ENVIRONMENTAL ASSESSMENT OF PROPOSED GEODUCK HARVEST
ALONG THE WESTERN SHORELINE OF VASHON ISLAND,
IN COLVOS PASSAGE, PUGET SOUND
AT THE LISABEULA GEODUCK TRACT (#09450)

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 harvest management plans. Harvest is conducted by divers from subtidal beds between the -18 foot and -70 foot water depth contours (corrected to mean lower low water, hereafter MLLW). Harvest is rotated throughout Puget Sound in six geoduck management regions. The fishery, its management, and its environmental impacts are presented in the Puget Sound Commercial Geoduck Fishery Management Plan (DNR & WDFW, 2008) and the Final Supplemental Environmental Impact Statement (WDFW & DNR, 2001). The proposed harvest is along the western shoreline of Vashon Island, in Colvos Passage, Puget Sound, and is described below.

Proposed Harvest Dates: 2020 - 2021

Tract name: Lisabeula geoduck tract (Tract #09450)

Description: (Figure 1, Tract vicinity map)

The Lisabeula geoduck tract is a subtidal area with a proposed harvest area of approximately 136 acres (Table 1) along the western shoreline of Vashon Island in Colvos Passage, Puget Sound in the South Puget Sound Geoduck Management Region. The northern boundary of the tract begins approximately 4,700 yards south of Point Vashon and continues southerly approximately 9,600 yards. The commercial tract area lies between the -26 ft. and the -70 ft. (MLLW) water depth contours.

The harvest area is bounded by a line projected from a Control Point (CP) on the -26 foot (MLLW) water depth contour in the northeastern corner of the tract at 47°28.398’ N. latitude, 122°29.934’ W. longitude (CP 1) southerly along the -26 foot (MLLW) water depth contour to a point at 47°24.183’ N. latitude, 122°31.468’ W. longitude (CP 2); then westerly to a point on the -70 foot (MLLW) water depth contour at 47°24.192’ N. latitude, 122°31.558’ W. longitude (CP 3); then northerly along the -70 foot (MLLW) water depth contour to a point at 47°28.394’ N. latitude, 122°30.045’ W. longitude (CP 4); then easterly to the point of origin (Figure 2).

The estimate of the tract boundary is made using GIS and field data collected from the 2001 Puyallup and the 2008 WDFW geoduck surveys. All contours are corrected to mean lower low water (MLLW). Depth contour GIS layers were obtained from Dale Gombert (WDFW) and were generated from NOAA soundings. Shoreline data was from DNR, digitized at 1:24000 scale in 1999. The -70 ft. (MLLW) water depth contour is

used for the deep-water boundary, and the shallow water boundary is defined by the -26 ft. contour (MLLW). The latitude and longitude positions are reported in decimal minutes to the closest thousandth of a minute. Corner latitude and longitude positions are generated using GIS, and have not been field verified to determine consistency with area estimates, landmark alignments, or water depth contours. The delineation of the tract boundary will be field verified by DNR prior to any geoduck harvest. Any variance to the stated boundary will be coordinated between WDFW and DNR prior to geoduck harvest.

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 water current velocity. Coarse sediments are generally found in areas of fast currents and finer (muddier) sediments 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 known long-term effects. The substrate holes refill in areas with strong water currents much faster than in areas with weak water currents. Water currents tend to be moderate to high in the vicinity of the Lisabeula tract and are northward for both ebb and flood tides. Currents reach a projected maximum flood velocity of 1.6 knots and maximum ebb velocity of 1.8 knots (Tides and Currents software; station number 1761, Gig Harbor entrance; projected time frame from January 30, 2020 to January 30, 2021.

Subsurface substrate type data were not taken as part of the 2001 and 2008 tract surveys (Table 2). Surface substrate data were not taken as part of the 2001 tract survey (Table 3-A). The surface substrates observed on this tract during the 2008 survey were mostly sand/mud or uniform sand, with sand being the predominant substrate on 9 out of 16 transects (Table 3-B). Other substrate types including mud, pea gravel, cobble and shell were noted on 7 transects (Table 3-B).

Water Quality:

Water quality is acceptable for shellfish harvest at the Lisabeula geoduck tract. Colvos Passage (body of water in which Lisabeula tract is found) is classified by the Washington Department of Health (DOH) as “Approved” as of December 31, 2012. This area was evaluated for inorganic arsenic levels and this tract is currently on the list of approved tracts to export geoducks to China, (list found at http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/CommercialShellfish/ExporttoChina). Additional information regarding arsenic can be found at the DOH web site, including a fact sheet found at http://www.doh.wa.gov/Portals/1/Documents/4400/332-

146-Arsenic-in-Shellfish.pdf. DNR will verify the health status of the Lisabeula tract prior to any geoduck harvest.

The following data on water quality have been provided by the Washington Department of Ecology (DOE) for the Puget Sound Main Basin - Tacoma Narrows Point Defiance station (NRR 001) at 47.3167° North latitude; 122.5483° West longitude. The DOE latitude and longitude positions are reported by DOE in decimal degrees. For 1991 (most recently completed data year available) at a water depth of 10 meters, the mean reported water temperature at this station was 9.9°C with a range from 8.0 to 12.1°C. The mean salinity at this station was 29.2 ppt with a range from 28.1 to 30.2 ppt.

Biota:

Geoduck:

The Lisabeula geoduck tract was surveyed in 2001 by the Puyallup Tribe (49 transects; Figure 3-A). In 2008 WDFW conducted a supplemental pre-fishing survey (16 transects; Figure 3-B). The results of both surveys are used in the preparation of this environmental assessment. This tract has been commercially harvested for geoduck clams since 2007.

The Lisabeula geoduck tract proposed harvest area is approximately 136 acres. Portions of this tract may be difficult to access by harvesters due to the steep slope of the tract bottom and the statutory restriction for harvest vessels (Revised Code of Washington 77.60.070). The abundance of geoducks in this harvest area is moderate, with a current estimated average density of 0.13 geoducks/sq.ft. This area currently contains an estimated 1,521,442 pounds of geoducks (Table 1). This biomass estimate is made using 2001 Puyallup Tribe pre-fishing survey data and subtracting harvest to date (2,019,191 pounds). The standard Table 2 data (digging difficulty ratings) that has been provided in previous Environmental Assessments of Proposed Geoduck Harvest were not reported during the 2001 Puyallup survey, nor was dig data collected during the 2008 WDFW survey on the Lisabeula tract. The density range from the 2001 pre-fishing survey is 0.06 geoducks/sq.ft. on transect #63 to 0.71 geoducks/sq.ft. on transect #79 (Table 3-A). The density range from the 2008 supplemental survey is 0.01 geoducks/sq.ft. on transect #15 to 0.40 geoducks/sq.ft. on transect #7 (Table 3-B). The average geoduck weight at the Lisabeula tract is 1.9 pounds, which is slightly less than the average geoduck weight in Puget Sound of 2.1 pounds. Geoduck whole weight ranged from 0.81 to 3.69 pounds (Table 4). Geoduck counts corrected with siphon “show factors” are listed in Tables 5-A and 5-B, and station locations for the 2008 survey are listed in Table 5-B.

Geoducks are managed for long-term sustainable harvest. No more than 2.7% of the fishable stocks are harvested (total fishing mortality) each year in each management

region throughout Puget Sound. The fishable portion of the total Puget Sound population includes only geoducks that are found between -18 ft. and -70 ft. (corrected to mean lower low water - MLLW). Other geoducks which are not harvestable are found inshore and offshore of the harvest areas. Observations in south Puget Sound show that major 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 previously harvested 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 on a tract is 39 years. In actual fishing 100 percent of the geoducks are never removed from a tract. The average percentage removal of the tracts in the regeneration study was 69 percent. Recent surveys in South Puget Sound indicate that the rate of tract recovery may have changed dramatically in the last decade, possibly due to lower recruitment, increased mortality, or a combination of both factors. 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 and support many fish species, such as rockfish and lingcod. The bottoms are relatively flat and composed of soft sediments, which provide few attachments for macroalgae that are often associated with rockfish and lingcod. The fish observed during the surveys at the Lisabeula tract (Table 6) were flatfish (including butter sole, C-O sole, sand sole, English sole and sand dabs), sculpins, a ratfish and a skate.

WDFW marine fish managers were asked of their concerns of any possible impacts on groundfish and baitfish that geoduck fishing would have. Greg Bargmann of WDFW stated that geoduck fishing would have no long-term detrimental impacts and may have some short-term benefits to groundfish populations by increasing the availability of food. Dan Penttila of the WDFW Fish Management Program recommended that eelgrass beds within the harvest tract should be preserved for any spawning herring. There are no Pacific herring spawning grounds along the shoreline in the vicinity of the Lisabeula tract, but there are some spawning grounds nearby, within Quartermaster Harbor (Figure 4). As a precautionary measure, the Lisabeula nearshore tract boundary will be along the -26 ft. (MLLW) water depth contour to provide year-round protection and a vertical buffer (at least 2 vertical feet) between eelgrass beds and geoduck harvest.

There has been no surf smelt spawning habitat identified in the vicinity of the proposed

harvest area of the Lisabeula tract. Surf smelt deposit adhesive, semitransparent eggs on beaches that have a specific mixture of coarse sand and pea gravel. Inside Puget Sound, surf smelt spawning is thought to be associated with freshwater seepage, where the water keeps the spawning gravel moist. Eggs are deposited near the water's edge in water a few inches deep, around the time of the high water slack. There is substantial vertical separation between surf smelt spawning (slack high tide) and geoduck harvest activity (-26 ft. to -70 ft., MLLW).

Sand lance have not been documented near the Lisabeula tract. Sand lance populations are widespread within Puget Sound, the Strait of Juan de Fuca and the coastal estuaries of Washington. They are most commonly noted in areas such as the eastern Strait and Admiralty Inlet. However, WDFW plankton surveys and ongoing exploratory spawning habitat surveys suggest that there are very few if any bays and inlets in the Puget Sound basin that will not be found to support sand lance spawning activity. Sand lance spawning occurs at tidal elevations ranging from +5 feet to about the mean higher high water line. After deposition, sand lance eggs may be scattered over a wider range of the intertidal zone by wave action. The incubation period is about four weeks. Sand lances are an important part of the trophic link between zooplanktons and larger predators in the local marine food webs. Like all forage fish, sand lance are a significant component in the diet of many economically important resources in Washington. On average, 35 percent of juvenile salmon diets are comprised of sand lance. Sand lance are particularly important to juvenile chinook salmon, where 60 percent of their diet is comprised of sand lance. Other economically important species, such as Pacific cod (*Gadus macrocephalus)*, Pacific hake (*Merluccius productus*) and dogfish (*Squalus acanthias*) feed heavily on juvenile and adult sand lance. There is substantial vertical separation between sand lance spawning (+5 feet to mean higher high water) and geoduck harvest activity (-26 ft. to -70 ft., MLLW). Geoduck fishing on the Lisabeula tract should have no detrimental impacts on sand lance spawning.

NOAA Fisheries Service announced on April 27, 2010 that it was listing canary and yelloweye rockfish as “threatened” and bocaccio as “endangered” under ESA (federal Endangered Species Act). The listings became effective on July 27, 2010. Historic high levels of fishing and water quality are cited as reasons that these rockfish populations are in peril and have been slow to recover. On January 23, 2017; canary rockfish were delisted based on newly obtained samples and genetic analysis (Federal Register 82 FR 7711). Geoduck fishery managers are tracking this process and will take actions necessary to reduce the risk of “take” of any listed rockfish species that could potentially result from geoduck harvest activity.

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 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 late August through late 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. Recent recovery and supplementation efforts have reversed the trend of decline in Hood Canal summer run chum salmon stocks. Total escapement for Hood Canal summer run chum salmon has reached historic high levels and risk of extinction has decreased for all stocks (Adicks, K. *et al*., 2007). The Lisabeula tract is outside of the critical habitat range for Hood Canal summer run chum salmon.

Critical habitat for Puget Sound chinook salmon includes all marine, estuarine and river reaches accessible to listed chinook salmon in Puget Sound. WDFW recognizes 27 distinct stocks of chinook salmon; 8 spring-run, 4 summer-run, and 15 summer/fall and fall-run stocks. The existence of an additional five spring-run stocks is in dispute. The majority of Puget Sound chinook salmon emigrate to the ocean as subyearlings.

Major tributaries in the general vicinity of the Lisabeula geoduck tract, which support chinook salmon runs, are the Duwamish Waterway/Green River basin and the Lake Washington basin (mouth at Shilshole Bay; with Cedar River, Issaquah Creek, and north Lake Washington tributaries sub-basins). Three viable runs of chinook salmon have been identified in the Duwamish Waterway/Green River basin. The status of the Spring run of chinook salmon in the Duwamish Waterway/Green River basin is extinct. The status of the natural Summer/Fall run of chinook salmon in the Duwamish Waterway/Green River basin is mixed native and non-native origin; a composite of wild, cultured, or unknown/unresolved production; and healthy with a 5-year geometric mean for total estimated escapement at 4,889 fish. The timing of the Duwamish River run is uncertain and has a 5-year geometric mean for total estimated escapement at 5,216 fish. The status of the Summer/Fall run in Newaukum Creek is mixed native and non-native origin; wild production; and healthy (NMFS, Appendix E, TM-35, Chinook Status Review).

The production of the Lake Washington Summer/Fall run of chinook salmon is natural with a 5-year geometric mean for total estimated escapement at 557 fish. The status of the natural Cedar River Summer/Fall run of chinook salmon is native origin; wild production; with a 5-year geometric mean for total estimated escapement at 377 fish. The status of the mixed Summer/Fall run of chinook salmon in Issaquah Creek is non-native origin; a composite of wild, cultured, or unknown/unresolved production; and healthy. The status of the natural Summer/Fall run of chinook salmon in the North Lake Washington tributaries is native origin; wild production; with a 5-year geometric mean

for total estimated escapement at 145 fish (NMFS, Appendix E, TM-35, Chinook Status Review).

Three Chinook salmon runs have been identified in the Puyallup River. The status of the Spring run of Chinook salmon in the Puyallup River is extinct (NMFS, Appendix E, TM-35, Chinook Status Review). The status of the natural Summer/Fall run of Chinook salmon in the Puyallup River is undetermined with a 5-year geometric mean for total estimated escapement at 2,518 fish (NMFS, Appendix E, TM-35, Chinook Status Review). The Fall run of Chinook salmon in the Puyallup River is a mixed or composite production of special concern with an unknown origin and run size (NMFS, Appendix E, TM-35, Chinook Status Review).

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 of the University of Washington School of Fisheries stated that the exclusionary principle of not allowing leasing/harvesting in water shallower than -18 ft. MLLW, the 2+ ft. vertically from elevation of the 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 salmon populations.

On May 7, 2007 NOAA Fisheries Service announced listing of Puget Sound steelhead as “threatened” under ESA. This listing includes more than 50 stocks of summer- and winter-run steelhead. In NOAA’s 2011 5-Year Review, it was reported that for all but a few demographically independent populations of steelhead in Puget Sound, estimates of mean population growth rates obtained from observed spawner or red counts are declining, typically 3 to 10% annually. Steelhead share many of the same waters as Puget Sound Chinook salmon, which are already protected by ESA, and will benefit from shared conservation strategies. There is a winter run of steelhead in the Green-Duwamish watershed that is rated “healthy.” This rating was made because spawner escapements have generally varied within a range of +/- 25% of the escapement goal of 2000 wild spawners. Spawning for this stock generally occurs between early March to mid-June. This is a native stock with wild production. The horizontal separation between the tributaries that support a steelhead run and the Lisabeula tract will assure that geoduck harvest will likely have no impact on steelhead populations.

Green sturgeon have undergone ESA review in recent years, due to depressed populations. NOAA Fisheries Service produced an updated status review on February 22, 2005 and reaffirmed that the northern green sturgeon Distinct Population Segment (DPS)

warranted listing as a "species of concern", however proposed that the Southern DPS should be listed as "threatened" under the ESA. NMFS published a final rule on April 7, 2006 listing the Southern DPS as "threatened" [pdf] (71 FR 17757), which took effect June 6, 2006. The green sturgeon critical habitat proposed for designation includes the outer coast of Washington within 110 meters (m) depth (including Willapa Bay and Grays Harbor) to Cape Flattery and the Strait of Juan de Fuca to its United States boundary. Puget Sound proper has been excluded from this critical habitat designation. The Lisabeula geoduck tract is outside of the critical habitat range of green sturgeon and geoduck harvest at this location will have no adverse effects on ESA recovery efforts for green sturgeon populations.

Invertebrates:

Many different kinds of marine invertebrates, which are frequently found on geoduck beds, were observed on this tract during the 2008 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 local populations of 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 4.6 years of study have shown no adverse effects on crab populations due to geoduck fishing. Dungeness crab are found on this tract in moderate numbers. Dungeness crab were observed on 4 of 16 transects (900 sq. ft./transect) during the 2008 WDFW biological survey of this harvest area, or 25% of transects done on this survey in this area. Dungeness crab which are present on the tract may experience peak molt in mid-April, based on data from the Kingston area (Cain, 10/15/01).

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 the tract and shoreward of the tract to the +1 ft. level and seaward out to -360 ft.(MLLW) water depth contour (Figure 5, Potential crab habitat map). Dr. Dave Armstrong at the University of Washington has determined that Dungeness crab utilize Puget Sound bottoms from the +1 ft. level out to the -330 ft. level. The entire crab habitat along this tract is approximately 1,328 acres. There were about 1,842,723 harvestable geoducks in the entire 136 acre tract harvest area, from the 2001 pre-fishing survey estimate. With a harvest of 65 percent, the total number harvested would be 1,197,770 geoducks. Approximately 1.18 square feet of substrate is disturbed for every geoduck harvested, so 1,197,770 x 1.18 = 1,413,369 square feet of substrate. This equals about 32.4 acres. This is about 2.4 percent of the total available crab habitat in the vicinity of this tract. Based

on the low amount of disturbance, plus 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.

Aquatic Algae:

Large attached aquatic algae are not generally found in geoduck beds in large quantities. Light restriction often limits algal growth to areas shallower than where most geoduck harvest occurs. Aquatic algae observed during the 2008 WDFW geoduck survey include *Costaria costada* (seersucker kelp), *Desmarestia* algae (acid kelp), *Laminaria* algae, *Ulva* spp. (sea lettuce), *Nereocystis luetkeana* (bull kelp), a diatom layer and small and large red algae (Table 7).

John Boettner and Tim Flint, of the WDFW Habitat Division, have stated that as long as geoduck fishing was restricted seaward of the eelgrass beds they have no concerns about the fishing. The shallow boundary of geoduck harvest is set at least two vertical feet seaward of the deepest occurrence of eelgrass, to protect all eelgrass along the tract from harvest activities. An eelgrass survey was conducted at the southern portion of the Lisabeula geoduck tract on June 21, 2007 by the Puyallup Tribe. No eelgrass was observed deeper than -16 ft. (MLLW). No eelgrass was observed within the tract during the 2008 survey. On November 14 and 15, 2012 WDFW conducted an eelgrass survey and found rooted eelgrass occurring at a maximum depth of -24 ft. (MLLW). The shoreward boundary of this tract will be no shallower than the -26 ft. water depth contour (MLLW), which should provide sufficient buffer for any eelgrass beds in the vicinity of the tract.

Marine Mammals:

Several species of marine mammals, including seals, sea lions, and river otters may be observed in the vicinity of this geoduck tract. There have also been sporadic reports of gray whales feeding near Bainbridge Island and rare reports of humpback whales near Vashon Island. Killer whales may also be observed in the vicinity of this tract, particularly between November and March. The Southern Resident stock of killer whales resides mainly in the San Juan Islands throughout spring and summer, but incursions south into Puget Sound occur more frequently during winter months (Brent Norberg, NOAA, pers. comm. 5/15/06). The Southern Resident stock of killer whales was listed as "endangered" under the federal Endangered Species Act (ESA) by the National Marine Fisheries Service on November 15, 2005. This is in addition to the designation of this stock in May 2003 as "depleted" under the Marine Mammal Protection Act. More information and a draft conservation plan for this stock can be found at the NOAA website (http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-

Whales/ESA-Act-Status/Listing-Final.cfm). 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. 5/15/06). Precautions should be taken by commercial divers, when marine mammals are in the area, to be aware of marine mammal movements and behaviors to eliminate the remote risk of entanglement with diver hoses and lines.

Birds:

A variety of marine birds are common in Puget Sound and the general vicinity of this tract. The most significant of these are guillemots, murres, murrelets, grebes, loons, scoters, dabbing ducks, black brant, mergansers, buffleheads, cormorants, gulls, and terns. Blue heron, bald eagles, and osprey are also regularly observed. 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 the 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 geoduck clam harvest is unlikely to have any adverse impacts on bald eagle productivity.

Other uses:

Adjacent Upland Use:

The shoreline along the Lisabeula geoduck tract is mostly designated as Forestry and Natural Shorelines with some Rural Shorelines and a small portion as a Resource Shoreline (King County Comprehensive Plan 2010, Chapter 5, Shoreline Management).

To minimize possible disturbance to adjacent residents, harvest vessels are not allowed shoreward of the 200 yards seaward of the ordinary high tide line (OHT). See Appendices A-1 and A-2 for maps of where this 200 yard line falls along the shoreline of the Lisabeula tract. Harvest is allowed only during daylight hours and no harvest is allowed on Saturday, Sunday, or state holidays.

The only visual effect of harvest is the presence of the harvest vessels on the tract. These boats (normally 35-40 feet long) are anchored during harvest and divers conduct all harvest out of sight. Noise from boats, compressors and pumps may not exceed 50 dB measured 200 yards from the noise source, which is 5 dB below the state noise standard.

Fishing:

The waters in the vicinity of this geoduck tract (in Marine Area 11) are not prime sport fishing areas, however, some recreational salmon fishing for blackmouth and silvers could occur seasonally in proximity to this tract. Sport fishing is open year round for surfperch. Rockfish fishing is closed. Lingcod can only be taken May 1-June 15 by hook and line or May 21 to June 15 by spearfishing. The WDFW Sport Fishing Rules pamphlet describes additional seasons, size limits, daily limits, specific closed areas, and additional rules for salmon and other marine fish species. The fishing which does occur should not create any problems for the geoduck harvesting effort in the area.

Geoduck harvesting on this tract is managed in coordination with the South Puget Sound treaty tribes through state/tribal geoduck harvest management plans. The non-Indian geoduck fishery should not be in conflict with any concurrent tribal fisheries.

Navigation:

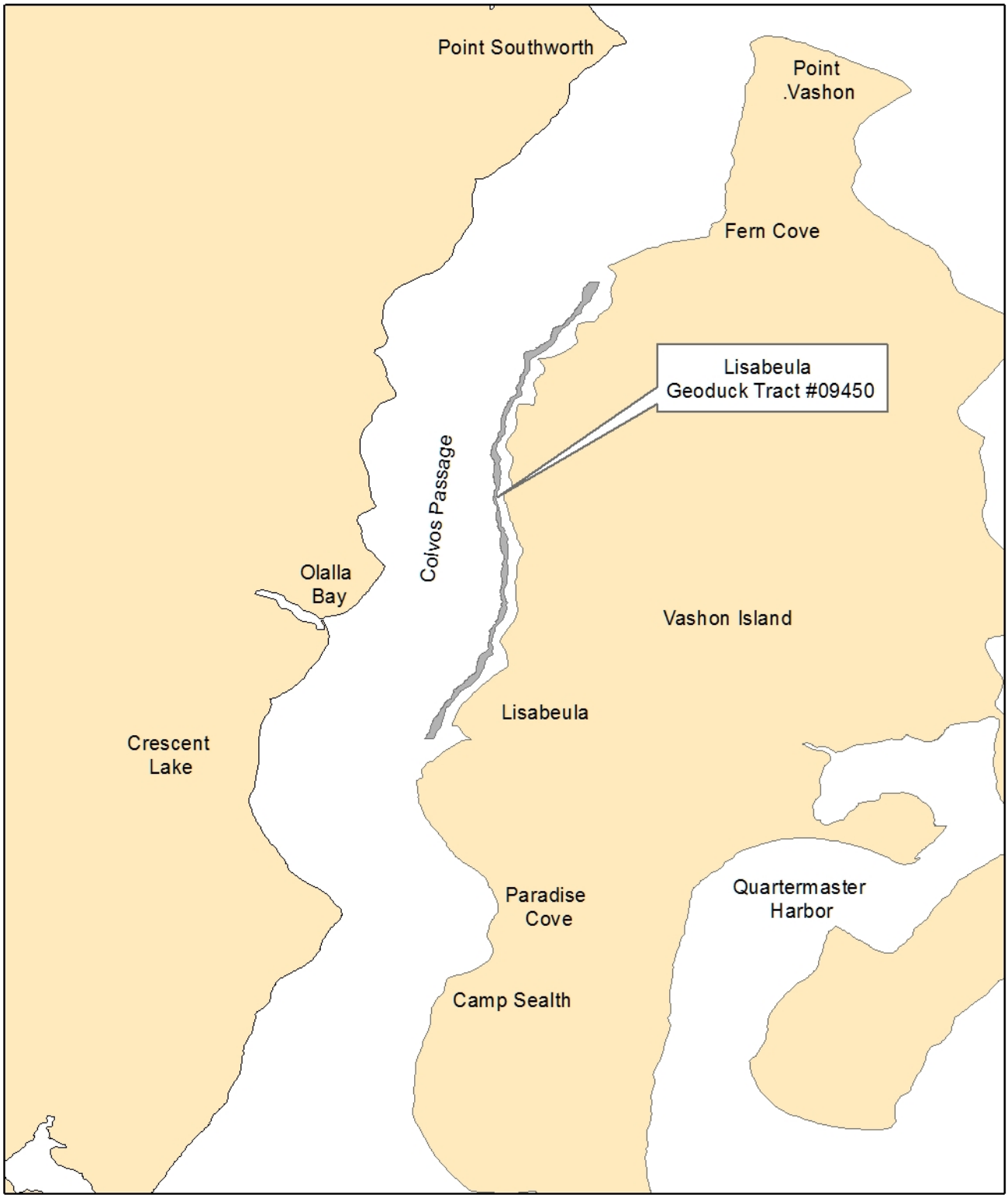
The Lisabeula area is used by recreational vessels traveling in South Puget Sound and is not in a commercial vessel traffic lane. Geoduck harvesting at this site should not result in any significant navigational conflicts. The Washington Department of Natural Resources will notify the local boating community prior to any harvest.

Summary:

The continued commercial geoduck harvest is proposed for one harvest area of one tract along the western shoreline of Vashon Island in Colvos Passage, Puget Sound. The tract was surveyed in 2001 by the Puyallup Tribe and in 2008 the Washington Department of Fish and Wildlife conducted a supplemental survey. The current biomass estimate for the 136 acre harvest area is 1,521,442 pounds. This estimate is based on the 2001 Puyallup Tribe pre-fishing geoduck survey less total harvest that occurred since the survey. Fishing by the Puyallup Tribe has occurred on this tract since 2007 and state sanctioned harvest began in 2012. Harvest along certain steep sloped bottoms of the tract will be challenging to access by commercial harvesters, due to statutory restrictions for harvest vessels. The commercial tract is classified by DOH as "Approved." The anticipated environmental impacts of this harvest are within the range of conditions discussed in the 2001 Final Supplemental Environmental Impact Statement. To reduce the possible impacts to forage fish and eelgrass, the harvest will be seaward of the -26 ft. water depth contour (MLLW) along the tract. No significant impacts are expected from this harvest.

File: 200130_Lisabeula_EA_09450.doc

Figure 1. Vicinity Map, Lisabeula Commercial Geoduck Tract #09450



N
W E
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1:100,000

1 inch = 1.58 miles

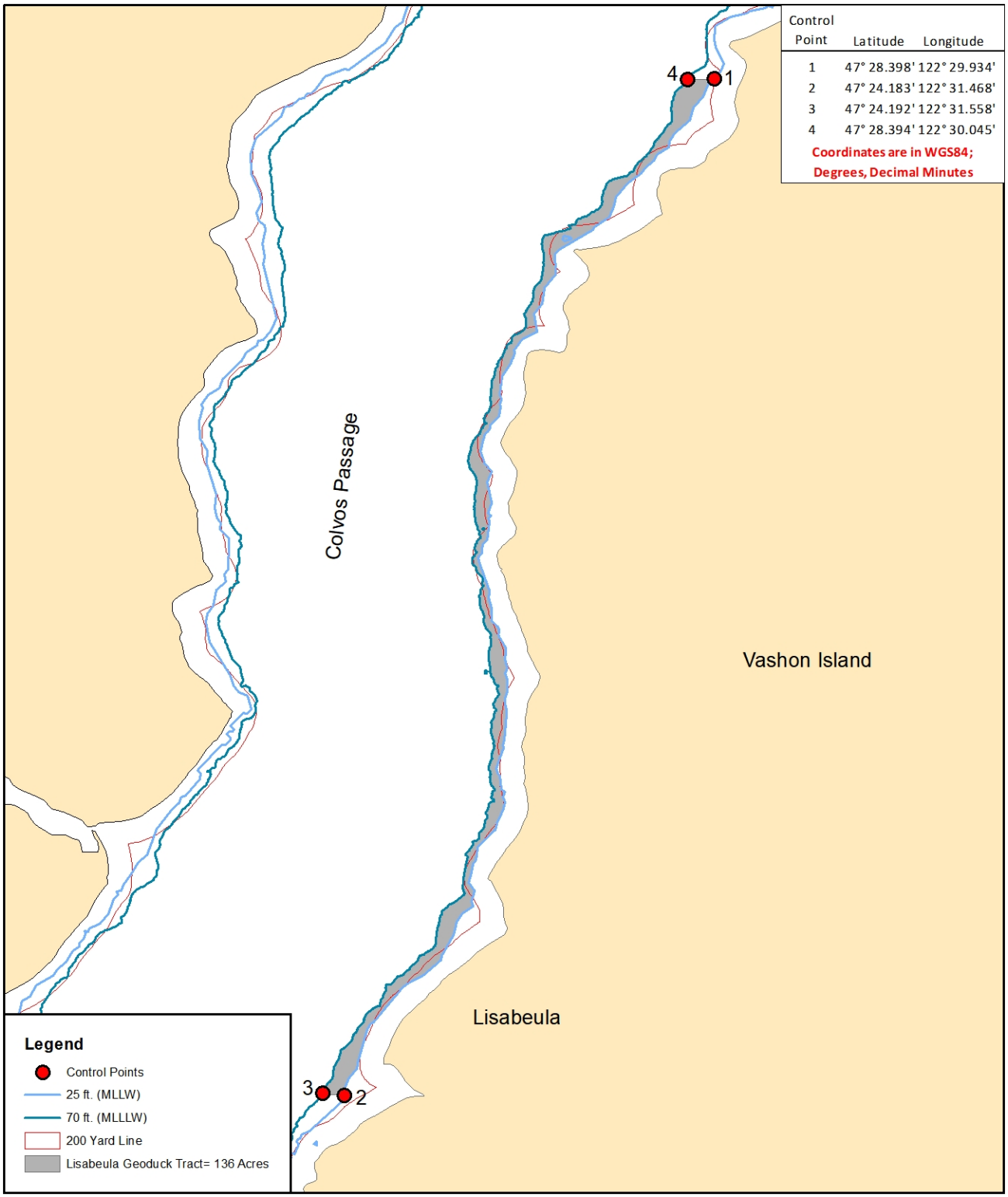
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.5 1 2 3 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 2. Control Points Map, Lisabeula Commercial Geoduck Tract #09450



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1 inch = 0.71 miles

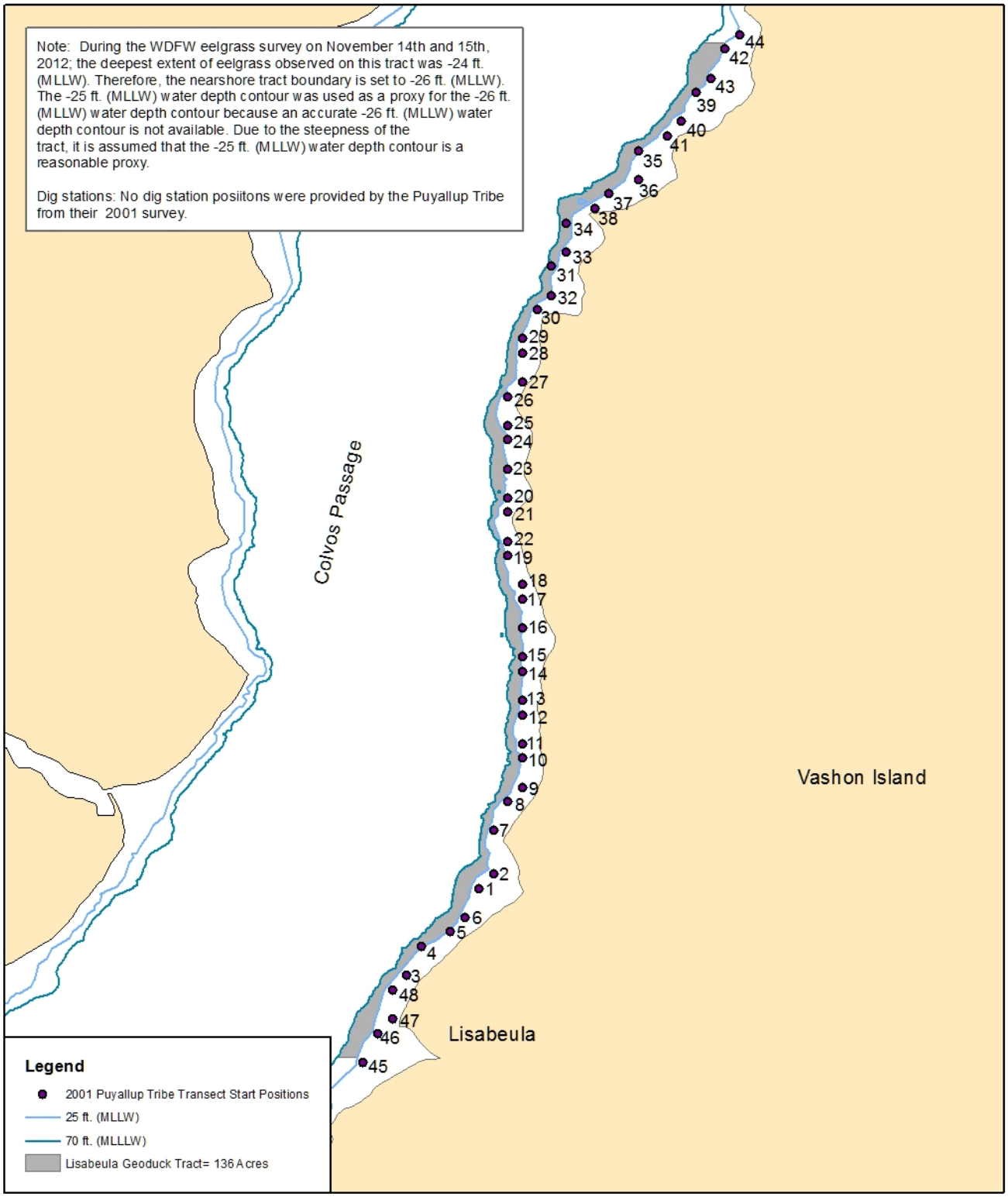
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.225 0.45 0.9 1.35 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 31, 2020
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 3-A. Puyallup Tribe Transect Start Position Map, Lisabeula Commercial Geoduck Tract #09450



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1 inch = 0.71 miles

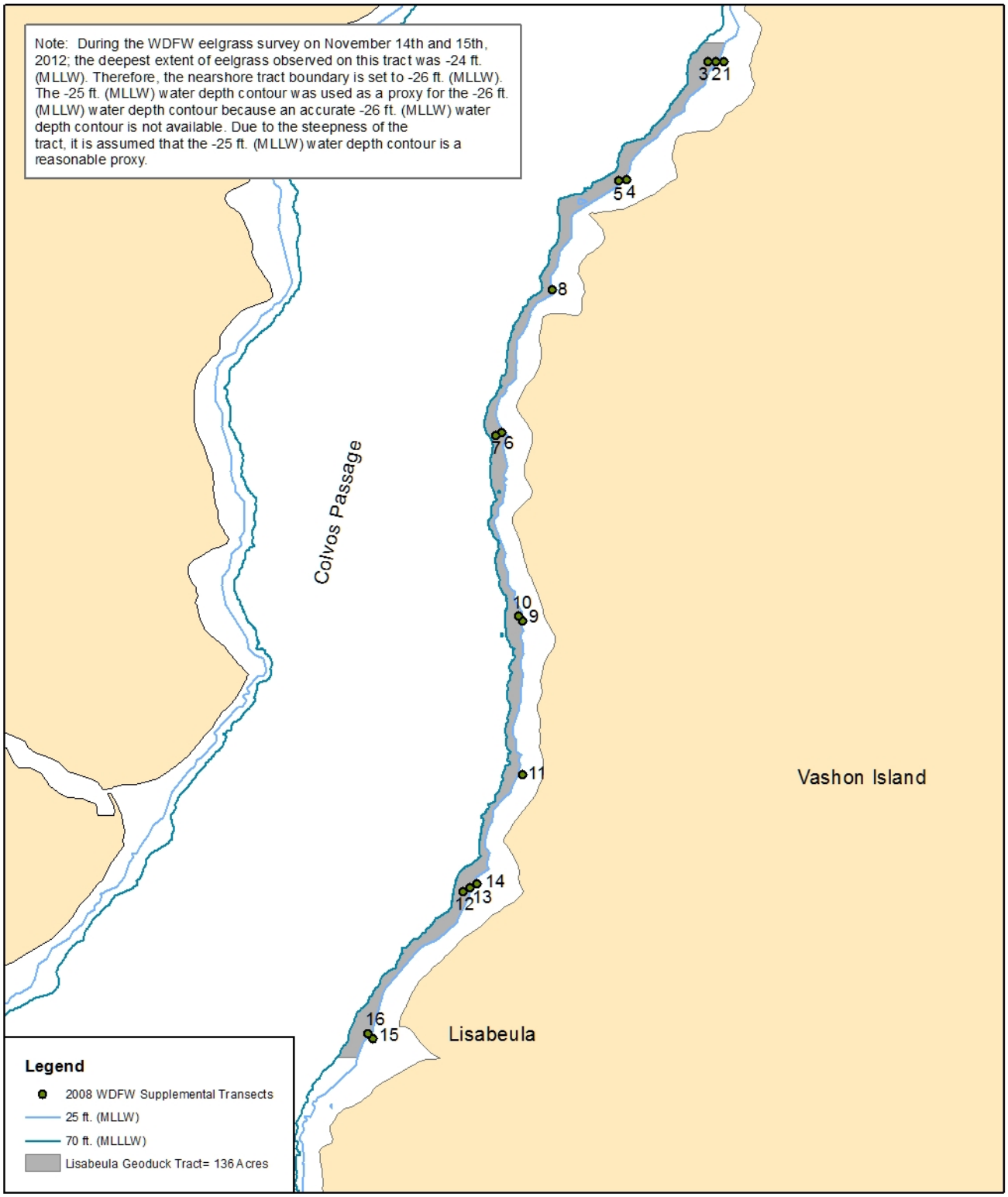
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.225 0.45 0.9 1.35 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 3-B. 2008 WDFW Transect Map, Lisabeula Commercial Geoduck Tract #09450



N
W E
S

1:45,000

1 inch = 0.71 miles

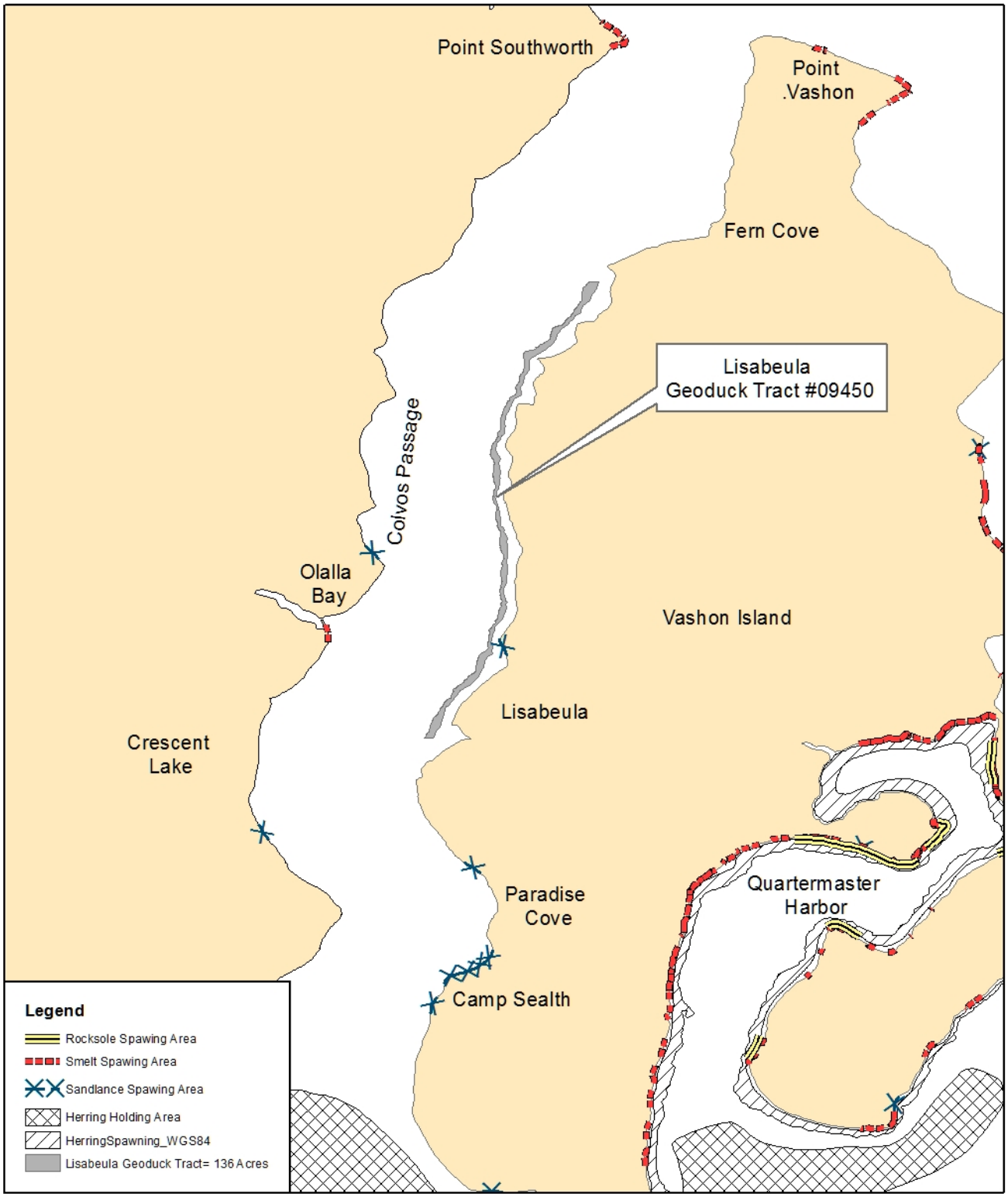
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.225 0.45 0.9 1.35 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 4. Fish Spawning Areas Near the Lisabeula Commercial Geoduck Tract #09450



N
W E
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1:100,000

1 inch = 1.58 miles

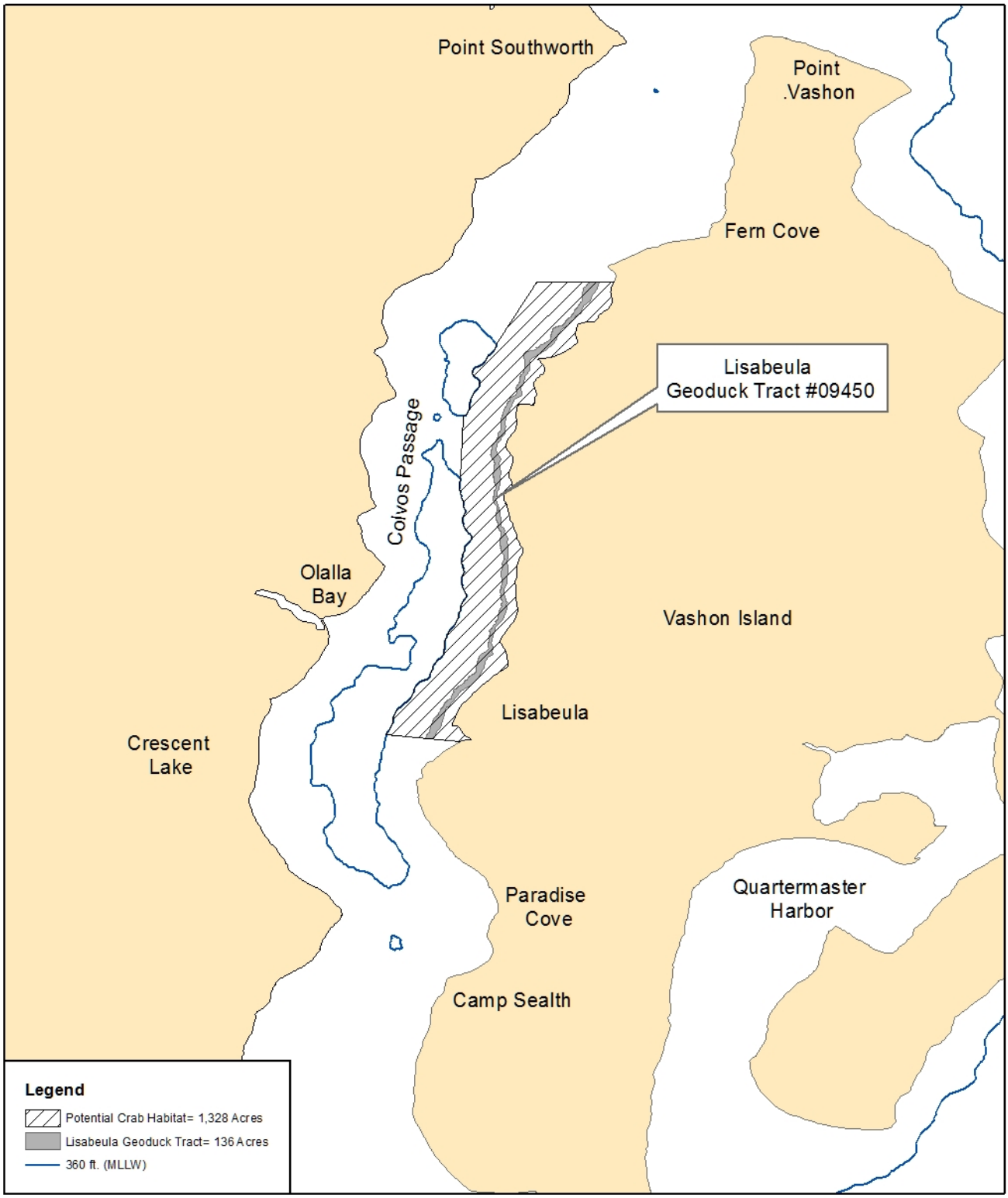
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.5 1 2 3 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 5. Dungeness Crab Habitat Map, Lisabeula Commercial Geoduck Tract #09450



N
W E
S

1:100,000

1 inch = 1.58 miles

Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.5 1 2 3 Miles

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Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

EXPLANATION OF SURVEY DATA TABLES

The geoduck survey data for each tract is reported in seven computer-generated tables. These tables contain specific information gathered from transect and dig samples and diver observations. The following is an explanation of the headings and codes used in these tables.

Tract Summary

This table is a general summary of survey information for the geoduck tract including estimates of *Tract Size* in acres, average geoduck *Density* in animals per sq.ft., *Total Tract Biomass* in pounds with statistical confidence, and *Total Number of Geoducks*. Mass estimators are reported in average values for *Whole Weight* and *Siphon Weight* in pounds. Geoduck siphon weights are also reported in *Siphon Weight as a percentage of Whole Weight.* Biomass estimates are adjusted for any harvest that may occur subsequent to the pre-fishing 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.

Transect Water Depths, Geoduck Densities 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 is predominant. A one (1) rating indicates the substrate type was present.

Geoduck Weights and Proportion Over 2 Pounds

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 *Avg. Whole Weight (lbs.)* column gives the average sample weight of whole geoduck clams for each dig station. The *Avg. Siphon Weight (lbs.)* column gives the average weight of the siphons of the geoducks for each dig station. The percentage of geoducks greater than two pounds is given in the *% Greater than 2 lbs.* column.

Transect - Corrected Geoduck Count and Position Table

This table reports the diver *Corrected Count*, the geoduck siphon *Show Factor* used to correct the count, and the *Latitude/Longitude* position of the start point of each survey transect. Raw (observed) siphon counts are "corrected" by dividing diver observed counts for each transect with a siphon "show" factor (See WDFW Tech. Report FPT00-01 for explanation of show factor) to estimate the sample population density. Transect positions are reported in degrees and decimal minutes to the thousandth of a minute, datum WGS84.

Most Common and Obvious Animals Observed

This table summarizes the animals, other than geoducks, that were observed during the geoduck survey, and reports the total number of transects on which they were present (*# of Transects Where Observed)*. This is qualitative presence/absence data only, and only animals that can be readily seen by divers at or near the surface of the substrate are noted. The *Group* designation allows for the organization of similar species together in the table. Whenever possible, the scientific name of the animal is listed in *Taxonomer*, and a generally accepted *Common Name* is also listed. Many variables may make it difficult for divers to notice other animals on the tract, including but not limited to poor visibility, diver skill, animals fleeing the divers, animal size, or cryptic appearance or behavior (in crevasses or under rocks).

Most Common and Obvious Algae Observed

This table summarizes marine algae observed during the geoduck survey, and reports the total number of transects on which they were seen (*# of Transects Where Observed)*. This is qualitative presence/absence data only, and only for macro algae, with the exception of diatoms. At high densities diatoms form a "layer" on or above the substrate surface that is readily visible and obvious to divers. Other types of phytoplankton are not sampled and are rarely noted. Whenever possible, the scientific name or a general taxonomic grouping of each algae is listed in *Taxonomer*.

Last Updated: May 7, 2019
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Table 1. GEODUCK TRACT SUMMARY

Lisabeula geoduck tract # 09450.

Tract Name	Lisabeula
Tract Number	09450
Tract Size (acres)[a]	136
Density of geoducks/sq.ft.[b]	0.13
Total Tract Biomass (lbs.)[b]	1,521,442
Total Number of Geoducks on Tract[b]	791,835
Confidence Interval (%)	14.0%
Mean Geoduck Whole Weight (lbs.)	1.92
Mean Geoduck Siphon Weight (lbs.)[c]	N/A
Siphon Weight as a % of Whole Weight[c]	N/A
Number of Transect Stations[d]	93
Number of Geoducks Weighed	74

[a.] Tract area is between the -26 ft. and the -70 ft. (MLLW) water depth contours

[b.] Current biomass estimate is based on the 2001 Puyallup tribe pre-fishir survey (pre-fishing biomass of 3,540,633 pounds) minus total harvest of 2 pounds reported through January 30, 2020. 2008 WDFW transects were for this biomass estimate, but for supplemental data only.

Note: Some sampling units are not uniform in area and the variance has not been adjusted to account for unequal sampling unit areas. 2008 WDFW transects are included for supplemental purposes.

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Table 2: DIGGING DIFFICULTY TABLE

Lisabeula geoduck tract #09450, 2001 Puyallup Tribe 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)

No digging difficulty data provided

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Table 3-A: TRANSECT WATER DEPTHS, GEODUCK DENSITIES, AND SUBSTRATE OBSERVATIONS

Lisabeula geoduck tract #09450, 2001 Puyallup Tribe pre-fishing survey.

Transect	Start Depth (ft.)[a]	End Depth (ft.)[a]	Area Surveyed (ft.^{2})[b]	Geoduck Density (no. / sq.ft.)[c]	Substrate
2	41	49	900	0.4074	Substrate Data not provided
3	49	69	900	0.6193	
4	26	48	900	0.1704	
5	48	62	900	0.5733	
6	27	58	900	0.4489	
7	58	70	900	0.6207	
8	28	62	900	0.6459	
10	59	57	900	0.4474	
12	37	66	900	0.1748	
14	44	66	900	0.4844	
16	39	70	900	0.2237	
18	35	57	900	0.3704	
19	57	70	900	0.5319	
21	39	53	900	0.5481	
22	53	64	900	0.6000	
25	62	70	240	0.5167	
27	46	71	420	0.5683	
29	47	70	720	0.4074	
31	60	70	258	0.1189	
33	62	70	264	0.4697	
35	55	70	546	0.4054	
37	52	70	726	0.3710	
39	43	68	900	0.3437	
41	50	70	612	0.2680	
43	48	70	564	0.1111	
45	54	70	360	0.1481	
50	52	70	738	0.4228	
52	70	52	900	0.6193	
56	70	52	492	0.2791	
58	51	70	678	0.3795	
60	57	70	258	0.6408	
63	54	71	480	0.0583	
65	45	70	780	0.5504	
67	54	70	360	0.3852	
69	50	70	600	0.4289	
71	56	70	720	0.1426	
73	45	70	900	0.1437	
75	35	62	900	0.3156	
76	62	70	300	0.3022	
78	38	58	900	0.4444	
79	58	70	372	0.7097	
81	44	70	798	0.3709	
84	43	64	900	0.4711	
86	32	48	900	0.3941	
87	48	70	900	0.5585	
89	35	50	900	0.4830	
90	50	67	900	0.4844	
92	35	50	900	0.4519	
93	50	64	900	0.6533	

[a.] All depths are corrected to mean lower low water (MLLW)

[b.] Transect Stations were not uniform in size and the variance has not been adjusted to account for this factor.

[c.] Densities were calculated using a standard daily siphon show factor of 0.75

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Table 3-B: TRANSECT WATER DEPTHS, GEODUCK DENSITIES, AND SUBSTRATE OBSERVATIONS

Lisabeula geoduck tract #09450, 2008 WDFW supplemental pre-fishing survey.

Transect	Start Depth (ft.)[a]	End Depth (ft.)[a]	Area Surveyed Surveyed (ft.^{2}	Geoduck Density (no. / sq.ft.) [b]	Substrate[c] Mud	Sand	Cobble	Peagravel	Shell
1	26	35	900	0.073	1	2			
2	35	46	900	0.259	1	1			
3	46	56	900	0.267	1	2			
5	40	60	900	0.178	1	2			
7	51	64	900	0.400		1	1	1	1
8	26	60	900	0.357	1	2			
10	32	53	900	0.375		2			
12	27	31	900	0.043		2			
13	32	41	900	0.102		2			
14	41	57	900	0.049		2			
16	42	54	900	0.163		2		1	

[a.] All depths are corrected to mean lower low water (MLLW)

[b.] Densities were calculated using a daily siphon show factor of 0.75

[c.] Substrate ratings: 1 = present; 2 = predominant; blank = not observed

Note: 2008 WDFW supplemental pre-fishing survey data is included to provide information on substrates, plants, and animals.

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Table 4: GEODUCK SIZE SUMMARY

Lisabeula geoduck tract #09450, 2001 Puyallup Tribe pre-fishing survey dig sample*

average whole weight (lbs.)	1.92
number of geoducks dug	74
minimum weight (lbs.)	0.81
maximum weight (lbs.)	3.69

*dig station locations were not documented during this survey

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Table 5-A: TRANSECT CORRECTED GEODUCK COUNT AND POSITION TABLE

Lisabeula geoduck tract #09450, 2001 Puyallup Tribe pre-fishing survey.

Transect	Corrected Count	Show Factor[a]	Area Surveyed (ft.^{2})[b]	Latitude	Longitude
2	367	0.75	900	No transect position data provided	
3	557	0.75	900		
4	153	0.75	900		
5	516	0.75	900		
6	404	0.75	900		
7	559	0.75	900		
8	581	0.75	900		
10	403	0.75	900		
12	157	0.75	900		
14	436	0.75	900		
16	201	0.75	900		
18	333	0.75	900		
19	479	0.75	900		
21	493	0.75	900		
22	540	0.75	900		
25	124	0.75	240		
27	239	0.75	420		
29	293	0.75	720		
31	31	0.75	258		
33	124	0.75	264		
35	221	0.75	546		
37	269	0.75	726		
39	309	0.75	900		
41	164	0.75	612		
43	63	0.75	564		
45	53	0.75	360		
50	312	0.75	738		
51	283	0.75	900		
52	557	0.75	900		
56	137	0.75	492		
58	257	0.75	678		
60	165	0.75	258		
63	28	0.75	480		
65	429	0.75	780		
67	139	0.75	360		
69	257	0.75	600		
71	103	0.75	720		
73	129	0.75	900		
75	284	0.75	900		
76	91	0.75	300		
78	400	0.75	900		
79	264	0.75	372		
81	296	0.75	798		
84	424	0.75	900		
86	355	0.75	900		
87	503	0.75	900		
89	435	0.75	900		
90	436	0.75	900		
92	407	0.75	900		
93	588	0.75	900		

[a.] Daily siphon show factor was used to correct combined geoduck counts

[b.] Not all transects are standard size (900 sq.ft.), and the variance has not been adjusted to account for this.

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Table 5-B: TRANSECT CORRECTED GEODUCK COUNT AND POSITION TABLE

Lisabeula geoduck tract #09450, 2008 WDFW supplemental pre-fishing survey.

Transect	Corrected Count	Show Factor[a]	Area Surveyed (ft.^{2})	Latitude[b]		Longitude[b]	
1	65	0.75	900	47	28.329	122	29.885
2	233	0.75	900	47	28.330	122	29.919
3	240	0.75	900	47	28.327	122	29.949
4	27	0.75	900	47	27.838	122	30.288
5	160	0.75	900	47	27.835	122	30.322
6	315	0.75	900	47	26.789	122	30.807
7	360	0.75	900	47	26.777	122	30.829
8	321	0.75	900	47	27.384	122	30.595
9	21	0.75	900	47	26.007	122	30.719
10	337	0.75	900	47	26.029	122	30.735
11	192	0.75	900	47	25.371	122	30.720
12	39	0.75	900	47	24.918	122	30.910
13	92	0.75	900	47	24.903	122	30.938
14	44	0.75	900	47	24.887	122	30.966
15	11	0.75	900	47	24.276	122	31.339
16	147	0.75	900	47	24.298	122	31.360

[a.] Daily siphon show factor was used to correct combined geoduck counts

[b.] Latitude and longitude are in degrees and decimal minutes and are in NAD27 datum

Note: 2008 WDFW supplemental pre-fishing survey data is included to provide information on substrates, plants, and animals.

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Table 6: MOST COMMON AND OBVIOUS ANIMALS OBSERVED

Lisabeula geoduck tract #09450, 2008 WDFW supplemental pre-fishing survey.

# of Transects where Observed	Group	Common Name	Taxonomer
12	ANEMONE	BURROWING ANEMONE	*Pachycerianthus fimbriatus*
7	ANEMONE	PLUMED ANEMONE	*Metridium* spp.
4	ASCIDIAN	SESSILE TUNICATE	Unspecified Tunicate
10	BIVALVE	HARDSHELL CLAMS	*Veneridae* spp.
4	BIVALVE	HEART COCKLE	*Clinocardium nuttalli*
11	BIVALVE	HORSE CLAM	*Tresus* spp.
1	BIVALVE	HORSE MUSSEL	*Modiolus rectus*
2	BIVALVE	PIDDOCK	Unspecified Pholadidae
6	CNIDARIA	SEA PEN	*Ptilosarcus gurneyi*
3	CNIDARIA	SEA WHIP	*Stylatula elongata*
5	CRAB	DECORATOR CRAB	*Oregonia gracilis*
4	CRAB	DUNGENESS CRAB	*Cancer magister*
11	CRAB	GRACEFUL CRAB	*Cancer gracilis*
9	CRAB	HERMIT CRAB	Unspecified hermit crab
3	CRAB	RED ROCK CRAB	*Cancer productus*
2	CRAB	SHARP-NOSED CRAB	*Scyra acutifrons*
10	CUCUMBER	BURROWING CUCUMBER	Unspecified burrowing Holothurian
8	CUCUMBER	SEA CUCUMBER	*Parastichopus californicus*
4	CUCUMBER	WHITE CUCUMBER	*Eupentacta quinquesemita*
1	FISH	BUTTER SOLE	*Iopsetta isolepis*
1	FISH	C-O SOLE	*Pleuronichthys coenosus*
1	FISH	ENGLISH SOLE	*Parophrys vetulus*
1	FISH	FISH	Unspecified Fish
15	FISH	FLATFISH	Unspecified flatfish
1	FISH	RATFISH	*Hydrolagus colliei*
1	FISH	SAND SOLE	*Psettichthys melanostictus*
2	FISH	SANDDAB	*Citharichthys* spp.
12	FISH	SCULPIN	Unspecified Cottidae
1	FISH	SKATE	Unspecified Raja spp.
1	GASTROPOD	MOON SNAIL	*Polinices lewisii*
7	GASTROPOD	MOON SNAIL EGGS	*Polinices lewisi* i egg case
2	GASTROPOD	NUDIBRANCH	Unspecified nudibranch
1	MISC	BRYOZOAN COLONY	Unspecified bryozoan
2	NUDIBRANCH	ARMINA	*Armina californica*
1	SEA STAR	BLOOD STAR	*Henricia leviuscula*
5	SEA STAR	LEATHER STAR	*Dermasterias imbricata*
4	SEA STAR	ROSE STAR	*Crossaster papposus*
3	SEA STAR	SAND STAR	*Luidia foliolata*
3	SEA STAR	SHORT-SPINED STAR	*Pisaster brevispinus*
2	SEA STAR	SPINY STAR	*Hippasteria spinosa*
11	SEA STAR	SUN STAR	*Solaster* spp.
6	SEA STAR	SUNFLOWER STAR	*Pycnopodia helianthoides*
4	SEA STAR	VERMILLION STAR	*Mediaster aequalis*
7	SHRIMP	GHOST SHRIMP	Unspecified ghost shrimp
1	SHRIMP	SHRIMP	Unspecified shrimp

Table 6: CONTINUED

# of Transects where Observed	Group	Common Name	Taxonomer
3	WORM	ROOTS	Chaetopterid polychaete tubes
11	WORM	SABELLID TUBE WORM	*Sabellid* spp.
13	WORM	TEREBELLID TUBE WORM	*Terebellid* spp.
3	WORM	WORM	Unspecified annelid worm

Note: 2008 WDFW supplemental pre-fishing survey data is included to provide information on substrates, plants, and animals. These data were not used to estimate the geoduck biomass on this tract.

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Table 7: MOST COMMON AND OBVIOUS PLANTS OBSERVED

Lisabeula geoduck tract #09450, 2008 WDFW supplemental pre-fishing survey.

# of Transects where observed	Taxonomer
1	*Costaria costada*
3	*Desmarestia* spp.
3	*Nereocystis luetkeana*
3	Diatoms
14	*Laminaria* spp.
13	Unspecified large red algae
15	*Ulva* spp.
15	Unspecified small red algae

Note: 2008 WDFW supplemental pre-fishing survey data is included to provide information on substrates, plants, and animals. These data were not used to estimate the geoduck biomass on this tract.

Generation Date: January 30, 2020
Generated By: O. Working, WDFW
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