, including, but not limited to:

Chapter 69.30 RCW (sanitary control of shellfish);
RCW 77.60.070 (gear and shoreward boundaries);
RCW 77.65.410 (geoduck diver licenses);
RCW 79.135.030 (taking shellfish from public lands);
WAC 220-52-010 (vessel identification numbers);
WAC 220-52-019 (harvesting methods and restrictions);
WAC 220-52-01901 (gear and validation cards);
WAC 220-69-240 (fish tickets);
WAC 220-69-241 (fish tickets);
Chapter 90.58 RCW (Shoreline Management Act);
Chapter 246-282 WAC (sanitary control of shellfish); and
Applicable portions of Title 33 C.F.R. (United States Coast Guard regulations).

(b) Diving Safety. Purchaser and Purchaser's agents or representatives shall comply with all applicable commercial diving safety standards and regulations promulgated and implemented by the federal Occupational Safety and Health Administration (OSHA) established under the federal Occupational Safety and Health Act of 1970 as such law exists or as hereafter amended (84 Stat. 1590 et seq.; 29 USC 651 et seq.) Some of those regulations appear at 29 CFR Part 1910, Subpart T.

(c) Hazardous Substances. Purchaser shall comply with all federal, state, and local laws and regulations concerning the use and disposal of substances designated as hazardous, toxic or harmful under those laws and regulations. Purchaser shall immediately notify the DNR of:

(1) Any release of hazardous, toxic or harmful substances; and

(2) Any inquiries, inspections, and regulatory actions taken or proposed by any governmental entity or private party concerning the Property.

(d) Cooperation. Purchaser shall cooperate fully with any employee of the State of Washington or of the United States, including any employee of the DNR, the Washington Department of Fish and Wildlife, the Washington Department of Health, the Washington Industrial Safety and Health Administration, and OSHA.

Purchaser shall not harass, obstruct impede or otherwise interfere with any state or federal employee in the carrying out of the employee's duties.

11. TEMPORARY CLOSURES

(a) Department of Health Closures. The Washington Department of Health may close shellfish beds judged not to meet the sanitation standards of Chapter 69.30 RCW and Chapter 246-282 WAC. Purchaser shall observe those closures.

(b) DNR Closures. To protect public resources, DNR may, at its discretion, temporarily close all or a portion of the Property to geoduck harvesting during the term of this contract. DNR shall notify Purchaser of any temporary closure under this Subclause. DNR shall designate closed areas with shore and/or buoy markers.

(c) Purchaser's Right to Terminate. Purchaser may, by providing written notice to DNR, elect to terminate this contract if DNR unilaterally reduces the total volume of geoducks available for harvest under this contract more than 10 percent below the original level in the bid offering. The election to terminate must be made within five (5) business days of the date that DNR provides written notice to Purchaser of the reduction. If Purchaser elects to terminate, Purchaser shall be reimbursed for any advance payments made for geoducks not yet harvested, exclusive of the Bonus Bid. If Purchaser elects to terminate, the Bonus Bid will be reimbursed based upon the percentage calculated as One Hundred percent (100%) minus the percentage of original Harvest Ceiling pounds that were harvested (the number of original Harvest Ceiling pounds actually harvested divided by the total original Harvest Ceiling pounds identified in Clause 2). If DNR unilaterally reduces the Harvest Ceiling by 10 percent or less, or Purchaser elects not to terminate in the case of a reduction in the Harvest Ceiling greater than 10 percent, Purchaser shall receive a refund of the Bonus Bid equal to the percent reduction in the Harvest Ceiling times the Bonus Bid. The refund provided under this subclause 11(c) shall be calculated after taking into account any refund provided under subclause 11(d) to prevent double recovery of the Bonus Bid. The refund shall be paid within 45 days of the written notice of reduction in the Harvest Ceiling by DNR , or within 45 days of Purchaser's written election not to terminate, whichever is later.

(d) Purchaser's Right to Refund. If the actions of a governmental agency, beyond the control of Purchaser, its agents or its employees, prohibit harvesting on legal harvest days during the term of this contract, Purchaser shall be entitled to a refund of a portion of the Bonus Bid equal to the amount of the Bonus Bid divided by the number of legal harvest days included within the term of this contract multiplied by the number of lost harvest days. The amount of the Bonus Bid to be refunded shall be computed after accounting for any refund provided under subclause 11(c) to prevent any double recovery of the Bonus Bid. A harvest closure for a partial day shall not be counted as a lost harvest day if Purchaser elects to harvest for the partial day, or if the

lost harvest does not exceed four (4) hours that day. Any such refund shall be paid to Purchaser within 45 days of the termination date of this contract.

(e) Inclement Weather. DNR may suspend harvesting while the United States Coast Guard weather bulletin is announcing gale force winds in the vicinity of the Property. DNR may prohibit harvesting in other types of inclement weather and in other dangerous situations, as well.

(f) Court Order. Purchaser is on notice that there is continuing litigation relating to tribal indian rights to harvest shellfish and that such litigation may affect Purchaser's ability to harvest under this contract. DNR may suspend harvesting pursuant to any existing or future court order or consent decree relating to the determination of shellfish harvesting rights for tribal indians. In the event such order prevents further harvesting during the term of this contract, the contract shall be deemed terminated as of the effective date of the court order. Purchaser's right to any reimbursement in the event the contract is terminated shall be limited to the amounts specified in subclause 11(c).

12. WEIGHING AND REPORTING OF GEODUCKS HARVESTED

(a) Daily Weight. Purchaser shall have aboard each harvest vessel a scale supplied by Purchaser and approved by DNR. Purchaser shall weigh all geoducks harvested each day and shall accurately record their weight on a form approved by DNR. DNR approves the State of Washington Department of Fish and Wildlife's Shellfish Receiving Tickets as forms for recording the daily weight of geoducks harvested. Purchaser shall alter no information on a daily weight form that has been signed by Purchaser and DNR.

(b) Manner of Determining Daily Weight. Unless DNR requires otherwise, Purchaser shall weigh the geoducks in DNR's presence, before the vessel leaves the water surface above the Harvest Area(s). Purchaser's harvest vessel shall not leave the water surface above the Property without DNR's permission, unless Purchaser has made reasonable efforts to contact DNR and has been unable to establish contact. Reasonable efforts include telephoning the DNR geoduck vessel and the DNR Aquatic Resources Division at telephone numbers furnished by DNR.

(c) Daily Weight of Geoduck Parts. Purchaser shall harvest only whole geoduck clams. Geoduck parts shall count as whole clams, and the weight of any geoduck part harvested and presented for weighing shall be adjusted to reflect the weight of the whole clam. The percent of geoduck neck weight relative to the whole geoduck for each Harvest Area is shown on Exhibit A. If Purchaser harvests and presents for weighing a geoduck neck that has been severed from the body of the clam, Purchaser shall multiply the weight of the neck by the specific Neck Weight Factor shown on Exhibit A for the particular Harvest Area and record the amount on Purchaser's daily weight form.

13. HARVESTING OPERATION REQUIREMENTS

(a) Days and Hours of Operation. Harvesting is prohibited on Saturdays, Sundays, and on all state holidays as defined by the Office of Financial Management. On all other days, harvesting is permitted between the hours shown on Exhibit A for each Harvest Area. No harvest vessel may be on the water surface above the Harvest Area after the Harvest Area closure time or before the Harvest Area start time without DNR's prior written or verbal consent.

(b) Documents and Instruments to be Carried Aboard. While Purchaser's harvest vessel is harvesting or transporting geoducks, Purchaser shall, at all times, have aboard the harvest vessel copies of this

contract, sight line photographs, maps, Washington Department of Fish and Wildlife Validation Card, and instruments for ascertaining the boundaries of the Harvest Area(s). Instruments satisfying this requirement are a set of binoculars, depth-finder, distance measuring device, and VHF marine radio. Every diver shall carry an accurate depth gauge while diving within the water column above the Harvest Area(s).

(c) Vessel Separation. It is the responsibility of the harvesters to conduct a cooperative, orderly, and safe harvest. It shall be the Purchaser's responsibility to enter and set up operations within the Harvest Area(s) in a manner that is consistent with this requirement.

(d) Vessel Use. At no time may Purchaser have more than one (1) harvest vessel in the Harvest Area without DNR's prior consent. While Purchaser's harvest vessel is in the Harvest Area, Purchaser shall not moor or raft it to any other vessel without DNR's prior consent. A harvest vessel not actively engaged in geoduck harvesting operations shall leave the Harvest Area. Purchaser shall cause no harvesting operations to be conducted from a vessel that has not been identified in the Plan of Operation required by Clause 8.

(e) Noise Abatement. At all times during harvest, transport, and off-loading, properly-functioning noise-abatement devices must be on all equipment. Purchaser shall maintain and operate such equipment so as not to exceed 50 dB at 200 yards. At no time may noise levels exceed Department of Ecology standards contained in Chapter 173-60 WAC.

(f) Number of Divers Per Vessel. Purchaser shall have no more than two (2) divers in the water at any one time.

(g) Off-Load Location. The term "Off-Load" means the transfer of harvested geoducks from the harvest vessel to shore. Purchaser shall off-load harvested geoducks only at the site approved by DNR. When weather or other circumstances make an off-load site's use impractical, DNR may at its discretion, change the off-load site locations.

(h) Person in Charge. All harvest vessels shall have a designated person in charge on board the vessel at all times while in the Harvest Area. This person will be responsible for all aspects of the harvest operation and will have the authority to approve inspections from any entity listed under Subclause 10(d). Failure to have a designated person in charge on board the vessel at all times is a breach of the Harvest Agreement requiring immediate shut down of the harvest operation.

14. RECORD-KEEPING, ENTRY, INSPECTION, AND COMPLIANCE

(a) Purchaser's Duty to Preserve Records. Purchaser shall retain all books, records, documents, and other materials relevant to this contract, including vessel and dive logs, for six (6) years after this contract terminates.

(b) Entry and Inspection. DNR shall have the right to enter into and upon the Property and Purchaser's harvest vessel at all times to make investigations and to secure compliance with the terms of this contract. DNR shall have the right to inspect any and all containers, compartments, and locations on harvest vessels to ensure compliance with Clause 12. DNR shall have the right to inspect the books and accounts of Purchaser, and to make any investigation and secure or receive any material or information necessary to determine Purchaser's compliance with the terms of this contract. Purchaser agrees to make its books and accounts available to DNR for inspection during business hours.

(c) Suspension to Investigate. If DNR has reason to suspect that Purchaser has taken geoducks from state-owned aquatic lands outside the boundaries of the Harvest Area, failed to report all harvested geoducks, or that Purchaser has harvested geoducks in excess of the Harvest Ceiling, DNR may, by oral or written notice to

Purchaser, immediately suspend Purchaser's harvesting operations for five (5) days to investigate. DNR shall not be liable for any damages arising from such a suspension.

If DNR has reason to suspect that Purchaser or anyone else has taken geoducks from state-owned lands outside the boundaries of the Harvest Area, DNR may temporarily close to geoduck harvesting any portion of the Harvest Area adjacent to a suspected site of off-tract harvesting.

15. BREACH BY PURCHASER

The occurrence of any one or more of the following acts or omissions of Purchaser shall constitute a material breach of this contract:

(a) Geoduck harvesting outside the boundaries of the Harvest Area (off-tract harvesting);

(b) Exceeding the Harvest Ceiling(s) identified in Clause 2;

(c) Failure to make complete and timely payment of any amounts due under this contract, including failure to reimburse the DNR for substitute insurance procured under Subclause 22(d);

(d) Deviating from the Plan of Operation without DNR's prior written consent;

(e) Failure to comply with applicable laws or failure to cooperate with government employees as required under Clause 10;

(f) Failure to comply with Clause 12 (weighing and reporting of geoducks harvested), or submitting a false Geoduck Removal Statement or daily weight form;

(g) Failure to comply with Clause 13 (harvesting operation requirements);

(h) Failure to comply with Clause 14 (record-keeping, entry, inspection, and compliance);

(i) Failure to have a Bond in force at all times during the term of the contract;

(j) Failure to have insurance in force at all times during the term of the contract; and

(k) Any failure to perform duties under this contract that persists for more than fifteen (15) days after DNR notifies Purchaser in writing of the failure to perform.

16. BREACH BY PURCHASER: DNR'S REMEDIES

(a) DNR's Remedies Generally.

(1) Upon the occurrence of any of the acts or omissions described in Clause 15, DNR may, in its sole discretion, do one or more of the following:

(i) Suspend Purchaser's rights as provided in Subclause 16(c);

(ii) Terminate this contract as provided in Subclause 16(d); or

(iii) Recover liquidated damages as provided in Subclause 16(e).

(2) DNR's exercise of any rights under this Clause 16 shall not preclude DNR from exercising all other rights available to DNR under this Clause under this contract, and at law.

(b) Meeting Between DNR and Purchaser. DNR shall notify Purchaser, orally or in writing, when DNR believes that an act or omission described in Clause 15 has occurred. Within three (3) days of such notification, Purchaser shall meet with a DNR representative and may explain Purchaser's view of the matter at the meeting.

(c) DNR's Right to Suspend. Upon the occurrence of any of the acts or omissions described in Clause 15, DNR may, by written notice to Purchaser, suspend Purchaser's harvest operations.

(1) DNR may continue the suspension:

(i) Until Purchaser fully cures the act or omission where DNR has provided written notice of an opportunity to cure; or

(ii) Until DNR exercises its right to terminate under Subclause 16(d).

(2) If one or more of Purchaser's agents, as defined in Subclause 9(a), is responsible for a breach of Subclause 10(b) (diving safety), Purchaser may cure the act or omission by terminating the principal agent relationship. Such termination shall be deemed to delete the agent from Purchaser's Plan of Operations. Purchaser shall also be required to abate any defects in Purchaser's equipment or harvesting procedures associated with a breach under Subclause 10(d).

(3) Purchaser has no right to an opportunity to cure a suspension except as provided in Subclauses 16(c)(1)(i) and (c)(2) or as DNR may, in its discretion, provide by written notice to Purchaser.

(d) DNR's Right to Terminate. Upon the occurrence of any of the acts or omissions described in Clause 15, DNR may, by written notice to Purchaser, terminate this contract and Purchaser's right to harvest geoducks from the Harvest Area(s). Upon termination, DNR may recover its incidental damages caused by Purchaser's breach. Where Purchaser's act or omission falls under Subclauses 15(c) (delinquent payments), 15(e) (failure to comply with laws or cooperate with government employees), 15(i) (failure to have a Bond), or 15(j) (failure to have insurance), DNR agrees not to terminate the contract before allowing Purchaser at least fifteen (15) days to cure. Where Purchaser's act or omission consists of the failure to comply with Subclause 10(b) (diving safety), and where such failure is attributable to one or more of Purchaser's agents as defined in Subclause 9(a), the Purchaser may cure such act or omission, and DNR agrees not to terminate this contract, if Purchaser terminates the principal-agent relationship. Such termination shall be deemed to delete the agent from Purchaser's Plan of Operations. In all other cases, DNR may terminate this contract without providing an opportunity to cure. This provision shall not affect DNR's right to suspend operations under Subclause 16(c) nor shall any of the provisions of Subclause 16(c) be required as a prerequisite to DNR's exercise of its right to terminate this contract. Upon termination of the contract pursuant to this provision, Purchaser shall not be entitled to a refund of any portion of the Bonus Bid.

(e) Liquidated Damages. Upon the occurrence of any of the acts or omissions described in Subclauses 15(a) (off-tract harvesting), 15(b) (exceeding Harvest Ceiling(s)), 15(e) (failure to comply with laws or cooperate with government employees), 15(g) (noncompliance with operational requirements), or 15(k) (fifteen (15) day noncompliance), DNR may recover liquidated damages as provided in this Subclause. The parties agree that it is difficult and impracticable to ascertain precisely the actual harm to DNR from Purchaser's breach. The parties agree that the amounts shown in this Subclause are reasonable estimates of the actual harm to DNR, and are not penalties. Purchaser shall pay the amounts shown below within ten (10) days of breach.

(1) Liquidated Damages for Off-tract Harvesting or Harvesting Beyond the Harvest Ceiling. Off-tract harvesting in violation of Clause 3 and Subclause 15(a), and harvesting in excess of the Harvest Ceiling in violation of Clause 2 and Subclause 15(b), cause substantial injury to the DNR. Purchaser agrees to pay DNR, as liquidated damages, a sum calculated as follows:

LD = 3(CPPP)(Q)+AC;

Where:

LD = Liquidated Damage amount;

CPPP = Contract Price Per Pound under Subclause 4(a);

Q = Quantity of geoducks taken off-tract or in excess of the Harvest Ceiling, in pounds; and

AC = Administrative costs of $100.00 for each hour that DNR spends in investigating and responding to violations, plus the actual cost of any goods and services purchased by DNR in the course of investigating or responding to violations.

To determine the quantity of geoducks taken off-tract, DNR may conduct an underwater survey, or DNR may approximate the quantity taken from the quantity of geoducks on board any vessel engaged in off-tract harvesting when DNR discovers the breach. DNR may require the Purchaser to proceed directly to an off-load point, weigh all geoducks on board, and complete DNR-approved forms under DNR or Department of Fish and Wildlife supervision. Purchaser may retain the geoducks after they have been weighed, but all geoducks taken off-tract shall be counted toward the Harvest Ceiling. The minimum liquidated damages due under this Clause shall be $250.00.

Alternatively, DNR may seek the remedies provided in RCW 79.135.030, which permits DNR to seek civil damages in the Thurston County Superior Court for wrongful taking of shellfish from the public lands.

(2) Liquidated Damages for Violations of Operation, Weighing, and Reporting Requirements. Failure to conform to the operational requirements of Clauses 8, 10, and 13, and failure to conform to the weighing and reporting requirements in Clause 12 result in substantial injury to the DNR. Such failures reduce resource removal accountability, encourage others to take geoducks illegally, and increase the DNR's administrative costs. Those damages are difficult to assess. Therefore, Purchaser agrees to pay DNR as liquidated damages $100.00 for each hour that DNR spends in investigating and responding, plus the actual cost of any goods and services purchased by DNR in the course of investigating and responding to each such failure to conform that is a material breach under Clause 15.

17. PURCHASER'S REMEDIES AND DUTIES UPON DNR'S BREACH

(a) Notice of Breach. If Purchaser believes that DNR has failed to comply with any provisions of this contract, Purchaser shall give written notice to the DNR describing the alleged noncompliance, and shall allow the DNR at least fifteen (15) days to cure. Unless Purchaser gives such notice and opportunity to cure, Purchaser may not declare a breach, initiate a lawsuit or seek any remedies available under this contract for DNR's failure to perform.

(b) Exclusive Remedy of Purchaser and Limitation on DNR's Liability. If DNR breaches this contract, DNR's liability is limited to the return to Purchaser of any payments made for geoducks not harvested, exclusive of the Bonus Bid. Purchaser's exclusive remedy shall be to rescind this contract and recover payments made for geoducks not harvested, exclusive of the Bonus Bid. In no case shall DNR be liable for any incidental or consequential damages, including lost profits.

(c) Further Limitation on DNR's Liability. To the extent that DNR's actions constitute a breach and specifically and directly prevent Purchaser from harvesting geoducks, Purchaser shall be entitled to seek reimbursement of any prepayments, and reimbursement of a portion of the Bonus Bid based upon the percentage of the original Harvest Ceiling pounds of geoduck identified in Clause 2 that Purchaser was prevented from harvesting. In no event shall DNR's liability ever exceed the aggregate amount of payments it has received from Purchaser under this contract. In no case shall DNR be liable for any incidental or consequential damages, including lost profits. This limitation on DNR's liability shall apply to any breach of this contract by DNR where Subclause 17(b) is not enforced. In calculating any bid submitted for this contract, Purchaser has accounted for this limitation on liability.

18. ASSIGNMENT AND DELEGATION

Purchaser may assign any rights or delegate any duties created under this contract. DNR reserves the right to approve or disapprove the re-assignment of the Agreement. DNR has up to thirty (30) days to process the necessary documents for the re-assignment after approval.

19. NO SECURITY INTEREST

Purchaser shall permit no creation of any security interest in the geoducks identified in Clause 2 or in the Property.

20. INDEMNIFICATION

(a) Indemnification. To the fullest extent permitted by law, Purchaser shall indemnify, defend and hold harmless the State of Washington, agencies of State, and all officials, agents and employees of State, from and against all claims arising out of or resulting form the performance of the agreement. "Claim" as used in this agreement means any financial loss, claim, suit, action, damage, or expense, including but not limited to attorney's fees, attributable for bodily injury, sickness, disease or death, or injury to or destruction of tangible property including loss of use resulting therefrom. Purchaser's obligation to indemnify, defend, and hold harmless includes any claim by Purchaser's agents, employees, or representatives, or any subcontractor or its employees. Purchaser expressly agrees to indemnify, defend, and hold harmless State for any claim arising out of or incident to Purchaser's or any subcontractor's performance or failure to perform the agreement. Purchaser's obligation to indemnify, defend, and hold harmless State shall not be eliminated or reduced by any actual or alleged concurrent negligence of State or its agents, agencies, employees and officials. Purchaser waives its immunity under Title 51 RCW to the extent it is required to indemnify, defend, and hold harmless State and its agencies, officials, agents or employees.

(b) Hazardous Waste Indemnification. Purchaser shall indemnify, defend, and save harmless the State of Washington and any agencies, officers, agents, and employees thereof from all costs and damages assessed under any federal or state hazardous substance cleanup law as a result of activities undertaken by Purchaser in connection with this contract.

21. PERFORMANCE SECURITY

Purchaser must provide a performance security in an amount equal to «Bond_Amt» within ten (10) business days after successful bid at auction. The bond must guarantee the purchaser's performance of all provisions in this contract, with the exception of the obligations under Hazardous Waste Indemnification sub-clause above. The bond must name State as the obligee. A Letter of Credit may substitute for a performance bond unless prohibited by statute, if it is irrevocable, allows the State to draw funds at will, and names State as beneficiary. A Letter of Credit must comply with Title 62A RCW, Article 5. A savings account assignment may substitute for a performance bond. Purchaser shall not operate unless a performance security has been accepted by the State. If at any time the State decides that this security has become unsatisfactory, Purchaser agrees to suspend operations and, within 24 hours of notification, to either replace the security with one acceptable to the State, or to supplement the amount of the existing security. The performance security shall remain in force at all times during the term of this contract and until all payment required under Clauses 4 and

16 are made. Upon any default by Purchaser in its obligations under this agreement, State may collect on the performance security to offset the liability of Purchaser to State. Collection on the performance security shall not relieve Purchaser of liability, shall not limit any of State's other remedies, and shall not reinstate or cure the default or prevent termination of the agreement because of the default.

22. INSURANCE

Purchaser shall procure and maintain the insurance described in this Clause for the entire term of this contract.

(a) General Requirements for Insurance. Purchaser shall, at all times during the term of this contract at its cost and expense, buy and maintain insurance of the types and amounts listed below. If Purchaser fails to procure and maintain the insurance described below, Purchaser shall be in material breach of this contract. In case of breach, State, at its election, shall have the right to terminate the contract or to procure and maintain, at Purchaser's expense, substitute insurance with right of offset against any money due Purchaser.

All insurance and surety bonds should be issued by companies admitted to do business within the State of Washington and have a rating of A-, Class VII or better in the most recently published edition of Best's Reports. Any exception shall be reviewed and approved by the department's risk manager before the contract is accepted. If an insurer is not admitted, all insurance policies and procedures for issuing the insurance policies must comply with Chapter 48.15 RCW and 284-15 WAC.

State of Washington, Department of Natural Resources shall be provided written notice before cancellation or non-renewal of any insurance referred to therein, in accord with the following specifications:

(1) Insurers subject to Chapter 48.18 RCW (admitted and regulated by the Insurance Commissioner): The insurer shall give the State 45 days advance notice of cancellation or non-renewal. If cancellation is due to non-payment of premium, the State shall be given 10 days advance notice of cancellation.

(2) Insurers subject to Chapter 48.15 RCW (surplus lines): The State shall be given 20 days advance notice of cancellation. If cancellation is due to non-payment of premium, the State shall be given 10 days advance notice of cancellation.

Within ten (10) business days of successful bid at auction, Purchaser shall furnish State of Washington, Department of Natural Resources with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements specified in the contract and, if requested, copies of polices to State. The certificate of insurance shall reference the State of Washington, Department of Natural Resources, and the harvesting agreement number.

Purchaser shall include all subcontractors as insured under all required insurance policies, or shall furnish separate certificates of insurance and endorsements for each subcontractor. Subcontractor(s) must comply fully with all insurance requirements stated herein. Failure of subcontractor(s) to comply with insurance requirements does not limit Purchaser's liability or responsibility.

The State of Washington, Department of Natural Resources, its elected and appointed officials, agents and employees shall be named as an additional insured on all general liability, excess, umbrella, and property insurance policies.

All insurance provided in compliance with this contract shall be primary as to any other insurance or self-insurance programs afforded to or maintained by State.

Purchaser waives all rights against State for recovery of damages to the extent these damages are

covered by general liability or umbrella insurance maintained pursuant to this contract.

By requiring insurance herein, State does not represent that coverage and limits will be adequate to protect Purchaser, and such coverage and limits shall not limit Purchaser's liability under the indemnities and reimbursements granted to State in this contract.

The limits of insurance, which may be increased by State of Washington, Department of Natural Resources, as deemed necessary, shall not be less than as follows:

(b) Commercial General Liability (CGL)/Marine General Liability (MGL) Insurance. Purchaser shall maintain commercial general liability (CGL) insurance or marine general liability (MGL) insurance covering claims for bodily injury, personal injury, or property damage arising on the property and/or out of Purchaser's operations and, if necessary, commercial umbrella insurance with a limit of not less than $1,000,000.00 per each occurrence. If such CGL or MGL insurance contains aggregate limits, the General Aggregate limit shall be at least twice the "each occurrence" limit. CGL or MGL insurance shall have products-completed operations aggregate limit of at least two times the "each occurrence" limit.

CGL insurance shall be written on Insurance Services Office (ISO) occurrence form CG 00 01 (or a substitute form providing equivalent coverage). All insurance shall cover liability arising out of premises, operations, independent contractors, products completed operations, personal injury and advertising injury, and liability assumed under an insured contract (including the tort liability of another party assumed in a business contract), and contain separation of insured (cross liability) condition.

(c) Protection and Indemnity Insurance. Purchaser shall procure and maintain protection and indemnity (P and I) insurance, including hull coverage. This insurance will cover all claims with respect to injuries or damages to persons or property, including nets and fishing lines, sustained in, on, or about the property, including while at a marina and in transit, with limits of liability not less than $1,000,000.00. If necessary, commercial umbrella insurance covering claims for these risks shall be procured and maintained.

(d) Worker's Compensation Insurance. Purchaser shall comply with all State of Washington workers' compensation statutes and regulations. Workers' compensation coverage shall be provided for all employees of Purchaser and employees of any subcontractor or sub-subcontractor. Coverage shall include bodily injury (including death) by accident or disease, which exists out of or in connection with the performance of this contract. Except as prohibited by law, Purchaser waives all rights of subrogation against State for recovery of damages to the extent they are covered by workers' compensation, employer's liability, commercial general liability, or commercial umbrella liability insurance.

If Purchaser, subcontractor or sub-subcontractor fails to comply with all State of Washington workers' compensation statutes and regulations and State incurs fines or is required by law to provide benefits to or obtain coverage for such employees, Purchaser shall indemnify State. Indemnity shall include all fines, payment of benefits to Purchaser or subcontractor employees, or their heirs or legal representatives, and the cost of effecting coverage on behalf of such employees.

(e) Longshore and Harbor Worker's Insurance. Certain work or services under this agreement may require insurance coverage for longshore and harbor workers other than seaman as provided in the Longshore and Harbor Worker's Compensation Act [33 U.S.C.A. Section 901 et seq.]. Failure to obtain coverage in the amount required by law may result in civil and criminal liabilities. Purchaser is fully responsible for ascertaining if such insurance is required and shall maintain insurance in compliance with this Act. Purchaser is responsible for all civil and criminal liability that may arise from the failure to maintain such coverage.

(f) Jones Act. Certain work or services under this agreement may require insurance coverage for seaman injured during employment resulting from negligence of the owner, master or fellow crew members as provided in 46 U.S.C.A. Section 688. Failure to obtain coverage in the amount required by law may result in civil and criminal liabilities. Purchaser is fully responsible for ascertaining if such insurance is required and shall maintain insurance in compliance with this Act. Purchaser is responsible for all civil and criminal liability that may arise from the failure to maintain such coverage.

(g) Marine Pollution Liability Insurance. Purchaser shall obtain for the duration of the contract marine pollution liability coverage, including investigation and defense costs, for bodily injury and property damage, including loss of use of damaged property or of property that has been physically damaged or destroyed. Such coverage must provide coverage for both on-site and off-site clean up costs and cover gradual and sudden pollution, and includes in its scope of coverage, natural resource damage claims. The State of Washington, Department of Natural Resources shall be named as additional insured. Coverage shall be maintained in an amount of at least:

(1) $1,000,000.00 each occurrence for contractor's operations at the site(s) identified above, and
(2) If the policy contains a general aggregate limit or policy limit, it shall be at least $5,000,000.00.

Such insurance may be provided on an occurrence or claims-made basis. If such coverage is obtained as an endorsement to the CGL and is provided on a claims-made basis, the following additional conditions must be met:

(1) The Insurance Certificate must state that the insurer is covering hazardous substance removal.
(2) The policy must contain no retroactive date, or the retroactive date must precede abatement services.
(3) Coverage must be continuously maintained with the same insurance carrier through the official completion of any work on the agreement Area.
(4) The extended reporting period (tail) must be purchased to cover a minimum of 36 months beyond completion of work.

(h) Failure to Have Insurance. If Purchaser at any time during the term of this contract fails to procure or maintain the insurance required by this Clause, DNR may procure substitute insurance. Upon demand, Purchaser shall reimburse DNR for any premiums DNR has paid under this Subclause, together with interest at the rate stated in Subclause 4(c).

(i) Compliance with Laws Not Assured. Compliance with this Clause 22 does not assure compliance with applicable insurance laws. The insurance required herein is intended only to protect DNR.

23. GOVERNING LAW AND VENUE

This contract shall be governed by the laws of the State of Washington. The venue for any lawsuit arising out of the provisions of this contract shall be the Superior Court for Thurston County, Washington.

24. ATTORNEY FEES

Should either party take any legal action to enforce the terms of this contract, each party shall bear its own costs and attorney fees.

25. MODIFICATIONS

No modification of this contract shall be binding on either party unless in writing and signed by both parties.

26. WAIVER

No waiver of any right under this contract shall be effective unless in writing. Waiver of any default shall not be deemed to be a waiver of any subsequent default. Waiver of breach of any provision of the contract shall not be deemed to be a waiver of any other or subsequent breach and shall not be construed to be a modification of the terms of this contract unless stated to be such in writing, signed by both parties, and attached to the original contract.

27. ENTIRE AGREEMENT

This contract and any attachments are the final expression of the parties' Agreement. There are no understandings, Agreements, or representations expressed or implied, that are not specified in this contract.

28. AUTHORIZED REPRESENTATIVES

Unless this contract expressly provides otherwise, any notice required to be given under this contract shall be in writing and shall be personally delivered or mailed to the party's authorized representative. Notice mailed through the United States Postal Service shall be deemed received on the third (3rd) day after mailing.

The DNR's Aquatic Resources Division Manager, or designee, is the DNR's authorized representative under this contract. The Division Manager's address is:

DEPARTMENT OF NATURAL RESOURCES
Loren J. Stern
Aquatic Resources Division
1111 Washington St SE
P.O. Box 47027
Olympia, WA 98504-7027

DNR agrees to notify Purchaser of any change of address or title of its authorized representative.

The address and authorized representative of Purchaser are:

«Purchaser»
«Purchaser_Address»
«Purchaser_City», «Purchaser_St» «Purchaser_Zip»
«Purchaser_Country»

Purchaser agrees to notify DNR of any change of name or address of its authorized representative.

IN WITNESS HEREOF, the Parties hereto have entered into this Harvesting Agreement and Contract of Sale.

STATE:
STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

_____
LOREN J. STERN, Aquatic Resources Division Manager

DATE:_____

PURCHASER:
«Purchaser»

BY: _____

DATE: _____

CERTIFICATE OF ACKNOWLEDGMENT

STATE OF WASHINGTON)
) ss.
County of Thurston)

On this ____ day of _____, 20____, personally appeared before me LOREN J. STERN, to me known to be the Aquatic Resources Division Manager of the Department of Natural Resources, State of Washington, who executed the within and foregoing instrument on behalf of the State of Washington, and acknowledged said instrument to be the free and voluntary act and deed of the State of Washington for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument and that the seal affixed is the official seal of the Commissioner of Public Lands for the State of Washington.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

S E A L

_____
NOTARY PUBLIC in and for the
State of Washington
My commission expires _____

CERTIFICATE OF ACKNOWLEDGMENT
INDIVIDUAL

STATE OF _____)
) ss
County of _____)

On this _____ day of _____, 20_____, personally appeared before me _____, to me known to be the individual described in and who executed the within and foregoing instrument and acknowledged that **he/she** signed the same as **his/her** free and voluntary act and deed for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

S E A L

_____
NOTARY PUBLIC in and for the
State of _____
My commission expires _____

Appendix C. The most common and obvious plants and animals seen by SCUBA divers on geoduck surveys performed between 2001-2006[1]. Plants and animals are listed by Geoduck Management Region[2], in order of most encountered to least encountered determined by the percentage of transects surveyed in that region on which that plant or animal was seen. Data is shown in three tables. Table 1 lists animals seen on at least 50% of the transects in each region. Table 2 lists animals observed on all transects by region[3]. Table 3 lists plants observed on all transects by region[4]. Number of transects (N) is given for each region in each table.

Table 1. The Most Common and Obvious Animals Observed by Divers on at least 50% of the Transects in each Geoduck Management Region Surveyed from 2001-2006.

Scientific Name	Common Name	Phylum	% of Transects in Region	Region
Tresus spp.	HORSE CLAM	MOLLUSCA	81%	Central Sound
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	64%	N = 257
Chaetopterid polychaete tubes	CHAETOPTERID TUBE WORM	ANNELIDA	60%	
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	57%	
Cancer magister	DUNGENESS CRAB	ARTHROPODA	50%	
Metridium spp.	PLUMED ANEMONE	CNIDARIA	54%	Hood Canal
Tresus spp.	HORSE CLAM	MOLLUSCA	54%	N = 456
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	50%	
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	87%	North Sound
Metridium spp.	PLUMED ANEMONE	CNIDARIA	84%	N = 129
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	66%	
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	56%	
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	60%	South Sound
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	58%	N = 817
Metridium spp.	PLUMED ANEMONE	CNIDARIA	52%	
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	50%	
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	81%	Strait of Juan de
Urticina spp.	STRIPED ANEMONE	CNIDARIA	54%	Fuca N = 355

Table 2. The Most Common and Obvious Animals Observed by Divers on All Transects in Each Geoduck Management Region Surveyed from 2001-2006. Table 2.A. Central Sound, Table 2.B. Hood Canal, Table 2.C. North Sound, Table 2.D. South Sound, and Table 2.E. Strait of Juan de Fuca.

Table 2.A. Central Puget Sound Geoduck Management Region

Scientific Name	Common Name	Phylum	% of Transects (N = 257)
Tresus spp.	HORSE CLAM	MOLLUSCA	81%
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	64%
Chaetopterid polychaete tubes	CHAETOPTERID TUBE WORM	ANNELIDA	60%
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	57%
Cancer magister	DUNGENESS CRAB	ARTHROPODA	50%
Unspecified shrimp	SHRIMP	ARTHROPODA	49%
Terebellid spp.	TEREBELLID TUBE WORM	ANNELIDA	46%
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	46%
Armina californica	ARMINA	MOLLUSCA	45%
Stylatula elongata	SEA WHIP	CNIDARIA	40%
Veneridae spp.	HARDSHELL CLAMS	MOLLUSCA	39%

Citharichthys spp.	SANDDAB	CHORDATA	38%
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	38%
Cancer productus	RED ROCK CRAB	ARTHROPODA	37%
Metridium spp.	PLUMED ANEMONE	CNIDARIA	31%
Unspecified Cottidae	SCULPIN	CHORDATA	30%
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	25%
Oregonia gracilis	DECORATOR CRAB	ARTHROPODA	23%
Unspecified nudibranch	NUDIBRANCH	MOLLUSCA	22%
Modiolus rectus	HORSE MUSSEL	MOLLUSCA	19%
Unspecified flatfish	FLATFISH	CHORDATA	19%
Unspecified tunicate	SESSILE TUNICATE	CHORDATA	18%
Parophrys vetulus	ENGLISH SOLE	CHORDATA	15%
Unspecified brittle star	BRITTLE STAR	ECHINODERMATA	14%
Mya truncata	TRUNCATED MYA	MOLLUSCA	12%
Unspecified opisthobranch	OPISTHOBRANCH	MOLLUSCA	11%
Parastichopus californicus	CALIFORNIA SEA CUCUMBER	ECHINODERMATA	11%
Pachycerianthus fimbriatus	BURROWING ANEMONE	CNIDARIA	10%
Pleuronichthys coenosus	C-O SOLE	CHORDATA	9%
Urticina spp.	STRIPED ANEMONE	CNIDARIA	9%
Iopsetta isolepis	BUTTER SOLE	CHORDATA	8%
Dirona albolineata	DIRONA	MOLLUSCA	6%
Mediaster aequalis	VERMILLION STAR	ECHINODERMATA	5%
Unspecified fish	FISH	CHORDATA	5%
Lepidopsetta bilineata	ROCK SOLE	CHORDATA	5%
Panomya spp.	FALSE GEODUCK	MOLLUSCA	5%
Henricia leviuscula	BLOOD STAR	ECHINODERMATA	4%
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	4%
Unspecified ghost shrimp	GHOST SHRIMP	ARTHROPODA	4%
Polinices lewisii egg case	MOON SNAIL EGGS	MOLLUSCA	4%
Clinocardium nuttalli	HEART COCKLE	MOLLUSCA	4%
Pododesmus macrochisma	JINGLESHELL OYSTER	MOLLUSCA	4%
Unspecified Serpulidae tubeworm	TUBE WORM	ANNELIDA	4%
Unspecified Embiotocidae	PERCH	CHORDATA	3%
Evasterias troschelli	FALSE OCHRE STAR	ECHINODERMATA	2%
Pentamera spp.	MUD CUCUMBER	ECHINODERMATA	2%
Platichthys stellatus	STARRY FLOUNDER	CHORDATA	2%
Cryptochiton stelleri	GUMBOOT CHITON	MOLLUSCA	2%
Squalus acanthias	DOGFISH SHARK	CHORDATA	2%
Tritonia diomedea	ROSY TRITONIA	MOLLUSCA	2%
Luidia foliolata	SAND STAR	ECHINODERMATA	1%
Pugettia spp.	KELP CRAB	ARTHROPODA	1%
Telmessus cheiragonus	HELMET CRAB	ARTHROPODA	1%
Crossaster papposus	ROSE STAR	ECHINODERMATA	1%
Dendronotus spp.	DENDRONOTUS	MOLLUSCA	1%
Hermissenda crassicornis	HERMISSENDA	MOLLUSCA	1%
Raja spp. egg case	SKATE EGG CASE	CHORDATA	1%
Unspecified bryozoan	MOSS ANIMAL	BRYOZOA	1%
Unspecified hydroid	HYDROIDS	CNIDARIA	1%
Chlamys hastata	SPINY SCALLOP	MOLLUSCA	< 1%
Clupea harengus pallasi	PACIFIC HERRING	CHORDATA	< 1%
Crassadoma gigantea	ROCK SCALLOP	MOLLUSCA	< 1%
Cribrinopsis fernaldi	CRIMSON ANEMONE	CNIDARIA	< 1%
Hydrolagus colliei	RATFISH	CHORDATA	< 1%

Octopus or *Enteroctopus* spp.	OCTOPUS	MOLLUSCA	< 1%
Polinices lewisii	MOON SNAIL	MOLLUSCA	< 1%
Rossia pacifica	STUBBY SQUID	MOLLUSCA	< 1%
Scorpaenichthys marmoratus	CABEZON	CHORDATA	< 1%
Solaster spp.	SUN STAR	ECHINODERMATA	< 1%
Unspecified Agonidae	POACHER	CHORDATA	< 1%
Unspecified annelid worm	WORM	ANNELIDA	< 1%
Unspecified burrowing holothurian	BURROWING CUCUMBER	ECHINODERMATA	< 1%
Unspecified *Hexagrammos* spp.	GREENLING	CHORDATA	< 1%
Unspecified Pholadidae	PIDDOCK	MOLLUSCA	< 1%
Unspecified Porifera	SPONGE	PORIFERA	< 1%
Unspecified *Raja* spp.	SKATE	CHORDATA	< 1%

Table 2.B. Hood Canal Geoduck Management Region

Scientific Name	Common Name	Phylum	% of Transects (N = 456)
Metridium spp.	PLUMED ANEMONE	CNIDARIA	54%
Tresus spp.	HORSE CLAM	MOLLUSCA	54%
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	50%
Stylatula elongata	SEA WHIP	CNIDARIA	46%
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	44%
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	39%
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	36%
Cancer productus	RED ROCK CRAB	ARTHROPODA	29%
Chaetopterid polychaete tubes	CHAETOPTERID TUBE WORM	ANNELIDA	27%
Unspecified nudibranch	NUDIBRANCH	MOLLUSCA	27%
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	27%
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	24%
Urticina spp.	STRIPED ANEMONE	CNIDARIA	22%
Unspecified annelid worm	WORM	ANNELIDA	21%
Cancer magister	DUNGENESS CRAB	ARTHROPODA	20%
Pachycerianthus fimbriatus	BURROWING ANEMONE	CNIDARIA	19%
Unspecified tunicate	SESSILE TUNICATE	CHORDATA	18%
Parastichopus californicus	CALIFORNIA SEA CUCUMBER	ECHINODERMATA	17%
Armina californica	ARMINA	MOLLUSCA	17%
Luidia foliolata	SAND STAR	ECHINODERMATA	16%
Hermissenda crassicornis	HERMISSENDA	MOLLUSCA	16%
Unspecified shrimp	SHRIMP	ARTHROPODA	15%
Unspecified flatfish	FLATFISH	CHORDATA	15%
Terebellid spp.	TEREBELLID TUBE WORM	ANNELIDA	14%
Modiolus rectus	HORSE MUSSEL	MOLLUSCA	12%
Citharichthys spp.	SANDDAB	CHORDATA	11%
Veneridae spp.	HARDSHELL CLAMS	MOLLUSCA	11%
Unspecified Cottidae	SCULPIN	CHORDATA	10%
Dirona albolineata	DIRONA	MOLLUSCA	9%
Oregonia gracilis	DECORATOR CRAB	ARTHROPODA	9%
Lepidopsetta bilineata	ROCK SOLE	CHORDATA	8%
Evasterias troschelli	FALSE OCHRE STAR	ECHINODERMATA	7%
Mya truncata	TRUNCATED MYA	MOLLUSCA	7%
Tritonia diomedea	ROSY TRITONIA	MOLLUSCA	7%
Clinocardium nuttalli	HEART COCKLE	MOLLUSCA	7%
Polinices lewisii egg case	MOON SNAIL EGGS	MOLLUSCA	6%

Unspecified ghost shrimp	GHOST SHRIMP	ARTHROPODA	6%
Raja spp. egg case	SKATE EGG CASE	CHORDATA	5%
Parophrys vetulus	ENGLISH SOLE	CHORDATA	5%
Dermasterias imbricata	LEATHER STAR	ECHINODERMATA	5%
Panomya spp.	FALSE GEODUCK	MOLLUSCA	4%
Platichthys stellatus	STARRY FLOUNDER	CHORDATA	4%
Unspecified Pholadidae	PIDDOCK	MOLLUSCA	4%
Unspecified Porifera	SPONGE	PORIFERA	4%
Solaster spp.	SUN STAR	ECHINODERMATA	4%
Unspecified burrowing holothurian	BURROWING CUCUMBER	ECHINODERMATA	4%
Pododesmus macrochisma	JINGLESHELL OYSTER	MOLLUSCA	3%
Unspecified arthropod	ARTHROPOD	ARTHROPODA	3%
Dendronotus spp.	DENDRONOTUS	MOLLUSCA	3%
Hydrolagus colliei	RATFISH	CHORDATA	3%
Pleuronichthys coenosus	C-O SOLE	CHORDATA	3%
Polinices lewisii	MOON SNAIL	MOLLUSCA	3%
Henricia leviuscula	BLOOD STAR	ECHINODERMATA	2%
Unspecified bryozoan	MOSS ANIMAL	BRYOZOA	2%
Unspecified *Hexagrammos* spp.	GREENLING	CHORDATA	2%
Cribrinopsis fernaldi	CRIMSON ANEMONE	CNIDARIA	1%
Crossaster papposus	ROSE STAR	ECHINODERMATA	1%
Unspecified hydroid	HYDROIDS	CNIDARIA	1%
Unspecified fish	FISH	CHORDATA	1%
Unspecified holothurian	BLACK CUCUMBER	ECHINODERMATA	1%
Unspecified *Raja* spp.	SKATE	CHORDATA	1%
Mediaster aequalis	VERMILLION STAR	ECHINODERMATA	1%
Pugettia spp.	KELP CRAB	ARTHROPODA	1%
Telmessus cheiragonus	HELMET CRAB	ARTHROPODA	1%
Unspecified Agonidae	POACHER	CHORDATA	1%
Unspecified Embiotocidae	PERCH	CHORDATA	1%
Unspecified Pectinidae	SCALLOP	MOLLUSCA	1%
Aulorhynchus flavidus	TUBESNOUT	CHORDATA	< 1%
Cryptochiton stelleri	GUMBOOT CHITON	MOLLUSCA	< 1%
Cucumaria miniata	ORANGE CUCUMBER	ECHINODERMATA	< 1%
Dendraster excentricus	SAND DOLLAR	ECHINODERMATA	< 1%
Syngnathus leptorhynchus	BAY PIPEFISH	CHORDATA	< 1%
Unspecified Gobiidae	GOBIE	CHORDATA	< 1%
Balanus nubilis	GIANT BARNACLE	ARTHROPODA	< 1%
Chlamys hastata	SPINY SCALLOP	MOLLUSCA	< 1%
Fusitriton oregonensis	OREGON HAIRY TRITON	MOLLUSCA	< 1%
Munida quadrispina	PINCH BUG/ SQUAT LOBSTER	ARTHROPODA	< 1%
Octopus or *Enteroctopus* spp.	OCTOPUS	MOLLUSCA	< 1%
Orthasterias koehleri	RAINBOW STAR	ECHINODERMATA	< 1%
Psettichthys melanostictus	SAND SOLE	CHORDATA	< 1%
Pteraster tesselatus	SLIME STAR	ECHINODERMATA	< 1%
Squalus acanthias	DOGFISH SHARK	CHORDATA	< 1%
Stylasterias forreri	FISH-EATING STAR	ECHINODERMATA	< 1%
Unspecified bivalve mollusc	MOLLUSC	MOLLUSCA	< 1%
Unspecified opisthobranch	OPISTHOBRANCH	MOLLUSCA	< 1%
Unspecified Serpulidae tubeworm	TUBE WORM	ANNELIDA	< 1%

Table 2.C. North Puget Sound Geoduck Management Region

Scientific Name	Common Name	Phylum	% of Transects (N = 129)
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	87%
Metridium spp.	PLUMED ANEMONE	CNIDARIA	84%
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	66%
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	56%
Cancer magister	DUNGENESS CRAB	ARTHROPODA	47%
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	30%
Unspecified opisthobranch	OPISTHOBRANCH	MOLLUSCA	30%
Solaster spp.	SUN STAR	ECHINODERMATA	21%
Platichthys stellatus	STARRY FLOUNDER	CHORDATA	18%
Raja spp. egg case	SKATE EGG CASE	CHORDATA	18%
Terebellid spp.	TEREBELLID TUBE WORM	ANNELIDA	18%
Citharichthys spp.	SANDDAB	CHORDATA	14%
Cancer productus	RED ROCK CRAB	ARTHROPODA	13%
Unspecified Cottidae	SCULPIN	CHORDATA	13%
Unspecified flatfish	FLATFISH	CHORDATA	9%
Unspecified nudibranch	NUDIBRANCH	MOLLUSCA	9%
Parophrys vetulus	ENGLISH SOLE	CHORDATA	7%
Lepidopsetta bilineata	ROCK SOLE	CHORDATA	5%
Oregonia gracilis	DECORATOR CRAB	ARTHROPODA	5%
Hippasteria spinosa	SPINY STAR	ECHINODERMATA	5%
Pleuronichthys coenosus	C-O SOLE	CHORDATA	5%
Tresus spp.	HORSE CLAM	MOLLUSCA	5%
Unspecified tunicate	SESSILE TUNICATE	CHORDATA	5%
Armina californica	ARMINA	MOLLUSCA	3%
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	3%
Pachycerianthus fimbriatus	BURROWING ANEMONE	CNIDARIA	3%
Mediaster aequalis	VERMILLION STAR	ECHINODERMATA	2%
Pentamera spp.	MUD CUCUMBER	ECHINODERMATA	2%
Ammodytes hexapterus	SAND LANCE	CHORDATA	2%
Crossaster papposus	ROSE STAR	ECHINODERMATA	2%
Evasterias troschelli	FALSE OCHRE STAR	ECHINODERMATA	2%
Loligo opalescens	SQUID EGGS	MOLLUSCA	2%
Unspecified brittle star	BRITTLE STAR	ECHINODERMATA	2%
Parastichopus californicus	CALIFORNIA SEA CUCUMBER	ECHINODERMATA	2%
Polinices lewisii	MOON SNAIL	MOLLUSCA	2%
Sebastes maliger	QUILLBACK ROCKFISH	CHORDATA	2%
Chlamys hastata	SPINY SCALLOP	MOLLUSCA	1%
Clinocardium nuttalli	HEART COCKLE	MOLLUSCA	1%
Mya truncata	TRUNCATED MYA	MOLLUSCA	1%
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	1%
Rossia pacifica	STUBBY SQUID	MOLLUSCA	1%
Strongylocentrotus droebachiensis	GREEN URCHIN	ECHINODERMATA	1%
Unspecified Agonidae	POACHER	CHORDATA	1%
Unspecified shrimp	SHRIMP	ARTHROPODA	1%
Urticina spp.	STRIPED ANEMONE	CNIDARIA	1%

Table 2.D. South Puget Sound Geoduck Management Region

Scientific Name	Common Name	Phylum	% of Transects (N = 817)

Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	60%
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	58%
Metridium spp.	PLUMED ANEMONE	CNIDARIA	52%
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	50%
Citharichthys spp.	SANDDAB	CHORDATA	48%
Tresus spp.	HORSE CLAM	MOLLUSCA	48%
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	42%
Pachycerianthus fimbriatus	BURROWING ANEMONE	CNIDARIA	39%
Unspecified Cottidae	SCULPIN	CHORDATA	37%
Cancer productus	RED ROCK CRAB	ARTHROPODA	35%
Terebellid spp.	TEREBELLID TUBE WORM	ANNELIDA	32%
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	32%
Polinices lewisii egg case	MOON SNAIL EGGS	MOLLUSCA	30%
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	28%
Unspecified tunicate	SESSILE TUNICATE	CHORDATA	25%
Luidia foliolata	SAND STAR	ECHINODERMATA	24%
Stylatula elongata	SEA WHIP	CNIDARIA	19%
Unspecified flatfish	FLATFISH	CHORDATA	19%
Parastichopus californicus	CALIFORNIA SEA CUCUMBER	ECHINODERMATA	19%
Unspecified ghost shrimp	GHOST SHRIMP	ARTHROPODA	16%
Veneridae spp.	HARDSHELL CLAMS	MOLLUSCA	15%
Chaetopterid polychaete tubes	CHAETOPTERID TUBE WORM	ANNELIDA	15%
Panomya spp.	FALSE GEODUCK	MOLLUSCA	14%
Unspecified brittle star	BRITTLE STAR	ECHINODERMATA	14%
Armina californica	ARMINA	MOLLUSCA	14%
Unspecified opisthobranch	OPISTHOBRANCH	MOLLUSCA	12%
Urticina spp.	STRIPED ANEMONE	CNIDARIA	12%
Oregonia gracilis	DECORATOR CRAB	ARTHROPODA	11%
Solaster spp.	SUN STAR	ECHINODERMATA	11%
Lepidopsetta bilineata	ROCK SOLE	CHORDATA	9%
Unspecified nudibranch	NUDIBRANCH	MOLLUSCA	9%
Mya truncata	TRUNCATED MYA	MOLLUSCA	8%
Unspecified shrimp	SHRIMP	ARTHROPODA	8%
Crossaster papposus	ROSE STAR	ECHINODERMATA	8%
Platichthys stellatus	STARRY FLOUNDER	CHORDATA	8%
Polinices lewisii	MOON SNAIL	MOLLUSCA	8%
Parophrys vetulus	ENGLISH SOLE	CHORDATA	8%
Cancer magister	DUNGENESS CRAB	ARTHROPODA	7%
Mediaster aequalis	VERMILLION STAR	ECHINODERMATA	6%
Unspecified annelid worm	WORM	ANNELIDA	6%
Unspecified Pholadidae	PIDDOCK	MOLLUSCA	6%
Dendronotus spp.	DENDRONOTUS	MOLLUSCA	6%
Hermissenda crassicornis	HERMISSENDA	MOLLUSCA	5%
Hydrolagus colliei	RATFISH	CHORDATA	5%
Evasterias troschelli	FALSE OCHRE STAR	ECHINODERMATA	5%
Dermasterias imbricata	LEATHER STAR	ECHINODERMATA	5%
Unspecified Porifera	SPONGE	PORIFERA	4%
Unspecified fish	FISH	CHORDATA	4%
Pleuronichthys coenosus	C-O SOLE	CHORDATA	4%
Unspecified hydroid	HYDROIDS	CNIDARIA	4%
Unspecified burrowing holothurian	BURROWING CUCUMBER	ECHINODERMATA	3%
Henricia leviuscula	BLOOD STAR	ECHINODERMATA	3%
Modiolus rectus	HORSE MUSSEL	MOLLUSCA	3%

Unspecified Agonidae	POACHER	CHORDATA	2%
Hippasteria spinosa	SPINY STAR	ECHINODERMATA	2%
Pododesmus macrochisma	JINGLESHELL OYSTER	MOLLUSCA	2%
Unspecified holothurian	BLACK CUCUMBER	ECHINODERMATA	2%
Raja spp. egg case	SKATE EGG CASE	CHORDATA	2%
Clinocardium nuttalli	HEART COCKLE	MOLLUSCA	1%
Tritonia diomedea	ROSY TRITONIA	MOLLUSCA	1%
Unspecified Embiotocidae	PERCH	CHORDATA	1%
Squalus acanthias	DOGFISH SHARK	CHORDATA	1%
Aulorhynchus flavidus	TUBESNOUT	CHORDATA	1%
Hydrolagus colliei egg case	RATFISH EGG CASE	CHORDATA	1%
Loligo opalescens	SQUID EGGS	MOLLUSCA	1%
Crassadoma gigantea	ROCK SCALLOP	MOLLUSCA	1%
Eupentacta quinquesemita	WHITE CUCUMBER	ECHINODERMATA	1%
Pugettia spp.	KELP CRAB	ARTHROPODA	1%
Dirona albolineata	DIRONA	MOLLUSCA	1%
Unspecified bivalve mollusc	MOLLUSC	MOLLUSCA	1%
Unspecified *Raja* spp.	SKATE	CHORDATA	1%
Syngnathus leptorhynchus	BAY PIPEFISH	CHORDATA	1%
Unspecified bryozoan	MOSS ANIMAL	BRYOZOA	1%
Dendraster excentricus	SAND DOLLAR	ECHINODERMATA	1%
Chlamys hastata	SPINY SCALLOP	MOLLUSCA	< 1%
Rossia pacifica	STUBBY SQUID	MOLLUSCA	< 1%
Unspecified anemone	ANEMONE	CNIDARIA	< 1%
Unspecified Gobiidae	GOBIE	CHORDATA	< 1%
Unspecified *Hexagrammos* spp.	GREENLING	CHORDATA	< 1%
Balanus nubilis	GIANT BARNACLE	ARTHROPODA	< 1%
Octopus or *Enteroctopus* spp.	OCTOPUS	MOLLUSCA	< 1%
Unspecified *Sebastes* spp.	ROCKFISH	CHORDATA	< 1%
Chlamys rubida	PINK SCALLOP	MOLLUSCA	< 1%
Cryptochiton stelleri	GUMBOOT CHITON	MOLLUSCA	< 1%
Cucumaria miniata	ORANGE CUCUMBER	ECHINODERMATA	< 1%
Leptasterias hexactis	SIX-RAYED SEA STAR	ECHINODERMATA	< 1%
Olivella biplicata	OLIVE SNAIL	MOLLUSCA	< 1%
Ophiodon elongatus	LINGCOD	CHORDATA	< 1%
Pisaster ochraceus	OCHRE STAR	ECHINODERMATA	< 1%
Psettichthys melanostictus	SAND SOLE	CHORDATA	< 1%
Scorpaenichthys marmoratus	CABEZON	CHORDATA	< 1%
Sebastes caurinus	COPPER ROCKFISH	CHORDATA	< 1%
Sebastes maliger	QUILLBACK ROCKFISH	CHORDATA	< 1%
Semele rubropicta	ROSE SEMELE	MOLLUSCA	< 1%
Strongylocentrotus droebachiensis	GREEN URCHIN	ECHINODERMATA	< 1%
Telmessus cheiragonus	HELMET CRAB	ARTHROPODA	< 1%
Unspecified mysid	MYSID SHRIMP	ARTHROPODA	< 1%

Table 2.E. Strait of Juan de Fuca Geoduck Management Region

Scientific Name	Common Name	Phylum	% of Transects (N = 355)
Sabellid spp.	SABELLID TUBE WORM	ANNELIDA	81%
Urticina spp.	STRIPED ANEMONE	CNIDARIA	54%
Pycnopodia helianthoides	SUNFLOWER STAR	ECHINODERMATA	49%
Tresus spp.	HORSE CLAM	MOLLUSCA	48%

Chaetopterid polychaete tubes	CHAETOPTERID TUBE WORM	ANNELIDA	45%
Cancer productus	RED ROCK CRAB	ARTHROPODA	42%
Unspecified hermit crab	HERMIT CRAB	ARTHROPODA	34%
Unspecified Cottidae	SCULPIN	CHORDATA	32%
Cancer magister	DUNGENESS CRAB	ARTHROPODA	31%
Mya truncata	TRUNCATED MYA	MOLLUSCA	31%
Citharichthys spp.	SANDDAB	CHORDATA	30%
Panomya spp.	FALSE GEODUCK	MOLLUSCA	29%
Oregonia gracilis	DECORATOR CRAB	ARTHROPODA	28%
Unspecified shrimp	SHRIMP	ARTHROPODA	26%
Veneridae spp.	HARDSHELL CLAMS	MOLLUSCA	26%
Parastichopus californicus	CALIFORNIA SEA CUCUMBER	ECHINODERMATA	22%
Unspecified nudibranch	NUDIBRANCH	MOLLUSCA	22%
Henricia leviuscula	BLOOD STAR	ECHINODERMATA	12%
Polinices lewisii egg case	MOON SNAIL EGGS	MOLLUSCA	11%
Unspecified hydroid	HYDROIDS	CNIDARIA	10%
Orthasterias koehleri	RAINBOW STAR	ECHINODERMATA	10%
Raja spp. egg case	SKATE EGG CASE	CHORDATA	10%
Unspecified Porifera	SPONGE	PORIFERA	10%
Clinocardium nuttalli	HEART COCKLE	MOLLUSCA	10%
Pisaster brevispinus	SHORT-SPINED STAR	ECHINODERMATA	10%
Unspecified bryozoan	MOSS ANIMAL	BRYOZOA	10%
Unspecified annelid worm	WORM	ANNELIDA	8%
Unspecified flatfish	FLATFISH	CHORDATA	7%
Cryptochiton stelleri	GUMBOOT CHITON	MOLLUSCA	7%
Unspecified anemone	ANEMONE	CNIDARIA	6%
Fusitriton oregonensis	OREGON HAIRY TRITON	MOLLUSCA	6%
Mediaster aequalis	VERMILLION STAR	ECHINODERMATA	6%
Unspecified burrowing holothurian	BURROWING CUCUMBER	ECHINODERMATA	6%
Cribrinopsis fernaldi	CRIMSON ANEMONE	CNIDARIA	5%
Cancer gracilis	GRACEFUL CRAB	ARTHROPODA	5%
Evasterias troschelli	FALSE OCHRE STAR	ECHINODERMATA	5%
Unspecified fish	FISH	CHORDATA	4%
Polinices lewisii	MOON SNAIL	MOLLUSCA	4%
Terebellid spp.	TEREBELLID TUBE WORM	ANNELIDA	4%
Platichthys stellatus	STARRY FLOUNDER	CHORDATA	3%
Ptilosarcus gurneyi	SEA PEN	CNIDARIA	3%
Pugettia spp.	KELP CRAB	ARTHROPODA	3%
Unspecified coral	CORAL	CNIDARIA	3%
Hydrolagus colliei	RATFISH	CHORDATA	3%
Ammodytes hexapterus	SAND LANCE	CHORDATA	3%
Modiolus rectus	HORSE MUSSEL	MOLLUSCA	3%
Strongylocentrotus droebachiensis	GREEN URCHIN	ECHINODERMATA	3%
Unspecified Pholadidae	PIDDOCK	MOLLUSCA	3%
Dirona albolineata	DIRONA	MOLLUSCA	2%
Balanus nubilis	GIANT BARNACLE	ARTHROPODA	2%
Solaster spp.	SUN STAR	ECHINODERMATA	2%
Unspecified tunicate	SESSILE TUNICATE	CHORDATA	2%
Cucumaria miniata	ORANGE CUCUMBER	ECHINODERMATA	1%
Telmessus cheiragonus	HELMET CRAB	ARTHROPODA	1%
Unspecified *Hexagrammos* spp.	GREENLING	CHORDATA	1%
Hermissenda crassicornis	HERMISSENDA	MOLLUSCA	1%
Parophrys vetulus	ENGLISH SOLE	CHORDATA	1%

Strongylocentrotus franciscanus	RED URCHIN	ECHINODERMATA	1%
Armina californica	ARMINA	MOLLUSCA	1%
Luidia foliolata	SAND STAR	ECHINODERMATA	1%
Unspecified brittle star	BRITTLE STAR	ECHINODERMATA	1%
Stylasterias forreri	FISH-EATING STAR	ECHINODERMATA	1%
Chlamys hastata	SPINY SCALLOP	MOLLUSCA	1%
Crassadoma gigantea	ROCK SCALLOP	MOLLUSCA	1%
Hydrolagus colliei egg case	RATFISH EGG CASE	CHORDATA	1%
Lepidopsetta bilineata	ROCK SOLE	CHORDATA	1%
Pleuronichthys coenosus	C-O SOLE	CHORDATA	1%
Chlamys rubida	PINK SCALLOP	MOLLUSCA	< 1%
Chlamys spp.	SWIMMING SCALLOPS	MOLLUSCA	< 1%
Dendraster excentricus	SAND DOLLAR	ECHINODERMATA	< 1%
Dendronotus spp.	DENDRONOTUS	MOLLUSCA	< 1%
Metridium spp.	PLUMED ANEMONE	CNIDARIA	< 1%
Octopus or *Enteroctopus* spp.	OCTOPUS	MOLLUSCA	< 1%
Ophiodon elongatus	LINGCOD	CHORDATA	< 1%
Pachycerianthus fimbriatus	BURROWING ANEMONE	CNIDARIA	< 1%
Patinopecten caurinus	WEATHERVANE SCALLOP	MOLLUSCA	< 1%
Solen sicarius	JACK KNIFE CLAM	MOLLUSCA	< 1%
Stylatula elongata	SEA WHIP	CNIDARIA	< 1%
Unspecified ghost shrimp	GHOST SHRIMP	ARTHROPODA	< 1%
Unspecified mysid	MYSID SHRIMP	ARTHROPODA	< 1%
Unspecified opisthobranch	OPISTHOBRANCH	MOLLUSCA	< 1%
Unspecified *Raja* spp.	SKATE	CHORDATA	< 1%
Unspecified *Sebastes* spp.	ROCKFISH	CHORDATA	< 1%
NO ANIMALS			< 1%

Table 3. The Most Common and Obvious Plants Observed by Divers on All Transects in Each Geoduck Management Region Surveyed from 2001-2006. Table 3.A. Central Sound, Table 3.B. Hood Canal, Table 3.C. North Sound, Table 3.D. South Sound, and Table 3.E. Strait of Juan de Fuca.

Table 3.A. Central Puget Sound Geoduck Management Region

Scientific Name	Description	Phylum	% of Transects (N = 257)
Laminaria spp.	BROWN KELP	OCHROPHYTA	77%
Unspecified	SMALL RED ALGAE	RHODOPHYTA	67%
Desmarestia spp.	ACID KELP	OCHROPHYTA	46%
Diatoms	BROWN SINGLE-CELL ALGAE	BACILLARIOPHYTA	40%
Unspecified	LARGE RED ALGAE	RHODOPHYTA	36%
Ulva spp.	SEA LETTUCE	CHLOROPHYTA	24%
Zostera marina	EELGRASS	TRACHEOPHYTA	2%
	NO PLANTS		2%

Table 3.B. Hood Canal Geoduck Management Region

Scientific Name	Description	Phylum	% of Transects (N = 456)
Unspecified	SMALL RED ALGAE	RHODOPHYTA	41%
Laminaria spp.	BROWN KELP	OCHROPHYTA	35%
	NO PLANTS		29%
Diatoms	BROWN SINGLE-CELL ALGAE	BACILLARIOPHYTA	23%

Unspecified	LARGE RED ALGAE	RHODOPHYTA	21%
Ulva spp.	SEA LETTUCE	CHLOROPHYTA	20%
Desmarestia spp.	ACID KELP	OCHROPHYTA	7%
Gigartina papillata	TURKISH TOWEL	RHODOPHYTA	1%
Iridaea cordata	IRIDESCENT RED ALGAE	RHODOPHYTA	1%
Zostera marina	EELGRASS	TRACHEOPHYTA	1%
Costaria costata	5-RIB BULLATE BROWN ALGAE	OCHROPHYTA	< 1%
Pterygophora californica	FEATHER PALM ALGAE	OCHROPHYTA	< 1%
Unspecified	SMALL BROWN ALGAE	OCHROPHYTA	< 1%

Table 3.C. North Puget Sound Geoduck Management Region

Scientific Name	Description	Phylum	% of Transects (N = 129)
Ulva spp.	SEA LETTUCE	CHLOROPHYTA	76%
Diatoms	BROWN SINGLE-CELL ALGAE	BACILLARIOPHYTA	26%
	NO PLANTS		14%

Table 3.D. South Puget Sound Geoduck Management Region

Scientific Name	Description	Phylum	% of Transects (N = 817)
Ulva spp.	SEA LETTUCE	CHLOROPHYTA	71%
Unspecified	SMALL RED ALGAE	RHODOPHYTA	66%
Laminaria spp.	BROWN KELP	OCHROPHYTA	61%
Unspecified	LARGE RED ALGAE	RHODOPHYTA	29%
Diatoms	BROWN SINGLE-CELL ALGAE	BACILLARIOPHYTA	26%
Desmarestia spp.	ACID KELP	OCHROPHYTA	17%
	NO PLANTS		7%
Nereocystis luetkeana	BLADDER OR BULL WHIP KELP	OCHROPHYTA	1%
Costaria costata	5-RIB BULLATE BROWN ALGAE	OCHROPHYTA	< 1%
Zostera marina	EELGRASS	TRACHEOPHYTA	< 1%

Table 3.E. Strait of Juan de Fuca Geoduck Management Region

Scientific Name	Description	Phylum	% of Transects (N = 355)
Unspecified	SMALL RED ALGAE	RHODOPHYTA	96%
Diatoms	BROWN SINGLE-CELL ALGAE	BACILLARIOPHYTA	56%
Laminaria spp.	BROWN KELP	OCHROPHYTA	54%
Unspecified	LARGE RED ALGAE	RHODOPHYTA	33%
Desmarestia spp.	ACID KELP	OCHROPHYTA	23%
Lithothamnion or *Lithophyllum* spp.	CRUSTOSE CORALLINE ALGAE	RHODOPHYTA	4%
Pterygophora californica	FEATHER PALM ALGAE	OCHROPHYTA	2%
Corallina spp., *Bosiella* spp.	ARTICULATED CORALLINE ALGAE	RHODOPHYTA	2%
Ulva spp.	SEA LETTUCE	CHLOROPHYTA	1%
Alaria spp.	RIBBON KELP	OCHROPHYTA	1%
Nereocystis luetkeana	BLADDER OR BULL WHIP KELP	OCHROPHYTA	1%
Iridaea cordata	IRIDESCENT RED ALGAE	RHODOPHYTA	1%
Sarcodiotheca gaudichaudii	BRANCHING RED ALGAE	RHODOPHYTA	< 1%
	NO PLANTS		< 1%

[1] Geoduck surveys performed by Washington Department of Fish and Wildlife (WDFW). Data were queried from the master geoduck database on October 2, 2006 by Tina Blewett, WDFW, 360-902-2678. No WDFW surveys took place in the San Juan Island Geoduck Management Region during those years.

[2] Six geoduck management regions were established in marine waters of Washington by state and tribal managers (in 1995) based on major hydrogeographic basins of Puget Sound, Usual and Accustomed fishing areas of treaty tribes, and WDFW Marine Fish/Shellfish Management and Catch Reporting Areas. These regions are described in annual state/tribal commercial geoduck harvest management plans.

[3] Please read the following notes for important information regarding these observations. These are data from WDFW geoduck surveys, from tracts surveyed in the years 2001-2006. This table contains a list of the most common and obvious animals that were seen by divers while surveying geoduck on those tracts. This list is not meant to be a comprehensive list of everything that occurs on tracts with geoducks. Many animals may exist on or in the vicinity of the tract but may not be not seen or identified. Reasons are varied but include and are not limited to: animals that are too small to be seen or identified by the naked eye, are buried in the substrate, have the ability and the awareness to avoid the divers, are exceptionally cryptic, are migratory and thus are not on the tract when the surveys are conducted, are rare enough that the number of transects done for geoduck surveys is not adequate to encounter it, if visibility is poor (divers cannot see well), or seasonality (if the tract survey was done during a season of the year when that species is not on the tract or not as noticeable due to behavior, life stage, or change in appearance).

The tracts queried for these results were simply the tracts that happened to be surveyed in these years; they were not selected as "average" or "representative" of that region. Other animals may exist on other tracts not represented here. These tracts may include pre-fishing surveys, surveys on unfished tracts, or post-harvest surveys, which may affect the species present on the tract.

These data are Presence/Absence only. They are not meant to be used quantitatively. Also, any ranking of species or groups based on number of transects may not represent that species' or group's biomass on the tract.

Lastly, highly mobile and migratory animals (for example but not limited to: salmon, birds, and marine mammals) are assumed to be able to occur on or near any geoduck tract.

[4] These are data from WDFW geoduck surveys, from tracts surveyed in the years 2001-2006. This table contains a list of the most common and obvious plants attached to the substrate that were seen by divers while surveying geoduck on those tracts. This list is not meant to be a comprehensive list of everything that occurs on tracts with geoducks; other species may occur that are not listed here. Most plants observed are not identified to species level. We do not include "drift algae" but only list algae here that were attached to the substrate. An important note is that most algae are annual (die back in the winter), so certain plants may not be found on a tract if that survey was done during a season of the year when that species is not on the tract or not as noticeable due to its life stage, or seasonal differences in appearance.

These surveys may include pre-fishing surveys, surveys on unfished tracts, or post-harvest surveys, which may affect the species present on the tract. Also, the tracts queried for these results were simply tracts that happened to be surveyed in these years; they were not selected as "average" or "representative" of that region. Other plants may exist on other tracts not represented here. These data are Presence/Absence only and are not meant to be used quantitatively. Also, any ranking of species or groups based on number of transects may not represent that species' or group's biomass on the tract.

Department of Natural Resources
CONTRACT COVER SHEET

TRACKING NUMBER

05-AQ RGN-**101105**-06-61

(Year-Division/Region Acronym-Date-Document No.)

FINAL REVIEW

Review/Signature List:
(Initial Box After Review)

- ☒ William C. Brooks
- ☒ Doug Southerland — Off for DS
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Brief Summary: Agreement for $371-816, includes $350,000 for survey work that we budgeted for geoduck fishery and additional $21,816 for WDFW component of Hood Canal Dissolved Oxygen Program (HCDOP) funded by legislature in HB 1896. The details for all field and office work (detailed in agreement) that WDFW will be providing us, has been prioritized based upon current needs and may need to be modified during the course of Harvest Planning and events related to Tribal/State Management Plan negotiations. Language of the agreement has been written to allow for changes that reflect where surveys may need to be conducted.

ORIGINATOR'S INFORMATION

From Division/Region: Aquatic Resources Division
Originator/Contact: Todd Palzer
Phone: (360) 902-2439, **Extension:**
Date: October 10, 2005
Subject/Agreement No.: IAA 06-61 (WDFW #05-2128) Geoduck Stock Assessment & Eelgrass Surveys 05-07

CONTRACT INFORMATION

Type of Contract: Interagency Agreement, (if other, describe):
Contractor Name: Doug Sutherland
Original Contract Amount: $371,816.00
Original Contract Term and Dates: July 1, 2005 - June 30, 2007
Amended Contract Amount:
Amended Contract Term and Dates:

DETAILED FUNDING INFORMATION

EXPENDITURE	Fund(s)/Appropriation(s):	Prgm. Index:
	Trust(s):	Project Code:
	Object Info:	Sub-object:
	Do you wish to have these funds encumbered? Select from Dropdown Menu (If yes, please contact Finance.)	
REVENUE	Fund(s):	Trust(s):
	Revenue Source:	Sub-source:

REVIEWER COMMENTS

Return fully executed document to: Vickie Diamond, Aquatic Resources Division.

If you have any questions or updates regarding this form, please call Farra Arnold at (360) 902-1055.

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

October 4, 2005

Todd Palzer
Washington Department of Natural Resources
PO Box 47000
Olympia, Washington 98504-7000

RE: DNR AGREEMENT # IAA 06-61 (WDFW #05-2128) – GEODUCK STOCK ASSESSMENT & EELGRASS SURVEYS 2005-2007

Dear Mr. Palzer:

Enclosed are two copies of the above referenced contract document which have been signed by the authorized WDFW representative. Please sign both copies where indicated and return one copy to my attention at the above mailing address. The second copy should be retained in your permanent records.

If you have any questions please call the WDFW Project Manager, Bob Sizemore, at (360) 902-2827, or me at (360) 902-2439.

Sincerely,

Theresa J. Walker

Theresa J. Walker
Deputy Contracts Officer

Enclosures

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES
DOUG SUTHERLAND, Commissioner of Public Lands

INTERAGENCY AGREEMENT
WITH WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE
(Geoduck Stock Assessment and Eelgrass Surveys 2005-2007)

Agreement No. IAA 06-61

This Agreement is between the Washington State Department of Fish and Wildlife, referred to as WDFW and the Washington State Department of Natural Resources, referred to as DNR.

DNR and WDFW enter into this Agreement under authority of Chapter 39.34RCW of Washington State, Interlocal Cooperation Act.

The purpose of this Agreement is to fund field surveys, management studies, collection of biological information, and analytical work necessary to support the management of the commercial geoduck fishery. The information provided by this Agreement may be used by DNR and WDFW when making aquatic land use and resource management decisions in order to protect and manage the geoduck clam resource as directed by RCW 79.135.210 and RCW 77.04.012.

IT IS MUTUALLY AGREED THAT:

1.01. Statement of Work: WDFW shall furnish the necessary personnel, services, written reports, and otherwise conduct all activities necessary for, or incidental to, the performance of the work set forth in Exhibit "A." Unless otherwise specified, WDFW shall be responsible for performing all fiscal and program responsibilities as set forth in Exhibit "A."

2.01. Identification: The Interagency Agreement No. 06-61 must appear on all documents, correspondence, invoices, and all other written materials submitted or prepared in conjunction with this agreement.

3.01. Period of Performance: Irrespective of the date of signature, this agreement shall be effective starting on July 1, 2005 until June 30, 2007, unless sooner terminated by either party as provided herein.

4.01. Payment: Total compensation including expenses payable to WDFW for satisfactory performance of the work under this Agreement shall not exceed Three hundred seventy one thousand and eight hundred sixteen dollars ($371,816), contingent on available funding. DNR shall reimburse WDFW for costs associated with this project, as identified in the attached Budget (Exhibit B) from July 1, 2005 and onwards. Parties agree that this Interagency Agreement between WDFW and DNR will not include any indirect charge (WDFW agency overhead). Requests for payment for work completed by WDFW shall be submitted to the DNR Project

Coordinator monthly. Payment to WDFW for approved and completed invoices will be made by DNR within 30 days of receipt of complete invoices. Complete invoices will be supplemented with quarterly progress reports of geoduck-related activities. WDFW will provide additional accounting information to DNR upon request.

In addition to the proposed budget of $371,816 for the 2003-2005 biennium, DNR will provide a truck for WDFW shellfish program use. The value of the use of this truck is equivalent to approximately $15,000. A mileage log will be kept in accordance with agency and state guidelines. Non-contract related mileage and associated repairs and maintenance will be reimbursed to DNR and reflected in the mileage log. During the contract period, if the truck experiences mechanical or structural problems significant enough to require replacement prior to the conclusion of its planned useful life, the truck will be replaced by DNR if sufficient additional funds can be identified. Failing in-kind replacement due to lack of available funds, DNR will make every effort to provide an alternate vehicle to allow the towing of vessel and the transportation of staff and equipment for the remainder of this agreement.

5.01. Independent Capacity: WDFW and its employees or agents performing under this Agreement are not employees of DNR.

6.01. Assignability: This Agreement is not assignable or delegable by WDFW either in whole or in part.

7.01. Amendments: This Agreement shall only be amended by written mutual consent of both parties. Survey activities and reallocation of funds and resources associated with survey activities, within the scope of this agreement, may be modified by the WDFW and DNR Project Coordinators. Any modification to the revised survey activities will be mutually agreed upon by both WDFW and DNR, and documented by a letter to the file.

8.01. Nondiscrimination: During the performance of this Agreement, WDFW shall comply with all federal and state nondiscrimination laws, regulations, and policies. In the event of WDFW's noncompliance or refusal to comply with any nondiscrimination law, regulation, or policy, this Agreement may be rescinded, canceled, or terminated in whole or in part, and WDFW may be declared ineligible for further contracts with DNR.

9.01. Unilateral Termination: DNR may unilaterally terminate this Agreement in the event that funding for this Agreement from federal, state or other sources becomes no longer available to DNR. Such action is effective upon sixty (60) days from receipt of written notification by WDFW of termination by DNR.

DNR may terminate this Agreement in the event DNR becomes aware of non-geoduck program related activities being charged under this contract. Such action is effective upon sixty (60) days from receipt of written notification to WDFW of termination by DNR. WDFW may terminate this Agreement if DNR fails to reimburse WDFW within 60 days of the receipt of a complete invoice.

10.01. Termination: Either party may agree in writing to mutually terminate this Agreement by specifying the reason for termination, and providing at least thirty (30) days notice before the effective date of such termination.

11.01. Indemnification: WDFW and DNR each agree to defend, protect, save, and hold harmless the other party, its officers, agents, and employees from any and all claims, costs, damages, and expenses suffered due to the actions of the other party, or other party's agents or employees in the performance of this agreement.

12.01. Disputes: When a dispute arises concerning this Agreement between DNR and WDFW, the matter(s) will be referred to the signatories to this agreement. These persons will meet and attempt to resolve the dispute in a timely manner.

13.01. Waiver: A failure by either party to exercise its rights shall not constitute a waiver of any rights under this Agreement unless stated to be such in writing signed by an authorized representative of said party and attached to the original agreement.

14.01. Severability: If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, and to this end the provisions of this Agreement are declared to be severable.

15.01. General Insurance Requirements: DNR and WDFW are part of the State of Washington and protected by the State's self-insurance liability program as provided by Chapter 4.92.130. DNR and WDFW have entered into an agreement to provide the services herein. This agreement will terminate on the date listed in the period of performance. Both agencies agree to share responsibility equally for losses that arise out of this agreement.

16.01. Entire Agreement: This document contains all covenants, stipulations, and provisions agreed by both parties. No agent or representative of either party has authority to make, and the parties shall not be bound by or be liable for, any statement representation, promise or agreement not set forth herein. No changes, amendments, or modifications of the terms hereof shall be valid unless reduced to writing and signed by the parties as an amendment to this Agreement.

This contract as signed formally documents and validates the ongoing work that has been done and the work to be completed in accordance with Exhibit A – Scope of Work, and the period of performance specified in the agreement.

17.01. Contract Management: The Project Coordinator for each of the parties shall be the contact person for this agreement. All communications and billings will be sent to the project coordinator.

18.01. Project Coordinators:

(1) The Project Coordinator for WDFW is Bob Sizemore, Telephone Number 360-902-2827.

(2) The Project Coordinator for DNR is Todd Palzer, Telephone Number 360-902-1864.

IN WITNESS WHEREOF, the parties have executed this Agreement.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

Dated: OCT 04 2005, 2005

By: W C Brooks
William C. Brooks, C.P.M.

Title: Contracts Officer

Address: 1111 Washington St SE
Olympia, WA 98504

Telephone No. (360) 902-2433

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

Dated: 10/14/5, 2005

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EXHIBIT "A"

STATEMENT OF WORK

I. Geoduck and eelgrass surveys, fieldwork:

WDFW shall conduct geoduck surveys between March 1 and October 15 each year, consistent with the time frame of this Interagency Agreement between DNR and WDFW. WDFW biological survey work for pre-fishing surveys shall include geoduck population average density estimates and water jet dig samples for geoduck valve sizes and average weight estimates. WDFW will analyze the samples and send DNR a report on the results. Pre-fishing population surveys will be done at a 95% confidence level and the confidence interval will be within +/- 30% of the mean tract biomass estimate.

Geoduck resource surveys will be conducted either by the WDFW dive team or by the joint DNR and WDFW scuba dive team, and will be consistent with the Reciprocal Dive Memorandum of Understanding #05-74 between WDFW and DNR. DNR and WDFW will be diligent in maintaining diver readiness through annual dive physicals, on-going diver training, and dive equipment maintenance. The diver surveys consist of geoduck siphon show counts in belt transects. Each of the transects are 150' x 6' each (900 square feet) and will systematically sample the tract area between the -18 to -70 foot (MLLW) water depth contours. The interval between lines of transects along the shore will vary from about 1000 feet or a lesser distance to meet precision requirements for biomass estimations. Data collected will include geoduck counts, water depth, GPS position, substrate types, and associated macroscopic flora and fauna. Unless indicated otherwise, geoduck counts will be adjusted by a "show factor" determined from site-specific show plots. At approximately every 6th transect a geoduck dig sample is obtained, consisting of ten geoducks taken randomly with a water jet. At the dig stations, data collected includes number of geoducks dug, time needed to dig geoducks, water depth, substrate information, and digging difficulty.

Eelgrass surveys are done separately as part of the pre-fishing surveys to comply with state laws and permitting requirements. The entire shoreward boundary is examined in the vicinity of the 16-foot (MLLW) water depth contour. If eelgrass is discovered, the divers will define the deepest seaward extension of eelgrass. The shoreward boundary of the harvest area is set two vertical feet deeper than the deepest and most seaward occurrence of rooted eelgrass. Alternately a 180 horizontal foot buffer zone deeper and seaward of the deepest occurrence of rooted eelgrass may be used to define the shoreward boundary of the tract.

Exploratory and verification surveys may be completed at a lower precision level than prefishing surveys. For exploratory surveys, divers will target areas where geoducks have been reported or areas that have suitable substrates for geoducks, which have not previously been surveyed. The location of areas which have commercial potential will be documented and additional transects may be completed at a future date. Verification surveys may be done where inadequate or incomplete data is available or when the density or average weight is more than 2 standard deviations above or below the regional means. Verification surveys may attempt to replicate existing stations or systematically sample an existing tract area.

Tracts in each management region that are eligible for post-harvest surveys will be identified jointly by WDFW and DNR. Eligibility criteria for a tract include achieving a minimum "fished down" level of at least 65% of the original biomass estimate, or 0.04 geoduck/ft^2. These quantities are initially calculated by subtracting the amount harvested from the pre-fishing biomass estimate. An alternative management strategy for "fish down" level may be used if substrate type(s) or other tract characteristics or conditions prevent on-going geoduck harvest. Tracts eligible for post-harvest surveys are placed in recovery status, even though they may not be in the recovery study, and these tracts may not be fished again until the pre-fishing densities are achieved. The methodology for post-harvest surveys will be identical to that for pre-fishing surveys, with the following three exceptions: 1) The confidence interval for post-harvest surveys is not required to be within ±30% of the mean geoduck density estimate; the number of transects for the post-harvest survey will be the same as, or very similar to, the number of transects performed in the pre-fishing survey, and will be determined *post hoc* based on systematic grid lines beginning from a random starting point along the shoreward boundary of the tract; 2) The estimate of mean weight per geoduck will be the pre-fishing estimate (i.e., no dig samples are required for a post-harvest survey), unless WDFW and DNR agree that dig samples will provide a more accurate estimate of mean weight on an individual tract; and 3) The number of articulated geoduck shells within transects will be counted. Certain "fished out" tracts are included in a WDFW recovery study to determine rates of recovery. These beds will receive a series of post harvest surveys and will be identified in the annual Geoduck Atlas.

Fieldwork (July 1, 2005 to June 30, 2007)

Recovery tract surveys:

WDFW will continue the recovery study by surveying tracts to empirically verify rates of geoduck recruitment. Tracts slated for recovery surveys are:

	TRACT	TRACT #	ACRES	TIMING
1.	Dougall Pt. 1A	15600	26	July
2.	Dougall Pt. 2	15550	20	July
3.	Big Hunter	16900	93	late May
4.	Vashon E.	09750	53	Sept.
5.	Jamestown 2*	00500	295	Apr.-May

*A geoduck siphon show plot will need to be established.

Post-harvest surveys:

	TRACT	TRACT #	ACRES	TIMING
1.	Nisqually*	13800	145	March to Sept.
2.	Sisters/Shine**	23000	459	May - June
3.	Mahnckes 2-4*	12950	149	May-Sept.
4.	Austin***	05200	94	September
5.	Double Bluff***	05300	73	September
6.	Hood Head East	20200	33	March

*These tracts were harvested by the state and the tribes. In-kind contributions (survey

alternating transect lines, establishing or surveying siphon show plots, dividing tract areas for surveys, and providing survey materials or support) for post-harvest surveys will be sought. For the Mahnckes 2-4 tract, the Still Harbor show plot can be used during the post-harvest survey.
**It may be feasible to use the Vinland show plot for the Sisters/Shine survey.
***A show plot should be established for the Austin and Double Bluff tract surveys.

Pre-fishing surveys:

	TRACT	TRACT #	ACRES	TIMING
1.	Steamboat 4*	17800	18+	August
2.	Steamboat 1*	17600	26+	August
3.	Steamboat 2*	17550	48+	August
4.	Steamboat 3*	17500	48+	August
5.	Point Beals**	09600	65+	March – Sept.
6.	Wyckoff N.***	12200	299	July
7.	Still Harbor***	12750	57	July
8.	McNeil Island***	12700	106	July
9.	Hogan Pt. S.***	12850	28	July
10.	Peale Passage*	16450	33+	July

* Cooper Point show plot can be used for these tracts.
** Show plot will need to be established for the Point Beals tract.
***Surveys initiated in May and June 2005.

Index stations:

As a population monitoring tool for relative changes to geoduck abundance over short temporal spans, several permanent show plots in each region will be periodically re-surveyed:

SHOW PLOT	TIMING
Cooper Point	2006
Siebert Creek	2006
Still Harbor	2007
Briedablick	2007
Freshwater Bay	Establish in 2006
West Point	Establish in 2006
Langley	Establish in 2007
Point Partridge	Establish in 2007

Confirm geoduck biomass following illegal harvest:

TRACT	TRACT #	ACRES
Fox Island N.	11200	50
Fox Island	11250	70
Fox Island S.	11260	61
Point Robinson E.	10100	43
Maury Island	10150	130

Biomass confirmation surveys may include density transects only and no dig samples. The state and tribes will share this survey work, including in-kind contributions.

Revisions to fieldwork:

There may be unforeseen circumstances, which require revisions to the fieldwork listed in this agreement. Parties may mutually agree to revise the field schedule including additions and deletions of survey areas and changes in completion dates.

II. Laboratory work and environmental assessment reports:

Whole geoducks obtained with a commercial water jet will be weighed wet and their shell lengths measured. The geoduck siphons will be removed, weighed, and recorded. All data from the fieldwork and the laboratory analysis are entered into an Access database for data storage and analysis. The completed analysis will be provided to DNR, including maps and station locations, and a table showing estimates of tract size, geoduck density, geoduck biomass with confidence intervals, number of geoducks, mean geoduck weight, mean siphon weight, siphon weight as a percentage of whole weight, percentage over two pounds, number of water jet samples, and number of geoducks weighed. Three additional tables of data for each tract are supplied that give all data for each station, including digging difficulty, substrate observations, geoduck densities, and geoduck size.

Letters will be sent by WDFW and DNR to county governments, state agencies, affected tribes, other sections within WDFW, and other affected parties soliciting information and/or concerns with respect to proposed geoduck fishing within these selected beds. These letters will inform the recipient to contact WDFW regarding environmental and biological information requests, and to contact DNR regarding geoduck harvest and sales. After receiving responses to these letters and addressing concerns, an Environmental Assessment report (EA) will be written by WDFW (typically four to six pages) and supplied to DNR. The assessment will also list the flora and fauna observed in the surveys and the results of the eelgrass surveys. A pre-auction report will revise biomass estimates of an existing valid environmental assessment to account for subsequent commercial harvest and include an estimate of the fish down percentage of the tract(s). EAs will be requested in writing by DNR; WDFW will supply the EAs within 30 days of DNR's request, unless otherwise agreed.

If a WDFW survey reveals that an area is not suitable for commercial geoduck harvest, a report of these findings will be provided to DNR.

III. Calculate Total Allowable Catch (TAC):

WDFW will compile geoduck resource data from state surveys, tribal surveys, resource agencies, and other reliable sources and create an electronic database. The data will be summarized annually in the "Geoduck Atlas" and WDFW website. The annual revisions to the geoduck tract information will be available by April 1 each year, contingent on receipt of geoduck population survey data from the tribes, and receipt of final catch data from DNR and the tribes, in coordination with DNR, the Washington Department of Health (DOH), and treaty tribes. The map information for the Atlas will be maintained as ArcInfo files. WDFW will supply DNR with an updated version of the tract status tables (known commonly as the Geoduck Atlas) after

completion each year. Commercial geoduck tracts identified in the Geoduck Atlas will be used to calculate the Total Allowable Catch (TAC) in pounds of geoduck clams for each management region by April 1 of each year. This information will be provided to DNR in writing.

IV. Federal shellfish case:

WDFW and DNR will prepare for and participate in requests for production, interrogatories, statements, reviews and responses needed for the state/tribal shellfish case. Part of this work will include data entry and analysis of all geoduck resource surveys and harvest patterns. Two FTE months of data entry of resource surveys (1969-1989) into access database and verification is identified as part of the shellfish case preparation.

V. Resource compensation work:

Surveys of geoduck habitat and resources lost to subtidal marine projects and sewage outfalls will be reviewed and approved by WDFWand DNR. Compensation for these losses will be assessed and received by the DNR Aquatics Region.

Environmental consultants conducting geoduck resource surveys will be required to attend a WDFW geoduck stock assessment training class. A minimum of two "slots" in each training class will be made available to DNR staff to provide a broader understanding of the survey results produced. DNR participation will be coordinated through the DNR Project Coordinator.

VI. Geoduck aging project:

Collection of geoduck samples for aging is essential to determine population trends for geoduck recruitment and natural mortality. Currently a PhD candidate and staff at the University of Washington are aging geoduck shells. To the extent the aging analysis work by the University of Washington continues, WDFW and DNR will coordinate the collection of geoduck samples for this work and strive to attain representative samples from all management regions.

VII. Geoduck tract area and biomass within 200 yards from ordinary high tide contour:

State geoduck harvest opportunity and co-management of the geoduck resource with treaty tribes is affected by statutory limits to non-treaty geoduck harvest nearshore (200 yards from ordinary high tide). To make estimates of commercial tract areas affected and the associated geoduck biomass unavailable to non-treaty harvest, WDFW will use geographic information (NOAA contours, DNR shoreline data, DNR tract mapping, WDFW tract mapping, and other available GIS information) and ARCInfo software. A summary of these estimates will be provided to DNR.

VIII. Hood Canal Dissolved Oxygen Program (HCDOP):

The Washington state legislature has made an appropriation to conduct geoduck studies related to low dissolved oxygen events in Hood Canal. The work will include surveying previously surveyed and unfished geoduck tracts, establishing index stations, and collecting whole geoducks and geoduck valves for aging and chemical analysis in northern, central and southern Hood Canal. The work performed by WDFW will include:

1) Coordinating research design and implementation of research with DNR staff to meet the requirements of HR1896.

2) Surveying Bridge tract (#20650), Dosewallips tract (#22250), and Tahuya tract (#23550) in 2005 and compare average tract density with previous surveys.

3) Establishing geoduck index stations (show plots) at Briedablick near Bangor, Hamma Hamma, and Tahuya in 2006.

4) Coordinating dig locations and sample methods with DNR staff to obtain geoduck samples near Bangor, Hamma Hamma, and Tahuya.

If a sufficient number of live geoduck samples cannot be obtained at the selected dig locations, due to low average density (such as Tahuya), then WDFW will sample geoduck valves using a venture dredge to increase the sample size for aging analysis.

IX. Administrative and maintenance work:

A) WDFW will prepare for and participate in shoreline permit hearings as needed.

B) WDFW will participate in development and review of management documents and environmental information produced for the Commercial Wild Stock Geoduck Fishery, including:

Review of the application to NOAA for the Low Effect Habitat Conservation Plan for the Commercial Wild Stock Geoduck Fishery

C) WDFW will prepare work plans, biennial budgets, and agreements in cooperation with DNR, including:

Prepare, review work plans with DNR
Review and update Dive MOU with DNR as needed
Prepare list of stock assessment and research needs

D) WDFW will implement and track budget expenditures and will provide a quarterly summary report of activities to DNR, including:

Budget preparation, updates
WDFW geoduck progress report as it relates to this Agreement
Brief DNR on status of budget expenditures

E) WDFW geoduck management program also includes routine office work, maintenance of equipment, presenting research at professional meetings, media contacts and similar activities. Geoduck related activities will be charged to DNR, and included as documentation for monthly billing, as they can be demonstrated to be in direct support of this Agreement.

EXHIBIT A
ENVIRONMENTAL ASSESSMENT OF PROPOSED GEODUCK HARVEST
IN MASON COUNTY, PEALE PASSAGE GEODUCK TRACT (#16450)

Commercial geoduck harvest is jointly managed by the Washington Departments of Fish and Wildlife (WDFW) and Natural Resources (DNR) and is coordinated with treaty tribes through annual harvest management plans. Harvest is conducted by divers from subtidal beds between the minus 18 foot (corrected to mean lower low water - MLLW) and the minus 70 foot water depth (at any tide height). Harvest is rotated around Puget Sound in five geoduck management regions. The fishery, its management, and its environmental impacts are presented in the Final Supplemental Environmental Impact Statement for the Puget Sound Commercial Geoduck Fishery (WDFW & DNR, May 2001). The proposed harvest in Mason County is described below.

Proposed Harvest Dates: October 1, 2005 to October 1, 2010

Tract name: Peale Passage Tract (tract #16450)

Description (Figure 1):

The Peale Passage tract was re-surveyed for subtidal geoduck clams in the year 2005 by WDFW and DNR. The tract area available to non-Indian harvest is approximately 119 subtidal acres along the southeastern shoreline of Squaxin Island and southwestern shoreline of Hartstene Island, South Puget Sound. The tract is located within the southern portion of Peale Passage and extends northerly, from a line projected southwesterly from Brisco Point on Hartstene Island, about 1150 yards into the passage.

The commercial tract area is deeper than and seaward of the minus 18 foot (MLLW) water depth contour. The commercial tract area is also seaward of a line 200 yards seaward and parallel to the ordinary high tide (OHT) line. The description below is for the Peale Passage tract (Figure 2):

The northern-most point ("control point" #3 in Figure 2) along the west side of the tract is on the 200 yards seaward of the OHT contour line at 47° 10.177' N. latitude, 122° 53.243' W. longitude. From this point the boundary line follows the 200 yards seaward of the OHT contour line southerly to a point at 47° 10.034' N. latitude, 122° 53.332' W. longitude, then projects southeasterly to a point on the –70 ft (MLLW) water depth contour at 47° 9.979' N. latitude, 122° 53.188' W. longitude , then follows the –70 ft (MLLW) water depth contour southeasterly to a point at 47° 9.688' N. latitude, 122° 52.983' W. longitude, then projects northeasterly to a point on the 200 yards seaward of the OHT contour line at 47°

9.744' N. latitude, 122° 52.821' W. longitude, then follows the 200 yards seaward of the OHT contour line northerly to a point at 47° 9.931' N. latitude, 122° 52.738' W. longitude where the 200 yards seaward of the OHT contour line intersects the –18 ft (MLLW) water depth contour, then follows the –18 ft (MLLW) water depth contour northerly to a point at 47° 10.281' N. latitude, 122° 52.628' W. longitude where the –18 ft (MLLW) water depth contour intersects the 200 yards seaward of the OHT contour line, then follows the 200 yards seaward of the OHT contour line northerly to a point at 47° 10.300' N. latitude, 122° 52.637' W. longitude, then projects southwesterly to the point of origin.

For purposes of determining tract area, the minus 70 foot water depth contour corrected to MLLW is used. The maximum allowable fishing depth during harvest is minus 70 feet uncorrected to MLLW (also referred to as gauge depth).

Substrate:

Geoducks are found in a wide variety of sediments, ranging from soft mud to gravel. The most common sediments where geoducks are harvested are sand with varying amounts of mud and/or gravel. The specific sediment type of a bed is primarily determined by the water current velocity. Coarse sediments are generally found in areas of fast currents and finer (muddier) sediments are found in areas of weak currents. The major impact of harvest will be the creation of small holes where the geoducks are removed. The holes fill in within a few days to several weeks and have no long-term effects. The substrate holes refill in areas with strong water currents much faster than in areas with weak currents.

Water currents are weak to moderate in Peale Passage. Currents of up to 0.6 knots occur at maximum flood tide (tidal current tables 2005 National Oceanic and Atmospheric Administration). Current velocities can be moderate to strong in southern portions of the tract near Brisco Point on Hartstene Island and Unsal Point (also known as Tucksel Point) on Squaxin Island. Evidence of this is current-swept substrates, observed near these points of land, consisting of cobble and hardpan.

The Peale Passage tract has variable substrates of mud, sand, sand/mud mixtures, shell fragments (shell hash), gravel, and cobble (Table 1). Mud was present on 25 out of 30 survey transects and was the predominant substrate on 15 of those transects. Sand was present on 17 out of 30 transects and was the predominant substrate on 10 of those transects. Cobble was present on 8 transects in the western and most southern portion of the tract. Shell hash was noted on two transects (#s 7 & 44, locations listed in Table 2 and shown on Figure 3) and gravel was noted on one transect (#44).

Water Quality:

Water quality is good at the Peale Passage commercial geoduck tract. Water mixing at this tract is affected by a convergence of currents from Dana Passage, Peale Passage and Squaxin Passage, which prevents stratification (water layering) and brings deeper nutrient-rich waters to the surface. As a result, the marine waters at the southern portion of Peale Passage are well oxygenated and productive. At a Washington Department of Ecology water quality station (#DNA001) located southeasterly of Brisco Point in Dana Passage (47.1617 degrees N. latitude, 122.8700 degrees W. longitude), the range of dissolved oxygen concentration at the 33-foot water depth is 5.0 to 13.8 mg/liter. Salinities recorded at this water depth are between 26.2 to 32.3 parts per thousand. Water temperatures recorded at this station and these water depths range from 7.2 –15.1° C (44.9-59.3° F).

This geoduck tract status has been reviewed by the Washington Department of Health (DOH) and the tract has been classified as "Approved" for shellfish harvest (Woolrich, 10/8/05).

Biota:

Geoduck:

The Peale Passage tract available for non-Indian harvest is approximately 119 acres and contains an estimated 1,722,000 pounds of geoducks (Table 3). Geoducks at this location are mixed quality, with dark wrinkled epidermis (periostracum, outer surface tissue, outer layer of skin) noted on station #s 5, 16, 26, and 33. Dig station #s 5 and 6 also had geoduck samples with deformed shells, indicating cobble or other hard surfaces adjacent to shell during geoduck growth. The five dig stations within this tract were rated "commercial" (Table 4). Dig station #s 5, 16, and 33 have shell in the substrate noted which can affect ability to dig. The stations with the highest level of dig difficulty (#'s 5, 26, and 33) also had compact mud noted as a factor which inhibited time taken to dig geoducks. The geoduck density is low to moderate, compared to other Puget Sound tracts, averaging 0.10 geoducks/square foot based on the 2005 WDFW tract survey. The average density range from the 2005 survey was 0.000 geoduck/square foot at stations #17 and #24 to 0.385 geoducks/square foot at station #45 (Table 1). The geoducks on the Peale Passage tract are average at 3.26 pounds compared to the Puget Sound average of 2.0 pounds per geoduck clam. The lowest average whole weight was 2.92 pounds per geoduck at dig station 26 and the highest average whole weight was 3.70 pounds per geoduck at dig station #16 (Table 5).

Peale Passage was previously surveyed in 1969 and 1973 by WDFW (18 transects). About 9 of these transects, from the 1969 and 1973 surveys, were located within the

current tract boundary configuration. The tract was resurveyed in 2001 by the Squaxin Tribe (25 transects). The most recent survey in 2005 by WDFW includes only the area (119 acres) available for non-Indian harvest and the biomass estimates in this report are based solely on the 2005 survey.

Geoducks are managed for long term sustainable harvest. No more than 2.7% of the commercially fishable stocks are harvested (total fishing mortality) each year, in each harvest management region, throughout Puget Sound. The fishable portion of the total Puget Sound population for non-Indian harvest includes geoducks that are seaward of the 200 yards seaward of the ordinary high tide line (OHT) in water between minus 18 feet (corrected to MLLW) and minus 70 feet (uncorrected to MLLW). Other geoducks, which are not harvestable, are found inshore and offshore of the harvest areas. Observations in South Puget Sound show that geoduck populations continue to depths of 360 feet. Additional geoducks exist in polluted areas and are also unavailable for harvest, but continue to spawn and contribute to the total population.

The low rate of harvest is due primarily to geoduck's low rate of natural recruitment. WDFW has studied the regeneration rate of geoducks on certain tracts scattered throughout Puget Sound. The estimated average time to regenerate a new crop of geoducks after removal of 100 percent of the original geoducks is 39 years. The longest regeneration time is 73 years, and the shortest regeneration time is 11 years. The regeneration research to empirically analyze tract recovery rates is continuing.

Fish:

Geoduck beds are generally devoid of rocky outcroppings and other relief features that attract or support fish. The bottoms are relatively flat and composed of soft, unstable sediments which provide few attachments for macroalgae and few vertical structures which attract fish. As noted in the section of this report describing tract substrate, mud was the predominant substrate present. To a lesser extent sand, and sand/mud mixtures, were observed during the 2005 tract survey (Table 1). The only attached algae observed which may attract marine fish were Laminarian algae, red algae, and bladder kelp. Fish species observed and identified during the 2005 survey were sculpins, tubesnouts, dogfish sharks, and various flatfish including sanddabs and starry flounders.

WDFW marine fish managers were asked of their concerns of any possible impacts on marine fish stocks that geoduck harvest may have. Rock sole (*Lepidopsetta bilineata*) spawning habitat (Figure 4) has been identified along the southern shorelines of Peale Passage, adjacent to the Peale Passage geoduck tract. Rock sole spawning beds are located in the upper and middle beach containing sand and/or gravel mixtures. Greg Bargmann (WDFW Marine Resources, pers. comm. 11/14/05) stated that there are no concerns about impacts to rock sole spawning habitat from geoduck harvest. This is

based on the vertical separation between rock sole spawning habitat (intertidal) and the –18 foot (MLLW) water depth nearshore harvest restriction for geoduck harvest. Marine Fish Managers have previously stated that no problems should occur to other marine fish stocks or fisheries due to geoduck fishing. Geoduck harvest should not affect any recreational or commercial groundfish fisheries in the vicinity of this tract. There has been no concern expressed by WDFW marine fish managers to commercial geoduck harvest, as long as the minimum geoduck harvest depth of -18 ft. (MLLW) is adhered to.

Seven marine fish species were considered for listing under federal Endangered Species Act (ESA). In November 2000, the National Marine Fisheries Service determined that three of the seven species; Pacific cod, Pacific hake and walleye pollock; did not need ESA protection. In April 2001, NMFS announced that the remaining four species under consideration; copper rockfish, quillback rockfish, brown rockfish, and Pacific herring; are also relatively stable or are increasing with existing conservation measures in place. Proposed geoduck harvest at this tract is not in the immediate vicinity of documented herring spawning grounds. There is a herring spawning area identified along the southwestern shoreline of Squaxin Island, just northwesterly of Unsal Point. The Squaxin Passage area is also identified as a herring "holding area." Direct interactions between geoduck harvest and herring spawning habitat is not expected. Surf smelt habitat has been identified along the southern shorelines of Peale Passage (Figure 4). Surf smelt (*Hypomesus pretiosus*) spawning beds are located in the upper beach area containing sand and/or gravel bed materials. Geoduck harvest on the Peale Passage tract should have no detrimental impacts on Pacific herring or surf smelt due to horizontal and vertical separation between harvest activity and spawning habitat.

Two salmon populations, Puget Sound Chinook salmon and Hood Canal summer run chum salmon, were listed by the National Marine Fisheries Service on March 16, 1999 as threatened species under the federal Endangered Species Act (ESA). Critical habitat for summer run chum salmon populations include all marine, estuarine, and river reaches accessible to the listed chum salmon between Dungeness Bay and Hood Canal and within Hood Canal. The timing for summer run chum spawning is early September to mid-October. Out-migration of juveniles has been observed in Hood Canal during February and March, though out-migration may be as late as mid-April. The Peale Passage tract is outside of the critical habitat range for Hood Canal summer run chum salmon.

Critical habitat for Puget Sound Chinook salmon include all marine, estuarine and river reaches accessible to listed chinook salmon in Puget Sound. WDFW recognizes 108 distinct stocks of Chinook salmon in Washington; 54 considered healthy, 35 considered depressed, 5 considered critical, and 14 have an unknown status. The majority of Puget Sound Chinook salmon emigrate to the ocean as subyearlings.

The stock origin (ancestry) of present day Chinook salmon in South Puget Sound are largely Soos Creek Hatchery (Green River). The independent tributaries in South Puget Sound are not typical Chinook salmon habitat because of the relatively small stream size and low water flows during the late summer/early fall spawning season. Some smaller streams presently support low-escapement populations from current hatchery production or strays from viable South Sound "natural" populations. Most Chinook salmon spawning in South Puget Sound takes place in McAllister Creek, Deschutes River, and Percival Creek. Other independent tributaries that support Chinook spawning in South Puget Sound are Woodland Creek, Mill Creek, Goldborough Creek, Case Inlet streams, Carr Inlet streams, and East Kitsap streams (WDFW Salmonid Stock Inventory, 2002). Streams or tributaries near the Peale Passage geoduck tract are Woodland Creek (approximately 7.2 miles from the tract via marine water route), Deschutes River (approximately 8.6 miles from the tract via marine water route), and Mill Creek (approximately 10.0 miles from the tract via marine water route).

The geographic separation (horizontal) of this tract from known spawning tributaries and vertical separation of geoduck harvest (deeper and seaward of the -18 ft. MLLW contour) from juvenile salmon rearing areas and migration corridors (upper few meters of the water column) reduces or eliminates potential impacts to salmon populations. Charles Simenstad from the University of Washington School of Fisheries stated that the "exclusionary principle of not allowing leasing/harvesting in water shallower than -18 ft. MLLW or (within) 200 yards from shore, 2 ft. vertically from elevation of lower eelgrass margin, and within any regions of documented herring or forage fish spawning should under most conditions remove the influences of harvest induced sediment plumes from migrating salmon." Geoduck harvest should have no impact on ESA-listed or other salmon populations.

Invertebrates:

Many different kinds of invertebrates, which are frequently found in geoduck beds throughout Puget Sound, were observed on the tract during the 2005 survey. The most common and obvious groups include mollusks, crustaceans, echinoderms, cnidarians, and various species of marine worms (Table 6). Geoduck harvest has not been shown to have long-term adverse effects on these invertebrates. Geoduck harvest can depress some benthic invertebrates; however, most of these populations recover within one year.

WDFW and DNR have studied the effects of geoduck harvest on the population of Dungeness crab at Thorndyke Bay in Hood Canal. The results of this 4.6 year study indicated no adverse effects on crab catch-per-unit-effort due to geoduck fishing.

Dungeness crab were observed on one transect during the survey of the Peale Passage tract. The area in the vicinity of this tract is not considered to be significant Dungeness crab habitat by WDFW crustacean biologists.

To determine the potential impacts to Dungeness crab, the percentage of substrate disturbed during fishing was calculated and compared to the entire crab habitat within Carr Inlet in the vicinity of the tract the tract deeper than the +1 foot tide level (Figure 3). Dr. Dave Armstrong at the University of Washington has determined that Dungeness crab utilize Puget Sound bottoms from the +1 foot level out to the minus 330 foot level. The entire crab habitat in the vicinity of this geoduck bed is approximately 425 acres. From the most recent survey in 2005, there is an estimated 528,000 harvestable geoducks on this tract. With a harvest of 85 percent of these geoducks, the total number harvested would be 448,800 geoducks. Approximately 1.18 square feet of substrate is disturbed for every geoduck harvested, so 448,800 x 1.18 = 529,584 square feet of substrate. This equals about 12.2 acres or 2.9 percent of the total available crab habitat in the vicinity of this tract. This represents a low amount of disturbance to the crab habitat in the immediate vicinity of this geoduck tract. Since this tract is outside of the principle range of distribution of Dungeness crab, few Dungeness crab were observed during scuba surveys, and the lack of effects observed at the Thorndyke Bay study, we conclude that any effects on Dungeness crab will be very minor, if they occur at all.

Red rock crab (*Cancer productus*) were observed on 27 of 30 transects (90% of the transects observations on Peale Passage tract had red rock crab listed). The crab catch study at Thorndyke Bay in Hood Canal (Armetta Cain, January 1995) found no significant difference in red rock crab Catch Per Unit Effort (CPUE) on a tract prior to geoduck fishing, during geoduck fishing, and following geoduck fishing. Based on observations of red rock crab within the Peale Passage tract there is a potential for impacts to red rock crab populations in the vicinity of the tract. The impacts will likely not be significant if the findings of the Thorndyke Bay study apply to the Peale Passage tract location. Since the abundance of red rock crab at the Thorndyke Bay study was less (12% of pre-fishing geoduck survey transects had red rock crab observations) it is uncertain that the conclusions will be the same. A post-harvest survey will be conducted on this tract, following geoduck fishing, which should provide better information about relative changes in abundance of red rock crab at this location.

In a note dated October 10, 2005 the WDFW Region 6 Shellfish Manager, Brad Sele, stated that there are no specific shellfish concerns regarding the proposed geoduck harvest in this vicinity.

Aquatic Plants:

Large quantities of attached aquatic plants are not generally found in geoduck beds. Light restriction often limits plant growth to areas shallower than where most geoduck harvest occurs. Aquatic plants observed on the geoduck survey include: Laminarian algae, red algae, bladder kelp, and diatoms (Table 7).

WDFW conducted eelgrass surveys at the Peale Passage tract on August 3, 2005. The conclusion of this work was that no eelgrass was observed deeper than the -16 foot level (corrected to MLLW). Therefore, the shallow boundaries of this tract is set at no shallower than the -18 foot level to conform with state statute (RCW 77.60.070).

Marine Mammals:

There are 26 species of whales observed in Washington, though many are infrequent visitors to South Puget Sound. In 1990 and 1991 gray whales (*Eschrichtius robustus*) were often observed in South Puget Sound (1990 – 174 sightings, 1991 – 158 sightings) and may occasionally be in the vicinity of the Peale Passage N. geoduck tract. Killer whales (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), and harbor seals (*Phoca vitulina*) are other marine mammals that may be observed on or near geoduck tracts occasionally.

Hand pick shellfish fisheries, like geoduck harvesting, are considered Category III under the Marine Mammal Authorization Program for Commercial Fisheries. This means that there is a "rare or remote" likelihood of marine mammal "take," (Brent Norberg, NOAA, pers. comm. 6/25/03). Precautions should be taken by commercial divers, when whales are in the area, to be aware of whale movements and behavior to eliminate the remote risk of entanglement with vessel and hoses and lines. There is no known seal haul-out in the vicinity of this tract and Gray whales are not known to occur predictably in Peale Passage, therefore marine mammal biologists have expressed no concern with geoduck harvest at this location (Brent Norberg, NOAA, 10/11/05). No conflicts have been observed between marine mammals and geoduck harvest activities.

Birds:

A variety of marine birds are observed in South Puget Sound. These include birds such as murres, murrelets, grebes, loons, scoters, dabbling ducks, mergansers, buffleheads, cormorants, and gulls. Blue heron are also common along the shores of this area. Geoduck harvest does not appear to have any significant effect on these birds or their use of the waters where harvest occurs. A study by DNR and WDFW was conducted at northern Hood Canal to learn the effects of geoduck fishing on bald eagles (Watson et.

al., 1995). A significant conclusion of this study is that commercial harvest of geoduck is unlikely to have any adverse impacts on bald eagle productivity.

Other uses:

Adjacent Upland Use:

The upland property at Squaxin Island, along the Peale Passage geoduck tract, is designated "Reservation" and the upland property at Hartstene Island, along the Peale Passage tract, is designated "Rural." Non-Indian geoduck harvest is not allowed shoreward of the 200 yards seaward of the ordinary high tide (OHT) line. Harvest is only allowed during daylight hours, and no harvest is allowed on Saturdays, Sundays, or state holidays.

The only visual effect of harvest is the presence of the harvest vessels on the tract. These 35-40 foot boats are anchored during harvest and all harvest is conducted out of sight by divers. Noise from the boats, compressors and pumps may not exceed 50 dBA measured 200 yards from the noise source, 5 dBA below the state noise standard.

Fishing:

This area has some significant seasonal sportfishing interest, mostly in the vicinity of Brisco Pont, Hartstene Island, using small vessels. The fishing area off Brisco Point has very dynamic water currents, which is not within the geoduck tract area. The WDFW 2005/2006 Sport Fishing Rules pamphlet describes seasons, size limits, daily limits, specific closed areas, and additional rules for salmon and other marine fish species. A few small-scale commercial fisheries may also take place in the area. The fishing which does occur should not create any problems for the geoduck harvesting effort.

Geoduck fishing on this tract is managed in coordination with the southern Puget Sound treaty tribes through annual state/tribal harvest management plans. The non-Indian geoduck fishery should not be in conflict with any concurrent tribal fisheries.

Navigation:

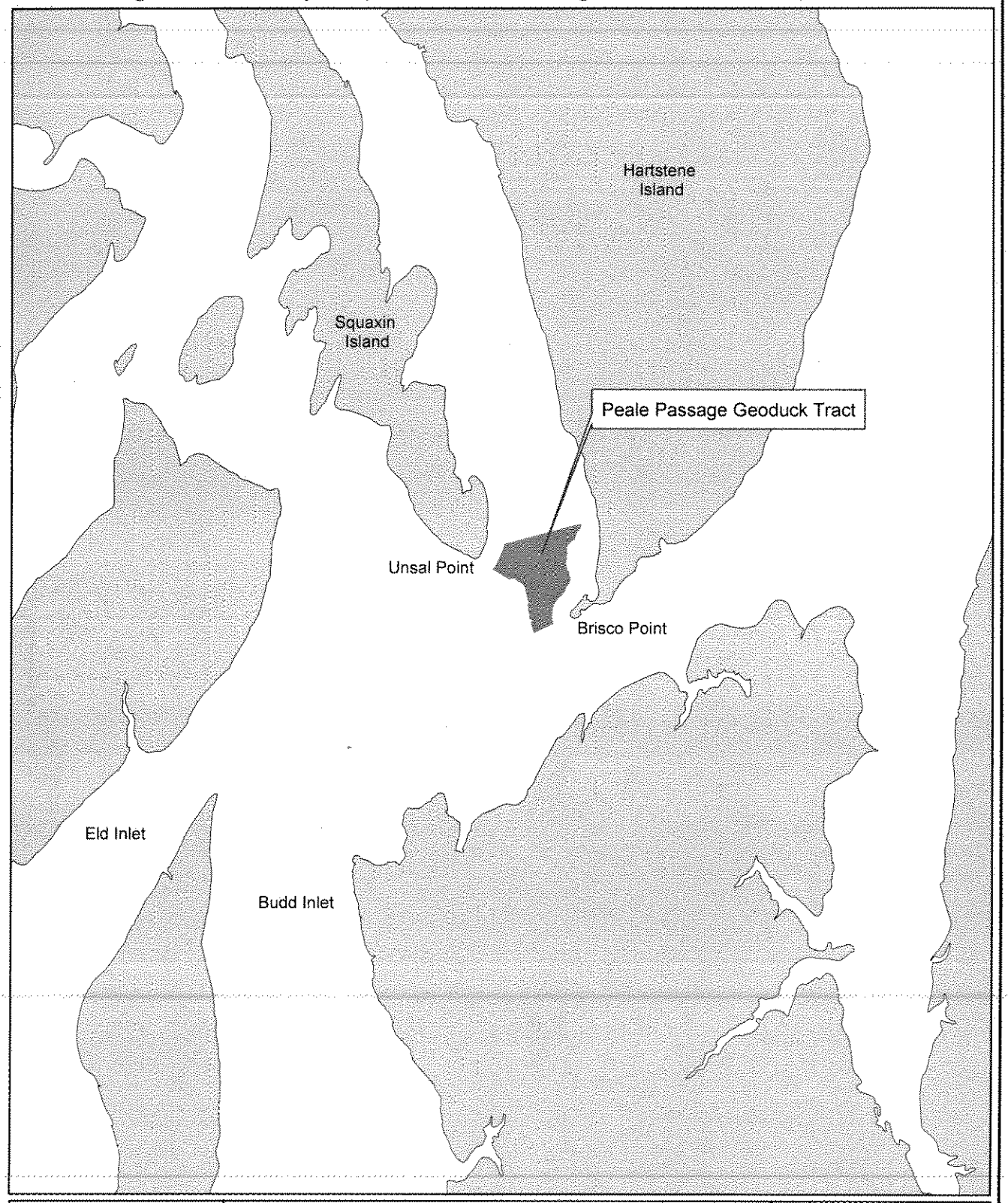
The Peale Passage geoduck tract is at the southern entrance to Peale Passage. The passage is relatively shallow and narrow, and is therefore not used heavily by vessel traffic. Geoduck harvesting at this site should not result in any significant navigational conflicts. The Washington Department of Natural Resources will notify the local boating community, the U.S. Coast Guard for inclusion in the Notice to Mariners, the local Port authority, and the N.W. Vessel Pilots Association prior to geoduck harvests.

Summary:

Commercial geoduck harvest is proposed for the Peale Passage geoduck tract, located at the entrance of Peale Passage, beginning in 2005. The geoduck population on the tract was most recently surveyed in the year 2005 and the current tract biomass estimate is based on the most recent survey. The anticipated environmental impacts of this harvest are within the range of conditions discussed in the Final Supplemental Environmental Impact Statement (2001) for the commercial geoduck clam fishery. To reduce possible impacts to salmon, baitfish, rock sole, and eelgrass beds, harvest will be deeper and seaward of the -18 foot (MLLW) contour. There are potential impacts to red rock crab populations in the vicinity of this tract due to the high incidence of red rock crab, though studies to date have not confirmed that any significant impacts should be expected. A post-harvest survey of this tract will be done to study potential crab impacts and establish a post-harvest geoduck biomass. No other significant impacts are expected from this harvest.

Date prepared: November 15, 2005
File path - C:\BOB\GEODUCK\EA's\2005\Peale Passage \05Nov9_Peale Passage_#16450_EA.doc

Figure 1. Vicinity Map of Peale Passage Geoduck Tract # 16450



N
W E
S

1:54,000
1 inch equals 4,500 feet

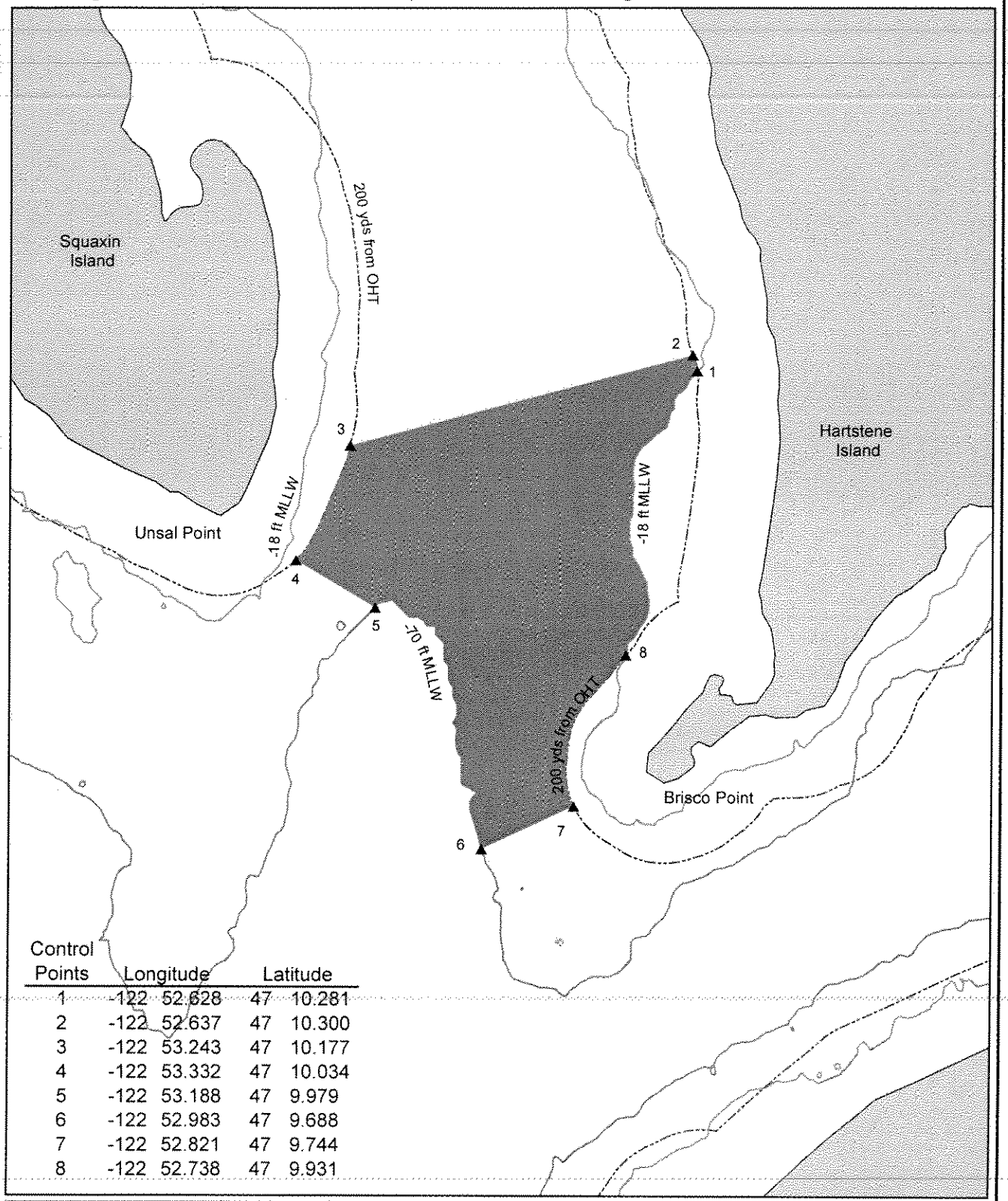
Data Sources:
Projection for data is Stateplane, Washington Zone South, units feet, Datum NAD 27. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.375 0.75 1.5 2.25 Miles

Washington Department of FISH and WILDLIFE

Map Date: 11-10-05
Map Author: T. Blewett
File: EAmaps_3.mxd

Figure 2. Control Points Map of Peale Passage Geoduck Tract # 16450



Control Points	Longitude		Latitude	
1	-122	52.628	47	10.281
2	-122	52.637	47	10.300
3	-122	53.243	47	10.177
4	-122	53.332	47	10.034
5	-122	53.188	47	9.979
6	-122	52.983	47	9.688
7	-122	52.821	47	9.744
8	-122	52.738	47	9.931

N W E S

1:12,000
1 inch equals 1,000 feet

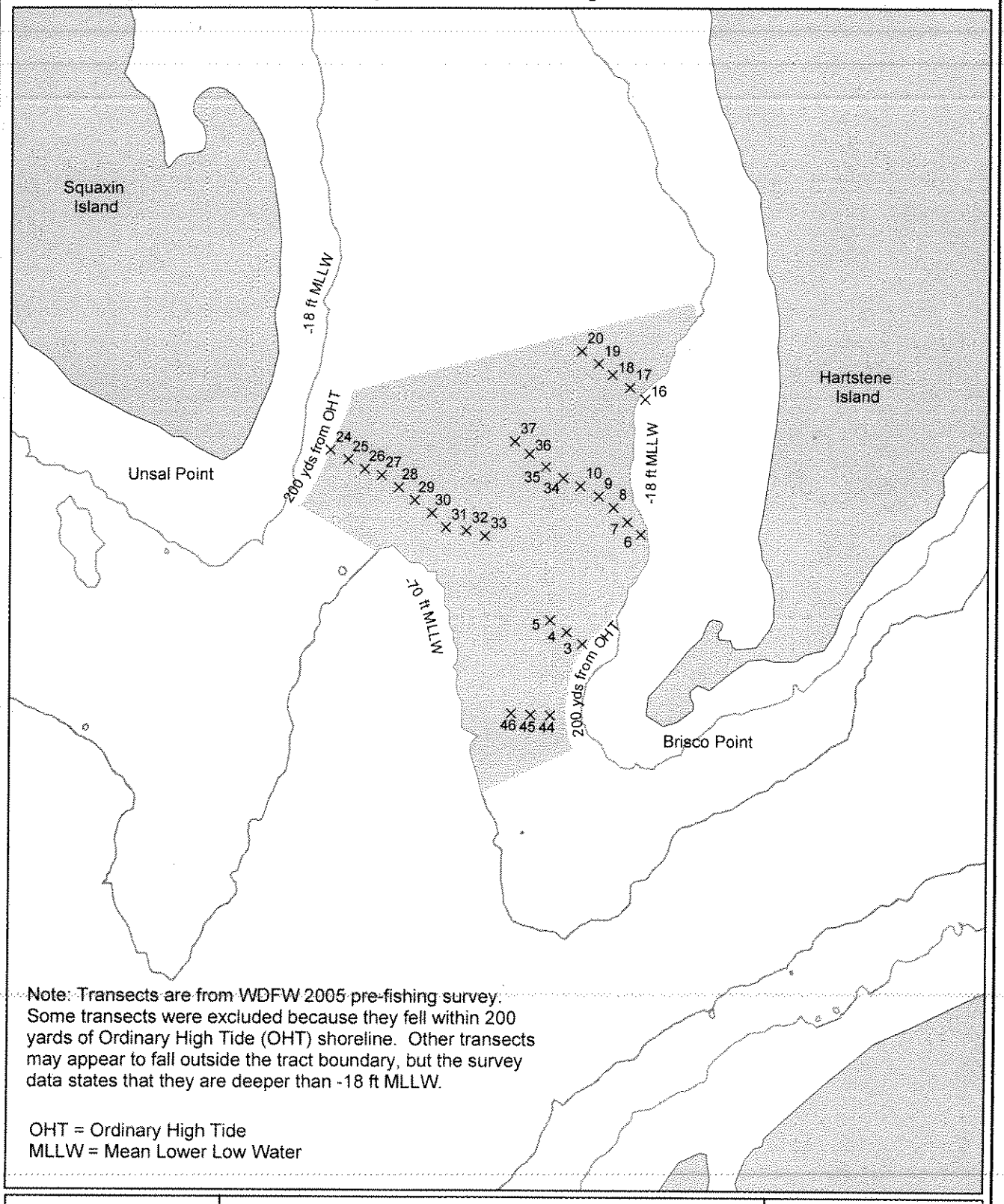
Data Sources:
Projection for data is Stateplane, Washington Zone South, units feet, Datum NAD 27. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.05 0.1 0.2 0.3 Miles

Washington Department of FISH and WILDLIFE

Map Date: 11-10-05
Map Author: T. Blewett
File: EAmaps_3.mxd

Figure 3. Transect Map of Peale Passage Geoduck Tract # 16450



Note: Transects are from WDFW 2005 pre-fishing survey. Some transects were excluded because they fell within 200 yards of Ordinary High Tide (OHT) shoreline. Other transects may appear to fall outside the tract boundary, but the survey data states that they are deeper than -18 ft MLLW.

OHT = Ordinary High Tide
MLLW = Mean Lower Low Water

N
W E
S

1:12,000
1 inch equals 1,000 feet

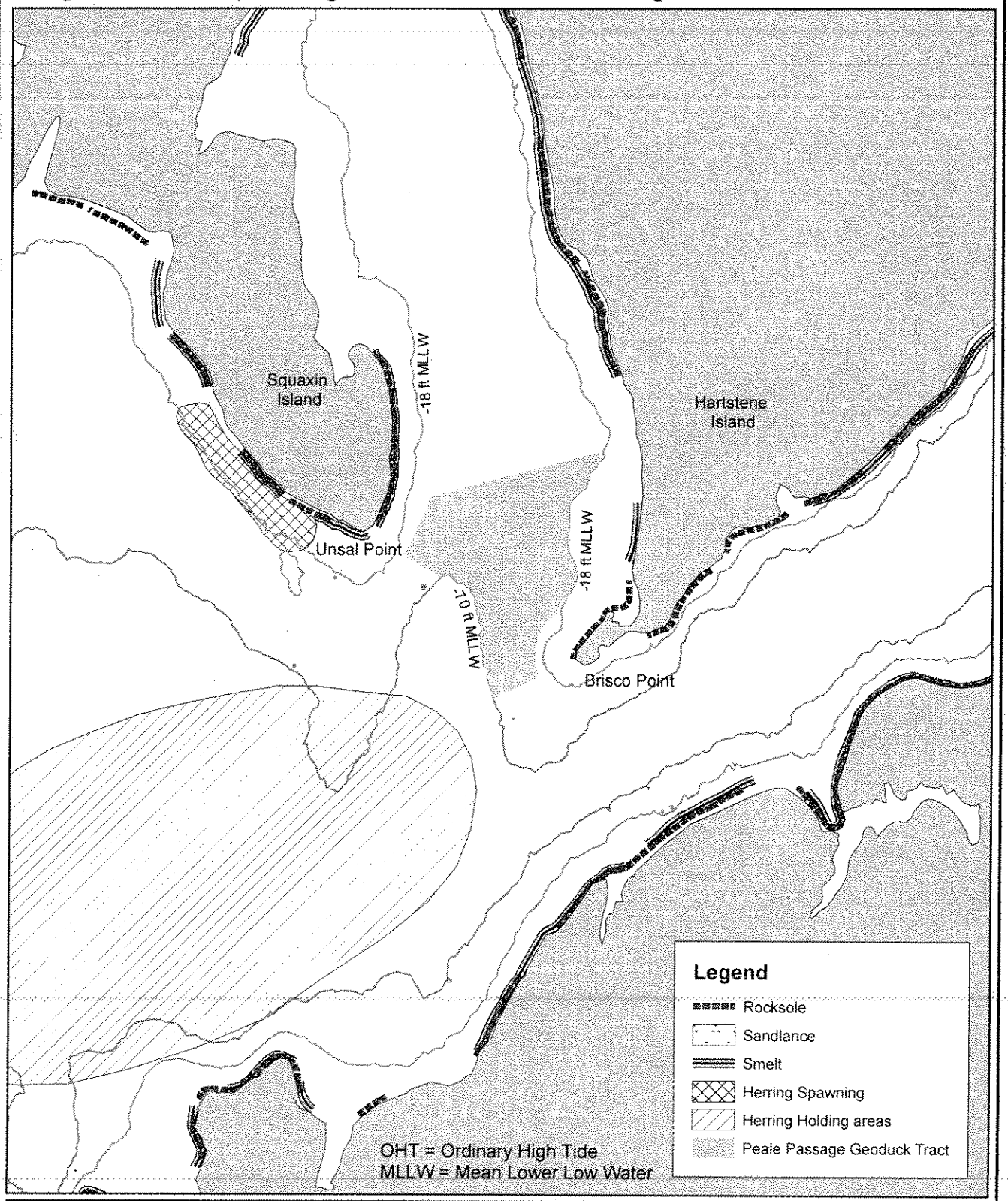
Data Sources:
Projection for data is Stateplane, Washington Zone South, units feet, Datum NAD 27. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.1 0.2 0.4 0.6 Miles

Washington Department of FISH and WILDLIFE

Map Date: 11-10-05
Map Author: T. Blewett
File: EAmaps_3.mxd

Figure 4. Fish Spawning Areas near Peale Passage Geoduck Tract # 16450



N
W E
S

1:24,000
1 inch equals 2,000 feet

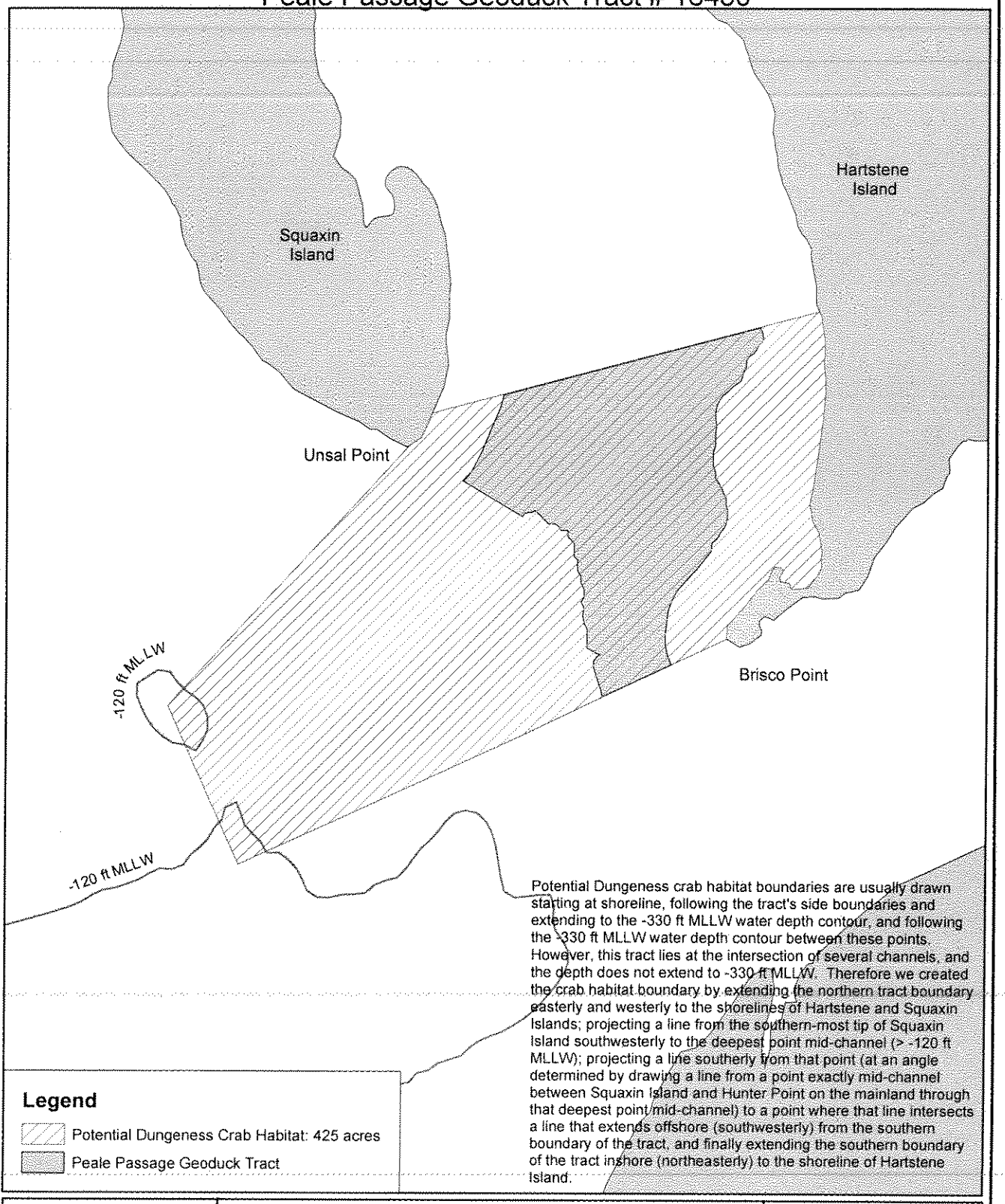
Data Sources:
Projection for data is Stateplane, Washington Zone South, units feet, Datum NAD 27. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.
Beach spawner data from WDFW, the consulting biologist for these coverages is: Dan Penttila, WDFW in La Conner, WA

0 0.2 0.4 0.8 1.2 Miles

Washington Department of FISH and WILDLIFE

Map Date: 11-10-05
Map Author: T. Blewett
File: EAmaps_3.mxd

Figure 5. Potential Dungeness Crab Habitat Map
Peale Passage Geoduck Tract # 16450



Potential Dungeness crab habitat boundaries are usually drawn starting at shoreline, following the tract's side boundaries and extending to the -330 ft MLLW water depth contour, and following the -330 ft MLLW water depth contour between these points. However, this tract lies at the intersection of several channels, and the depth does not extend to -330 ft MLLW. Therefore we created the crab habitat boundary by extending the northern tract boundary easterly and westerly to the shorelines of Hartstene and Squaxin Islands; projecting a line from the southern-most tip of Squaxin Island southwesterly to the deepest point mid-channel (> -120 ft MLLW); projecting a line southerly from that point (at an angle determined by drawing a line from a point exactly mid-channel between Squaxin Island and Hunter Point on the mainland through that deepest point mid-channel) to a point where that line intersects a line that extends offshore (southwesterly) from the southern boundary of the tract, and finally extending the southern boundary of the tract inshore (northeasterly) to the shoreline of Hartstene Island.

Legend

- Potential Dungeness Crab Habitat: 425 acres
- Peale Passage Geoduck Tract

N W E S

1:16,000

1 inch equals 1,333.3 feet

Data Sources:
Projection for data is Stateplane, Washington Zone South, units feet, Datum NAD 27. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.125 0.25 0.5 0.75 Miles

Washington Department of FISH and WILDLIFE

Map Date: 11-10-05
Map Author: T. Blewett
File: EAmaps_3.mxd

EXPLANATION OF SURVEY DATA TABLES

The geoduck survey data for the Peale Passage tract is reported in seven tables. These tables contain specific information gathered from transect and dig surveys. The following is an explanation of the headings and codes used in these tables.

Water depths, geoduck density and substrate observations

This table reports findings for each transect. *Start Depth* and *End Depth* (corrected to MLLW) are given for each transect. *Geoduck Density* is reported as the average number of geoducks per square foot for each 900 square foot transect. *Substrate Type* and *Substrate Rating* refer to evaluations of the substrate **surface**. A two (2) rating indicates that the substrate type predominated. A one (1) rating indicates the substrate type was present.

Transect corrected count and position

This table reports the *Corrected Count*, the *Show Factor* used to correct the count, and the *Latitude/Longitude* position of the start point of survey transect. Counts are "corrected" by dividing diver counts (raw counts) with a siphon show factor (See WDFW Tech. Report FPT00-01 for explanation of show factor). Transect positions are reported in decimal minutes to the thousandth of a minute.

Tract summary

This table is a general summary of survey information for the geoduck tract; *Tract Size* in acres, average geoduck *Density*, *Total Pounds* with statistical confidence, and estimated *Total Number* of geoducks. Size estimators are reported in average values for *Whole Weight* and *Siphon Weight* in pounds. Quality estimators of geoduck samples are reported in *Siphon Weight as a percentage of Whole Weight* and percentage of samples *Over Two Pounds*. Any post-survey harvest information listed is derived from fish receiving tickets and new biomass estimates are survey estimates adjusted for harvest subsequent to the survey.

Digging difficulty

This table presents a station-by-station evaluation of the factors contributing to the difficulty of digging geoduck samples with a 5/8" inside nozzle diameter water jet. Codes for the overall subjective summary of the digging difficulty are given in the *Difficulty* column. An explanation of the codes for the dig difficulty follows:

Code	Degree of Difficulty	Description
0	Very Easy	Sediment conducive to quick harvest.

1	Easy	Significant barrier in substrate to inhibit digging.
2	Some difficulty	Substrate may be compact or contain gravel, shell or clay; most geoducks still easy to dig.
3	Difficult	Most geoducks were difficult to dig, but most attempts were successful.
4	Very Difficult	It was laborious to dig each geoduck. Unable to dig some geoducks.
5	Impossible	Divers could not remove geoducks from the substrate.

Abundance refers to the relative geoduck abundance; a zero (0) indicates that geoducks were very sparse, a one (1) indicates that they were moderately abundant and a two (2) indicates that they were very abundant. *Depth* refers to the depth that the geoducks were found in the substrate. A zero (0) indicates that they were shallow, a one (1) indicates that they were moderately deep and a two (2) indicates that they were very deep. The columns labeled *Compact*, *Gravel*, *Shell*, *Turbidity* and *Algae* refer to factors that contribute to digging difficulty by interfering with the digging process. A zero (0) in one of these columns indicates that the factor was not a problem, a one (1) indicates that the factor caused moderate difficulty and a two (2) indicates that the factor caused a significant amount of difficulty when digging. *Compact* refers to the compact or sticky nature of a muddy substrate. *Gravel* and *Shell* refer to the difficulty caused by these substrate types. *Turbidity* refers to the turbidity within the water near the dig hole caused by the digging activity. High turbidity makes it difficult to find the geoduck siphon shows. The difficulty of digging associated with turbidity varies with the amount of tidal current present. Therefore, the turbidity rating refers only to the conditions occurring when the sample was collected. *Algae* refers to algal cover, which also makes it difficult for the diver to find geoduck siphon shows. Because algal cover varies seasonally, this value only applies to the conditions when the sample was collected. The *Commercial* column gives a subjective assessment of whether or not it would be feasible to harvest geoducks on a commercial basis at the given station. A "checked" check box indicates yes, it would be feasible and a "blank" check box indicates it would not.

Size and quality

This table summarizes the size and quality of the geoducks at each of the stations where dig samples were collected. Weight values for any geoduck dig samples that were damaged during sampling to the extent that water loss occurred, are excluded from calculations. The *Number Dug* column lists the number of geoducks collected. The *Ave. Whole Weight (lbs.)* column gives the average sample weight of whole geoduck clams. The *Ave. Siphon Weight (lbs.)* column gives the average weight of the siphons of the geoducks in the sample. The percentage of geoducks greater than two pounds is given in

the *% Greater than 2 lbs.* column. A "blank cell" in any column indicates that the parameter is not available because the parameter was not measured or the data was not available for that station.

Most common and obvious animals observed

This table summarizes animals observed in association with geoduck transects. This information is presence/absence only. An animal does not have to be within the transect to be noted as "present." *Number of transects where observed* provides a rough relative abundance of animals observed during the survey. For example, piddocks may be observed in association with 2 out of 30 transects completed. *Group* generally classifies the types of animals observed by divers. *Common name* is the local common name in use for a particular species or taxonomic assemblage of morphologically similar species. *Taxonomer* is the current scientific name (genus and species) of an animal or the most specific identification possible from gross morphology observed by divers *in situ*.

Most common and obvious plants observed

This table summarizes plants observed in association with geoduck transects. This information is presence/absence only. A plant does not have to be within the transect to be noted as "present." *Number of transects where observed* provides a rough relative abundance of plants observed during the survey. For example, *Laminaria* sp. may be observed in association with 6 out of 30 transects completed. *Taxonomer* is the current scientific name (genus and species) of a plant or the most specific identification possible from gross morphology observed by divers *in situ*.

Table 1: TRANSECT WATER DEPTHS, GEODUCK DENSITIES, AND SUBSTRATE OBSERVATIONS

Peale Passage, 2005 WDFW Pre-Fishing Survey

Transect [a]	Start depth (ft) [b]	End depth (ft) [b]	Geoduck Density (no. / sq ft) [c]	Substrate [d]				
				mud	sand	gravel	shellhash	cobble
3	34	43	0.366	1	2			
4	43	50	0.271	1	1			
5	50	55	0.288	2	1			
6	18	21	0.114		2			
7	21	26	0.136		2		1	
8	26	38	0.176	1	2			
9	39	43	0.154	2				
10	43	46	0.059	2				
16	18	32	0.137	1	2			
17	32	39	0.000	2				
18	39	38	0.003	2				
19	38	40	0.003	2				
20	40	43	0.023	2				
24	43	54	0.000	1				1
25	54	60	0.007	1				1
26	60	58	0.064	1	1			
27	59	62	0.062	1	2			
28	62	64	0.019		2			1
29	64	63	0.030	1	1			1
30	62	65	0.064	2	1			1
31	65	64	0.070	2	1			1
32	64	65	0.100	2	1			
33	65	62	0.074	2				
34	46	49	0.072	2				
35	49	52	0.035	2				
36	52	54	0.018	2				
37	54	52	0.020	2				
44	43	55	0.018		2	1	1	1
45	55	62	0.385		2			1
46	62	67	0.277	1	2			
		min=	0.0000					
		max=	0.3846					

[a] Transects were excluded if they were within 200 yards of Ordinary High Tide, or if the entire transect line had a count of zero.

[b] All depths are corrected to mean lower low water (MLLW).

[c] Densities were calculated using a daily show factor.

[d] Substrate codes: 1 = present ; 2 = dominant

Generation Date: October 19, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 2: TRANSECT CORRECTED GEODUCK COUNT AND POSITION TABLE

Peale Passage, 2005 WDFW Pre-Fishing Survey

Transect	Corrected Count	Show Factor [a]	Latitude [b]		Longitude [b]	
3	329	0.787	47	09.875	122	52.813
4	244	0.787	47	09.889	122	52.842
5	259	0.787	47	09.903	122	52.872
6	103	0.787	47	10.012	122	52.715
7	122	0.787	47	10.027	122	52.740
8	159	0.787	47	10.044	122	52.766
9	139	0.787	47	10.057	122	52.793
10	53	0.787	47	10.069	122	52.827
16	123	0.77	47	10.178	122	52.716
17	0	0.77	47	10.192	122	52.744
18	3	0.77	47	10.207	122	52.776
19	3	0.77	47	10.220	122	52.802
20	21	0.77	47	10.235	122	52.833
24	0	0.926	47	10.103	122	53.278
25	6	0.926	47	10.092	122	53.245
26	57	0.923	47	10.081	122	53.215
27	56	0.926	47	10.074	122	53.184
28	17	0.926	47	10.060	122	53.152
29	27	0.926	47	10.045	122	53.123
30	57	0.926	47	10.030	122	53.091
31	63	0.926	47	10.013	122	53.065
32	90	0.926	47	10.010	122	53.028
33	67	0.926	47	10.004	122	53.994
34	65	0.926	47	10.078	122	52.858
35	31	0.926	47	10.091	122	52.890
36	16	0.926	47	10.106	122	52.920
37	18	0.926	47	10.121	122	52.947
44	16	0.91	47	09.786	122	52.866
45	346	0.91	47	09.786	122	52.901
46	249	0.91	47	09.787	122	52.936

[a] Show factor was used to correct combined geoduck counts.

[b] Latitude and Longitude are in Degrees and Decimal Minutes (NAD 27).

Generation Date: October 19, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 3 - TRACT SUMMARY

Tract Name	Peale Passage
Tract Number	16450
Tract Size (acres) [a]	119
Density of geoducks/sq.ft [b]	0.10
Total Tract Biomass (lbs.) [b]	1,722,189
Total Number of Geoducks on Tract [b]	527,762
Confidence Interval (%)	39.8%
Mean Geoduck Whole Weight (lbs.)	3.26
Mean Geoduck Siphon Weight (lbs.)	0.65
Siphon Weight as a % of Whole Weight	20%
Number of 900 sq.ft. Transect Stations	30
Number of Geoducks Weighed	47

[a] Tract area is based on GIS using the -18 ft MLLW water depth contour or 200 yds seaward from Ordinary High Tide, whichever is farther, and the -70 ft MLLW water depth contour, and 2005 WDFW geoduck transect data.

[b] Biomass is based on the 2005 WDFW geoduck survey.

Generation Date: October 19, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 4: DIGGING DIFFICULTY TABLE

Peale Passage, 2005 WDFW Pre-Fishing Survey

Dig Station	Difficulty (0-5)	Abundance (0-2)	Depth (0-2)	Compact (0-2)	Gravel (0-2)	Shell (0-2)	Turbidity (0-2)	Algae (0-2)	Commercial (Y/N)
5	2	0	2	1	0	1	0	0	Yes
16	0	0	1	0	0	1	0	0	Yes
26	2	1	1	1	0	0	2	0	Yes
33	2	0	0	1	0	1	1	0	Yes
45	0	2	0	0	0	0	0	0	Yes

Generation Date: October 19, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 5: GEODUCK SIZE AND QUALITY

Peale Passage, 2005 WDFW Pre-Fishing Survey

Dig Station	Number Dug	Avg. Whole Weight (lbs)	Avg. Siphon Weight (lbs)	% Greater than 2 lbs
5	8	3.14	0.59	100%
16	11	3.70	0.70	91%
26	10	2.92	0.60	80%
33	10	3.37	0.71	100%
45	8	3.09	0.60	88%

Generation Date: October 19, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 6: MOST COMMON AND OBVIOUS ANIMALS OBSERVED

Peale Passage Geoduck Tract # 16450, 2005 WDFW Pre-Fishing Survey

Number of Transects where observed	Group	Common Name	Taxonomer
8	ANEMONE	BURROWING ANEMONE	Pachycerianthus fimbriatus
1	ANEMONE	PLUMED ANEMONE	Metridium senile
13	ANEMONE	STRIPED ANEMONE	Urticina sp.
12	BIVALVE	HARDSHELL CLAMS	Veneridae sp.
19	BIVALVE	HORSE CLAM	Tresus spp.
2	BIVALVE	PIDDOCK	Unspecified Pholadid
2	BIVALVE	TRUNCATED MYA	Mya truncata
2	CRAB	DECORATOR CRAB	Oregonia gracilis
1	CRAB	DUNGENESS CRAB	Cancer magister
26	CRAB	GRACEFUL CRAB	Cancer gracilis
28	CRAB	HERMIT CRAB	Unspecified hermit crab
27	CRAB	RED ROCK CRAB	Cancer productus
1	FISH	DOGFISH SHARK	Squalus acanthias
4	FISH	FISH	Unspecified Fish
10	FISH	FLATFISH	Unspecified flatfish
14	FISH	SANDDAB	Citharichthys sp.
13	FISH	SCULPIN	Unspecified cottid
4	FISH	STARRY FLOUNDER	Platichthys stellatus
2	FISH	TUBESNOUT	Aulorhynchus flavidus
1	GASTROPOD	MOON SNAIL EGGS	Polinices lewisii egg case
16	MISC	SEA PEN	Ptilosarcus gurneyi
25	MISC	SEA WHIP	Stylatula elongata
4	MISC	SPONGE	Unspecified Porifera
5	NUDIBRANCH	ARMINA	Armina californica
1	NUDIBRANCH	DENDRONOTUS	Dendronotus sp.
1	NUDIBRANCH	HERMISSENDA	Hermissenda crassicornis
2	SEA STAR	LEATHER STAR	Dermasterias imbricata
22	SEA STAR	SHORT-SPINED STAR	Pisaster brevispinus
1	SEA STAR	SUN STAR	Solaster sp.
21	SEA STAR	SUNFLOWER STAR	Pycnopodia helianthoides
4	SEA STAR	VERMILLION STAR	Mediaster aequalis
8	SHRIMP	GHOST SHRIMP	Unspecified ghost shrimp
7	WORM	SABELLID TUBE WORM	Sabellid sp.
13	WORM	TEREBELLID TUBE WORM	Terebellid sp.

Generation Date: November 15, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Table 7: MOST COMMON AND OBVIOUS PLANTS OBSERVED

Peale Passage Geoduck Tract # 16450, 2005 WDFW Pre-Fishing Survey

Number of Transects where observed	Taxonomer
15	No Plants
6	Laminaria
2	Nereocystis luetkeana
11	Unspecified small red algae
3	Unspecified large red algae
4	Diatoms

Generation Date: November 15, 2005

Generated By: T. Blewett, WDFW

File: C:\Data\EA'S\Tables\2005 EA Tables\EATables1-5_PealePassage_101405.xls

Appendix F. Vessel Spill Contingency Plan

WASHINGTON STATE DEPARTMENT OF
Natural Resources

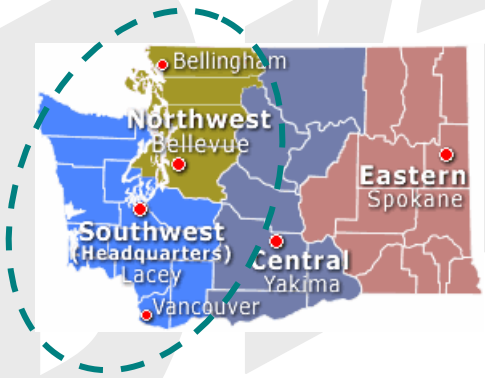
Aquatic Resources Program - Vessel Spill Contingency Plan July 2003

Spill emergency response contacts (call both state and federal contacts):

State Dept of Ecology contacts (coastal regions):
Northwest Office, Bellevue: **1-425-649-7000**
Southwest Office, Olympia: **1-360-407-6300**

- or after normal business hours -

State Emergency Management Division 24-hour #: 1-800-258-5990



Federal contact:
United States Coast Guard/USEPA via the
National Response Center, Washington DC
1-800-424-8802 (24-hour #)

Information to be reported immediately to emergency response contacts:

- Location of spill
- Source of spill
- Time of spill discovery
- Estimated volume of spill
- Nature and potential danger of spilled material
- Anticipated movement of spilled material
- Responsible party name, address, phone number (if known)

- Action already taken
- Weather conditions at spill site

Upon encountering a spill, DNR personnel will immediately contact emergency response officials (***see* Spill Emergency Contacts *top of this page***) and manage the scene until those officials respond. “Managing the scene” shall not place DNR personnel or the general public at risk.

Subsequent duties for a release from a DNR vessel:

- **If conditions allow, deploy onboard spill containment equipment -** Stop the release and deploy spill containment equipment if safe to do so. Appropriate spill containment equipment shall be maintained onboard. Onboard spill containment equipment may be absorbent boom, pillows, and/or pads to contain the largest DNR vessel spill volume. If the spill cannot be contained with the resources at-hand, **a list of local spill response contractors is attached for use**. Authorizations for expenditures to hire a contractor may be required from DNR management prior to contracting these services.
- **Personnel shall follow-up with spill documentation/reporting -** Within 24-hours of the incident, DNR personnel shall report the incident to an appropriate DNR manager. Spill incidents may also need to be reported to DNR’s Communications office (360-902-1016) and/or Law Enforcement Services (360-407-0651). As soon as possible, an Initial Incident Response (IIR) report will be submitted to the appropriate Program Manager and DNR’s Safety Program Manager. The Aquatic Resources Program will maintain copies of the IIR’s as a spill history record.

Subsequent duties for a release from a non-DNR vessel or unknown source:

- **Assist emergency response officials –** Manage the scene until emergency response officials arrive.
- **Ensure protection of aquatic lands –** Provide DNR expertise/knowledge to protect aquatic lands.
- **Follow-up with spill documentation/reporting –** see above

Programmatic responsibilities for DNR vessel operators/staff:

DNR Vessel Inspections

- The vessel hull should be visually inspected upon each use or in accordance with the vessel’s regular maintenance schedule,
- The vessel fuel system and bilge tanks/pumps should be inspected periodically for operational deficiencies,
- Spill prevention & control equipment stocks should be regularly inventoried. Replenish supplies as needed.

Training

- DNR vessel operators and crew shall be properly instructed in the operation and maintenance of all onboard equipment used to prevent and mitigate fuel discharges,
- DNR vessel operators and crew shall be knowledgeable of all applicable spill prevention and reporting regulations,
- DNR will provide all necessary Worker-Right -To-Know information and training to affected personnel. MSDS sheets will be maintained onboard vessels for all hazardous materials normally encountered.

Maintenance of this plan

- The plan shall be regularly evaluated to determine if revisions are needed,
- All revisions to this plan shall be reviewed/approved by the ADM, Operations Section, Aquatics Resources Division. Plan revisions will be documented and maintained in a file.

Oil spill response services (*taken from The International Directory of Oil Spill Cleanup Contractors website*):

Foss Environmental Services
Seattle, WA 98106
Tel: (800) 337-7455
Tel: (206) 546-7150
Fax: (206) 546-7170

Marine Response Alliance
Seattle, WA 98111
Tel: (206) 332-8200
Fax: (206) 332-8500

Western Towboat Company Inc
Seattle, WA 98107
Tel: (206) 789-9000
Fax: (206) 789-9755

Polaris Applied Sciences Inc
Bainbridge Island, WA 98110
Tel: (206) 842-5667
Fax: (206) 842-2861

Western States Environmental, Inc
Kent, WA 98032
Tel: (206) 696-4293
Tel: (253) 520-3995
Fax: (253) 520-3802

The O'Brien's Group
Kent, WA 98042
Tel: (253) 638-2008
Tel: (800) 910-3778
Fax: (253) 638-2009

Cowlitz Clean Sweep, Inc.
Longview, WA 98632
Tel: (360) 423-6316
Tel: (516) 369-8644
Fax: (360) 423-3409

Crowley Marine Services
Seattle, WA 98121-1438
Tel: (206) 332-8000
Tel: (800) 248-8632
Fax: (206) 332-8300

Crowley Marine Services
Vancouver, WA 98661
Tel: (360) 546-0902
Tel: (800) 248-8632
Fax: (360) 546-0907

Marine Spill Response Corp. (MSRC)
Western Region Center
Everett, WA 980201
Tel: (425) 252-1300
Fax: (425) 339-1229

Marine Spill Response Corp. (MSRC)
Port Angeles, WA 98362
Tel: (360) 417-5437
Fax: (360) 417-3935

Global Environmental
Seattle, WA 98106
Tel: (206) 623-0621
Tel: (714) 963-3961

National Response Corp. (NRC)
Seattle, WA
Tel: (631) 224-9141
Fax: (631) 224-9082

Marine Vacuum Services
Seattle, WA 98124
Tel: (206) 762-0240
Fax: (206) 763-8084

Pacific Rim Transportation Ltd
La Conner, WA 98257
Tel: (360) 466-3114
Fax: (360) 466-3116

Clean Sound Cooperative, Inc.
Everett, WA 98201-1679
Tel: (425) 783-0908
Fax: (425) 783-0939