Request for an
Incidental Harassment Authorization

Under the
Marine Mammal Protection Act

Orcas Island and Friday Harbor Ferry Terminals Dolphin Replacement Projects

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Submitted To:
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Abbreviations and Acronyms

BMP	best management practices
CFR	Code of Federal Regulations
dB	decibels
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FR	Federal Register
HPA	Hydraulic Project Approval
Hz	hertz
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
kHz	kilohertz
kJ	kilojoules(s)
km	kilometer(s)
m	meters
Makah	Makah Indian Tribe
MLLW	Mean Low-Low Water
MHHW	Mean High-High Water
MM	mitigation measure
MMPA	Marine Mammal Protection Act of 1972
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanographic Atmospheric Administration
NOAA Fisheries	National Oceanic Atmospheric Administration/National Marine Fisheries Service
NTU	nephelometric turbidity units
OHW	ordinary high water
PBR	Potential Biological Removal
PSAMP	Puget Sound Ambient Monitoring Program

RCW	Revised Code of Washington
RL	Received Level
RMS	root mean square
SAR	Stock Assessment Report
SEL	Sound Exposure Level
SL	Source Level
SPCC	Spill Prevention, Control, and Countermeasures Plan
SPL	Sound Pressure Level
TL	Transmission Loss
TTS	Temporary Threshold Shift
µPa	micro-Pascals
UHMW	Ultra High Molecular Weight
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WSF	Washington State Department of Transportation Ferries Division
ZOI	Zone of Influence

1.0 Description of the Activity

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 Introduction

The Washington State Department of Transportation (WSDOT) Ferries Division (WSF) operates and maintains 19 ferry terminals and one maintenance facility (20 total facilities), all of which are located in either Puget Sound or the San Juan Islands (Georgia Basin) (Figure 1-1). Since its creation in 1951, WSF has become the largest ferry system in the United States (U.S.), operating 28 vessels on 10 routes (Figure 1-1) with over 500 sailings each day.

Figure 1-1. Washington State Ferry System Route Map

To improve, maintain, and preserve the terminals, WSF conducts construction, repair and maintenance activities as part of its regular operations. Two of these projects are the replacement of dolphin structures at the Orcas Island and Friday Harbor ferry terminals, and is the subject of this Incidental Harassment Authorization (IHA) request. The proposed projects will occur in marine waters that support several marine mammal species. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals, which is defined as to “harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill,” except under certain situations. Section 101 (a)(5)(D) allows for the issuance of an IHA, provided an activity results in negligible impacts on marine mammals and would not adversely affect subsistence use of these animals.

The project’s timing and duration and specific types of activities (such as pile driving) may result in the incidental taking by acoustical harassment (Level B take) of marine mammals protected under the MMPA. WSDOT/WSF is requesting an IHA for the 11 marine mammal species that may occur in the vicinity of the projects.

1.2 Project Purpose and Need

Dolphins (Figure 1-2) are structures located offshore that are used to guide the ferry into the terminal and hold it in place while docked. There are two types of dolphins common at WSF ferry terminals: timber and steel. Timber dolphins (Figure 1-3) are older structures, typically constructed of creosote treated pilings lashed together by galvanized steel rope, and reinforced as needed with 13” plastic/steel core piles. WSF is systematically replacing timber dolphins with steel dolphins avoid future structure failures. Steel dolphins (Figure 1-4) consist of reaction piles with a steel diaphragm, and larger fender piles with fender panels. Fender panels are made of UHMW plastic, and act as rub surfaces for the ferry.

Figure 1-2. Vessel in Berth Using Dolphins to Maintain Position

Figure 1-3. Orcas Island Ferry Terminal Timber Dolphin

Figure 1-4 Typical Steel Dolphin

1.3 Project Setting and Land Use

The projects will take place at the Orcas Island and Friday Harbor ferry terminals in the San Juan Islands of Washington State. The Friday Harbor terminal is located in the Town of Friday Harbor on San Juan Island (Figure 1-4). Land use in the San Juan Islands is a mix of rural, residential, business; local, State and National Parks, National Wildlife Refuges and marine preserves.

Figure 1-5. Orcas and Friday Harbor Ferry Terminal Locations

1.4 Project description

The project at the Orcas Island Terminal is to replace a single timber dolphin with a new steel dolphin (Figure 1-3). At the Friday Harbor Ferry Terminal the project is to replace two timber dolphins with new steel dolphins (Figure 1-4).

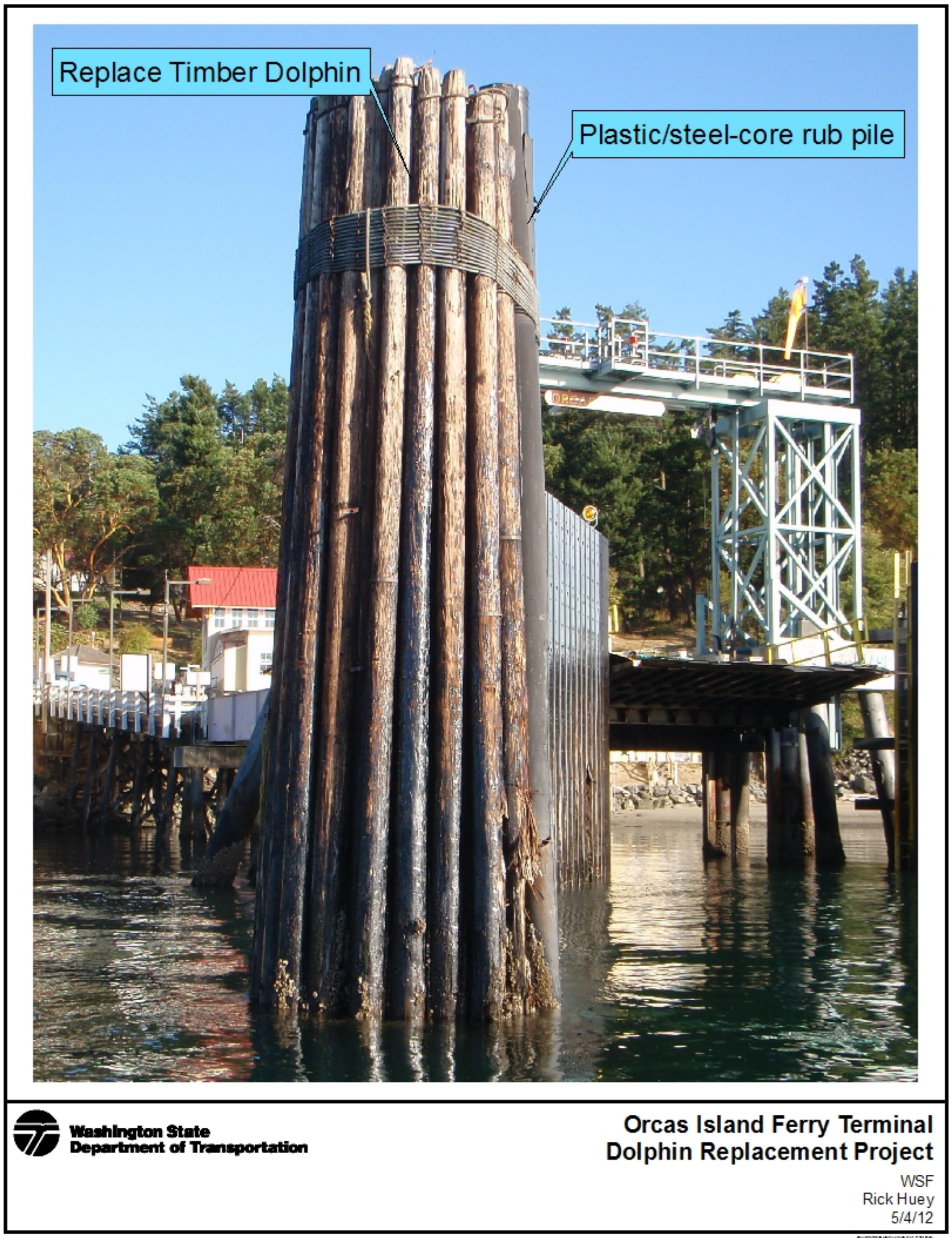

Figure 1-6. Orcas Island Ferry Terminal Dolphin Replacement

Figure 1-7. Friday Harbor Ferry Terminal Dolphins Replacement

Over time, 13-inch plastic/steel-core piles have been added to the timber dolphins to provide an improved rub-face for the ferry boats to rub against as they enter the slips. These plastic-faced piles have helped to extend the life of the structures (Fig. 1-6/1-7). There are five of these piles in the Orcas dolphin, none in the smaller Friday Harbor dolphin, and six in the larger Friday Harbor dolphin.

In-water construction is planned to take place between September 2013 and February 2014. The on-site work will last approximately 8 weeks with actual pile removal and driving activities taking place approximately 25% of that time. All work at the Orcas terminal will occur in water depths between -24.6 and -31.6 feet MLLW. At the Friday Harbor terminal all work will occur between -30 and -34 feet MLLW.

1.4.1 Construction Sequence

The following construction activities are anticipated for the Orcas terminal:

- Remove one 69-pile dolphin (13-inch timber & plastic/steel-core piles/106 tons of creosote-treated timber) with a vibratory hammer or by direct pull and clamshell removal.
- Vibratory pile drive four 24- or 30-inch (final size to be determined) hollow steel reaction piles and three 36-inch hollow steel fender piles.
- Place precast concrete diaphragm on new dolphin (Figure 1-8).
- Attach fender panels to new fender piles.
- Reposition one floating dolphin anchor.

The following construction activities are anticipated for the Friday Harbor terminal:

- Remove one 37-pile dolphin (13-inch timber piles/62 tons of creosote-treated timber) with a vibratory hammer or by direct pull and clamshell removal.
- Vibratory pile drive up to four 24- or 30-inch (final size to be determined) hollow steel reaction piles and one 36-inch hollow steel fender pile.
- Place precast concrete diaphragm on new dolphin.
- Attach fender panel to new fender pile.
- Remove one 102-pile dolphin (13-inch timber and plastic/steel-core piles/166 tons of creosote-treated timber) with a vibratory hammer or by direct pull and clamshell removal.
- Vibratory pile drive up to four 24- or 30-inch (final size to be determined) hollow steel reaction piles and four 36-inch hollow steel fender piles.
- Place precast concrete diaphragm on new dolphin.
- Attach fender panels to new fender piles.

A total of 334 tons of creosote-treated timbers will be removed from the marine environment. The total mudline footprint of the existing dolphins is 256 square feet (ft^2). The total mudline footprint of the new dolphins will be 95 ft^2, a reduction of 161 ft^2. In addition, the footprint of the new steel dolphins will be more open, allowing fish movement between the piles. The new dolphins will have 20 piles, compared to the existing dolphins, which have 208 tightly clustered piles with no space between them.

Figure 1-8. Pre-cast Concrete Diaphragm being lowered onto Steel Dolphin Piles

1.5 Project Elements

The proposed project has two elements involving noise production of concern to local marine mammals:

1. **Vibratory Hammer Removal.** Vibratory hammer removal consists of removing 175 timber piles.
2. **Vibratory Hammer Installation.** Vibratory hammer installation involves installing 20 steel piles for the new dolphins.

Each element is discussed separately below.

1.5.1 Vibratory Hammer Removal

Vibratory hammer extraction is a common method for removing timber piling. A vibratory hammer is a large mechanical device mostly constructed of steel (weighing 5 to 16 tons) that is suspended from a crane by a cable. It is attached to a derrick and positioned on the top of a pile. The pile is then unseated from the sediments by engaging the hammer, creating a vibration that loosens the sediments binding the pile, and then slowly lifting up on the hammer with the aid of the crane.

Once unseated, the crane will continue to raise the hammer and pull the pile from the sediment. When the pile is released from the sediment, the vibratory hammer is disengaged and the pile is pulled from the water and placed on a barge for transfer upland. Figure 1-7 shows a timber pile being removed with a vibratory hammer.

Figure 1-9. Vibratory Hammer Removing a Timber Dolphin Pile

Vibratory removal will take approximately 10 to 15 minutes per pile. The piling will be loaded onto the barge or into a container and disposed of offsite in accordance with State of Washington Administrative Code (WAC) 173-304 Minimum Functional Standards for Solid Waste Handling and mitigation measures in Section 11.0, Mitigation Measures, of this document.

1.5.2 Direct Pull and Clamshell Removal

Older timber pilings are particularly prone to breaking at the mudline because of damage from marine borers and vessel impacts and must be removed because they can interfere with the installation of new pilings. In some cases, removal with a vibratory hammer is not possible if the pile is too fragile to withstand the hammer force. Broken or damaged piles may be removed by wrapping the piles with a cable and pulling them directly from the sediment with a crane. If the piles break below the waterline, the pile stubs will be removed with a clamshell bucket, a hinged steel apparatus that operates like a set of steel jaws. The bucket will be lowered from a crane and the jaws will grasp the pile stub as the crane pulled up. The broken piling and stubs will be loaded onto the barge for off-site disposal. Clamshell removal will be used only if necessary. Direct pull and clamshell removal are not noise sources of concern.

1.5.3 Vibratory Hammer Installation

Vibratory hammers are commonly used in steel pile installation where sediments allow and involve the same vibratory hammer used in pile extraction. The pile is placed into position using a choker and crane, and then vibrated between 1,200 and 2,400 vibrations per minute (Figure 1-8). The vibrations liquefy the sediment surrounding the pile allowing the pile to penetrate to the required seating depth. The type of vibratory hammer that will be used for the project will likely be an APE 400 King Kong (or equivalent) with a drive force of 361 tons.

Figure 1-10. Vibratory Hammer Driving a Steel Dolphin Pile

1.6 Sound Levels

1.6.1 Reference Underwater Vibratory Sound Source Levels

The projects include vibratory removal of 13-inch timber and plastic-faced piles, and vibratory driving of 24-inch, 30-inch and 36-inch hollow steel piling.

No data is available for 13-inch timber and plastic-faced piles. Based on in-water measurements at the WSF Port Townsend Ferry Terminal (Laughlin 2011a), removal of 12-inch timber piles generated 149 to 152 dB RMS with an overall average RMS value of 150 dB RMS measured at 16 meters. A worst-case noise level for vibratory removal of 13-inch timber and plastic-faced piles will be 152 dB RMS at 16 m.

Based on in-water measurements at the WSF Friday Harbor Ferry Terminal, vibratory pile driving of a 24-inch steel pile generated 162 dB RMS measured at 10 meters (Laughlin 2010a).

Based on in-water measurements during a vibratory test pile at the WSF Port Townsend Ferry Terminal, vibratory pile driving of a 30-inch steel pile generated 170 dB RMS (overall average), with the highest measured at 174 dB RMS measured at 10 meters (Laughlin 2010b). A worst-case noise level for vibratory driving of 30-inch steel piles will be 174 dB RMS at 10 m.

Based on in-water measurements at the Port Townsend ferry terminal, vibratory pile driving of a 36" pile measured at 10 m generated 172 dB_{RMS} (overall average), with the highest measured at 177 dB_{RMS} (Laughlin 2010b). A worst-case noise level for vibratory driving of 36" steel piles will be 177 dB_{RMS} @ 10 m.

1.6.2 Background Noise

Background noise is the sound levels absent of the proposed activity (pile removal/driving in this case) while ambient sound levels absent of human activity (NMFS 2009). Various factors contribute to background noise levels in marine waters: ship traffic, fishing boat depth sounders, waves, wind, rainfall, current fluctuations, chemical composition, and biological sound sources (e.g., marine mammals, fish, shrimp) (Carr et al. 2006). It is important to compare background noise levels to the National Oceanic and Atmospheric Administration (NOAA) threshold levels designed to protect marine mammals to determine the zone of influence for noise sources.

For example, 120 dB_{RMS} is the threshold value for Level B acoustical harassment of marine mammals exposed to continuous noise sources (vibratory pile removal/driving noise). However, if background noise levels exceed 120 dB_{RMS}, for example 130 dB_{RMS}, then animals would not be exposed to "harassment level" sounds at less than 130 dB_{RMS} as those sounds no longer dominate; they are essentially part of the background. In this example, the 130 dB_{RMS} isopleth becomes the new project threshold for Level B take of marine mammals.

The only available in-water background noise data in the San Juan Islands area was collected on the west side of San Juan Island (approximately 11 miles west of the Orcas terminal/6 miles west of the Friday Harbor terminal), as part of the Orcasound in-water monitoring study. Data was collected over an 18 month period (April 2004 – November 2005). Average daytime in-water noise levels during the summer (July-Aug.) were 118 dB_{RMS}, and 116 dB_{RMS} non-summer (Oct.-April)(Veirs & Veirs 2005). Given that these background measurements are below the 120 dB threshold, no adjustments of the threshold for continuous noise sources will be made.

1.6.3 Underwater Transmission Loss

Underwater transmission loss has been described by Burgess et al. (2005):

> As sound propagates away from its source, several factors act to change its amplitude. These factors include the spreading of the sound over a wider area (spreading loss), losses to friction between water or sediment particles that vibrate with the passing sound wave (absorption), scattering and reflections from boundaries and objects in the sound's path, and constructive and destructive interference with one or more reflections of the sound off the surface or seafloor. The sound level that one would actually measure at any given distance from the source includes all these effects, and is called the received level. Received levels differ in dimensions from source levels, and the two cannot be directly compared. Received levels of underwater sound are usually presented in dB re 1 micro-Pascal (μPa), whereas the idealized source level at a distance of 1 m from the source is presented in dB re 1 μPa-m. The sum of all propagation and loss effects on a signal is called the transmission loss.

Transmission loss (TL) is characterized by the following equation:

$$TL = B*\log_{10}(R) + C*R$$

Where **B** represents the logarithmic (predominantly spreading) loss, **C** the linear (scattering and absorption) loss, and **R** the range from the source in meters.

Transmission-loss parameters vary with frequency, temperature, sea conditions, source depth, receiver depth, water depth, water chemistry, and bottom composition and topography (Greeneridge 2007). Logarithmic loss **B** is typically between 10 dB (10 Log R cylindrical spreading) and 20 dB (20 Log R spherical spreading) (Greeneridge 2007). Linear loss **C** has several physical components, including absorption in seawater, absorption in the sub-bottom, scattering from inhomogeneities in the water column and from surface and bottom roughness, and (for RMS levels of transient pulses) temporal pulse-spreading (Greeneridge 2007). Linear loss is also a function of frequency and is less a factor in the lower frequencies in which pile driving sounds dominate. Further, linear loss is site-specific, which is why there is no generally accepted **C** value for estimating linear loss in the broadband.

NMFS has requested that the 15 Log R practical (or semi-cylindrical) spreading model, without considering for linear loss, be used to estimate distances to marine mammal noise thresholds.

1.6.4 Airborne Transmission Loss

While in-air sounds are not applicable to cetaceans, they are to pinnipeds, especially harbor seals when hauled out. Loud noises can cause hauled out seals to panic back into the water, leading to disturbance and possible injury to stampeded pups. No unweighted in-air data is available for 13-inch timber and plastic-faced pile removal, or for 24- or 36-inch vibratory pile driving. Unweighted in-air measurements of vibratory driving of a 30-inch steel pile collected during the 2010 Keystone Ferry Terminal Wingwalls Replacement Project ranged from 95-97.8 @ 50 ft. (Laughlin 2010b). Removal of 13-inch pile in-air noise levels will be conservatively assumed to be the same as pile driving.

1.6.5 Attenuation to NMFS Thresholds

NMFS has established disturbance and injury noise thresholds for marine mammals (Table 1-1). Determining the area(s) exceeding each threshold level (the zone of influence [ZOI]) is necessary to estimate the number of animals for the Level B acoustical harassment take request, and to establish monitoring areas. For the projects in this application, there will be no impact pile driving. There is no Level A take during these projects, because the vibratory pile removal and driving source levels to not exceed the injury thresholds.

Table 1-1. Marine Mammal Injury and Disturbance Thresholds for Underwater and Airborne Noise

Marine Mammals	Airborne Noise from Marine Construction Activity Level at which Pinniped Haul-out Disturbance has been Documented	Vibratory Pile Driving Disturbance Threshold	Impact Pile Driving Disturbance Threshold	Injury Threshold
Cetaceans	N/A	120 dB_{RMS}	160 dB_{RMS}	180 dB_{RMS}
Pinnipeds	90 dB_{RMS} (unweighted) for harbor seals 100 dB_{RMS} (unweighted) for all other pinnipeds re: 20 µPa	120 dB_{RMS}	160 dB_{RMS}	190 dB_{RMS}

1.6.5.1 Vibratory Pile Driving (Underwater Noise)

If no site-specific in-water noise attenuation data is available, then the NOAA practical spreading model is used to determine the distances at which the vibratory pile removal or driving source levels are expected to attenuate down to the 120 dB RMS threshold. The NOAA practical spreading model distances are provided below:

- 152 dB_{RMS} at 16m (13-inch vibratory pile removal) = ~2.2 km (1.4 miles)
- 162 dB_{RMS} at 10m (24-inch vibratory steel pile driving) = ~6.3 km (3.9 miles)
- 174 dB_{RMS} at 10m (30-inch vibratory steel pile driving) = ~39.8 km (24.7 miles)
- 177 dB_{RMS} at 10m (36-inch vibratory steel pile driving) = ~63.1 km (39.2 miles).

However, land mass is intersected before these extents are reached, except for vibratory pile removal. For the Orcas terminal, land is intersected at a maximum of 3.5 km (2.2 miles). For the Friday Harbor terminal, land is intersected at a maximum of 4.7 km (2.9 miles). To simplify the ZOI for these projects, vibratory pile removal will conservatively be assumed to extend beyond the modeled distance, and also intersect land. The ZOI for the Orcas terminal is shown in Figure 1-6, and for the Friday Harbor terminal in Figure 1-11.

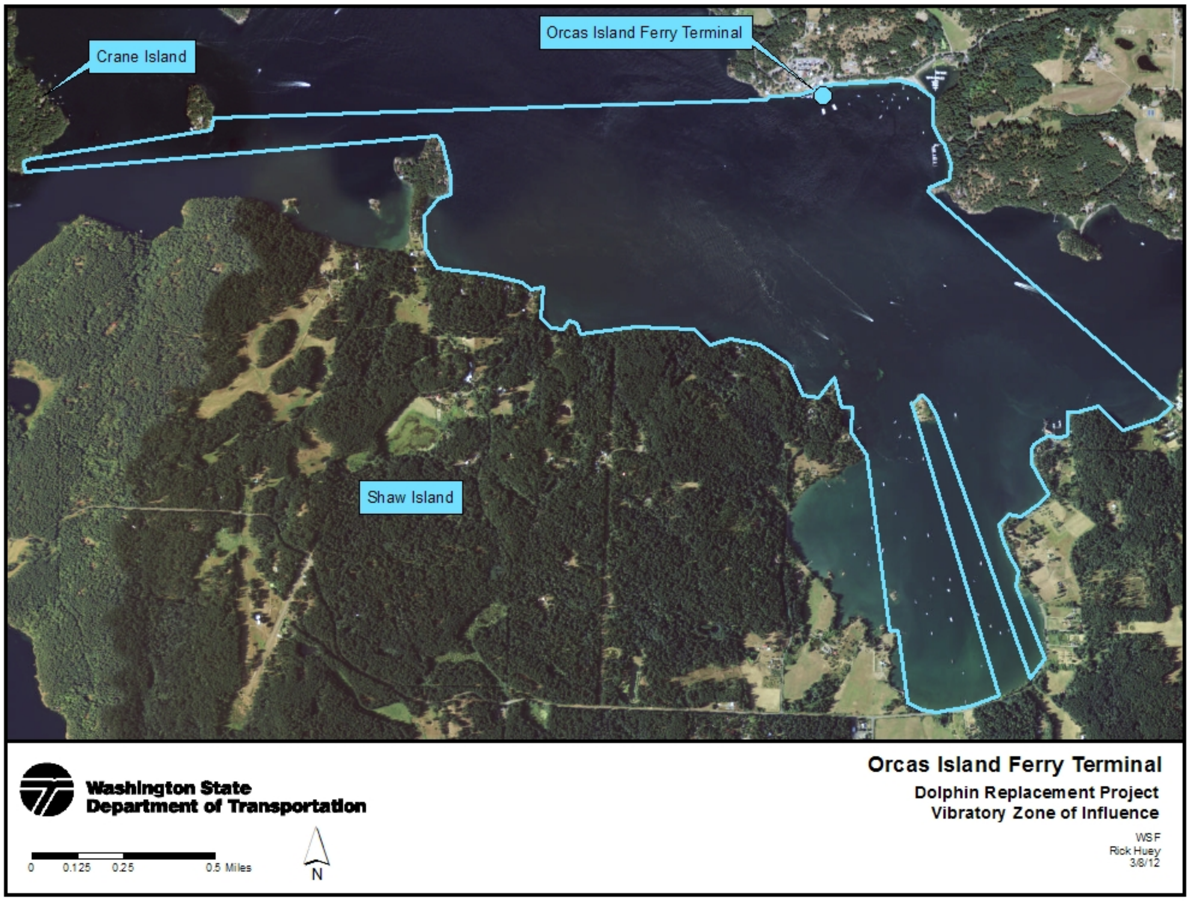

Figure 1-11. Orcas Island Ferry Terminal Vibratory Hammer ZOI (120 dB threshold)

Figure 1-12. Friday Harbor Ferry Terminal Vibratory Hammer ZOI (120 dB threshold)

1.6.5.2 Pile Driving (Airborne Noise)

NMFS has established an in-air noise disturbance threshold of 90 dB_{RMS} (unweighted) for harbor seals, and 100 dB_{RMS} (unweighted) for all other pinnipeds.

No unweighted in-air data is available for 13-inch pile removal, or for 24- or 36-inch steel vibratory pile driving. Unweighted in-air measurements of vibratory driving of a 30-inch steel pile collected during the 2010 Keystone Ferry Terminal Wingwalls Replacement Project ranged from 95-97.8 @ 50 ft. (Laughlin 2010b). Removal of 13-inch pile in-air noise levels will be conservatively assumed to be the same as pile driving.

Using a conservative measurement of 97.8 @ 50 ft., and attenuating at 6 dBA per doubling distance overwater, in-air noise from vibratory pile removal and driving will attenuate to the 90 dB_{RMS} threshold within approximately 37 m/123ft, and the 100 dB_{RMS} threshold within approximately 12 m/39ft.

The closest documented Steller sea lion haul out sites to the Orcas terminal is Green Point (8 miles NW); and the closest to the Friday Harbor terminal is Whale Rock (7 miles SE). Therefore, in-air disturbance will be limited to those animals moving through the immediate terminal area, within 12 m/39 ft of vibratory pile removal and driving.

The closest documented Steller sea lion haul out sites to the Orcas terminal is Green Point (8 miles NW); and the closest to the Friday Harbor terminal is Whale Rock (7 miles SE). Therefore, in-air disturbance will be limited to those animals moving through the immediate terminal area, within 12 m/39 ft of vibratory pile removal and driving.

The estimated in-air source level from vibratory pile driving a 30-inch steel pile is estimated at 97.8 dB RMS re: 20 µPa (unweighted) at 15 m (50 feet) from the pile (Laughlin 2010b). The distance in-air disturbance from pile driving would be expected to extend was calculated using a spherical spreading loss of 6 dB per doubling of distance from the pile driving source. The distances to the 90 dB and 100 dB thresholds were estimated at 37 m and 12 m, respectively.

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2.0 Dates, Duration, and Region of Activity

The date(s) and duration of such activity and the specific geographical region where it will occur.

2.1 Dates

Due to in-water work timing restrictions required by NMFS and the U.S. Fish and Wildlife Service (USFWS), which are used to avoid in-water construction when Endangered Species Act (ESA)-listed salmonids are most likely to be present, and those restrictions (Hydraulic Project Approval) mandated by the Washington Department of Fish and Wildlife (WDFW), pre-planned WSF in-water activities are limited each year to July 16 through February 15. For these projects, activities are planned to take place between September 1, 2013 and February 15, 2014.

2.2 Duration

The number of days it will take to remove and install the pilings largely depends on the condition of the piles being removed and the difficulty in penetrating the substrate during pile installation. Duration estimates of each of the pile driving elements follow:

- The daily construction window for pile removal or driving will begin no sooner than 30 minutes after sunrise to allow for initial marine mammal monitoring, and will end at sunset (or soon after), when visibility decreases to the point that effective marine mammal monitoring is not possible.
- Vibratory pile removal of the existing timber/plastic-faced piles will take approximately 10 to 15 minutes per pile. Vibratory removal will take less time than driving, because piles are vibrated to loosen them from the soil, and then pulled out with the vibratory hammer turned off. Assuming the worst case of 15 minutes per pile (with no direct pull or clamshell removal), removal of 69 piles at the Orcas terminal will take 17.2 hours over three days of pile removal (Table 2-1). Removal of 139 piles at the Friday Harbor terminal will take 34.75 hours over five days of pile removal (Table 2-2).
- Vibratory pile driving of the steel piles will take approximately 20 minutes per pile, with three to five piles installed per day. Assuming 20 minutes per pile, and three piles per day, driving of 7 piles at the Orcas terminal will take 2.3 hours over 2 days. Driving of 13 piles at the Friday Harbor terminal will take 4.3 hours over 5 days.

The total worst-case time for pile removal is 8 days, and for pile installation 7 days. The actual number of pile-driving days is expected to be less (Table 2-1/2-2).

Table 2-1. Worst Case Pile Removal and Driving for the Orcas Island Dolphin Replacement Project

Removal/Installed	Maximum Number of Piles	Time	Days
Vibratory Pile Removal	69	17.2 hrs.	3
Vibratory Pile Installation	7	2.3 hrs.	2

Table 2-2. Worst Case Pile Removal and Driving for the Friday Harbor Dolphins Replacement Project

Removal/Installed	Maximum Number of Piles	Time	Days
Vibratory Pile Removal	139	34.75 hrs.	5
Vibratory Pile Installation	13	4.3 hrs.	5

2.3 Region of Activity

The proposed activities will occur at the Orcas Island and Friday Harbor ferry terminals located in the San Juan Islands in Washington State (see Figures 1-1 and 1-9).

3.0 Species and Numbers of Marine Mammals in Area

The species and numbers of marine mammals likely to be found within the activity area.

Section 3.0 has been combined with Section 4.0 for ease of writing and reading due to the number of marine mammals discussed.

Section 3.0 requires a discussion of the species and numbers of marine mammals in the area. Section 4.0 requires a discussion of the status and distribution of the stock(s) and specifically:

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

Each requested topic in Section 4.0 (status, distribution, and seasonal distribution [if known]) has been clearly marked as a subheading in Section 3.0 for ease of finding relevant information while consolidating the species-specific information into one place to avoid searching for information between similar chapters.

3.1 Species Present

Eleven species of marine mammals are commonly found in the San Juan Islands region (Table 3-1).

3.2 Pinnipeds

There are four species of pinnipeds that occur in the inland waters of Washington: harbor seal (*Phoca vitulina richardsi*), California sea lion (*Zalophus californianus*), northern elephant seal (*Mirounga angustirostris*), and Steller sea lion (*Eumetopias jubatus*). Harbor seals are the most common and only pinniped that breeds and remains in the San Juan Islands year-round.

3.2.1 Harbor Seal

Harbor seals are members of the true seal family (Phocidae). For management purposes, differences in mean pupping date (Temte 1986), movement patterns (Jeffries 1985; Brown 1988), pollutant loads (Calambokidis et al. 1985), and fishery interactions have led to the recognition of three separate harbor seal stocks along the west coast of the continental U.S. (Boveng 1988). The three distinct stocks are: 1) inland waters of Washington State (including Hood Canal, Puget Sound, Georgia Basin and the Strait of Juan de Fuca out to Cape Flattery), 2) outer coast of Oregon and Washington, and 3) California (Carretta et al. 2007a).

Pupping seasons vary by geographic region. For the San Juan Island region, pups are born from June through August, and in southern Puget Sound pups are born from mid-July through September (Jeffries et al. 2000). However, recent observations by WDFW biologists reveal that harbor seal pupping seasons in San Juan Island and Georgia Basin extend from June 1 to October 1 (D. Lambourn pers. comm. 2008). After October 1 all pups in the inland waters of Washington are weaned.

Table 3-1. Marine Mammal Species Potentially Present in Region of Activity

Species	ESA Status	MMPA Status	Work Window Sept–Feb	Non-work Window Mar–Aug
Harbor Seal	Not listed	Non-depleted	Yes	Yes
California Sea Lion	Not listed	Non-depleted	Yes (males only)	Yes (males only until end of May)
Northern Elephant Seal	Not listed	Non-depleted	Yes	Yes
Steller Sea Lion	Threatened	Depleted	Yes, rare	Yes, rare
Harbor Porpoise	Not listed	Non-depleted	Yes	Yes
Dall's Porpoise	Not listed	Non-depleted	Yes	Yes
Pacific White-sided dolphin	Not listed	Non-depleted	Yes	No
Killer Whale	Endangered (Southern Resident)	Depleted	Yes	Yes
Gray Whale	Delisted	Unclassified	Yes	Yes
Humpback Whale	Endangered	Depleted	Yes	Yes
Minke Whale	Not listed	Non-depleted	Yes	Yes

Phocids have the broadest auditory bandwidth of pinnipeds. The bandwidth for phocids was estimated by Southall et al. (2007) as between 75 hertz (Hz) and 75 kilohertz (kHz) for "functional" underwater hearing and between 75 Hz and 30 kHz for "functional" aerial hearing. At lower frequencies (below 1 kHz) sounds must be louder to be heard (Kastak and Schusterman 1998). Harbor seals, like all pinnipeds, communicate both on land and underwater. Studies indicated that pinnipeds are sensitive to a broader range of sound frequencies in water than in air (Southall et al. 2007). Hearing capabilities for harbor seals in-water are 25 to 30 dB better than in-air (Kastak and Schusterman 1998).

3.2.1.1 Numbers

Of the four pinniped species that occur within the region of activity, harbor seals are the most numerous and the only one that breeds in the inland marine waters of Washington (Calambokidis and Baird 1994). In 1999, Jeffries et al. (2003) recorded a mean count of 9,550 harbor seals in Washington's inland marine waters, and estimated the total population to be approximately 14,600 animals (including the Strait of Juan de Fuca). The population across Washington increased at an average annual rate of 10 percent between 1991 and 1996 (Jeffries et al. 1997) and is thought to be stable (Jeffries et al. 2003). The Whale Museum/Marine Mammal Stranding Network estimates that approximately 4,000 seals are present in the San Juan Islands (Whale Museum 2012a).

3.2.1.2 Status

Harbor seals are not considered to be “depleted” under the MMPA or listed as “threatened” or “endangered” under the ESA. Because there is no current estimate of minimum abundance, a potential biological removal (PBR) cannot be calculated for this stock. The previous estimate of PBR was 771 (Carretta et al. 2009). Human-caused mortality relative to PBR is unknown, but it is considered to be small relative to the stock size. The Washington Inland Waters stock of harbor seals is not classified as a “strategic” stock. The stock is also considered within its Optimum Sustainable Population level (Jeffries et al. 2003).

3.2.1.3 Distribution

Harbor seals are the most numerous marine mammal species within the Strait of Juan de Fuca, Puget Sound and Georgia Basin. In general, harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the continental U.S., British Columbia, and southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. Harbor seals are non-migratory; their local movements are associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969, 1981). They are not known to make extensive pelagic migrations, although some long-distance movements of tagged animals in Alaska (174 km) and along the U.S. west coast (up to 550 km) have been recorded (Pitcher and McAllister 1981; Brown and Mate 1983; Herder 1983).

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice and feed in marine, estuarine, and occasionally fresh waters. Harbor seals display strong fidelity for haulout sites (Pitcher and Calkins 1979; Pitcher and McAllister 1981). Within the inland waters of Washington, there are numerous harbor seal haulout sites located on intertidal rocks, reefs, and islands.

The nearest known haulout sites to the Orcas Island ferry terminal are Blind Island Rocks and Blind Island (approximately 1.2 and 1.4 km south of the Orcas terminal) and Bell Island (approximately 2.7 km west of the Orcas terminal). The nearest known haulout sites to the Friday Harbor ferry terminal are the intertidal rocks NE of Point George on Shaw Island (approximately 4 km and 4.7 km NE of the Friday Harbor terminal) offshore of Shaw Island (Figure 3-2). The number of harbor seals using these haulouts is less than 100 per haulout (WDFW 2000). The level of use of this haulout during the fall and winter is unknown, but is expected to be much less as air temperatures become colder than water temperatures resulting in seals in general hauling out less (H. Huber pers. comm. 2010).

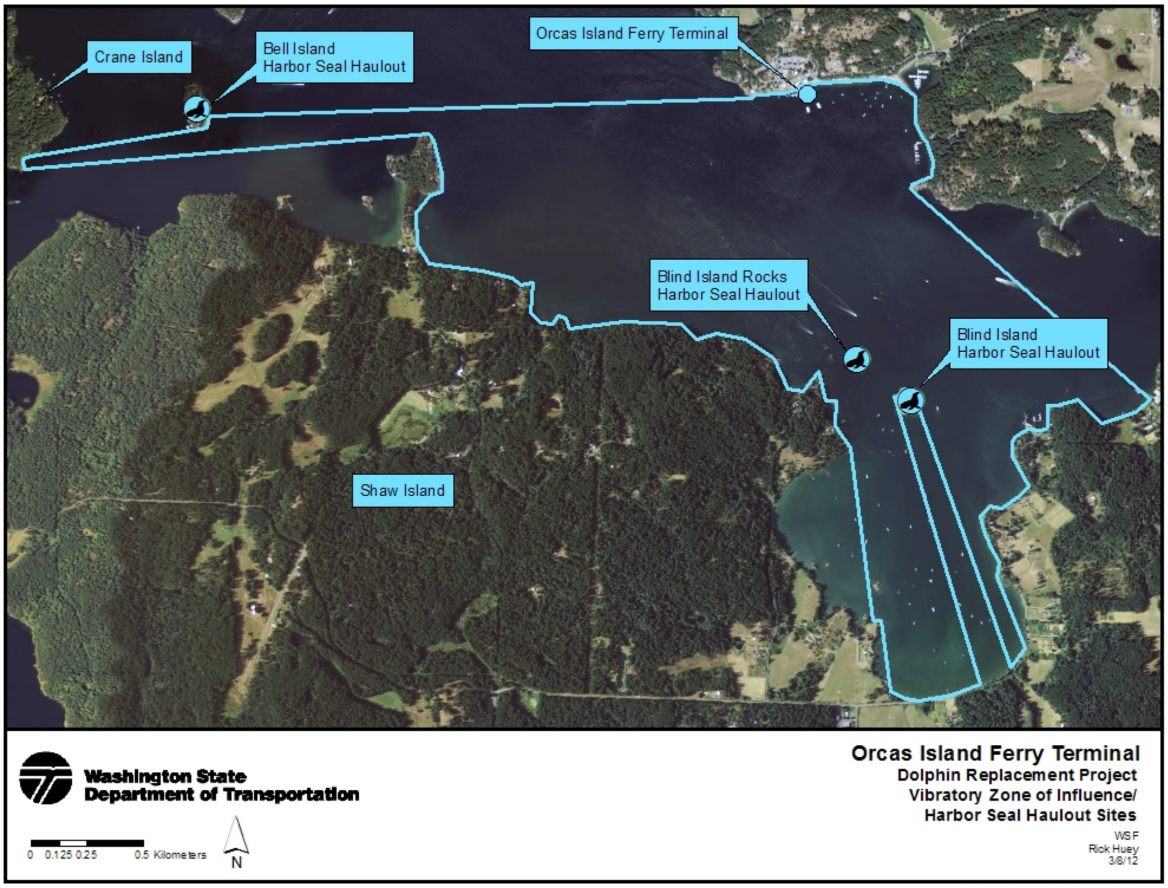

Figure 3-1. Orcas Island Ferry Terminal Seal Haulout Sites

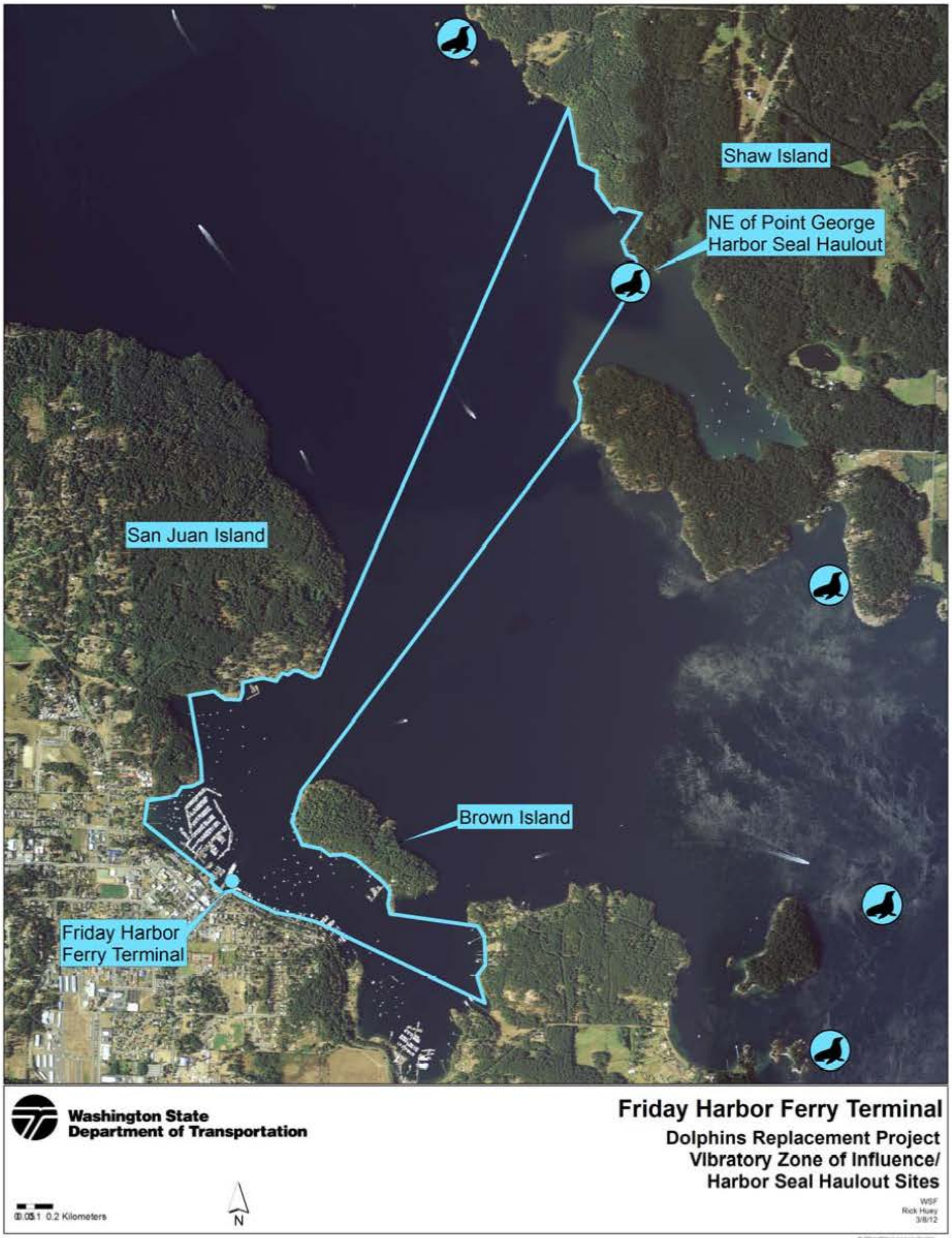

Figure 3-2. **Friday Harbor Ferry Terminal Seal Haulout Sites**

3.2.2 California Sea Lion

California sea lions are members of the family Otariidae or eared seals (sea lions and fur seals). The California sea lion includes three subspecies: *Z. c. wollebaeki* (on the Galapagos Islands), *Z. c. japonicus* (in Japan, but now thought to be extinct), and *Z. c. californianus* (found from southern Mexico to southwestern Canada; herein referred to as the California sea lion) (Carretta et al. 2007a). The breeding areas of the California sea lion are on islands located in southern California, western Baja California, and the Gulf of California (Carretta et al. 2007b). These three geographic regions are used to separate this subspecies into three stocks: 1) the U.S. stock begins at the U.S./Mexico border and extends northward into Canada; 2) the Western Baja California stock extends from the U.S./Mexico border to the southern tip of the Baja California Peninsula; and 3) the Gulf of California stock, which includes the Gulf of California from the southern tip of the Baja California peninsula and across to the mainland and extends to southern Mexico (Lowry et al. 1992). Washington sea lions occur within the geographic boundaries of the U.S. stock.

3.2.2.1 Numbers

The U.S. stock was estimated at 238,000 in the 2010 Stock Assessment Report (SAR) and may be at carrying capacity, although more data are needed to verify that determination (Carretta et al. 2007a). The number of California sea lions in the San Juan Islands and the adjacent Strait of Juan de Fuca totaled fewer than 3,000 in the mid-1980s (Bigg 1985; Gearin et al. 1986). In 1994, it was reported that the number of sea lions had stabilized or decreased in some areas (Gearin et al. 1988; Calambokidis and Baird 1994). More recently, 3,000 to 5,000 animals are estimated to move into northwest waters (both Washington and British Columbia) during the fall (September) and remain until the late spring (May) when most return to breeding rookeries in California and Mexico (Jeffries et al. 2000; J. Calambokidis pers. comm. 2007). Peak counts of over 1,000 animals have been made in Puget Sound (Jeffries et al. 2000).

3.2.2.2 Status

California sea lions are not listed as endangered or threatened under the ESA or as depleted under the MMPA. They are not considered a strategic stock under the MMPA, because total human-caused mortality, although unknown, is likely to be well less than the PBR (8,511) (Carretta et al. 2007b).

3.2.2.3 Distribution

California sea lions breed on islands off Baja Mexico and southern California with primarily males migrating north to feed in the northern waters (Everitt et al. 1980). Females remain in the waters near their breeding rookeries off California and Mexico. All age classes of males are present in Washington waters (Jeffries et al. 2000).

In Washington, California sea lions use haulout sites within all inland water regions (Jeffries et al. 2000). The nearest documented California sea lion haulout sites to the Orcas and Friday Habor terminals are intertidal rocks and reef areas around Trial Island and Race Rocks near

Victoria, B.C. (approximately 32/24 km west of the Orcas/Friday Harbor terminals, respectively). The number of California sea lions using these haulouts is less than 100 per haulout (WDFW 2000). Small numbers of sea lions may occasionally use navigation buoys in the San Juan Islands (WDFW 2000).

California sea lions were unknown in Puget Sound until approximately 1979 (Steiger and Calambokidis 1986). Everitt et al. (1980) reported the initial occurrence of large numbers at Port Gardner, just north of Everett (in northern Puget Sound), in the spring of 1979. The number of California sea lions using this area today number around 1,000 (P. Gearin pers. comm. 2008). This haulout remains the largest in the state for sea lions in general and for California sea lions specifically (P. Gearin pers. comm. 2008). Similar sightings and increases in numbers were documented throughout the region after the initial sighting in 1979 (Steiger and Calambokidis 1986), including urbanized areas such as Elliot Bay near Seattle and heavily used areas of central Puget Sound (P. Gearin et al. 1986). The movement of California sea lions into Puget Sound could be an expansion in range of a growing population (Steiger and Calambokidis 1986).

California sea lions do not avoid areas with heavy or frequent human activity, but rather may approach certain areas to investigate. This species typically does not flush from a buoy or haulout if approached.

3.2.3 Northern Elephant Seal

Northern elephant seals are the largest pinniped found in Washington marine waters. Populations of northern elephant seals in the U.S. and Mexico are the result of a few hundred survivors remaining after hunting nearly led to the species' extinction (Stewart et al. 1994). Elephant seals present in the region of activity are considered part of the California breeding stock (Carretta et al. 2007a). Northern elephant seals breed and give birth primarily on islands off of California and Mexico from December through March (Stewart and Huber 1993; Carretta et al. 2007a). Typically, juveniles form new colonies and one or more females join to result in new haulout and rookery sites (Bonnell et al. 1991).

3.2.3.1 Numbers

Once nearly extirpated, the West Coast population of this species has had a remarkable comeback. By the early 1990s, this species was once again considered abundant and stable within its range in the eastern North Pacific (Campbell 1987; Calambokidis and Baird 1994). Based on pup counts in California in 2005, the population of the eastern North Pacific stock was estimated at 124,000 (Carretta et al. 2007b). Based on current trends and pup counts in California, the population of northern elephant seals appears to remain stable (Carretta et al. 2007b).

Abundance estimates for inland Washington waters are not available due to the infrequency of sightings and the low numbers encountered (J. Calambokidis pers. comm. 2008). Rough estimates suggest less than 100 individuals use the area annually (S. Jeffries pers. comm. 2008a).

3.2.3.2 Status

Northern elephant seals are not listed as endangered or threatened under the ESA or as depleted under the MMPA. Annual human caused mortality is 60 animals, much less than the PBR for this stock of 4,382 (NMFS 2011).

3.2.3.3 Distribution

Breeding rookeries are located on beaches and islands in California and Mexico (Jeffries et al. 2000). Historically, after their winter breeding season and annual molt cycles, individuals dispersed northward along the Oregon and Washington coasts and were present only on a seasonal basis. However, a few individuals are now found in Washington inland waters year-round.

Haulout areas are not as predictable as for the other species of pinnipeds. In total, WDFW has identified seven haulout sites in inland Washington waters used by this species. A few individuals use beaches at Protection Island (52/46 km south of the Orcas/Friday Harbor terminals, respectively) and Smith/Minor Islands (32/27 km south of the Orcas/Friday Harbor terminals) (WDFW 2000). Typically these sites have only two to ten adult males and females, but pupping has occurred at all of these sites over the past ten years (S. Jeffries pers. comm. 2008a). A single individual has been observed hauled out at American Camp on San Juan Island (NPS 2012), and at Shaw Island County Park on Shaw Island (Miller 2012).

3.2.4 Steller Sea Lion

Steller sea lions comprise two recognized management stocks (eastern and western), separated at 144º W longitude (Loughlin 1997). Only the eastern stock is considered in this application because the western stock occurs outside of the geographic area under consideration. Breeding rookeries for the eastern stock are located along the California, Oregon, British Columbia, and southeast Alaska coasts, but not along the Washington coast or in inland Washington waters (Angliss and Outlaw 2007). Steller sea lions primarily use haulout sites on the outer coast of Washington and in the Strait of Juan de Fuca along Vancouver Island in British Columbia. Only sub-adults or non-breeding adults may be found in the inland waters of Washington (Pitcher et al. 2007; P. Gearin pers. comm. 2008).

3.2.4.1 Numbers

The eastern stock of Steller sea lions is estimated to be between 48,519 and 54,989 individuals based on 2002 through 2005 pup counts (Angliss and Outlaw 2007). Washington's estimate including the outer coast is 651 individuals (non-pups only) (Pitcher et al. 2007). However, recent estimates are that 1,000 to 2,000 individuals enter the Strait of Juan de Fuca during the fall and winter months (Jeffries pers. comm. 2008b).

Steller sea lions in Washington State decline during the summer months, which correspond to the breeding season at Oregon and British Columbia rookeries (approximately late May to early June) and peak during the fall and winter months (Jeffries et al. 2000). A few Steller sea lions can be observed year-round in Puget Sound/Georgia Basin although most of the breeding age animals return to rookeries in the spring and summer (P. Gearin pers. comm. 2008).

3.2.4.2 Status

Steller sea lions were listed as threatened range-wide under the ESA on November 26, 1990 (55 FR 49204). After division into two stocks, the western stock was listed as endangered under the ESA on May 4, 1997 and the eastern stock remained classified as threatened (62 FR 24345). In 2006 the NMFS Steller sea lion recovery team proposed removal of the eastern stock from listing under the ESA based on its annual rate of increase of approximately 3% since the mid-1970s.

On August 27, 1993, NMFS published a final rule designating critical habitat for the Steller sea lion (NMFS 1993). No critical habitat has been designated in Washington (NMFS 1993). Critical habitat is associated with breeding and haulout areas in Alaska, California, and Oregon (NMFS 1993).

Steller sea lions are listed as depleted under the MMPA. Both stocks are thus classified as strategic. The PBR for this stock is 2,378 animals (NMFS 2010a).

3.2.4.3 Distribution

As previously mentioned, adult Steller sea lions congregate at rookeries in Oregon, California, and British Columbia for pupping and breeding from late May to early June (Gisiner 1985). Rookeries are usually located on beaches of relatively remote islands, often in areas exposed to wind and waves, where access by humans and other mammalian predators is difficult (WDFW 1993).

For Washington inland waters, Steller sea lion abundances vary seasonally with a minimum estimate of 1,000 to 2000 individuals present or passing through the Strait of Juan de Fuca in fall and winter months (S. Jeffries pers. comm. 2008b). However, the number of haulout sites has increased in recent years. Haulouts in the San Juan Islands include Green Point on Speiden Island (12/13 km northwest of the Orcas/Friday Harbor terminals, respectively), North Peapod Rock (15/23 km northeast of the Orcas/Friday Harbor terminals), Bird Rocks (18/19 km southeast of the Orcas/Friday Harbor terminals) and Whale Rock (17/11 km south of the Orcas/Friday Harbor terminals) (NMFS 2012).

3.3 Cetaceans

Seven cetacean species are present in the inland waters of Washington, at least seasonally. Of these, harbor and Dall's porpoises are the most abundant and each number in the several thousands (Calambokidis and Baird 1994). Other species, such as the larger whales, are less numerous, but appear to be increasing. Each of the seven species is addressed below.

3.3.1 Harbor Porpoise

Harbor porpoises (*Phocoena phocoena*) are found in coastal and inland waters of the eastern North Pacific Ocean from Point Barrow, Alaska, south to Point Conception, California (Gaskin 1984). Harbor porpoises are divided into two stocks: 1) the Washington Inland Waters Stock, and 2) the Oregon/Washington Coast Stock (Carretta et al. 2007b). The Washington Inland Waters Stock occurs in waters east of Cape Flattery (Strait of Juan de Fuca, San Juan Island Region, and Puget Sound). The Oregon/Washington Coast Stock extends from Cape Flattery, Washington south to Cape Blanco, Oregon. Although harbor porpoises have been spotted in deep water, they tend to remain in shallower shelf waters (<150 m) where they are most often observed in small groups of one to eight animals (Baird 2003).

Little information regarding food habits of the harbor porpoise is available for British Columbia or inland Washington waters (Hall 2004). What prey species have been documented include juvenile blackbelly eelpout, opal squid, Pacific herring, walleye pollock, Pacific hake, eulachon, and Pacific sanddab (Walker et al. 1998). Based on the results from Walker et al. (1998) and Hall (2004), harbor porpoises in British Columbia and Washington are opportunistic feeders, with prey species varying based on seasonal abundance. They also likely alter their spatial and temporal distributions based on prey availability.

Harbor porpoises are high-frequency cetaceans with an estimated auditory bandwidth of 200 Hz to 180 kHz (Southall et al. 2007) with a maximum sensitivity between 16 and 140 kHz (73 FR 41318).

3.3.1.1 Numbers

The Washington Inland Waters Stock mean abundance estimate based on 2002 and 2003 aerial surveys conducted in the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia is 10,682 harbor porpoises (Carretta et al. 2007b). Abundance estimates of harbor porpoises for the Strait of Juan de Fuca and the San Juan Islands in 1991 were approximately 3,300 animals (Calambokidis et al. 1993). Harbor porpoises were once considered common in southern Puget Sound (Scheffer and Slipp 1948); however, there has been a significant decline in sightings within southern Puget Sound since the 1940s (Everitt et al. 1980; Calambokidis et al. 1985, 1992; Carretta et al. 2007b).

Virtually no data are available to assess population trends in Puget Sound (Scheffer and Slipp 1948; Everitt et al. 1980; Calambokidis et al. 1985, 1992; Calambokidis and Baird 1994). No harbor porpoises were observed within Puget Sound proper during comprehensive harbor porpoise surveys (Osmek et al. 1994) or Puget Sound Ambient Monitoring Program (PSAMP) surveys conducted in the 1990s. Declines were attributed to gill-net fishing, increased vessel activity, contaminants, and competition with Dall's porpoise. However, Puget Sound populations appear to be rebounding with increased sightings in central (Carretta et al. 2007b) and southern (D. Nysewander pers. comm. 2008; WDFW 2008) Puget Sound.

3.3.1.2 Status

The harbor porpoise is not listed under the ESA and is classified as non-depleted under the MMPA. The PBR for this stock is 63 harbor porpoise per year (NMFS 2011).

3.3.1.3 Distribution

Harbor porpoises are common in the Strait of Juan de Fuca and south into Admiralty Inlet, especially during the winter, but are not at all common south of Admiralty Inlet (Figures 3-3 and 3-4). Harbor porpoises occur year-round and breed in the waters around the San Juan Archipelago and north into Canadian waters (Calambokidis and Baird 1994).

Little information exists on harbor porpoise movements and stock structure near the Orcas and Friday Harbor terminals, although it is suspected that in some areas harbor porpoises migrate (based on seasonal shifts in distribution). For instance Hall (2004; pers. comm. 2008) found harbor porpoises off Canada's southern Vancouver Island to peak during late summer, while WDFW's PSAMP data show peaks in Washington water to occur during the winter. Still, no additional evidence exists for migrations in the inland waters of Washington or British Columbia (Calambokidis and Baird 1994; Rosel et al. 1995).

Hall (2004) found that the frequency of sighting of harbor porpoises decreased with increasing depth beyond 150 m with the highest numbers observed at water depths ranging from 61 to 100 m.

3.3.2 Dall's Porpoise

Dall's porpoise (*Phocoenoides dalli*) occur in the North Pacific Ocean and is divided into two stocks: 1) California, Oregon, and Washington; and 2) Alaska (Carretta et al. 2007b). The segment of the population within Washington's inland waters was last assessed in 1996 by aerial surveys (Calambokidis et al. 1997). During a ship line-transect survey conducted in 2005, Dall's porpoise was the most abundant cetacean species off the Oregon and Washington coast (Forney 2007). Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993). This species is commonly seen in shelf, slope, and offshore waters (Carretta et al. 2007b).

Their feeding strategies are likely dependent on what prey species are present and how the prey is distributed (Miller 1988). Dall's porpoises feed mainly on small schooling fishes and cephalopods, including herring, anchovies, sardines, mackerels, sauries, octopuses, squid, and cuttlefish (Miller 1988). They often chase fish at the water surface, and have been observed cooperatively herding prey when herring balls were present (Miller 1988). This species may also target deeply distributed single prey items by performing prolonged deep dives lasting up to 7 minutes (Miller 1988).

Like harbor porpoises, Dall's porpoises are high-frequency cetaceans with an estimated auditory bandwidth of 200 Hz to 180 kHz (Southall et al. 2007).

3.3.2.1 Numbers

The California, Oregon, and Washington stock mean abundance estimate of Dall's porpoises based on 2001 and 2005 ship surveys is 57,549 (Barlow 2003; Forney 2007). Within the inland waters of Washington and British Columbia, this species is most abundant in the Strait of Juan de Fuca east to the San Juan Islands. In 1994, Calambokidis and Baird (1994) estimated the Juan de Fuca population at 3,015 animals and the San Juan Island population at about 133 animals. More recently, Calambokidis et al. (1997) estimated that 900 animals annually inhabited Washington's inland waters. Prior to the 1940s, Dall's porpoises were not reported in Puget Sound.

3.3.2.2 Status

Dall's porpoise are not listed under the ESA and is classified as non-depleted under the MMPA. The PBR for this stock is 257 porpoise per year (NMFS 2011).

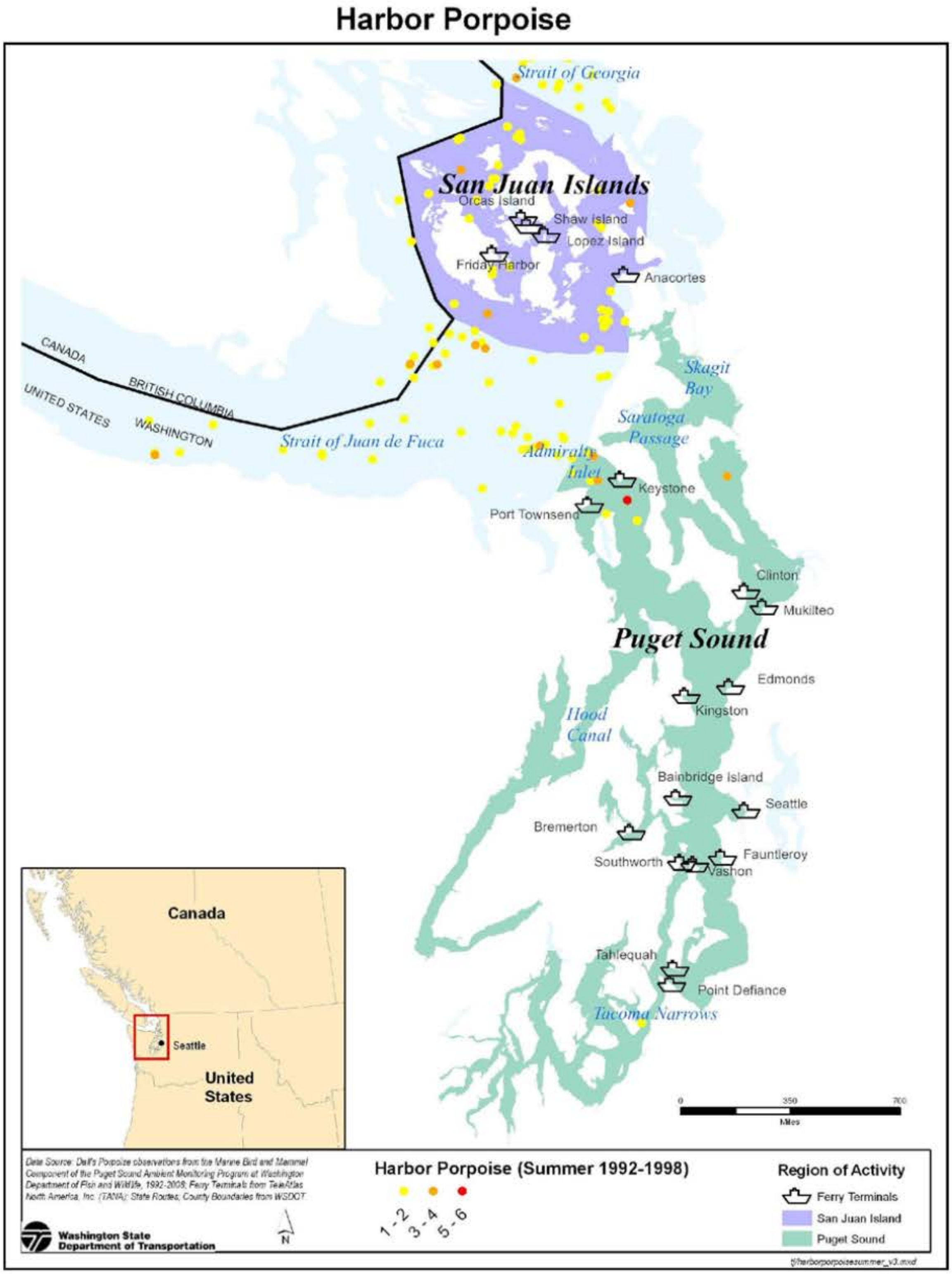

Figure 3-3. Harbor Porpoise Summer Sightings (groups)

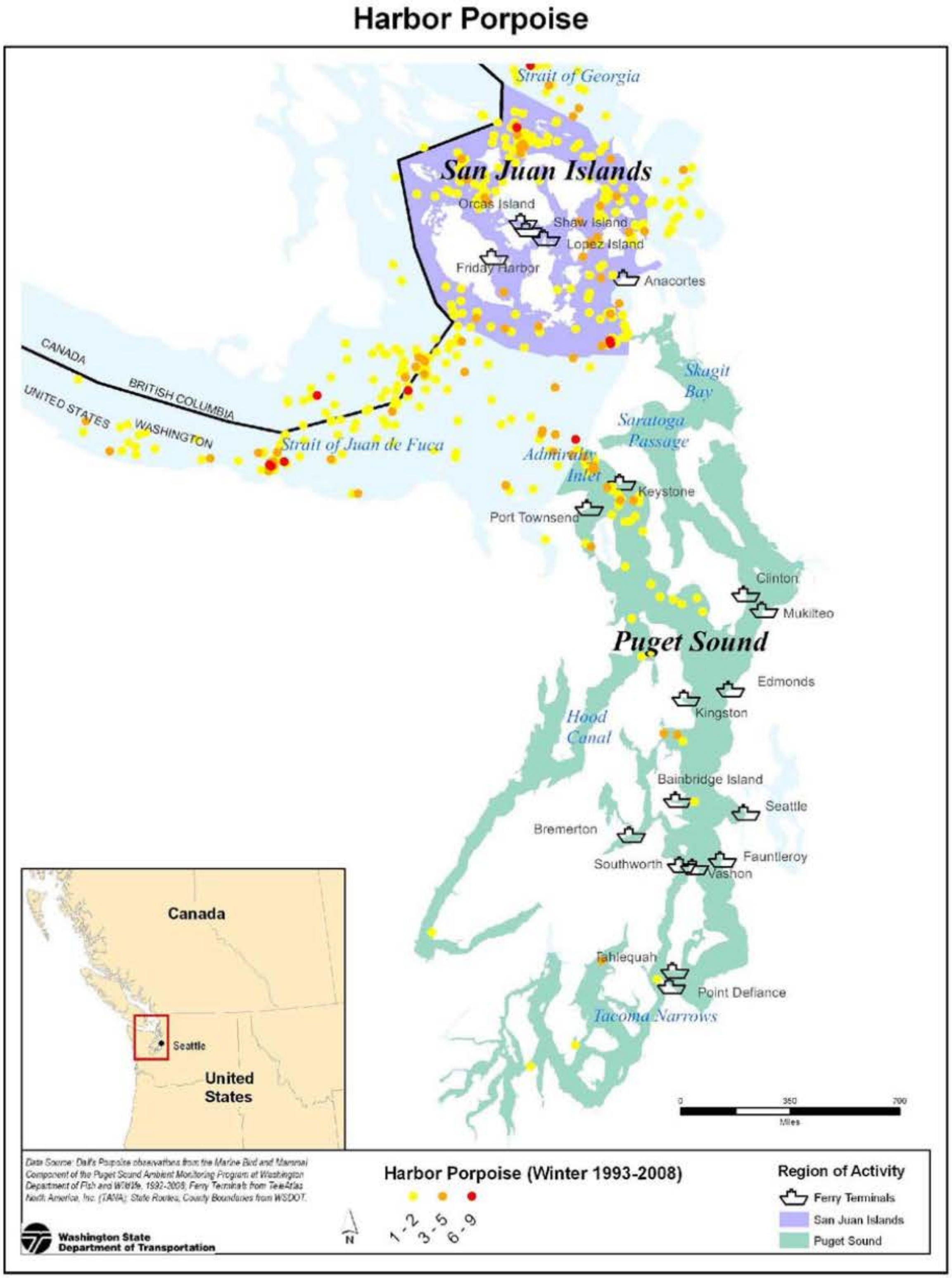

Figure 3-4. Harbor Porpoise Winter Sightings (groups)

3.3.2.3 Distribution

Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993), and are most abundant in Puget Sound during the winter (D. Nysewander et al. 2005; WDFW 2008). Despite their migrations, Dall's porpoises occur in all areas of inland Washington at all times of year (J. Calambokidis pers. comm. 2006), but with different distributions throughout Puget Sound from winter to summer (Figures 3-5 and 3-6).

3.3.3 Pacific White-sided Dolphin

Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) are divided into northern and southern stocks comprising two discrete, non-contiguous areas: 1) waters off California, Oregon, and Washington; and 2) Alaskan waters (Carretta et al. 2007b). Pacific white-sided dolphins are occasionally seen in the northernmost part of the Strait of Georgia and in western Strait of Juan de Fuca, but are generally only rare visitors to this area (Calambokidis and Baird 1994). This species is rarely seen in Puget Sound. Pacific white-sided dolphins have been documented primarily in deep, off-shore areas (Green et al. 1992, 1993; Calambokidis et al. 2004a).

Pacific white-sided dolphins are mid-frequency cetaceans with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al. 2007).

3.3.3.1 Numbers

The California, Oregon, and Washington stock mean abundance estimate based on the two most recent ship surveys is 25,233 Pacific white-sided dolphins (Forney 2007). This abundance estimate is based on two summer/autumn shipboard surveys conducted within 300 nautical miles of the coasts of California, Oregon, and Washington in 2001 and 2005 (Barlow 2003, Forney 2007). Surveys in Oregon and Washington coastal waters resulted in an estimated abundance of 7,645 animals (Forney 2007).

Fine-scale surveys in Olympic Coast slope waters and the Olympic Coast National Marine Sanctuary resulted in an estimated abundance of 1,196 and 1,432 animals, respectively (Forney 2007), but there are no population estimates for Washington's inland waters. During aerial surveys of Washington inland waters conducted under WDFW's PSAMP program between 1992 and 2008, only a single group of three Pacific white-sided dolphins was observed (summer 1995 in the Strait of Juan de Fuca), although Osborne et al. (1988) states they are regularly reported in the Strait of Juan de Fuca and Haro Strait. There are few records for Puget Sound.

3.3.3.2 Status

Pacific white-sided dolphins are not listed under the ESA and are classified as non-depleted under the MMPA. The PBR for this stock is 193 dolphins per year (NMFS 2011).

Dall's Porpoise

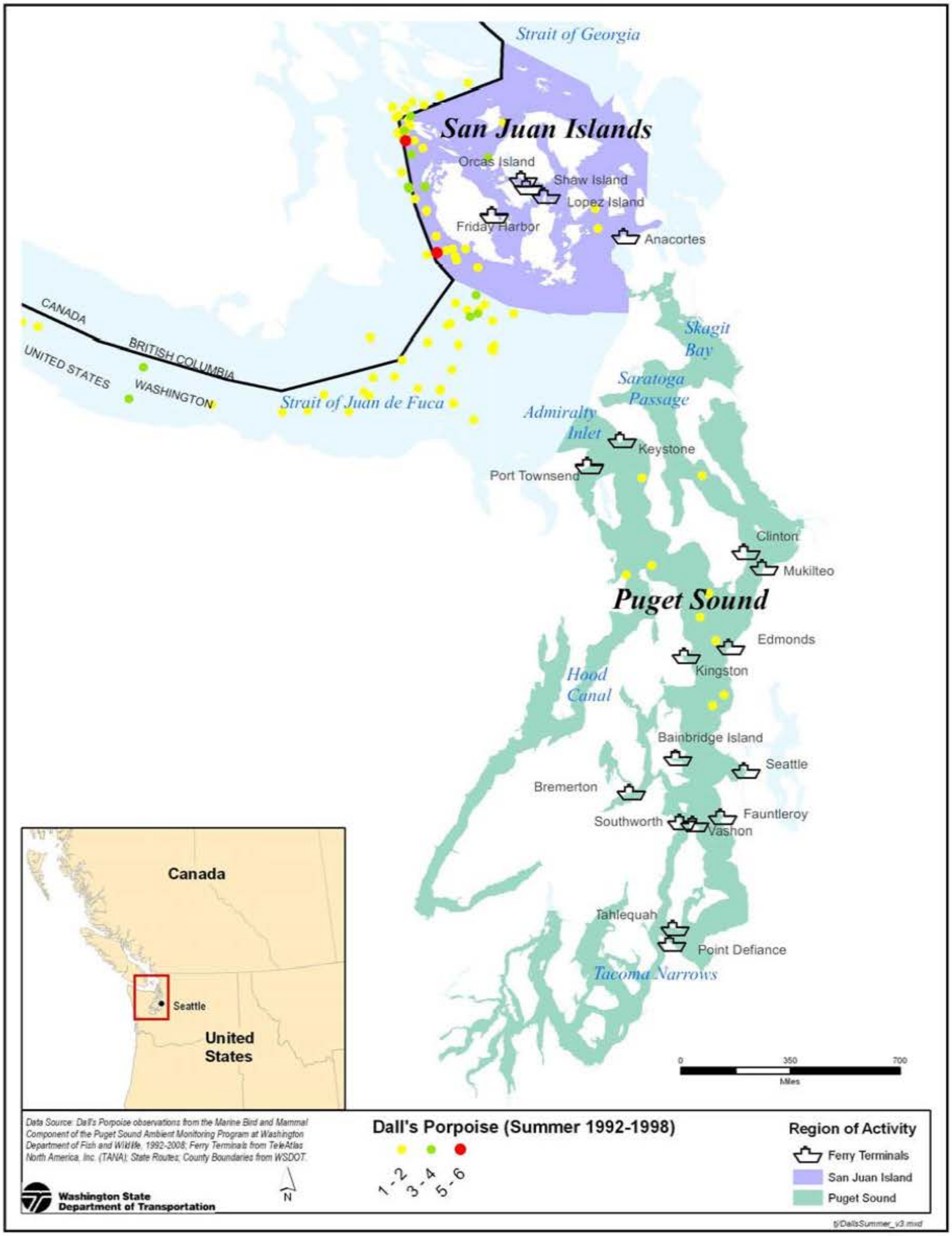

Figure 3-5. Dall's Porpoise Summer Sightings (groups)

Dall's Porpoise

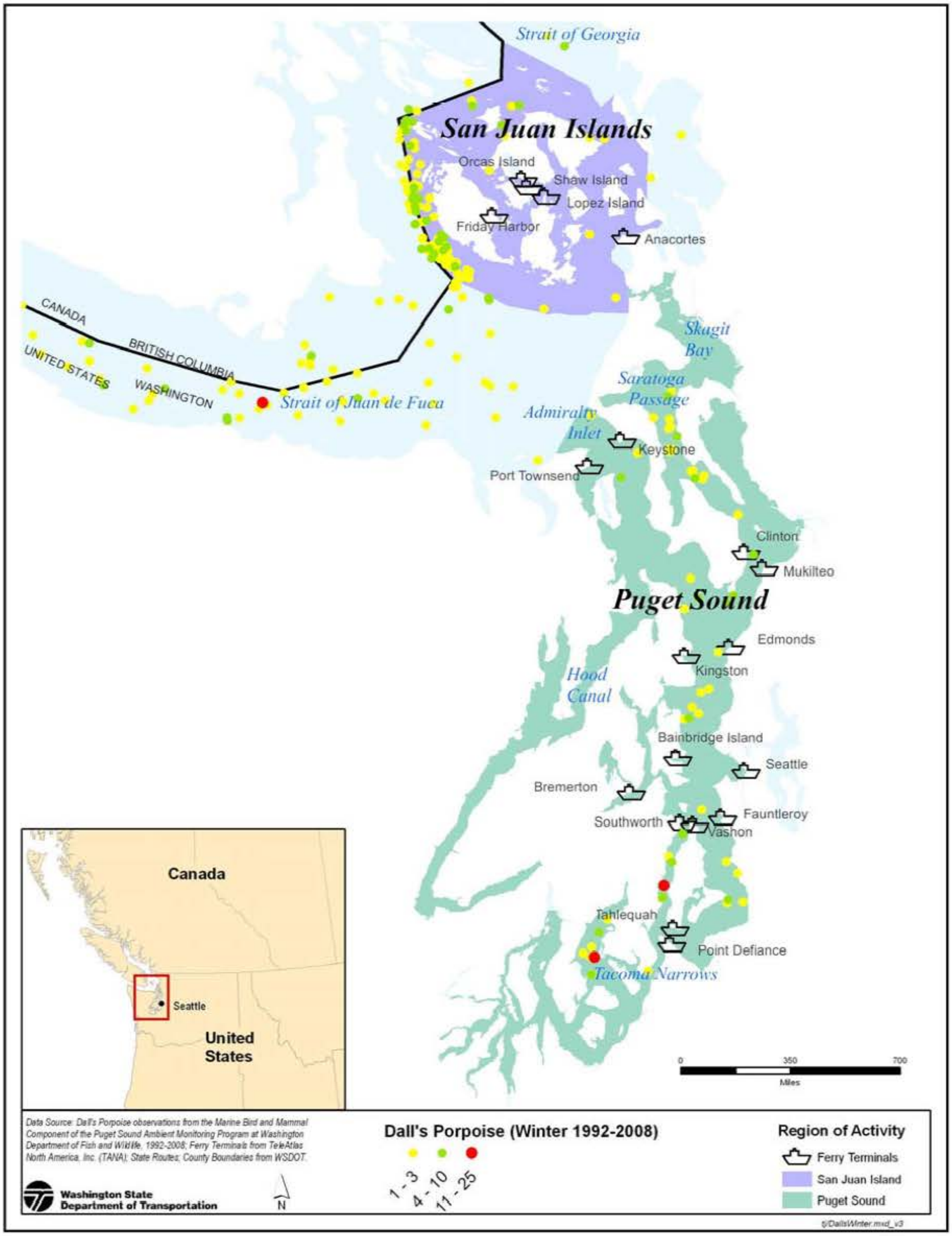

Figure 3-6. Dall's Porpoise Winter Sightings (groups)

3.3.3.3 Distribution

Sighting patterns from aerial and shipboard surveys conducted in California, Oregon, and Washington at different times of the year (Green et al. 1992, 1993; Barlow 1995; Forney et al. 1995) suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward into Oregon and Washington as water temperatures increase in late spring and summer (Green et al. 1992). Pacific white-sided dolphins have been reported to be regular summer and fall inhabitants of the Strait of Juan de Fuca and San Juan Islands (specifically Haro Strait) (Osborne et al. 1988), but extremely rare in Puget Sound. The Pacific white-sided dolphin is primarily a pelagic species that feeds along the continental slope or the shelf edge (Green et al. 1993; Calambokidis et al. 2004a).

3.3.4 Killer Whale

The killer whale (*Orcinus orca)* is the largest member of the dolphin family (Delphinidae) and occurs in most marine waters of the world (Rice 1998 as cited in NMFS 2008a). Killer whales are distinct among all cetaceans with their black-and-white coloration with characteristic gray or white saddle patches behind the dorsal fin and white eye patches. Killer whales live in family groups called pods, are highly social, and communicate with a highly developed acoustic sensory system that is also used to navigate and find prey (Ford 1989; Ford et al. 2000). Vocal communication is particularly advanced in killer whales and is an essential element of the species social structure (Wiles 2004; Krahn et al. 2004).

Two sympatric ecotypes of killer whales are found within the activity area: transient and resident. These types vary in diet, distribution, acoustic calls, behavior, morphology, and coloration (Baird 2000 as cited in NMFS 2008a; Ford et al. 2000). The ranges of transient and resident killer whales overlap; however, little interaction and high reproductive isolation occurs among the two ecotypes (Barrett-Lennard 2000; Barrett-Lennard and Ellis 2001; Hoelzel et al. 2002 as cited in NMFS 2008a). Resident killer whales are primarily piscivorous, whereas transients primarily feed on marine mammals, especially harbor seals (Baird and Dill 1996). Resident killer whales also tend to occur in larger (10 to 60 individuals), stable family groups known as pods, whereas transients occur in smaller (less than 10 individuals), less structured pods.

One stock of transient killer whale, the West Coast Transient stock, occurs in Washington State. This stock ranges from southern California to southeast Alaska and is distinguished from two other Eastern North Pacific transient stocks that occur further north, the AT1 and the "Gulf of Alaska transient stocks (Angliss and Outlaw 2007). This separation was based on variations in acoustic calls and genetic distinctness (Angliss and Outlaw 2007). West Coast transients primarily forage on harbor seals (Ford and Ellis 1999), but other species such as porpoises and sea lions are also taken (NMFS 2008a).

Two stocks of resident killer whales occur in Washington State: the Southern Resident and Northern Resident stocks. Southern Residents occur within the activity area, in the Strait of Juan de Fuca, Strait of Georgia, and in coastal waters off Washington and Vancouver Island, British Columbia (Ford et al. 2000). Northern Residents occur primarily in inland and coastal British

Columbia and Southeast Alaska waters and rarely venture into Washington State waters. Little interaction (Ford et al. 2000) or gene flow (Barrett-Lennard 2000; Barrett-Lennard and Ellis 2001; Hoelzel et al. 2004 as cited in Krahn et al. 2004) is known to occur between the two resident stocks.

The Southern Residents live in three family groups known as the J, K, and L pods. The entire Southern Resident population has been annually recorded since 1973 (Krahn et al. 2004). Individual whales are identified through photographs of unique saddle patch and dorsal fin markings. Each Southern Resident pod has a distinctive dialect of vocalizations (Ford 1989) and calls can travel 10 miles or more underwater. The southern residents forage primarily on salmon, with Chinook salmon considered the major prey in the Puget Sound region in late spring through the fall (NMFS 2008a). Other identified prey included chum salmon, other salmonids, herring, and rockfish (NMFS 2008a).

Killer whales are mid-frequency cetaceans (Southall et al. 2007) with an estimated auditory bandwidth of 50 Hz to 100 kHz and peak sensitivity around 15 kHz (73 FR 41318). Killer whale hearing is well developed for the species' complex underwater communication structure. However, Southern Residents are highly vocal while Transients limit their use of vocalization and may travel silently (apparently to avoid being detected by marine mammal prey; Deecke et al. 2005 as cited in 73 FR 41318).

Small population numbers make Southern Residents vulnerable to inbreeding depression and catastrophic events such as disease or a major oil spill. Ongoing threats to Southern Residents include declining prey resources, environmental contaminants, noise, and physical disturbance (Krahn et al. 2004; Wiles 2004). In Washington's inland waters, high levels of noise disturbance and potential behavior disruption are due to recreational boating traffic, private and commercial whale watching boats, and commercial vessel traffic (Wiles 2004). Other potential noise disturbance includes high output military sonar equipment and marine construction (Krahn et al. 2004). Noise effects may include altered prey movements and foraging efficiency, masking of whale calls, and temporary hearing impairment (Krahn et al. 2004).

3.3.4.1 Numbers

West Coast Transient Stock

The West Coast Transient stock, which includes individuals from California to southeastern Alaska, was estimated to have a minimum number of 354 (NMFS 2010b).

Trends in abundance for the West Coast Transients were unavailable in the most recent stock assessment report (Angliss and Outlaw 2007). Human-caused mortality and serious injury are estimated to be zero animals per year and do not exceed the population's biological removal rate, which is estimated at 3.5 animals (NMFS 2010b). West Coast Transient killer whale is sighted intermittently throughout the year in the San Juan Islands, in small groups of one to five individuals. However, there has been a recent increase in transient sightings, with a group of approximately 12-15 reported to enter the Strait and in this case, turn south into Puget Sound (Orca Network 2012a).

Southern Resident Stock

The Southern Resident stock was first recorded in a census in 1974, at which time the population comprised 71 whales. This population peaked at 97 animals in 1996, declined to 79 by 2001 (Center for Whale Research 2011), and then increased to 89 animals by 2006 (Carretta et al. 2007a). As of October 2012, the population collectively numbers 84 individuals: J pod has 25 members, K pod has 20 members, and L pod has 39 members (Whale Museum 2012b).

The Southern Resident stock has declined in the past 10 years due to a decrease in birth rates and an increase in mortalities, especially among the L pod (Krahn et al. 2004). There are a limited number of reproductive-age Southern Resident males, and several females of reproductive age are not having calves. Three major threats were identified in the ESA listing: reduced quantity and quality of prey; persistent pollutants that could cause immune or reproductive system dysfunction; and effects from vessels and sound (NMFS 2008a). Other threats identified were demographics, small population size, and vulnerability to oil spills. Previously, declines in the Southern Resident population were due to shooting by fishermen, whalers, sealers, and sportsmen largely due to their interference with fisheries (Wiles 2004) and the aquarium trade, which is estimated to have taken a significant number of animals from 1967 to 1973 (Ford et al. 1995).

The estimated annual level of human-caused mortality and serious injury is 0.2 animals per year, which exceeds the PBR of 0.17 animals and reflects a vessel strike of one animal every 5 years (NMFS 2011).

3.3.4.2 Status

Killer whales are protected under the MMPA of 1972. The West Coast Transient stock is not designated as depleted under the MMPA or listed as “threatened or “endangered” under the ESA. Because the estimated level of human-caused mortality and serious injury (zero animals per year) does not exceed the PBR rate (3.5), the stock is not classified as strategic.

The Southern Resident stock was declared depleted under the MMPA in May 2003 (68 FR 31980). At that time, NMFS announced preparation of a conservation plan to restore the stock to its optimal sustainable population. On November 18, 2005, the Southern Resident stock was listed as an endangered distinct population segment (DPS) under the ESA (70 FR 69903). On November 29, 2006, NMFS published a final rule designating critical habitat for the Southern Resident killer whale DPS (71 FR 69054). Both Puget Sound and the San Juan Islands are designated as core areas of critical habitat under the ESA, but areas less than 20 feet deep relative to extreme high water are not designated as critical habitat (71 FR 69054). A final recovery plan for southern residents was published in January of 2008 (NMFS 2008a).

In Washington State, killer whales were listed as a state candidate species in 2000. In April 2004, the State upgraded their status to a state endangered species.

3.3.4.3 Distribution

The West Coast Transient and the Southern Resident stocks are both found within Washington inland waters. Individuals of both forms have long-ranging movements and thus regularly leave the inland waters (Calambokidis and Baird 1994).

West Coast Transient Stock

The West Coast Transient stock occurs in California, Oregon, Washington, British Columbia, and southeastern Alaskan waters. In the activity area, small groups of one to five individuals are sighted intermittently throughout the year. Within the inland waters, they may frequent areas near seal rookeries when pups are weaned (Baird and Dill 1995).

Southern Resident Stock

Southern Residents are documented in coastal waters ranging from central California to the Queen Charlotte Islands, British Columbia (NMFS 2008a). They occur in all inland marine waters within the activity area (Figure 3-7). While in the activity area, resident killer whales generally spend more time in deeper water and only occasionally enter water less than 15 feet deep (Baird 2000). Distribution is strongly associated with areas of greatest salmon abundance, with heaviest foraging activity occurring over deep open water and in areas characterized by high-relief underwater topography, such as subsurface canyons, seamounts, ridges, and steep slopes (Wiles 2004).

3.3.4.4 Seasonal Distribution

West Coast Transients are documented intermittently year-round in Washington inland waters. Records from 1976 through 2006 document Southern Residents in the inland waters of Washington during the months of March through June and October through December, with the primary area of occurrence in inland waters north of Admiralty Inlet (The Whale Museum 2008a).

Spring/Summer Distribution

Beginning in May or June and through the summer months, all three pods (J, K, and L) of Southern Residents are most often located in the protected inshore waters of Haro Strait (west of San Juan Island), in the Strait of Juan de Fuca, and Georgia Strait near the Fraser River. Historically, the J pod also occurred intermittently during this time in Puget Sound; however, records from The Whale Museum (2008a) from 1997 through 2007 show that J pod did not enter Puget Sound south of the Strait of Juan de Fuca from approximately June through August.

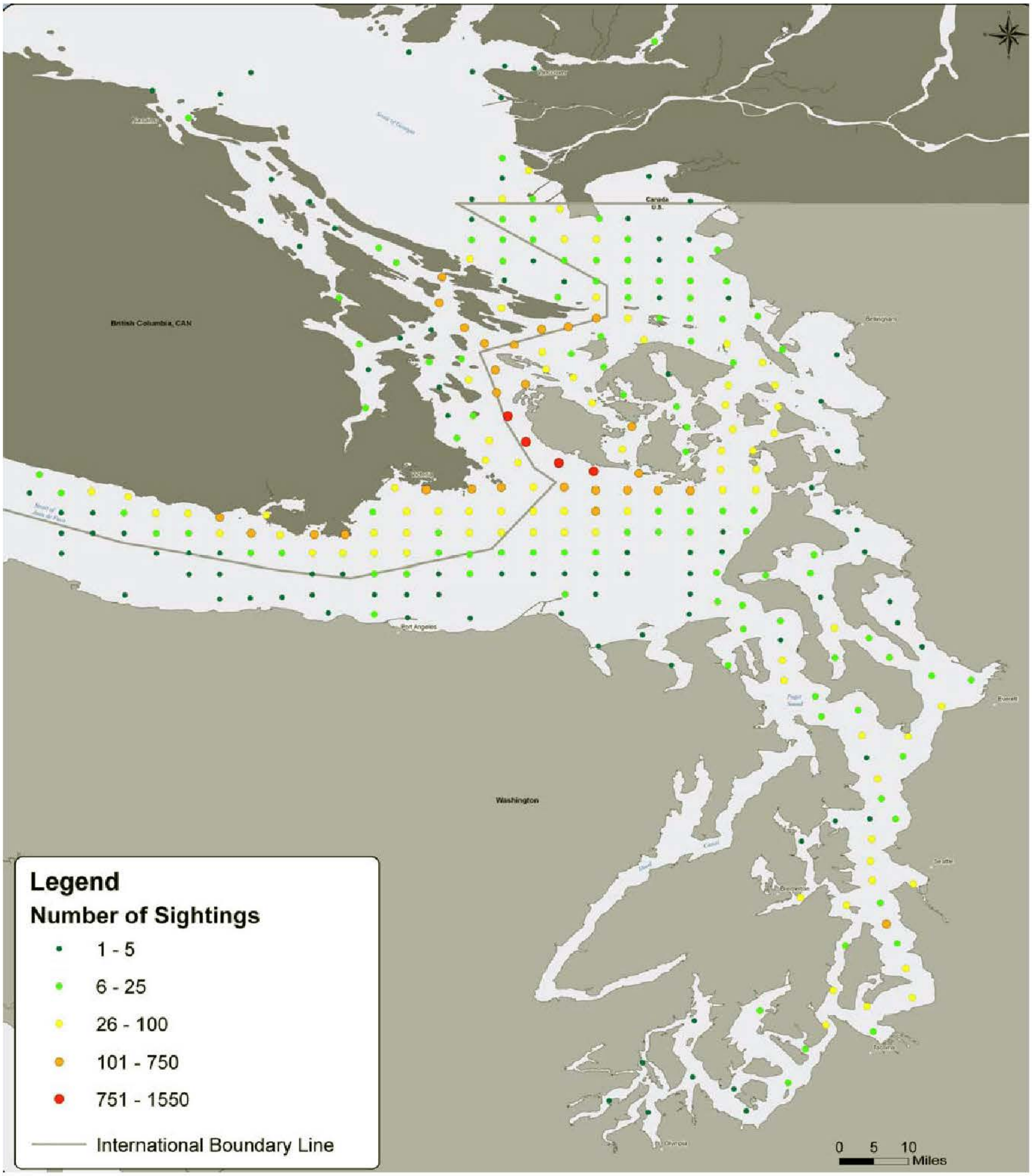

Figure from the Recovery Plan for Southern Resident Killer Whales (NMFS 2008).

Figure 3-7. Distribution of Southern Resident killer whale sightings (groups) 1990–2005

Fall/Winter Distribution

In fall, all three pods occur in areas where migrating salmon are concentrated such as the mouth of the Fraser River. They may also enter areas in Puget Sound where migrating chum and Chinook salmon are concentrated (Osborne 1999). In the winter months, the K and L pods spend progressively less time in inland marine waters and depart for coastal waters in January or February. The J pod is most likely to appear year-round near the San Juan Islands and, in the fall/winter, in the lower Puget Sound and in Georgia Strait at the mouth of the Fraser River.

The Friday Harbor Whale Museum keeps a database of verified marine mammal sightings (whale days) by location quadrants. Whale sightings, or 'whale days' do not indicate sightings of individual animals. Instead, sightings can be any number of animals. Between 1990 and 2008, in the September to February window proposed for these projects, an average of 1.16 killer whale sightings were annually reported for Quad 191 (which includes the Orcas Ferry Terminal), and an average of 3.16 killer whale sightings were annually reported for Quads 188 and 192 (which includes the Friday Harbor Ferry Terminal (NMFS 2012). Based on this information, the possibility of encountering killer whales during the project work window is low to medium, depending on the actual work month (Table 3-2).

Between September 2009 and February 2012, there were no reports of SR killer whale in the Orcas action area, and three reports of SR killer whale in the Friday Harbor action area (two in September 2009, one in January 2011) during the proposed in-water work window for these projects (Orca Network 2012a).

Table 3-2. SR killer whale sightings near Orcas and Friday Harbor Terminals 1990-2008 (*Proposed in-water work window months highlighted in green*)

Month	Orcas Quad 191	Friday Harbor Quads 188/192
September	4	15
October	0	3
November	1	4
December	0	2
January	0	3
February	3	2
March	1	3
April	4	6
May	1	5
June	0	9
July	7	19
August	1	9

Source: NMFS 2012

3.3.5 Gray Whale

Gray whales are members of baleen whales (Mysticete). The North Pacific gray whale (*Eschrichtius robustus*) stock is divided into two distinct geographically isolated stocks: eastern and western "Korean" (Rice et al. 1984; Angliss and Outlaw 2007). Individuals in this region are part of the Eastern North Pacific stock. The majority of the Eastern North Pacific population spends summers feeding in the Bering and Chukchi Seas, but some individuals have been reported summering in waters off the coast of British Columbia, Southeast Alaska, Washington, Oregon, and California (Rice et al. 1984; Angliss and Outlaw 2007). Gray whales migrate in the fall, south along the coast of North America to Baja California, Mexico to calve (Rice et al. 1981.) Gray whales are recorded in Washington waters during feeding migrations between late spring and autumn with occasional sightings during winter months (Calambokidis et al. 1994, 2002; Orca Network 2011).

Baleen whales are low-frequency cetaceans. No direct measurements of auditory capacity have been conducted for these large whales, but hearing sensitivity has been estimated by Southall et al. (2007) from various studies or observations of behavioral responses, vocalization frequencies used most, body size, ambient noise levels, and cochlear morphometry (Southall et al. 2007). A generalized auditory bandwidth of 7 Hz to 22 kHz has been estimated for all baleen whales (Southall et al. 2007).

3.3.5.1 Numbers

Early in the 20th century, it is believed that commercial hunting for gray whales reduced population numbers to below 2,000 individuals (Calambokidis and Baird 1994). After listing of the species under the ESA in 1970, the number of gray whales increased dramatically resulting in their delisting in 1994. Population surveys since the delisting estimate that the population fluctuates at or just below the carrying capacity of the species (~26,000 individuals) (Rugh et al. 1999; Calambokidis et al. 1994; Angliss and Outlaw 2007).

Within Washington waters, gray whale sightings reported to Cascadia Research and the Whale Museum between 1990 and 1993 totaled over 1,100 (Calambokidis et al. 1994). Forty-eight individual gray whales were observed in Puget Sound and Hood Canal in 2004 and 2005 (Calambokidis 2007). Abundance estimates calculated for the small regional area between Oregon and southern Vancouver Island, including the San Juan Area and Puget Sound, suggest there were 137 to 153 individual gray whales from 2001 through 2003 (Calambokidis et al. 2004b).

3.3.5.2 Status

The Eastern North Pacific stock of gray whales was removed from listing under the ESA in 1994 after a 5-year review by NOAA Fisheries (Angliss and Outlaw 2007). In 2001 NOAA Fisheries received a petition to relist the stock under the ESA, but it was determined that there was not sufficient information to warrant the petition (Angliss and Outlaw 2007). Since delisting under the ESA, the stock has not been reclassified under the MMPA. The PBR for this stock is 360 animals per year (NMFS 2010c).

3.3.5.3 Distribution

Gray whales migrate within 5 to 43 km of the coast of Washington during their annual north/south migrations (Green et al. 1995). Gray whales migrate south to Baja California where they calve in November and December, and then migrate north to Alaska from March through May (Rice et al. 1984; Rugh et al. 2001) to summer and feed. A very few gray whales are observed in Washington inland waters between the months of September and January, with peak numbers of individuals from March through May (J. Calambokidis pers. comm. 2007). Peak months of gray whale observations in the area of activity occur outside the proposed work window of September through February (Table 3-2). The average tenure within Washington inland waters is 47 days and the longest stay was 112 days (J. Calambokidis pers. comm. 2007).

Although typically seen during their annual migrations on the outer coast, a regular group of gray whales annually comes into the inland waters at Saratoga Passage and Port Susan from March through May to feed on ghost shrimp (Weitkamp et al. 1992; J. Calambokidis pers. comm. 2006). During this time frame they are also seen in the Strait of Juan de Fuca, the San Juan Islands, and areas of Puget Sound, although the observations in Puget Sound are highly variable between years (Calambokidis et al. 1994, 2002). In northern Puget Sound between Admiralty Inlet and the Edmonds/Kingston Ferry route, sightings of gray whales are more common and regular (Calambokidis et al. 1994, Orca Network 2011), although most all these sightings occur between March and May (Table 3-2). Between January 2005 and February 2012, the Orca Network logged 13 sightings of gray whales in the September to February window proposed for the Orcas and Friday Harbor Ferry Terminal projects (Table 3-3).

3.3.6 Humpback Whale

Humpback whales (*Megaptera novaeangliae*) are wide-ranging baleen whales that can be found virtually worldwide. They summer in temperate and polar waters for feeding, and winter in tropical waters for mating and calving. Humpbacks are vulnerable to whaling due to their tendency to feed in near shore areas. Recent studies have indicated sufficient evidence to suggest that there are three distinct stocks of humpback whale in the North Pacific: Eastern North Pacific, Central North Pacific, and Western North Pacific (NMFS 1991; Carretta et al. 2007a). The Eastern North Pacific stock calve and mate in coastal Central America and Mexico and migrate up the coast from California to southern British Columbia in the summer and fall to feed (NMFS 1991; Marine Mammal Commission 2003; Carretta et al. 2007a). Although infrequent, interchange between the other two stocks and the Eastern North Pacific stock occurs in breeding areas (Carretta et al. 2007a). Few humpback whales have been seen in Puget Sound, but more frequent sightings occur in the Strait of Juan de Fuca and near the San Juan Islands. Most sightings are in spring and summer. Humpback whales feed on krill, small shrimp-like crustaceans, and various kinds of small fish.

Like other baleen whales, humpback whales are low-frequency cetaceans. Information on hearing bandwidths for baleen whales is presented under gray whales (Section 3.3.5).

Table 3-3. Gray Whale Observations January 2005 to February 2012
(*Proposed in-water work window months highlighted in green*)

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
September	4	5	0	1
October	3	3	1	0
November	2	2	2	1
December	1	5	6	7
January	3	11	5	0
February	0	30	1	2
March	11	209	19	6
April	19	289	13	15
May	17	145	11	2
June	21	69	1	0
July	7	22	3	0
August	4	15	0	0

Source: Orca Network 2012b.

3.3.6.1 Numbers

Whaling statistics estimate that prior to 1905, the population in the North Pacific was approximately 15,000 (Rice 1978), but by 1966 the population was reduced by whaling to 1,200 to 1,400 (Gambell 1976; Johnson and Wolman 1984). In the 1990s the abundance of North Pacific humpback whales was estimated at 6,000 (Calambokidis et al. 1997). Current estimates indicated that the total abundance is just over 18,000 individuals (Calambokidis et al. 2008). The majority of the population (~9,000) winter in Hawaiian waters and feed (~6,000 to 14,000) in the Bering Sea and Aleutians (Calambokidis et al. 2008). New observations of Eastern North Pacific whales are photographically identified regularly, indicating that whales from other areas and/or stocks are immigrating to the Eastern North Pacific stock (Carretta et al. 2007a). Recent estimates of the Eastern North Pacific stock indicate that the population is between 1,100 and 1,300 individuals (Carretta et al. 2007a; Calambokidis et al. 2008). Abundance estimates for Washington and southern British Columbia are less than 500 (Calambokidis et al. 2008); estimates for inland Washington waters including Puget Sound are fewer. Vessel surveys in Washington coastal and inland waters between 1995 and 2000 estimated around 100 individuals (Calambokidis et al. 2008).

3.3.6.2 Status

Humpback whales were listed as endangered under the ESA in 1970. A recovery plan was adopted in 1991. Under the MMPA, the Eastern North Pacific stock is listed as depleted and strategic (Carretta et al. 2007a). The PBR for this stock is 11.3 animals per year NMFS 2011).

3.3.6.3 Distribution

Historically, humpback whales were common in inland waters of Puget Sound and the San Juan Islands (Calambokidis et al. 2002). In the early part of this century, there was a productive commercial hunt for humpbacks in Georgia Strait that was probably responsible for their long disappearance from local waters (Osborne et al. 1988). Since the mid-1990s, sightings in Puget Sound have increased. Between 1996 and 2001, Calambokidis et al. (2002) recorded only six individuals south of Admiralty Inlet. Between January 2005 and February 2012, the Orca Network logged 19 sightings of humpbacks in the September to February window proposed for the Orcas and Friday Harbor Ferry Terminal projects (Table 3-4).

Table 3-4. Humpback Whale Observations January 2005 to February 2012
(*Proposed in-water work window months highlighted in green*)

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
September	2	0	0	0
October	4	2	0	0
November	8	0	2	0
December	3	0	1	0
January	0	0	1	0
February	2	6	4	1
March	0	0	0	0
April	0	8	0	0
May	3	2	2	11
June	11	4	2	8
July	4	4	5	0
August	4	1	1	0

Source: Orca Network 2012b.

3.3.7 Minke Whale

Worldwide, minke whales are one of the most abundant whales (Calambokidis and Baird 1994). The northern minke whale (*Balaenoptera acutorostra*) is separated into two distinct subspecies: the Northern Pacific (*B. a. scammoni*) and the Northern Atlantic (*B. a. acutorostrata*). Within the Northern Pacific subspecies, there are three stocks of minke whale recognized: the Sea of Japan/East China Sea, the western Pacific, and the "remainder" of the Pacific (Carretta et al. 2007b). Within U.S. waters, the Northern Pacific stock is broken into three management stocks: the Alaskan stock, California/Oregon/Washington stock, and the Hawaiian stock (NMFS 2008b). The California/Oregon/Washington management stock is considered a resident stock, which is unlike the other Northern Pacific stocks (NMFS 2008b). This stock includes minke whales within the inland Washington waters of Puget Sound and the San Juan Islands (Dorsey et al. 1990; Carretta et al. 2007b).

Minke whales have small dark sleek bodies and a small dorsal fin. These whales are often recognized by surfacing snout first and a shallow but visible "bushy" blow. Minke whales feed by side lunging into schools of prey and gulping in large amounts of water. Food sources typically consist of krill, copepods, and small schooling fish, such as anchovies, herring, mackerel, and sand lance (NMFS 2008b). Like other baleen whales, minke whales are low-frequency cetaceans. Information on hearing bandwidths for baleen whales is presented under gray whales (Section 3.3.5).

3.3.7.1 Numbers

Information on minke whale population and abundance is limited due to difficulty in detection (Green et al. 1991). Conducting surveys for the minke whale is difficult because of their low profiles, indistinct blows, and tendency to occur as single individuals (Green et al. 1992). The total population size for the entire North Pacific is unknown (Calambokidis and Baird 1994; Carretta et al. 2007b). Some estimates indicate as many as 9,000 individuals reside in the North Pacific (Wada 1976; Green et al. 1992), but this number is uncertain (Calambokidis and Baird 1994). The number of minke whales in the California/Oregon/Washington stock is estimated between 500 and 1,015 individuals (Barlow 2003; Carretta et al. 2007b; NMFS 2008b). Over a 10-year period, 30 individuals were photographically identified in the transboundary area around the San Juan Islands and demonstrated high site fidelity (Dorsey et al. 1990; Calambokidis and Baird 1994). In a single year, up to 19 individuals were photographically identified from around the San Juan Islands (Dorsey et al. 1990).

3.3.7.2 Status

Minke whales are not listed under the ESA and are classified as non-depleted under the MMPA. The annual mortality due to fisheries and ship strikes is less than the potential biological removal, so they are not considered a strategic management stock under the MMPA (Carretta et al. 2007b). The PBR for this stock is two animals per year (NMFS 2011).

3.3.7.3 Distribution

Minke whales are reported in Washington inland waters year-round, although few are reported in the winter (Calambokidis and Baird 1994). Minke whales are relatively common in the San Juan Islands and Strait of Juan de Fuca (especially around several of the banks in both the central and eastern Strait), but are relatively rare in Puget Sound. Infrequent observations occur in Puget Sound south of Admiralty Inlet (Orca Network 2011). Between January 2005 and February 2012, the Orca Network logged 42 sightings of minke in the September to February window proposed for the Orcas and Friday Harbor Ferry Terminal projects (Table 3-5).

Table 3-5. Minke Whale Observations January 2005 to February 2012
(*Proposed in-water work window months highlighted in green*)

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
September	25	4	0	0
October	10	4	0	4
November	1	4	1	0
December	3	0	0	0
January	1	0	0	0
February	2	2	0	0
March	5	1	1	0
April	7	11	1	0
May	4	5	1	0
June	26	5	0	2
July	12	0	0	0
August	37	4	2	1

Source: Orca Network 2012b.

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4.0 Status and Distribution of Affected Species or Stocks

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

This section has been combined with Section 3.0 for ease of writing and reading. Each requested topic (status, distribution, and seasonally distribution) has been clearly marked as a subheading in Section 3.0 for ease of finding relevant information.

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5.0 Type of Incidental Take Authorization Requested

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury and/or death), and the method of incidental taking.

The MMPA defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 C.F.R, Part 216, Subpart A, Section 216.3-Definitions).

Level A is the more severe form of harassment because it may result in injury or death, whereas Level B only results in disturbance *without* the potential for injury (B. Norberg pers. comm. 2007a).

5.1 Incidental Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, WSF requests an IHA from September 1, 2013 through February 15, 2014 for Level B incidental take (behavioral harassment) of the marine mammals described within this application during dolphin replacement projects at the Orcas and Friday Harbor Ferry Terminals. Specifically, the requested authorization is for incidental harassment of any marine mammal that might enter the 120 dB ZOI during active vibratory hammer activity.

The scheduled pile-driving activities discussed in this application will occur between September 1, 2013 and February 15, 2014.

5.2 Method of Incidental Taking

The method of incidental take is Level B acoustical harassment of any non-listed marine mammal occurring within the 120 dB isopleth during vibratory pile removal or driving.

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6.0 Number of Marine Mammals that May Be Affected

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in [Section 5], and the number of times such takings by each type of taking are likely to occur.

This section summarizes potential incidental take of marine mammals during construction activities from WSF's anticipated projects described in Section 1.2 of this IHA. Section 6.2 describes the methods used to calculate potential incidental take for each marine mammal species. Section 6.4 provides the number of marine mammals by species for which take authorization is requested.

Due to the vibratory pile removal and driving source levels, this IHA application will incidentally take by Level B acoustical harassment small numbers of harbor seals, northern elephant seals, California sea lions, Steller sea lions, harbor porpoises, Dall's porpoises, white-sided dolphins, killer whales, gray whales, minke whales, and humpback whales.

With the exception of harbor seals, it is anticipated that all of the marine mammals that enter a Level B acoustical harassment ZOI will be exposed to pile driving noise only briefly as they are transiting the area. Only harbor seals are expected to forage and haulout in Orcas and Friday Harbor ZOIs with any frequency and could be exposed multiple times during a project (Jeffries 2000).

6.1 Estimated Duration of Pile Driving

As mentioned previously in Section 2.0, Dates, Duration, and Region of Activity, a worst-case scenario for the Orcas ferry terminal project assumes that it may take 3 days to remove the existing piles and 2 days to install the new piles (Table 2-1). The maximum total number of hours of pile removal activity is about 17.2 hours, and pile-driving activity is about 2.3 hours (averaging about 3.9 hours of active pile removal/driving for each construction day).

A worst-case scenario for the Friday Harbor ferry terminal project assumes that it may take 5 days to remove the existing piles and 5 days to install the new piles (Table 2-2). The maximum total number of hours of pile removal activity is about 34.75 hours, and pile-driving activity is about 4.3 hours (averaging about 3.9 hours of active pile removal/driving for each construction day).

The actual number of hours for both projects is expected to be less.

6.2 Estimated Zones of Influence

Distances to the various NMFS thresholds for Level B (harassment) take for vibratory pile removal and driving were estimated and presented in Section 1.6.6, Attenuation to NMFS Thresholds. From these distances were calculated the Orcas and Friday Harbor ZOIs (Figures 1-6/1-7).

The distance to the 120 dB contour Level B acoustical harassment threshold due to vibratory pile driving for the Orcas ferry terminal project extends a maximum of 3.5 km (2.2 miles) before land is intersected. For the Friday Harbor ferry terminal project, land is intersected at a maximum of 4.7 km (2.9 miles). To simplify the ZOI for these projects, vibratory timber pile removal will conservatively be assumed to extend the same distances as vibratory pile driving. The ZOI for the Orcas terminal is shown in Figure 1-6, and for the Friday Harbor terminal in Figure 1-7. Both of these areas will be monitored during construction to estimate actual harassment take of marine mammals.

Airborne noises can affect pinnipeds, especially resting seals hauled out on rocks or sand spits. The airborne 90 dB Level B threshold for hauled out harbor seals was estimated at 37 m, and the airborne 100 dB Level B threshold for all other pinnipeds is estimated at 12 m. This is much closer than the distance to the nearest harbor seal haulout site for the Orcas ferry terminal (1 km) and Friday Harbor ferry terminal (4 km).

6.3 Estimated Incidental Takes

Incidental take is estimated for each species by estimating the likelihood of a marine mammal being present within a ZOI during active pile driving. Expected marine mammal presence is determined by past observations and general abundance near the Orcas and Friday Harbor ferry terminals during the construction window. Typically, potential take is estimated by multiplying the area of the ZOI by the local animal density. This provides an estimate of the number of animals that might occupy the ZOI at any given moment. However, there are no density estimates for any Puget Sound population of marine mammal. As a result, the take requests were estimated using local marine mammal data sets (e.g., Orca Network, state and federal agencies), opinions from state and federal agencies, and incidental observations from WSF biologists. All estimates are conservative.

6.3.1 Harbor Seal

The harbor seal is the most numerous marine mammal in the vicinity of the Orcas and Friday Harbor ferry terminals, occurring year-round. The nearest known haulout sites to the Orcas Island ferry terminal are Blind Island Rocks and Blind Island (approximately 1.2 and 1.4 km south of the Orcas terminal) and Bell Island (approximately 2.7 km west of the Orcas terminal). The nearest known haulout sites to the Friday Harbor ferry terminal are the intertidal rocks NE of Point George on Shaw Island (approximately 4 km and 4.7 km NE of the Friday Harbor terminal) offshore of Shaw Island (Figure 3-2).

These haulouts are used by less than 100 seals each (WDFW 2000). Harbor seals haul out much less frequently during the fall and winter (when pile-driving activity is planned to occur) as air temperatures become colder than water temperatures reducing the thermal advantage for hauling out (H. Huber pers. comm. 2010). However, harbor seal haulout sites in the San Juans are not monitored in the winter, so no confirmation data on winter haulout use at is available. During most of the year, all age and sex classes are expected to forage in the San Juan Islands. Pups are present from June through September.

As mentioned above, less than 100 seals per day might use the documented haulouts near both terminals during the summer, but that number would be greatly reduced in the winter. For these projects it shall be assumed that up to 10 harbor seals may be present per haulout, and could be in the water within the ZOI during vibratory pile removal or driving.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days(Table 2-1).

For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for harbor seal exposures is estimated by:

Exposure estimate = N * H * days of pile driving activity, where:

N = # of animals (10/haulout)

H = # of haulouts in proximity to ZOI

Orcas project exposure estimate = 10 * 3 *5 days = 150

Friday Harbor project exposure estimate = 10 * 2 * 10 days = 200

Therefore, WSF is requesting authorization for Level B acoustical harassment of 150 harbor seals for the Orcas project, and 200 for the Friday Harbor project, for a total of 350. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.2 California Sea Lion

California sea lions are sighted and haul out throughout the San Juan Islands at all times of the year. However, abundances peak in the late fall and winter, which coincides with proposed periods of project activity. The nearest documented California sea lion haulout sites to the Orcas and Friday Habor terminals are intertidal rocks and reef areas around Trial Island and Race Rocks near Victoria, B.C. (approximately 32/24 km west of the Orcas/Friday Harbor terminals, respectively). Small numbers of sea lions may occasionally use navigation buoys in the San Juan Islands (WDFW 2000). The number of California sea lions using these haulouts is less than 100 per haulout (WDFW 2000). There are no documented haulout sites within any of the estimated ZOIs.

There are no density estimates of California sea lions for the inland waters of Washington. Transit of California sea lions through the ZOIs in the fall and winter is expected, but the total number of California sea lions that will enter Level B ZOIs is estimated to be low. For these projects it shall be assumed that up to 5 California sea lions may be present per project ZOI, and could be in the water within the ZOI during vibratory pile removal or driving.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days(Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for California sea lion exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (5)

Orcas project exposure estimate = 5 *5 days = 25

Friday Harbor project exposure estimate = 5 * 10 days = 50

Therefore, WSF is requesting authorization for Level B acoustical harassment of 25 California sea lions for the Orcas project, and 50 for the Friday Harbor project, for a total of 75. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.3 Northern Elephant Seal

There are no density estimates for elephant seals in inland marine waters.

A few individuals use beaches at Protection Island (52/46 km south of the Orcas/Friday Harbor terminals, respectively) and Smith/Minor Islands (32/27 km south of the Orcas/Friday Harbor terminals) (WDFW 2000). Typically these sites have only two to ten adult males and females, but pupping has occurred at all of these sites over the past ten years (S. Jeffries pers. comm. 2008a). A single individual has been observed hauled out at American Camp on San Juan Island (NPS 2012), and at Shaw Island County Park on Shaw Island (Miller 2012).

Elephant seals have been observed hauled out in the San Juans, but the likelihood of an elephant seal entering an active Level B ZOI is remote. Regardless, for the purposes of this IHA application, the WSF is assuming it is possible that very few elephant seals could be taken (Level B acoustical harassment) for each day of active pile driving, especially since they spend large amounts of time below the water surface where they are cannot be detected. For these projects it shall be assumed that up to 3 Northern Elephant seals may be present per project ZOI, and therefore could be in the water within the ZOI during vibratory pile removal or driving.

The calculation for Northern Elephant seals exposures is estimated by:

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days (Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for Northern Elephant seal exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (3)

Orcas project exposure estimate = 3 *5 days = 15

Friday Harbor project exposure estimate = 3 * 10 days = 30

Therefore, WSF is requesting authorization for Level B acoustical harassment of 15 Northern Elephant seals for the Orcas project, and 30 for the Friday Harbor project, for a total of 45. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.4 Steller Sea Lion

The nearest documented haulouts to the Orcas/Friday Harbor terminals are Green Point on Speiden Island (12/13 km northwest of the Orcas/Friday Harbor terminals, respectively), North Peapod Rock (15/23 km northeast of the Orcas/Friday Harbor terminals), Bird Rocks (18/19 km southeast of the Orcas/Friday Harbor terminals) and Whale Rock (17/11 km south of the Orcas/Friday Harbor terminals) (NMFS 2012). There are no documented Steller sea lion haulouts within the project's ZOIs. For these projects it shall be assumed that up to 5 Steller sea lions may be present per project ZOI, and could be in the water within the ZOI during vibratory pile removal or driving.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days(Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for Steller sea lion exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (5)

Orcas project exposure estimate = 5 *5 days = 25

Friday Harbor project exposure estimate = 5 * 10 days = 50

Therefore, WSF is requesting authorization for Level B acoustical harassment of 25 Steller sea lions for the Orcas project, and 50 for the Friday Harbor project, for a total of 75. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.5 Harbor Porpoise

Harbor porpoise are present in the San Juan Islands year around, though peaks occur in the winter, when the Orcas and Friday Harbor projects are planned to take place (fall/winter). Winter counts suggest that harbor porpoise are more present to the north and south west of the ZOIs (Figure 3-2). For these projects it shall be assumed that up to 10 Harbor porpoise may be present per project ZOI.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days (Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for Harbor porpoise exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (10)

Orcas project exposure estimate = 10 *5 days = 50

Friday Harbor project exposure estimate = 10 * 10 days = 100

Therefore, WSF is requesting authorization for Level B acoustical harassment of 50 Harbor porpoise for the Orcas project, and 100 for the Friday Harbor project, for a total of 150. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.6 Dall's Porpoise

Given the preference of Dall's porpoise for deeper waters (Reeves et al. 2002), and their winter presence in the San Juan Islands to the north and west of the Orcas and Friday Harbor terminals (Figure 3-4), they are not expected to regularly enter the project ZOIs. However, with the lack of good empirical data it can only be assumed that it is possible that Dall's porpoises might enter the ZOIs during proposed pile-removal/driving activity. Given an average winter group size of three animals (PSAMP data), for these projects it shall be assumed that up to 3 Dall's porpoise may be present per project ZOI.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days(Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for Dall's porpoise exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (3)

Orcas project exposure estimate = 3 *5 days = 15

Friday Harbor project exposure estimate = 3 * 10 days = 30

Therefore, WSF is requesting authorization for Level B acoustical harassment of 15 Dall's porpoise for the Orcas project, and 30 for the Friday Harbor project, for a total of 45. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.7 Pacific White-sided Dolphin

The presence of Pacific white-sided dolphins is rare throughout the inland waters of Washington. The inland distribution of this species is largely limited to the Strait of Juan de Fuca and Haro Strait on the west side of the San Juan Islands, during the summer and fall. Because these dolphins are more common in the deeper channels of the inland waters of Washington, they are not expected to regularly enter the project ZOIs. Further, these dolphins move to warmer temperate waters during the fall and winter, and may be entirely absent from Washington inland waters if the project take place during winter. For these projects it shall be assumed that up to 3 Dall's porpoise may be present per project ZOI.

For the Orcas terminal project, the duration of pile removal and driving is estimated to be is 5 days (Table 2-1). For the Friday terminal project, the duration of pile removal and driving is estimated to be 10 days (Table 2-2).

The calculation for Pacific White-sided dolphin exposures is estimated by:

Exposure estimate = N * days of pile driving activity, where:

N = # of animals (3)

Orcas project exposure estimate = 3 *5 days = 15

Friday Harbor project exposure estimate = 3 * 10 days = 30

Therefore, WSF is requesting authorization for Level B acoustical harassment of 15 Pacific White-sided dolphin for the Orcas project, and 30 for the Friday Harbor project, for a total of 45. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.8 Killer Whale

West Coast Transient killer whale is sighted intermittently throughout the year in the San Juan Islands, in small groups of one to five individuals. However, there has been a recent increase in transient sightings, with a group of approximately 12-15 reported to enter the Strait and in this case, turn south into Puget Sound (Orca Network 2012a).

In fall, the three Southern Resident killer whale pods occur in areas where migrating salmon are concentrated, such as the mouth of the Fraser River and Puget Sound. In the winter months, the K and L pods spend progressively less time in inland marine waters and depart for coastal waters in January or February. The J pod is most likely to appear year-round near the San Juan Islands.

Between 1990 and 2008, in the September to February window proposed for these projects, an average of 1.16 killer whale sightings were annually reported for Quad 191 (which includes the Orcas Ferry Terminal), and an average of 3.16 killer whale sightings were annually reported for Quads 188 and 192, which includes the Friday Harbor Ferry Terminal (NMFS 2012) (Table 3-2).

Between September 2009 and February 2012, there were no reports of SR killer whale in the Orcas action area, and three reports of SR killer whale in the Friday Harbor action area (two in September 2009, one in January 2011) during the proposed in-water work window for these projects (Orca Network 2012a). Based on this information, the possibility of encountering killer whales during the project work window is low to medium, depending on the actual work month.

For these projects it shall be assumed that up to one group of up to 12 transients plus the 25 animals comprising J pod may be present. The MMPA provides for incidental take of ‘small numbers’, which has been defined by NMFS as no more than 20% of the species stock. Given that the Southern Resident stock consists of 84 individuals, incidental take can be granted for only 16 individuals (20% of the SRKW stock) (Guan, S. 2012). It is assumed that if killer whales enter the ZOIs, they will not remain, but may be present in the ZOIs for 2 days as the transit in and out of the area.

The calculation for killer whale exposures is estimated by:

Exposure estimate = N * 2 days transit in and out of ZOI:

N = # of animals (16 - 12 transient + 4 SRKW)

Orcas project exposure estimate = 16 * 2 days = 32 (24 transient/8 SRKW)

Friday Harbor project exposure estimate = 16 * 2 days = 32 (24 transient/8 SRKW)

Therefore, WSF is requesting authorization for Level B acoustical harassment of 32 killer whale for the Orcas project, and 32 for the Friday Harbor project, for a total of 64. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.9 Gray Whale

Gray whales generally come into Washington inland waters from March through May and sightings during the fall and winter in the San Juan Islands (when pile-driving activity will occur) are infrequent.

For these projects it shall be assumed that up to one group of 2 animals (average group size) may be present. It is assumed that if Gray whales enter the ZOIs, they will not remain, but may be present in the ZOIs for 2 days as they forage in the area.

The calculation for Gray whale exposures is estimated by:

Exposure estimate = N * 2 days foraging in ZOI:

N = # of animals (2)

Orcas project exposure estimate = 2 *2 days = 4

Friday Harbor project exposure estimate = 2 * 2 days = 4

Therefore, WSF is requesting authorization for Level B acoustical harassment of 4 Gray whale for the Orcas project, and 4 for the Friday Harbor project, for a total of 8. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.10 Humpback Whale

Nearly all recent fall and winter humpback whale sightings are largely confined to the vicinity of the San Juan Islands. Between January 2005 and February 2012, the Orca Network logged 19 sightings of humpbacks in the San Juan Islands, in the timeframe scheduled for these projects.

For these projects it shall be assumed that up to one group of 2 animals (average group size) may be present. It is assumed that if Humpback whales enter the ZOIs, they will not remain, but may be present in the ZOIs for 2 days as they forage in the area.

The calculation for Humpback whale exposures is estimated by:

Exposure estimate = N * 2 days foraging in ZOI:

N = # of animals (2)

Orcas project exposure estimate = 2 *2 days = 4

Friday Harbor project exposure estimate = 2 * 2 days = 4

Therefore, WSF is requesting authorization for Level B acoustical harassment of 4 Humpback whale for the Orcas project, and 4 for the Friday Harbor project, for a total of 8. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.11 Minke Whale

Minke whales are relatively common in the San Juan Islands. Between January 2005 and February 2012, the Orca Network logged 42 sightings of minke whales in the San Juan Islands, in the timeframe scheduled for these projects. Therefore, WSF is requesting authorization for Level B acoustical harassment take of 10 minke whales (5 for Orcas/5 for Friday harbor).

For these projects it shall be assumed that up to one group of 5 animals may be present. It is assumed that if Minke whales enter the ZOIs, they will not remain, but may be present in the ZOIs for 2 days as they forage in the area.

The calculation for Minke whale exposures is estimated by:

Exposure estimate = N * 2 days foraging in ZOI:

N = # of animals (5)

Orcas project exposure estimate = 5 *2 days = 10

Friday Harbor project exposure estimate =5 * 2 days = 10

Therefore, WSF is requesting authorization for Level B acoustical harassment of 10 Minke whale for the Orcas project, and 10 for the Friday Harbor project, for a total of 20. It is assumed that this number will include multiple harassments of the same individual(s).

6.4 Number of Takes for Which Authorization is Requested

The total number of takes for which for Level B acoustical harassment take authorization is requested is presented in the table below:

Table 6-1. Level B Acoustical Harassment Take Requests

Species	Orcas ZOI	Friday Harbor ZOI	Combined ZOIs
Harbor Seal	150	200	350
California Sea Lion	25	50	75
Northern Elephant Seal	15	30	45
Steller Sea Lion	25	50	75
Harbor Porpoise	50	100	150
Dall's Porpoise	15	30	45
Pacific White-Sided Dolphin	15	30	45
Killer Whale	32	32	64
Gray Whale	4	4	8
Humpback Whale	4	4	8
Minke Whale	10	10	20
Total	**345**	**540**	**885**

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7.0 Anticipated Impact on Species or Stocks

The anticipated impact of the activity upon the species or stock of marine mammals.

7.1 Introduction

WSF is proposing to replace dolphins at the Orcas and Friday Harbor ferry terminals using a vibratory hammer over a maximum of 52.3 hours spread over 11 days (Table 2-1/2-2) during the fall and winter of 2013/2014. These activities generate sounds that exceed thresholds considered disturbing (Level B) to local marine mammals.

WSF is requesting authorization for Level B acoustical harassment take of 350 harbor seals, 75 California sea lions, 45 Northern elephant seals, 75 Steller sea lions, 150 harbor porpoises, 45 Dall's porpoises, 45 Pacific white-sided dolphins, 120 killer whales, 8 gray whales, 8 humpback whales, and 20 minke whales (Table 6-1). These numbers in relation to the overall stock size of each species, and the effect that Level B acoustical harassment could have to individual recruitment or survival within each stock of marine mammal, are discussed in further detail below.

7.2 Harbor Seal

The harbor seal population in the inland Washington waters is stable at approximately 14,612 individuals and is considered within its Optimum Sustainable Population level (Jeffries et al. 2003). An estimated 4,000 individuals are present in the San Juan Islands (Whale Museum 2012a). This application requests incidental taking by Level B acoustical harassment of up to 350 harbor seals occurring in the vicinity of the Orcas and Friday Harbor ferry terminals. Although the estimate assumes multiple take of a few individuals (not single takes of 350 individuals) the requested number of takes represents 8.75 percent of the San Juan population, but only 2.4 percent of the stock (14,612) as a whole. Further, local seals are accustomed to disturbance by local recreation activities. Thus, the small number of incidental takes of harbor seals by Level B acoustical harassment to this large, stable population is not expected to impact recruitment or survival and therefore, will have a negligible impact on the stock.

7.3 California Sea Lion

The U.S. stock was estimated to be 238,000 in the 2010 SAR and may be at carrying capacity, although more data are needed to verify that determination (Carretta et al. 2007a). This application requests incidental taking by Level B acoustical harassment of up to 75 California sea lions(or 0.03 percent of the stock). No California sea lion haulouts are present within either of the estimated ZOIs, so incidental takes will only occur to individuals transiting the 120 dB Level B acoustical harassment ZOI and therefore, will be for a short duration. Incidental takes are only expected to result in short-term changes in behavior and potentially temporary threshold shift (TTS). These takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the U.S. stock.

7.4 Northern Elephant Seal

The California stock of northern elephant seals is considered to be a stable population with a population estimate of approximately 124,000 individuals (Carretta et al. 2007b). This application requests incidental taking by Level B acoustical harassment of up to 45 northern elephant seals (or 0.04 percent of the stock). No winter northern elephant seal haulouts are present within any ZOI, so incidental takes will only occur to individuals transiting a Level B ZOI and therefore, will be for a short duration. Incidental takes are only expected to result in short-term changes in behavior and potentially TTS. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California stock.

7.5 Steller Sea Lion

The eastern stock of Steller sea lions is estimated to be between 48,519 and 54,989 individuals (Angliss and Outlaw 2007). An estimated 1,000 to 2,000 Steller sea lions enter the Strait of Juan de Fuca during the fall months, with some number passing through Admiralty Inlet into Puget Sound (Jeffries pers. comm.. 2008b). This application requests incidental taking by Level B acoustical harassment of up to 75 Steller sea lions, which represents 7.5 to 3.75 percent of that population, but only 0.15 percent of the stock (~48,500) as a whole. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the stock.

7.6 Harbor Porpoise

Harbor porpoises are relatively common in the San Juan Islands. This application requests incidental taking by Level B acoustical harassment of up to 150 harbor porpoise. Presumably, this number would represent multiple takes of a smaller number of individuals, which represent a small fraction (1.4 percent) of the 10,682 harbor porpoise most recently estimated for the Washington Inland Waters stock (Carretta et al. 2007b). Incidental takes are only expected to result in short-term changes in behavior. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Washington Inland Waters stock.

7.7 Dall's Porpoise

The California, Oregon, and Washington stock mean abundance estimate based on 2001 ship surveys is 57,549 individuals (Barlow 2003; Forney 2007). The San Juan Islands population is estimated at about 133 individuals (Calambokidis and Baird 1994). This application requests authorization of incidental taking by Level B acoustical harassment of up to 45 individuals which represents 34 percent of the San Juan Islands population, but only 0.08 percent of the stock (~57,549) as a whole. Incidental takes are only expected to result in short-term changes in behavior. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California, Oregon, and Washington stock.

7.8 Pacific White-sided Dolphin

This application requests incidental taking by Level B acoustical harassment of up to 45 Pacific white-sided dolphins, which represents only 0.18 percent of the 25,233 individuals estimated to comprise the California, Oregon, and Washington stock (Forney 2007). These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California, Oregon, and Washington stock.

7.9 Killer Whale

The West Coast Transient stock is estimated at 354 individuals (NMFS 2010b), and the Southern Resident stock is currently 84 individuals (Whale Museum 2012b). This application requests incidental taking by Level B acoustical harassment of up to 64 killer whales (48 transient, 16 Southern Resident). This represents 14 percent of the transient stock, and 19 percent of the Southern Resident stock. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the West Coast Transient or Southern Resident stock.

7.10 Gray Whale

The North Pacific Gray whale stock is estimated at 26,000 individuals (Rugh et al. 1999; Calambokidis et al. 1994; Angliss and Outlaw 2007). Regional estimates that include the San Juan Islands estimate up to 153 individuals (Calambokidis et al. 2004b). This application requests incidental taking by Level B acoustical harassment of up to 4 gray whales, which represents 2.6 percent of this population, but only 0.02 percent of the stock. Gray whales entering the Level B ZOIs during pile driving would be considered a very rare event. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Eastern North Pacific stock.

7.11 Humpback Whale

The Eastern North Pacific stock is estimated at 1,100 to 1,300 individuals (Carretta et al. 2007a; Calambokidis et al. 2008), and the Washington inland waters population at around 100 individuals (Calambokidis et al. 2008). This application requests incidental taking by Level B acoustical harassment of up to 8 animals (4 groups), which represents 8 percent of the Washington inland waters population, but only 0.7 percent of the stock. Humpback whales entering the Level B ZOI during pile driving would be considered a rare event. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Eastern North Pacific stock.

7.12 Minke Whale

The California/Oregon/Washington stock is estimated at 500 to 1,015 individuals (Barlow 2003; Carretta et al. 2007; NMFS 208b), and the San Juan Islands population is estimated to be 30 individuals. This application requests incidental taking by Level B acoustical harassment of up to 20 minke whales, which represents 67 percent of the San Juan Islands population, but only 4 percent of the stock. Minke whales entering the Level B ZOIs during pile driving would be considered a rare event. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California/Oregon/Washington stock.

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8.0 Anticipated Impact on Subsistence

The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.

8.1 Subsistence Harvests by Northwest Treaty Indian Tribes

Historically, Pacific Northwest Native American tribes were known to hunt several species of marine mammals including, but not limited to harbor seals, Steller sea lions, northern fur seals, gray whales, and humpback whales (B. Norberg pers. comm. 2007b). More recently, several Pacific Northwest Native American tribes have promulgated tribal regulations allowing tribal members to exercise treaty rights for subsistence harvest of harbor seals and California sea lions (Carretta et al. 2007a). The Makah Indian Tribe (Makah) has specifically passed hunting regulations for gray whales (B. Norberg pers. comm. 2007b). However, the directed take of marine mammals (not just gray whales) for ceremonial and/or subsistence purposes was enjoined by the Ninth Circuit Court of Appeals in rulings against the Makah in 2002, 2003, and 2004 (B. Norberg pers. comm. 2007b; NMFS 2007). Currently, there are no authorized ceremonial and/or subsistence hunts for marine mammals in Puget Sound or the San Juan Islands (B. Norberg pers. comm. 2007b) with the possible exception of some coastal tribes who may allow a small number of directed take for subsistence purposes.

8.1.1 Harbor Seals

The U.S. Pacific Marine Mammal Stock Assessments for 2006 (Carretta et al. 2007a) reports that there have been few takes of harbor seals from directed tribal subsistence hunts. They state that a few seals may have been taken in directed hunts because tribal fishers are able to use seals caught incidental to fishing operations in the northern Washington marine set gillnet and Washington Puget Sound Region treaty salmon gillnet fisheries for their subsistence needs.

No impacts on the availability of the species or stocks to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.2 California Sea Lions

Current estimates of annual subsistence take are zero to two animals per year (NMFS 2011).

No impacts on the availability of the species or stock to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.3 Gray Whales

The Makah ceased whaling in the 1920s after commercial whaling decimated the Eastern North Pacific gray whale population (NMFS 2007). On June 16, 1994, gray whales were removed from the endangered species list after a determination that the population has “recovered to near its estimated original population size and is neither in danger of extinction throughout all or a significant portion of its range, nor likely to again become endangered within the foreseeable future throughout all or a significant portion of its range” (59 FR 31094). On May 5, 1995, the Makah formally notified the U.S. Government of its interest in resuming treaty ceremonial and subsistence harvest of Eastern North Pacific gray whales, asking the Department of Commerce to represent them in seeking approval from the International Whaling Commission (IWC) for an annual quota (NMFS 2007). On October 18, 1997, the IWC approved an aboriginal subsistence quota of 620 Eastern North Pacific gray whales (with an annual cap of 140) for the Russian Checotah people and the Makah (Angliss and Outlaw 2007; NMFS 2007). The Makah successfully hunted one Eastern North Pacific gray whale on May 17, 1999 (NMFS 2005a).

Whaling by the Makah was halted on December 20, 2002, when the Ninth Circuit Court of Appeals ruled that an environmental impact statement rather than an environmental assessment should have been prepared under the National Environmental Protection Act and that the Makah must comply with the process prescribed in the MMPA for authorizing take of marine mammals otherwise prohibited by a moratorium (NMFS 2007). This was further upheld by rulings in 2003 and 2004 (NMFS 2007). At a 2007 meeting of the IWC (59th Annual Meeting in Anchorage, Alaska), an aboriginal subsistence quota for gray whales was again approved for natives in Russia and 20 whales (four per year for 5 years) for the Makah (Norberg pers. comm. 2007b), but under the Ninth Circuit Court ruling the Makah must first obtain a waiver of the MMPA take moratorium before harvesting under their IWC quota (Norberg pers. comm. 2007b). In February 2005, NMFS received a request from the Makah for a waiver of the MMPA take moratorium to resume limited hunting of Eastern North Pacific gray whales. A draft environmental impact statement to examine the alternatives for a decision to approve or deny the waiver was released for public comment on May 9, 2008, but to date, no final ruling has been made and the future of the Makah whale hunt remains in limbo.

However, any future hunts by the Makah would occur along the outer coast of Washington, not in the San Juan Islands. Therefore, the proposed activities would not interfere with any future hunt.

9.0 Anticipated Impact on Habitat

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

9.1 Introduction

Construction activities will have temporary impacts on marine mammal habitat by producing temporary disturbance primarily through increases in air noise and in-water sound pressure levels from pile driving. Other potential temporary changes are water quality (primarily through increases in turbidity levels) and prey species distribution. Best management practices (BMPs) and minimization practices used by WSF to minimize potential environmental effects from project activities are outlined in Section 11, Mitigation Measures.

9.2 In-air Noise Disturbance to Haulouts

In-air noise from vibratory pile driving is estimated to reach the behavioral threshold at 37 m for harbor seals and 12 m for all other pinnipeds. No haulout sites are within the in-air disturbance threshold distances. Therefore, no disturbance to hauled-out pinnipeds is expected, but terrestrial noise-disturbance may disturb pinnipeds while surfacing when swimming within the threshold distances. In-air noise from non-pile driving construction activities is not expected to cause in-air disturbance to pinnipeds, because the Orcas and Friday Harbor ferry terminals are currently subject to similar existing levels of in-air noise from ferry, boat, road, and other noise sources.

9.3 Underwater Noise Disturbance

NMFS is currently using an underwater noise disturbance threshold of 120 dB_{RMS} for pinnipeds and cetaceans for continuous noise sources. The distance to the Level B acoustical harassment thresholds is described in Section 2, Dates, Duration, and Region of Activity.

For cetaceans, sound is perhaps the most critical sensory pathway of information. Odontocetes, such as killer whales and dolphins, communicate with each other over short and long distances with a variety of clicks, chirps, squeaks, and whistles. They also use echolocation to find prey and to navigate. Long-term impacts from noise pollution to habitat would not likely show up as noticeable behavioral changes in habitat use, but rather as sensory damage or a gradual reduction in population health.

There are several short-term and long-term effects from noise exposure that may occur to marine mammals including impaired foraging efficiency and its potential effects on movements of prey, as well as harmful physiological conditions, energetic expenditures, and temporary or permanent hearing threshold shifts due to chronic stress from noise (Southall et al. 2007). The majority of the research on underwater noise impacts on whales is associated with vessel and navy sonar disturbances and does not often address impacts from pile driving. The NMFS (2008a) states that the threshold levels at which anthropogenic noise becomes harmful to killer whales are poorly understood. Because whale and pinniped occurrence is for the most part transient near the Orcas and Friday Harbor ferry terminals, and underwater noise impacts are localized and of short duration, any impact on individual marine mammals will be limited.

9.4 Water and Sediment Quality

Short-term turbidity is a water quality effect of most in-water work, including removing and installing piles. WSF must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area.

Roni and Weitkamp (1996) monitored water quality parameters during a pier replacement project in Manchester, Washington. The study measured water quality before, during, and after pile removal and pile replacement. The study found that construction activity at the site had "little or no effect on dissolved oxygen, water temperature, and salinity", and turbidity (measured in nephelometric turbidity units [NTU]) at all depths nearest the construction activity was typically less than 1 NTU higher than stations farther from the construction area throughout construction.

Similar results were recorded during pile removal operations at two WSF ferry facilities. At the Friday Harbor terminal, localized turbidity levels (from three timber pile removal events) were generally less than 0.5 NTU higher than background levels and never exceeded 1 NTU. At the Eagle Harbor maintenance facility, local turbidity levels (from removal of timber and steel piles) did not exceed 0.2 NTU above background levels. In general, turbidity associated with pile installation is localized to about a 25-foot radius around the pile (Everitt et al. 1980).

Cetaceans are not expected to be close enough to the Orcas and Friday Harbor ferry terminals to experience turbidity, and any pinnipeds will be transiting the terminal areas and could avoid the localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals.

Removal of the timber dolphins at Orcas and Friday Harbor ferry terminal will result in 197 creosote-treated piles (334 tons) removed from the marine environment. This will result in the potential, temporary and localized sediment re-suspension of some of the contaminants associated with creosote, such as polycyclic aromatic hydrocarbons. However, the actual removal of the creosote-treated wood piles from the marine environment will result in a long-term improvement in water and sediment quality, meeting the goals of WSF's Creosote Removal Initiative started in 2000. The net impact is a benefit to marine organisms, especially toothed whales and pinnipeds that are high in the food chain and bioaccumulate these toxins. This is especially a concern for long-lived species that spend their entire life in Puget Sound, such as Southern Resident killer whales (NMFS 2008a).

9.5 Passage Obstructions

Pile removal and installation operations at the Orcas and Friday Harbor ferry terminals will not obstruct movements of marine mammals. The operations at Orcas will occur within 75 m of the shoreline leaving 1 km of the channel for marine mammals to pass. At Friday Harbor, operations will occur within 160 m of the shoreline leaving 0.4 km of the harbor for marine mammals to pass. Further, a construction barge will be used to remove and install the pilings. In a previous concurrence letter for the Vashon Island Dolphin Replacement Project (August 4, 2008), NMFS stated the following:

> Vessels associated with any project are primarily tug/barges, which are slow moving, follow a predictable course, do not target whales, and should be easily detected by whales when in transit. Vessel strikes are extremely unlikely and any potential encounters with Southern Residents [killer whales] are expected to be sporadic and transitory in nature.

Similarly, vessel strikes are unlikely for the proposed project.

9.6 Conclusions Regarding Impacts on Habitat

The most likely effects on marine mammal habitat for the proposed project are temporary, short duration underwater noise, and water quality effects. The direct loss of habitat available to marine mammals during construction due to noise or water quality impacts and construction activity is expected to be minimal. All marine mammal species utilizing habitat near the terminal are primarily transiting the terminal area.

For the most part, any adverse effects on prey species during project construction will be short term. Given the large numbers of fish and other prey species in the San Juan Islands, the short-term nature of effects on fish species, and the mitigation measures (using vibratory hammer and BMPs (operating outside the fish window) to protect salmonids during construction, the proposed project is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species.

Long-term water quality improvements in the Georgia Basin will result from WSF's replacement of creosote-treated timber structures with steel pilings. Because many of the marine mammal species potentially present are at the top of the food chain and have a long life expectancy, bioaccumulation of toxins is of high concern. Removal of creosote from the aquatic environment has a beneficial effect on marine mammals.

Passage is not expected to be obstructed as a result of the proposed projects. Any temporary obstruction due to barge placement will be localized and limited in duration, and traveling barges are too slow to strike marine mammals.

10.0 Anticipated Impact of Loss or Modification of Habitat

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The proposed project will occur within the existing Orcas and Friday Harbor ferry terminal operational footprints and is not expected to result in a significant permanent loss or modification of habitat for marine mammals or their food sources. The most likely effects on marine mammal habitat for the proposed project are temporary, short duration underwater noise, prey (fish) disturbance, and water quality effects. The direct loss of habitat available to marine mammals during construction due to noise or water quality impacts and construction activity is expected to be minimal. These temporary impacts have been discussed in detail in Section 9.0, Anticipated Impact on Habitat.

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11.0 Mitigation Measures

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

WSF activities are subject to federal, state, and local permit regulations. WSF has developed and routinely uses the best guidance available (e.g., BMPs and mitigation measures [MMs]) to avoid and minimize (to the greatest extent possible) impacts on the environment, ESA species, designated critical habitats, and species protected under the MMPA.

The MMs will be employed during all pile removal and installation activities at the Orcas and Friday Harbor ferry terminals. The language in each MM is included in the Contract Plans and Specifications and must be agreed upon by the contractor prior to any pile activities. Upon signing the contract, it becomes a legal agreement between the Contractor and WSF. Failure to follow the prescribed MMs is a contract violation.

General MMs used for all construction practices are listed first (Section 11.1, All Construction Activities), followed by specific MMs for pile related activities (Section 11.2, Pile Removal and Installation). The MMs listed under Section 11.1 apply to different activities and are, therefore, listed additional times where appropriate. Specific MMs have been developed to reduce the potential for harassment to marine mammals; these are described beginning in Section 11.2.3.

11.1 All Construction Activities

All WSF construction is performed in accordance with the current WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. Special Provisions contained in preservation and repair contracts are used in conjunction with, and supersede, any conflicting provisions of the Standard Specifications.

- All construction equipment will comply with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment will have noise control devices no less effective than those provided on the original equipment.
- WSF policy and construction administration practice is to have a WSF inspector on site during construction. The role of the inspector is to ensure contract compliance. The inspector and the contractor each have a copy of the Contract Plans and Specifications on site and are aware of all requirements. The inspector is also trained in environmental provisions and compliance.
- The contractor will be advised that eelgrass beds are protected under state and federal law. When work will occur near eelgrass beds, WSF will provide plan sheets showing eelgrass boundaries to the contractor. The contractor shall exercise extreme caution when working in the area indicated on the plans as “Eelgrass Beds.” The contractor shall adhere to the following restrictions during the life of the contract.

- The contractor shall not:
    - Place derrick spuds or anchors in the area designated as "Eelgrass."
    - Shade the eelgrass beds for a period of time greater than 3 consecutive days during the growing season (generally March through September).
    - Allow debris or any type of fuel, solvent, or lubricant in the water.
    - Perform activities which could cause significant levels of sediment to contaminate the eelgrass beds.
    - Conduct activities that may cause scouring of sediments within the eelgrass beds or other types of sediment transfer out of or into the eelgrass beds.
    - Any damage to eelgrass beds or substrates supporting eelgrass beds that results from a contractor's operations will be repaired at the contractor's expense.
- WSF will obtain Hydraulic Project Approval (HPA) from WDFW as appropriate and the contractor will follow the conditions of the HPA. HPA requirements are listed in the contract specifications for the contractor to agree to prior to construction, and the HPA is attached to the contract such that conditions of the HPA are made part of the contract.
- The contractor shall be responsible for the preparation of a Spill Prevention, Control, and Countermeasures (SPCC) plan to be used for the duration of the project. The plan shall be submitted to the Project Engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
    - The SPCC plan shall identify construction planning elements, and recognize potential spill sources at the site. The SPCC plan shall outline BMPs, responsive actions in the event of a spill or release, and identify notification and reporting procedures. The SPCC plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
    - The SPCC will outline what measures shall be taken by the contractor to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."
    - The contractor shall maintain, at the job site, the applicable spill response equipment and material designated in the SPCC plan.
    - The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfers valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.

- No petroleum products, fresh cement, lime or concrete, chemicals, or other toxic or deleterious materials shall be allowed to enter surface waters.
- WSF will comply with water quality restrictions imposed by Ecology (Chapter 173-201A WAC), which specify a mixing zone beyond which water quality standards cannot be exceeded. Compliance with Ecology's standards is intended to ensure that fish and aquatic life are being protected to the extent feasible and practicable.
- Wash water resulting from washdown of equipment or work areas shall be contained for proper disposal, and shall not be discharged into state waters unless authorized through a state discharge permit.
- Equipment that enters the surface water shall be maintained to prevent any visible sheen from petroleum products appearing on the water.
- There shall be no discharge of oil, fuels, or chemicals to surface waters, or onto land where there is a potential for reentry into surface waters.
- No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.
- The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.
- Projects and associated construction activities will be designed so potential impacts on species and habitat are avoided and minimized to the extent practicable.

11.1.1 Timing Windows

Timing restrictions are used to avoid in-water work when ESA-listed salmonids are most likely to be present. The combined work window for in-water work for the Orcas and Friday Harbor ferry terminals is July 16 through February 15. Actual construction activities are planned to take place from September 1, 2013 and February 15, 2014.

11.2 Pile Removal and Installation

Specific to pile removal and installation, the following mitigation measures are proposed by WSF to reduce impacts on marine mammals to the lowest extent practicable.

11.2.1 Pile Removal

MMs to be employed during pile removal include:

- A containment boom surrounding the work area will be used during creosote-treated pile removal to contain and collect any floating debris and sheen, provided that the boom does not interfere with operations. The contractor will also retrieve any debris generated during construction and properly disposed of at an approved upland location.
- The contractor will have oil-absorbent materials on site to be used in the event of a spill if any oil product is observed in the water.
- All creosote-treated material, pile stubs, and associated sediments will be disposed of by the contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC. The contractor will provide receipts of disposal to the WSF Project Engineer. Both waste facilities that accept creosote waste in Washington State dispose of the piling in a landfill where they are buried.
- Removed piles, stubs, and associated sediments (if any) shall be contained on a barge. If piles are placed directly on the barge and not in a container, the storage area shall consist of a row of hay or straw bales, or filter fabric, placed around the perimeter of the barge.
- Excess or waste materials will not be disposed of or abandoned waterward of ordinary high water (OHW) or allowed to enter waters of the state, as per WAC 220-110-070. Waste materials will be disposed of in a landfill. Hazardous waste and treated wood waste will be disposed of by the contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC.
- Pilings that break or are already broken below the waterline may be removed by wrapping the piles with a cable or chain and pulling them directly from the sediment with a crane. If this is not possible, they will be removed with a clamshell bucket. To minimize disturbance to bottom sediments and splintering of piling, the contractor will use the minimum size bucket required to pull out piling based on pile depth and substrate. The clamshell bucket will be emptied of piling and debris on a contained barge before it is lowered into the water. If the bucket contains only sediment, the bucket will remain closed and be lowered to the mudline and opened to redeposit the sediment. In some cases (depending on access, location, etc.), piles may be cut below the mudline and the resulting hole backfilled with clean sediment.
- Demolition and construction materials shall not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.

11.2.2 Pile Removal and Installation

MMs to be employed during pile removal and installation include:

- The vibratory hammer method will be used to remove timber piles, and install steel piles to minimize noise levels.
- Marine mammal monitoring during vibratory pile removal and installation will be employed for the Level B ZOI (see Section 11.2.3, Marine Mammal Monitoring).
- Excess or waste materials will not be disposed of or abandoned waterward of OHW/MHHW or allowed to enter waters of the state, as per WAC 220-110-070. Waste materials will be disposed of in a landfill. Hazardous waste and treated wood waste will be disposed of by the contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC.
- WSF will comply with water quality restrictions imposed by Ecology (Chapter 173-201A WAC), which specifies a mixing zone beyond which water quality standards cannot be exceeded. Compliance with Ecology's standards is intended to ensure that fish and aquatic life are being protected to the extent feasible and practical.
- Creosote-treated timber piling shall be replaced with hollow steel piling.
- The contractor will be required to retrieve any floating debris generated during construction. Any debris in the containment boom will be removed by the end of the work day or when the boom is removed, whichever occurs first. Retrieved debris will be disposed of at an upland disposal site. Debris will be disposed of upland.
- Whenever activities that generate sawdust, drill tailings, or wood chips from treated timbers are conducted, tarps or other containment material shall be used to prevent debris from entering the water. If tarps cannot be used (because of the location or type of structure), a containment boom will be placed around the work area to capture debris and cuttings.
- Excess or waste materials will not be disposed of or abandoned waterward of OHW/MHHW or allowed to enter waters of the state.
- Demolition and construction materials shall not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.

11.2.3 Marine Mammal Monitoring

11.2.3.1 Coordination

WSF will conduct briefings between the construction supervisors and the crew and marine mammal observer(s) prior to the start of pile-driving activity, marine mammal monitoring protocol and operational procedures.

Prior to the start of pile driving, the Orca Network and/or Center for Whale Research will be contacted to find out the location of the nearest marine mammal sightings. The Orca Sightings Network consists of a list of over 600 (and growing) residents, scientists, and government agency personnel in the U.S. and Canada. Sightings are called or emailed into the Orca Network and immediately distributed to other sighting networks including: the Northwest Fisheries Science Center of NOAA Fisheries, the Center for Whale Research, Cascadia Research, the Whale Museum Hotline, and the British Columbia Sightings Network.

'Sightings' information collected by the Orca Network includes detection by hydrophone. The SeaSound Remote Sensing Network is a system of interconnected hydrophones installed in the marine environment of Haro Strait (west side of San Juan Island) to study orca communication, underwater noise, bottomfish ecology, and local climatic conditions. A hydrophone at the Port Townsend Marine Science Center measures average underwater sound levels and automatically detects unusual sounds. These passive acoustic devices allow researchers to hear when different marine mammals come into the region. This acoustic network, combined with the volunteer (incidental) visual sighting network allows researchers to document presence and location of various marine mammal species.

With this level of coordination in the region of activity, WSF will be able to get real-time information on the presence or absence of marine mammal species, particularly whales, before starting any pile driving.

11.2.3.2 Visual Monitoring

WSF has developed a monitoring plan that will collect sighting data for each distinct marine mammal species observed during pile driving activities. Marine mammal behavior, overall numbers of individuals observed, frequency of observation, and the time corresponding to the daily tidal cycle will also be included. Qualified marine mammal observers will be present on site at all times during pile removal and driving. A monitoring plan is included in Appendix B.

11.2.3.3 Soft Start

Soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. The procedure will be repeated two additional times. Monitoring for marine mammal presence will take place 30 minutes before, during and 20 minutes after pile driving.

Each day, WSF will use the soft-start technique at the beginning of pile removal or driving, or if pile removal or driving has ceased for more than one hour.

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12.0 Arctic Subsistence Uses, Plan of Cooperation

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;

(iii) A description of what measures the applicant has taken an/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

This section is not applicable. The proposed activities will take place in Washington State, specifically the San Juan Islands/Georgia Basin. No activities will take place in or near a traditional Arctic subsistence hunting area.

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13.0 Monitoring and Reporting Plan

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

13.1 Monitoring Plan

WSF has developed a marine mammal monitoring plan for these projects. This monitoring plan is detailed in Section 11.2.3, Marine Mammal Monitoring, and attached separately in Appendix B.

13.2 Reporting Plan

WSF will provide NMFS with a draft monitoring report within 90 days of the conclusion of monitoring. This report will detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed.

If comments are received from the Regional Administrator on the draft report, a final report will be submitted to NMFS within 30 days thereafter. If no comments are received from NMFS, the draft report will be considered to be the final report.

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14.0 Coordinating Research to Reduce and Evaluate Incidental Take

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

Underwater noise generated by vibratory pile driving at the Orcas and Friday Harbor ferry terminals is the primary issue of concern relative to local marine mammals. WSF has conducted research on sound propagation from vibratory hammers, and plans on continuing that research to provide data for future ferry terminal projects.

WSF does plan to coordinate with local marine mammal sighting networks (Orca Network, the Center for Whale Research, and/or the Whale Museum Whale Hotline) to gather information on the location of the Southern Resident killer whales (and other whales) prior to initiating pile-driving activity. Marine mammal monitoring will be conducted to collect information on presence of marine mammals within the ZOIs for these projects.

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15.0 References

Angliss, R.P. and R.B. Outlaw. 2007. Alaska Marine Mammal Stock Assessments, 2006. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-168. 244 pp.

Baird, R.W. 2003. Update COSEWIC status report on the harbour porpoise *Phocoena phocoena* (Pacific Ocean population) in Canada, *in* COSEWIC assessment and update status report on the harbour porpoise *Phocoena phocoena* (Pacific Ocean population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1–22 pp.

———. 2000. The killer whales, foraging specializations and group hunting. Pages 127-153 in J. Mann, R.C. Connor, P.L. Tyack, and H. Whitehead (editors). Cetacean societies: field studies of dolphins and whales. University of Chicago Press, Chicago, Illinois.

Baird, R.W. and L.M. Dill. 1996. Ecological and social determinants of group size in transient killer whales. *Behavioral Ecology* 7:408–416.

———. 1995. Occurrence and behavior of transient killer whales: seasonal and pod-specific variability, foraging behavior and prey handling. *Canadian Journal of Zoology* 73:1300–1311.

Barlow, J. 2003. Preliminary estimates of the abundance of cetaceans along the U.S. West Coast: 1991-2001. Southwest Fisheries Science Center Administrative Report LJ-03-03. Available from SWFSC, 8604 La Jolla Shores Dr. La Jolla CA 92037. 31p. As cited in Carretta et al. 2007.

———. 1995. The abundance of cetaceans in California waters. Part I: Ship surveys in summer and fall of 1991. *Fish. Bull.* 93:1–14.

Barrett-Lennard, L.G. 2000. Population structure and mating patterns of killer whales as revealed by DNA analysis. Ph.D. Thesis, University of British Columbia, Vancouver, British Columbia.

Barrett-Lennard, L.G. and G.M. Ellis. 2001. Population structure and genetic variability in northeastern Pacific killer whales: towards an assessment of population viability. Research Document 2001/065, Canadian Science Advisory Secretariat, Fisheries and Oceans Canada, Ottowa, Ontario.

Bigg, M.A. 1985. Status of the Steller sea lion (*Eumetopias jubatus*) and California sea lion (*Zalophus californianus*) in British Columbia. *Can. Spec Pub. Fish. Aquat. Sci.* 77. 20 p.

———. 1981. Harbour seal, *Phoca vitulina*, Linnaeus, 1758 and *Phoca largha*, Pallas, 1811. Pp. 1-27, In S.H. Ridgway and R.J. Harrison (eds.), Handbook of Marine Mammals, vol.2: Seals. Academic Press, New York, New York.

———. 1969. The harbour seal in British Columbia. *Fish. Res. Board Can. Bull.* 172. 31 p.

Bonnell, M.L., C.E. Bowlby, G.A. Green. 1991. Pinniped Distribution and Abundance off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue WA and Ecological Consulting Inc. Portland OR, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 60 pp.

Boveng, P. 1988. Status of the Pacific harbor seal population on the U.S. west coast. Admin. Rep. LJ-88-06. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, California, 92038. 43 pp.

Brown, R.F. 1988. Assessment of pinniped populations in Oregon, April 1984 to April 1985. NMFS-NWAFC Processed Rep. 8805, 44 p. Alaska Fisheries Science Center, Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way NE, Seattle, Washington, 98115.

Brown, R., and B. Mate. 1983. Abundance, movements and feeding habits of harbor seals, *Phoca vitulina*, at Netarts and Tillamook Bays, Oregon. *Fish. Bull.* 81:291–301.

Brown, R., S. Jeffries, B. Wright, M. Tennis, P. Gearin, S. Riemer, and D. Hatch. 2007. Filed Report -2007 Pinniped research and management activities at Bonneville Dam. August 29.

Burgess, W.C., S.B. Blackwell, and R. Abbott. 2005. Underwater acoustic measurements of vibratory pile driving at the Pipeline 5 crossing in the Snohomish River, Everett, Washington, Greeneridge Rep. 322-2, Rep. from Greeneridge Sciences Inc., Santa Barbara, California, for URS Corporation, Seattle, Washington, and the City of Everett, Everett, Washington. 35 pp.

CALTRANS 2007. California Pile Driving Compendium.

http://www.dot.ca.gov/hq/env/bio/files/pile_driving_snd_comp9_27_07.pdf

Calambokidis, John. 2008. Personal communication with Erin Britton. July 30, 2008. Cascadia Research, Olympia, Washington.

———. 2007. Summary of collaborative photographic identification of gray whales from California to Alaska for 2004 and 2005. Cascadia Research, Olympia, Washington. June 2007.

———. 2006. Personal communication between John Calambokidis (Research Biologist with Cascadia Research Collective) and Andrea Balla-Holden (Fisheries and Marine Mammal Biologist). June 2006.

Calambokidis, J. and R.W. Baird. 1994. Status of marine mammals in the Strait of Georgia, Puget Sound, and the Juan de Fuca Strait, and potential human impacts. *Canadian Technical Report of Fisheries and Aquatic Sciences* 1948:282–300.

Calambokidis, J., E.A. Falcone, T.J. Quinn, A.M. Burdin, P.J. Clapham, J.K.B. Ford, C.M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-Bracho, J.M. Straley, B.L. Taylor, J. Urban R., D. Weller, B.H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A. Havron, J. Huggins, and N. Maloney. 2008. SPLASH: Structure of populations, levels of abundance and status if humpback whales in the North Pacific. Final Report for Contract AB133F-03-RP-00078. Cascadia Research Olympia, Washington. Prepared for the Department of Commerce, Western Administrative Center, Seattle, Washington. May 2008.

Calambokidis, J., G.H. Steiger, D.K. Ellifrit, B.L. Troutman, and C.E. Bowlby. 2004a. Distribution and abundance of humpback whales (*Megaptera novaeangliae*) and other marine mammals off the northern Washington coast. *Fish. Bull.* 102:563–580.

Calambokidis, J., R. Lumper, J. Laake, M. Gosho, and P. Gearin. 2004b. Gray whale photographic identification in 1998-2003: collaborative research in the Pacific Northwest. National Marine Mammal Laboratory, Seattle Washington, December 2004.

Calambokidis, J., J.D. Darling, V. Deecke, P. Gearin, M. Gosho, W. Megill, C.M. Tombach, D. Goley, C. Toropova, and B. Gisborne. 2002. Abundance, range and movements of a feeding aggregation of gray whales (*Eschrichtus robustus*) from California to southeastern Alaska in 1998. *J. Cetacean Res. Manage* 4(3):267–276.

Calambokidis, J., G.H. Steiger, J.M. Straley, T.J. Quinn, II, L.M. Herman, S. Cerchio, D.R. Salden, M. Yamaguchi, F. Sato, J. Urbán R., J. Jacobsen, O. von Ziegesar, K.C. Balcomb, C.M. Gabriele, M.E. Dahlheim, N. Higashi, S. Uchida, J.K.B. Ford, Y. Miyamura, P. Ladrón de Guevara P., S.A. Mizroch, L. Schlender and K. Rasmussen. 1997. Abundance and population structure of humpback whales in the North Pacific Basin. Final Contract Report 50ABNF500113 to Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California 92038. 72p.

Calambokidis, John, Joseph R. Evenson, Gretchen H. Steiger and Steven J. Jeffries. 1994. Gray whales of Washington State: natural history and photographic catalog. Cascadia Research Collective, Olympia, Washington.

Calambokidis, J., J.C. Cubbage, J.R. Evenson, S.D. Osmek, J.L. Laake, P.J. Gearin, B.J. Turnock, S.J. Jeffries, and R.F. Brown. 1993. Abundance estimates of harbour porpoise in Washington and Oregon waters. Report to the National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, Washington. 55 p.

Calambokidis, J., J.R. Evenson, J.C. Cubbage, P.J. Gearin, and S.D. Osmek. 1992. Harbour porpoise distribution and abundance estimate off Washington from aerial surveys in 1991. Report to the National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, Washington. 44 p.

Calambokidis, J., S.M. Speich, J. Peard, G.H. Steiger, J.C. Cubbage, D.M. Fry, and L.J. Lowenstine. 1985. Biology of Puget Sound marine mammals and marine birds: Population health and evidence of pollution effects. NOAA Tech. Memo. NOS OMA 18, National Technical Information Service, Springfield, Virginia 159 p.

Campbell. 1987. Status of the northern elephant seal, *Mirounga angustirostris*, in Canada. *Can. Field Nat.* 101:266–270.

Carlson, T.J. 1996. The characterization of underwater infrasound generated by vibratory pile driving within the context of the characteristics of sound known to result in avoidance response by juvenile salmonids. Appendix A report prepared for Oregon State University. 19 pp.

Carretta, J. V., K. A. Forney, M. S. Lowry, J. Barlow, J. Baker, D. Johnston, B. Hanson, M. M. Muto, D. Lynch, and L. Carswell. 2009. U.S. Pacific marine mammal stock assessments: 2008. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-434. 336 pp.

Carretta, J. V., K. A. Forney, M. M. Muto, J. Barlow, J. Baker, B. Hanson, and M. Lowry. 2007a. US Pacific Marine Mammal Stock Assessments: 2006. NOAA-TM-NMFS-SWFSC-398. U.S. Department of Commerce. January 2007.

———. 2007b. US Pacific Marine Mammal Stock Assessments: 2007. NOAA-TM-NMFS-SWFSC-414. US Department of Commerce. December 2007.

Center for Whale Research. 2011. The Center for Whale Research, Friday Harbor WA. Website: http://www.whaleresearch.com/thecenter/research.html. Accessed on July 7, 2011.

Code of Federal Regulations (CFR). 2008. Regulations governing the taking and importing of marine mammals. Title 50, Chapter II, Subchapter C, Part 216. December.

Dorsey, E.M., S.J. Stern, A.R. Hoelzel and J. Jacobsen. 1990. Minke Whale *Balaenoptera acutorostrata* from the west coast of North America: individual recognition and small-scale site fidelity. *Rept. Int. Whal. Comm.* Special Issue 12:357–368.

Everitt, R.D., C.H. Fiscus, and R.L. DeLong. 1980. Northern Puget Sound Marine Mammals. DOC/EPA Interagency Energy/ Environ. R&D Program. Doc. #EPA-6009/7-80-139, U.S. Environmental Protection Agency, Washington, D.C. 134 p.

Federal Register. 2006. Endangered and threatened species; Designation of critical habitat for the Southern Resident Killer Whale; Final Rule. 50 CFR Part 226. Vol. 71, No. 229, pp. 690540-069070.

Fisher, H.D. 1952. The status of the harbour seal in British Columbia, with particular reference to the Skeena River. *Fish. Res. Bd. Can. Bull.* 93:58 pp.

Ford, J.K.B. 1989. Acoustic behavior of resident killer whales (*Orcinus orca*) off Vancouver Island, British Columbia. *Canadian Journal of Zoology* 67:727–745.

Ford, J.K.B. and G.M. Ellis. 1999. Transients: mammal-hunting killer whales of British Columbia, Washington, and southeastern Alaska. UBC Press, Vancouver, British Columbia.

Ford, J.K.B., G.M. Ellis, and K.C. Balcomb. 2000. Killer whales: the natural history and genealogy of *Orcinus orca* in British Columbia and Washington State. 2nd ed. UBC Press, Vancouver, British Columbia.

———. 1994. Killer whales: the natural history and genealogy of *Orcinus orca* in British Columbia and Washington State. UBC Press, Vancouver, British Columbia.

Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the U.S. West Coast and within four National Marine Sanctuaries during 2005. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-406. 28 pp.

Forney, K.A., J. Barlow, and J.V. Carretta. 1995. The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. *Fish. Bull.* 93:15–26.

Gambell, R. 1976. World Whale stocks. *Mammal Review* 6:41–53.

Gaskin, D.E. 1984. The harbour porpoise (*Phocoena phocoena* L.): regional populations, status, and information on direct and indirect catches. *Rep. Int. Whal. Comm*. 34:569–586.

Gearin, P. 2008. Personal communication with Sharon Rainsberry on October 20, 2008. National Marine Fisheries Service. National Marine Mammal Laboratory, Seattle, Washington.

Gearin, P., R. DeLong, and B. Ebberts. 1988. Pinniped interactions with tribal steelhead and coho fisheries in Puget Sound. Unpubl. manuscr., 23 p. (Available from Alaska Fisheries Science Center, Natl. Mar. Fish. Serv, NOAA, 7600 Sand Point Way NE, Seattle, Washington 98115.)

Gearin, P., R. Pfeifer, and S. Jeffries. 1986. Control of California sea lion predation of winter-run steelhead at the Hiram M. Chittenden Locks, Seattle, December 1985-April 1986 with observations on sea lion abundance and distribution in Puget Sound. Washington Department of Game Fishery Management Report 86-20, Olympia, Washington. 108 p.

Gisiner, R.C. 1985. Male territorial and reproductive behavior in Steller sea lion. *Eumetopias jubatus*. Ph.D. Thesis, University of California, Santa Cruz, California. 145 pp.

Green, G.A., R.A. Grotefendt, M.A. Smultea, C.E. Bowlby, and R.A. Rowlett. 1993. Delphinid aerial surveys in Oregon and Washington waters. Final Report prepared for NMFS, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, Washington, 98115, Contract #50ABNF200058.

Green, G.A., J.J. Brueggeman, R.A. Grotefendt, C.E. Bowlby, M.L. Bonnell, and K.C. Balcomb, III. 1992. Cetacean distribution and abundance off Oregon and Washington. Ch. 1. In: Oregon and Washington Marine Mammal and Seabird Surveys. OCS Study 91-0093. Final Report prepared for Pacific OCS Region, Minerals Management Service, U.S. Department of the Interior, Los Angeles, California.

Green, G.A., J.J. Brueggeman, C.E. Bowlby, R.A. Grotefendt, M.L. Bonnell, and K.T. Balcomb, III. 1991. Cetacean Distribution and Abundance off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue Washington and Ecological Consulting Inc., Portland Oregon, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 100 pp.

Green, G.A., J.J. Brueggeman, R.A. Grotefendt, and C.E. Bowlby. 1995. Offshore distances of gray whales migrating along the Oregon and Washington coasts, 1990. Northw. Sci. 69:223-227.

Greeneridge. 2007. Greeneridge Sciences Inc. Radius Calculator web page. Available at: <http://www.greeneridge.com>.

Guan, S. 2012. Personal communication between Shane Guan (NMFS) and Rick Huey (WSF) on September 25, 2012.

Hall, A. M. 2008. Personal communication (email) between Sharon Rainsberry, WSDOT biologist, and Anna Hall, PhD candidate, Marine Mammal Research Unit, University of British Columbia, December 10, 2008.

———. 2004. Seasonal abundance, distribution and prey species of harbour porpoise (*Phocoena phocoena*) in southern Vancouver Island waters. Master Thesis. University of British Columbia.

Herder, M.J. 1983. Pinniped fishery interactions in the Klamath River system, July 1979 to October 1980. Southwest Fish. Cent., Admin. Rep. LJ8312C, 71 p. (Available from Southwest Fisheries Science Center, Natl. Mar. Fish. Serv., NOAA, P.O. Box 271, La Jolla, California 92038.)

Hoelzel, A.R., A. Natoli, M.E. Dahlheim, C. Olavarria, R.W. Baird, and N.A. Black. 2002. Low worldwide genetic diversity in the killer whale (*Orcinus orca*): implications for demographic history. Proceedings of the Royal Society of London, Biological Sciences, Series B 269:1467–1473.

Huber, H. 2010. Personal communication with Gregory A. Green on May 6, 2010. National Marine Mammal Laboratory, Seattle, Washington.

Jeffries, S. 2010. Personal communication with Gregory A. Green on May 5, 2010. WDFW – Marine Mammal Investigations, Lakewood, Washington.

———. 2008a. Personal communication with Erin Britton on August 2, 2008. WDFW – Marine Mammal Investigations, Lakewood, Washington.

———. 2008b. Personal communication with Sharon Rainsberry on October 28, 2008. WDFW – Marine Mammal Investigations, Lakewood, Washington.

Jeffries, S.J. 1985. Occurrence and distribution patterns of marine mammals in the Columbia River and Adjacent coastal waters of northern Oregon and Washington. In: Marine mammals their interactions with fisheries of the Columbia River and adjacent waters 1980-1982 (Beach et al.). Third Annual Report to National Marine Fisheries Service, Seattle, Washington. 315 p.

Jeffries, S., H. Huber, J. Calambokidis, and J. Laake. 2003. Trends and status of harbor seals in Washington State: 1978-1999. *Journal of Wildlife Management* 67(1):208–219.

Jeffries S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of seal and sea lion haulout sites in Washington. Washington Department of Fish and Wildlife, Wildlife Science Division, 600 Capitol Way North, Olympia, Washington. 150 p.

Jeffries, S.J., R.F. Brown, H.R. Huber, and R.L. DeLong. 1997. Assessment of harbor seals in Washington and Oregon 1996. Annual report to the MMPA Assessment Program, Office of Protected Resources, NMFS, NOAA, 1335 East-West Highway, Silver Spring, Maryland 20910. Available at National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, Washington, 98115.

Johnson, J.H. and A.A. Wolman. 1984. The humpback whale, *Megaptera novaeangliae*. *Mar. Fish. Rev.* 46(4):30–37.

Kastak, D. and R.J. Schusterman, R. J. 1998. Low-frequency amphibious hearing in pinnipeds: methods, measurements, noise, and ecology. *J. Acoust. Soc. Am.* 103:2216–2228.

Krahn, M.M., M.J. Ford, W.F. Perrin, P.R. Wade, R.P. Angliss, M.B. Hanson, B.L. Taylor, G. Ylitalo, M.E. Dahlheim, J.E. Stein, and R.S. Waples. 2004. 2004 Status review of Southern Resident killer whales (*Orcinus orca*) under the Endangered Species Act. U.S. Dep. Commer., NOAA Tech. Memo NMFSNWFSC-62. 73 pp.

Lambourn, D. 2008. Personal communication between Dyanna Lambourn, WDFW Biologist and Jim Shannon on January 6, 2008. WDFW – Marine Mammal Investigations, Lakewood, Washington.

Laughlin, Jim. 2010a. **REVISED** Friday Harbor Vibratory Pile Monitoring Technical Memorandum. March 15, 2010. WSDOT. Seattle, WA .

———. 2010b. Airborne Noise Measurements (A-weighted and un-weighted) during Vibratory Pile Installation - Technical Memorandum. Prepared by the Washington State Department of Transportation, Office of Air Quality and Noise. June 21, 2010.

———. 2011. Port Townsend Dolphin Timber Pile Removal – Vibratory Pile Monitoring Technical Memorandum. Prepared by Washington State Department of Transportation, Office of Air Quality and Noise, Seattle, Washington. January 2011.

Loughlin, T.R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. In A. Dizon, S. J. Chivers, and W. F. Perrin (Eds), Molecular genetics of marine mammals, p. 159–171. *Soc. Mar. Mamm.* Spec. Publ. 3.

Lowry, M.S., P. Boveng, R.L. DeLong, C.W. Oliver, B.S. Stewart, H. DeAnda, and J. Barlow. 1992. Status of the California sea lion (*Zalophus californianus californianus*) population in 1992. NMFS Southwest Fish. Sci. Cent., Admin. Rep. LJ9232, 34 p. (Available from Southwest Fisheries Science Center, Natl. Mar. Fish. Serv., NOAA, P.O. Box 271, La Jolla, California 92038.)

Marine Mammal Commission. 2003. Marine Mammal Commission Annual Report to Congress, 2002. Chapter III. Species of Concern: Humpback Whales in the Central North Pacific. March 31, 2003. pp. 45–50.

Miller, B. 2012. Personal communication from Burt Miller (WSF) to Rick Huey (WSF). March 13, 2012.

Miller, E. 1988. Summary of research on the behavior and distribution of Dall's porpoise (*Phocoenoides dalli*) in Puget Sound (May-December, 1987). Unpublished report to the National Marine Mammal Laboratory, Northwest and Alaska Fisheries Center, 7600 Sand Point Way NE, Bldg. 4, Seattle, Washington 98115.

Nedwell, J. and B. Edwards. 2003. Measurements of underwater noise during piling at the Red Funnel Terminal, Southhampton, and other observations of its effect on caged fish.

National Marine Fisheries Service (NMFS). 1991. Final Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. November 1991.

———. 1993. Designated critical habitat Steller sea lion. Federal Register 58:45269-45285.

———. 2005a. Chronology of Major Events Related to the Makah Tribal Whale Hunt. Available at: <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Gray-Whales/loader.cfm?url=/commonspot/security/ getfile.cfm&pageid=23372>.

———. 2005b. Biological Opinion: Eagle Harbor Maintenance Facility Slip B Improvements Project, NMFS Tracking No. 2004-01747. Issued May 3, 2005.

———. 2007. Chronology of Major Events Related to Makah Tribal Whale Hunt. Available at: <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Gray-Whales/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=23372>. Accessed: May 21, 2008.

———. 2008a. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington. January 2008.

———. 2008b. Minke Whale (*Balaenoptera acutorostrata*). NOAA Fisheries Office of Protected Resources website. Available at: <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/minkewhale.htm>. Accessed: August 20, 2008.

———. 2009. Guidance Document: Data Collection Methods to Characterize Background and Ambient Sound within Inland Waters of Washington State. National Marine Fisheries Service, Northwest Region, Seattle, Washington. November 2009.

———. 2010a. Steller Sea Lion Eastern Stock – Stock Assessment Report. Revised 1/15/2010. http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2010slst-e.pdf

———. 2010b. Killer Whale – West Coast Transient Stock – Stock Assessment Report. Revised 1/22/2010. http://www.nmfs.noaa.gov/pr/pdfs/sars/po2010whki-pensr.pdf

———. 2010c. Gray Whale – Eastern North Pacific Stock – Stock Assessment Report. Revised 1/19/2010. http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2010whgr-en.pdf

———. 2011. U.S. Pacific Marine Mammal Stock Assessments: 2010. National Marine Fisheries Service, Southwest Fisheries Science Center. La Jolla, CA. June 2011.

———. 2011. Marine Mammal Consultation Tools. Steller Sea Lion Haulout Locations in Washington State. Accessed by Rick Huey (WSF) 3/13/12.

http://www.nwr.noaa.gov/Marine-Mammals/upload/MM-Steller-locations-WA.pdf

———. 2012. Marine Mammal Consultation Tools. Southern Resident Killer Whale Sightings 1990-2008. Accessed by Rick Huey (WSF) 3/23/12.

http://www.nwr.noaa.gov/Marine-Mammals/upload/MM-KW-map.pdf

NPS. 2012. National Park Service: American Camp. Website accessed by Rick Huey (WSF) 3/13/12: http://www.nps.gov/sajh/naturescience/northern-elephant-seal.htm

Norberg, B. 2007a. Personal email communication between Brent Norberg (NMML Biologist) and Andrea Balla-Holden (Fisheries and Marine Mammal Biologist) on Monday April 30, 2007.

———. 2007b. Personal email communication between Brent Norberg (NMML Biologist) and Andrea Balla-Holden (Fisheries and Marine Mammal Biologist) on Wednesday June 13, 2007.

Nysewander, D. 2008. Personal communication (email) between Matt Vasquez, WSDOT biologist and Dave Nysewander, Project Leader, Wildlife Biologist, Marine Bird and Mammal Component, Puget Sound Ambient Monitoring Program. April 9, 2008.

Nysewander, D.R., J.R. Evenson, B.L. Murphie, T.A. Cyra. 2005. Report of marine bird and mammal component, Puget Sound Ambient Monitoring Program, for July 1992 to December 1999 period. Unpublished Report, Washington State Department of Fish and Wildlife, Wildlife Management Program, Olympia, Washington.

Orca Network. 2012a. Orca Network Sightings Archive. September 22, 2012. http://archive.constantcontact.com/fs077/1101447505873/archive/1111072373158.html

Orca Network. 2012b. Recent whale sightings in the Salish Sea (Puget Sound, Northwest Straights, Gulf Islands and Georgia Straight) Sightings Archives. Available at: http://www.orcanetwork.org/sightings/archives.html.

Osborne, R.W. 1999. A historical ecology of Salish Sea "resident" killer whales (*Orcinus orca*): with implications for management. Ph.D. Thesis, University of Victoria, Victoria, British Columbia.

Osborne, R., J. Calambokidis, and E.M. Dorsey. 1988. A guide to marine mammals of greater Puget Sound. 191 p. Island Publishers, Anacortes, Washington.

Osmek, S., P. Rosel, A. Dizon, and R. DeLong. 1994. Harbor porpoise, *Phocoena phocoena*, population assessment in Oregon and Washington, 1993. 1993 Annual Report to the MMPA Assessment Program, Office of Protected Resources, NMFS, NOAA, 1335 East-West Highway, Silver Spring, MD 20910. 14 pp. Available at National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, Washington, 98115.

Pitcher, K.W., P.F. Olesiuk, R.F. Brown, M.S. Lowry, S.J. Jeffries, J.L. Sease, W.L. Perryman, C.E. Stinchcomb, and L.F. Lowry. 2007. Abundance and distribution of the eastern North Pacific Steller sea lion (*Eumetopias jubatus*) population. *U.S. Nat. Mar. Serv. Fish. Bull.* 107:102–115.

Pitcher, K.W. and D.C. McAllister. 1981. Movements and haul out behavior of radio-tagged harbor seals, *Phoca vitulina*. *Can. Field Nat.* 95:292–297.

Pitcher, K.W., and D.G. Calkins. 1979. Biology of the harbor seal, *Phoca vitulina richardsi*, on Tugidak Island, Gulf of Alaska. Final rep., OCSEAP, Dep. of Interior, Bur. Land Manage. 72 p. (Available from Alaska Fisheries Science Center, Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way NE, Seattle, Washington, 98115.)

Reeves, R.R., B.S. Stewart, P.J. Clapham, J.A. Powell, and P.A. Folkens. 2002. *Guide to Marine Mammals of the World*. Alfred A. Knopf, New York. p. 402–405.

———. 2007. Compendium of Pile Driving Data. Unpublished report prepared by Illingworth & Rodkin, Petaluma, CA for California Department of Transportation, Sacramento, California. 129 pp.

Rice, D.W. 1998. Marine mammals of the world: systematics and distribution. Special Publication No. 4, Society for Marine Mammals, Lawrence, Kansas.

———. 1978. The humpback whale in the North Pacific: distribution, exploitation, and numbers. Pp. 29-44. IN: K.S. Norris and R.R. Reeves (eds). Report on a Workshop on Problems Related to Humpback Whales (*Megaptera novaeangliae*) in Hawaii. Contr. Rept. to U.S. Marine Mammal Comm. NTIS PB-280-794. 90 pp.

Rice, D.W., A.A. Wolman, and H.W. Braham. 1984. The gray whale, *Eschrichtus robustus*. *Mar. Fish. Rev.* 46(4):7–14.

Rice, D.W., A.A. Wolman, D.E. Withrow, and L.A. Fleischer. 1981. Gray Whales in the winter grounds in Baja California. *Rep. Int. Whal. Comm.* 31:477–493.

Roni, P.R and L.A. Weitkamp. 1996. Environmental monitoring of the Manchester naval fuel pier replacement, Puget Sound, Washington, 1991-1994. Report for the Department of the Navy and the Coastal Zone and Estuarine Studies Division, Northwest Fisheries Science Center, National Marine Fisheries Service, January 1996.

Rosel, P.E., A.E. Dizon, and M.G. Haygood. 1995. Variability of the mitochondrial control region in populations of the harbour porpoise, *Phocoena phocoena*, on inter-oceanic and regional scales. *Can. J. Fish. and Aquat. Sci.* 52:1210–1219.

Rugh, D. J., M. M. Muto, S. E. Moore, and D. P. DeMaster. 1999. Status review of the eastern north Pacific stock of gray whales. U.S. Dep. Commer., NOAA Technical Memo. NMFS-AFSC-103, 93 p.

Rugh, D., J. Breiwick, M. Muto, R. Hobbs, K. Shelden, C. D'Vincent, I.M. Laursen, S. Reif, S. Maher, and S. Nilson. 2008. Report of the 2006-2007 census of the eastern North Pacific stock of gray whales. AFSC Processed Rep. 2008-03, 157 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle, Washington 98115.

Rugh, D.J., K.E.W. Selden, and A. Schulman-Janiger. 2001. Timing of gray whale southbound migration. *J. Cetacean Res. Manage* 3(1):31–39.

Scheffer, V.B. and J.W. Slipp. 1948. The whales and dolphins of Washington State with a key to the cetaceans of the west coast of North America. *Am. Midl. Nat*. 39:257–337

———. 1944. The harbor seal in Washington State. *Am. Midl. Nat.* 32(2):373–416

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigal, W.J. Richardson, J.A. Thomas, and P.L. Tyak. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, Volume 33(4).

Steiger, G.H. and J. Calambokidis. 1986. California and northern sea lions in southern Puget Sound, Washington. *Murrelet* 67:93–96.

Stewart, B.S. and H.R. Huber. 1993. *Mirounga angustirostris*. Mammalian Species 449: l-10.

Stewart, B.S., B.J. Le Boeuf, P.K. Yochem, H.R. Huber, R.L. DeLong, R.J. Jameson, W. Sydeman, and S.G. Allen. 1994. History and present status of the northern elephant seal population. In: B. J. Le Boeuf and R. M. Laws (eds.) Elephant Seals. University of California Press, Los Angeles, California.

Temte, J.L. 1986. Photoperiod and the timing of pupping in the Pacific harbor seal (*Phoca vitulina richardsi*) with notes on reproduction in northern fur seals and Dall's porpoises. Masters Thesis, Oregon State University. Corvallis, Oregon.

United States Code. Moratorium on taking and importing marine mammals and marine mammal products. Title 16, Chapter 13, Subtitle II, § 1371.

United States Fish and Wildlife Service (USFWS). 2004. Biological Opinion: Edmonds Crossing Ferry Terminal, USFWS Log # 1-3-03-F-1499. Prepared for the Federal Highway Administration, August 30, 2004.

Veirs, V. and S. Veirs. 2005. Average levels and power spectra of ambient sound in the habitat of southern resident orcas. Unpublished report to NOAA/NMFS/NWFSC. December 5, 2005.

Wada, S. 1976. Indices of abundance of large-sized whales in the 1974 whaling season. *Report of the International Whaling Commission* 26:382–391.

Walker, W.A., M.B. Hanson, R.W. Baird, and T.J. Guenther. 1998. Food habits of the harbor porpoise, *Phocoena phocoena*, and Dall's porpoise, *Phocoenoides dalli*, in the inland waters of British Columbia and Washington. AFSC Processed Report 98-10, Marine Mammal Protection Act and Endangered Species Act Implementation Program 1997.

Washington Department of Fish and Wildlife (WDFW). 1993. Status of the Steller (northern) sea lion (*Eumetopias jubatus*) in Washington. Draft unpubl. rep. Washington Department of Wildlife, Olympia, Washington.

———. 2000. Atlas of Seal and Sea Lion Haul Out Sites in Washington. February 2000.

———. 2008. Marine Bird and Mammal Component, Puget Sound Ambient Monitoring Program (PSAMP), 1992–2008. WDFW Wildlife Resources Data Systems.

Washington State Department of Transportation (WSDOT). 2011. Biological Assessment Preparation for Transportation Projects. Advanced Training Manual -Version 02-2011. February 2011.

Washington State Ferries (WSF). 2007. Vashon Ferry Terminal Dolphin Replacement Project Biological Assessment. Washington State Ferries, Washington State Department of Transportation. Seattle, Washington. November 2007.

Weitkamp, L.A., R.C. Wissmar, C.A. Simenstad, K.L. Fresh, and J.G. Odell. 1992. Gray whale foraging on ghost shrimp (*Callianassa californiensis*) in littoral sand flats of Puget Sound, USA. *Can. J. Zool* 70(11):2275–2280.

Whale Museum, The. 2008a. Days/months orcas have been detected in Puget Sound. Available at: <http://www.whale-museum.org/education/library/whalewatch/pugetsound.html>. Accessed: July 10, 2008.

———. 2008b. Whale sighting hotline data. Available at: <http://www.whalemuseum.org/hotlinefolder/update.html>. Accessed: June 19, 2008.

———. 2012a. Marine Mammal Stranding Network. Harbor Seals. Available at: http://www.whalemuseum.org/programs/stranding%20network/HarborSeals.html. Accessed: March 26, 2012.

———. 2012b. Meet the Southern Resident Whales. Available at: <http://www.whalemuseum.org/programs/orcadoption/whalelist.html>. Accessed: October 3, 2012.

Wiles, G.J. 2004. Washington State status report for the killer whale. Washington Department Fish and Wildlife, Olympia. 106 pp.

Appendix A
Sheets

Sheets are submitted in a separate electronic file.

Appendix B

Marine Mammal Monitoring Plan

Orcas Island and Friday Harbor Ferry Terminals
Dolphins Replacement Project
Marine Mammal Monitoring Plan

October 3, 2012

In accordance with the May 2012, Washington State Ferries Orcas Island and Friday Harbor Ferry Terminals Dolphins Replacement Projects Incidental Harassment Authorization Request, marine mammal monitoring will be implemented during this project.

Qualified marine mammal observers will be present on site at all times during pile removal and driving. Marine mammal behavior, overall numbers of individuals observed, frequency of observation, and the time corresponding to the daily tidal cycle will be recorded.

This project includes vibratory removal of 13-inch piling, and vibratory pile driving of 24- or 30-, and 36-inch hollow steel piling.

For vibratory pile removal and driving, no injury will occur (SL sounds are less than 180 dB), and so will result in a Level B acoustical harassment ZOI only. This zone is calculated to extend to the 120 dB (non-pulse) isopleth for vibratory pile removal and driving. However, for the Orcas project, land is reached at a maximum extent of 3.5 km/2.2 miles (Figure 1), and for the Friday Harbor project, land is reached at a maximum extent of 4.7 km/2.9 miles (Figure 2),

Monitoring to Estimate Take Levels

WSF proposes the following Marine Mammal Monitoring Plan in order to estimate project Level B acoustical harassment take levels in the ZOIs:

- To verify the required monitoring distance, the vibratory Level B acoustical harassment ZOI will be determined by using a range finder or hand-held global positioning system device.
- The vibratory Level B acoustical harassment ZOI will be monitored for the presence of marine mammals 20 minutes before, during, and 30 minutes after any pile removal or driving activity.
- Monitoring will be continuous unless the contractor takes a significant break-then the 20 minutes before, during, and 30 minutes monitoring sequence will begin again.
- If marine mammals are observed, their location within the ZOI, and their reaction (if any) to pile-driving activities will be documented.
- During vibratory pile removal and driving, one land-based biologist will monitor the area from the terminal work site, and one boat with a qualified marine mammal observer will navigate the ZOI in a circular path (Figures 3 and 4).
- The rationale for the monitoring is based on previous project experience, documented haulout sites, and availability (or lack of) public access locations.

Monitoring to Comply with SRKW Take Levels

WSF proposes the following Marine Mammal Monitoring Plan in order to comply with SRKW Level B acoustical harassment take levels in the ZOIs:

- If a group of SRKW that exceeds the 20% take level (16 individuals) approaches either ZOI during pile driving or removal, work will be paused until the group exits the ZOI to avoid exceeding the take limit.
- If take is verified for 16 SRKW individuals (20% of stock), and pile driving or removal is not yet complete, and more SRKW individuals approach either ZOI, work will be paused until the group exits the ZOI to avoid exceeding the 20% take level.

Minimum Qualifications for Marine Mammal Observers

Qualifications for marine mammal observers include:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars may be necessary to correctly identify the target.
- Advanced education in biological science, wildlife management, mammalogy or related fields (Bachelors degree or higher is preferred), but not required.
- Experience or training in the field identification of marine mammals (cetaceans and pinnipeds).
- Sufficient training, orientation or experience with the construction operation to provide for personal safety during observations.
- Ability to communicate orally, by radio or in person, with project personnel to provide real time information on marine mammals observed in the area as necessary.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- Writing skills sufficient to prepare a report of observations that would include such information as the number and type of marine mammals observed; the behavior of marine mammals in the project area during construction, dates and times when observations were conducted; dates and times when in water construction activities were conducted; dates and times when marine mammals were present at or within the defined shut-down safety or Level B acoustical harassment ZOI; dates and times when in water construction activities were suspended to avoid injury from impact pile driving; etc.

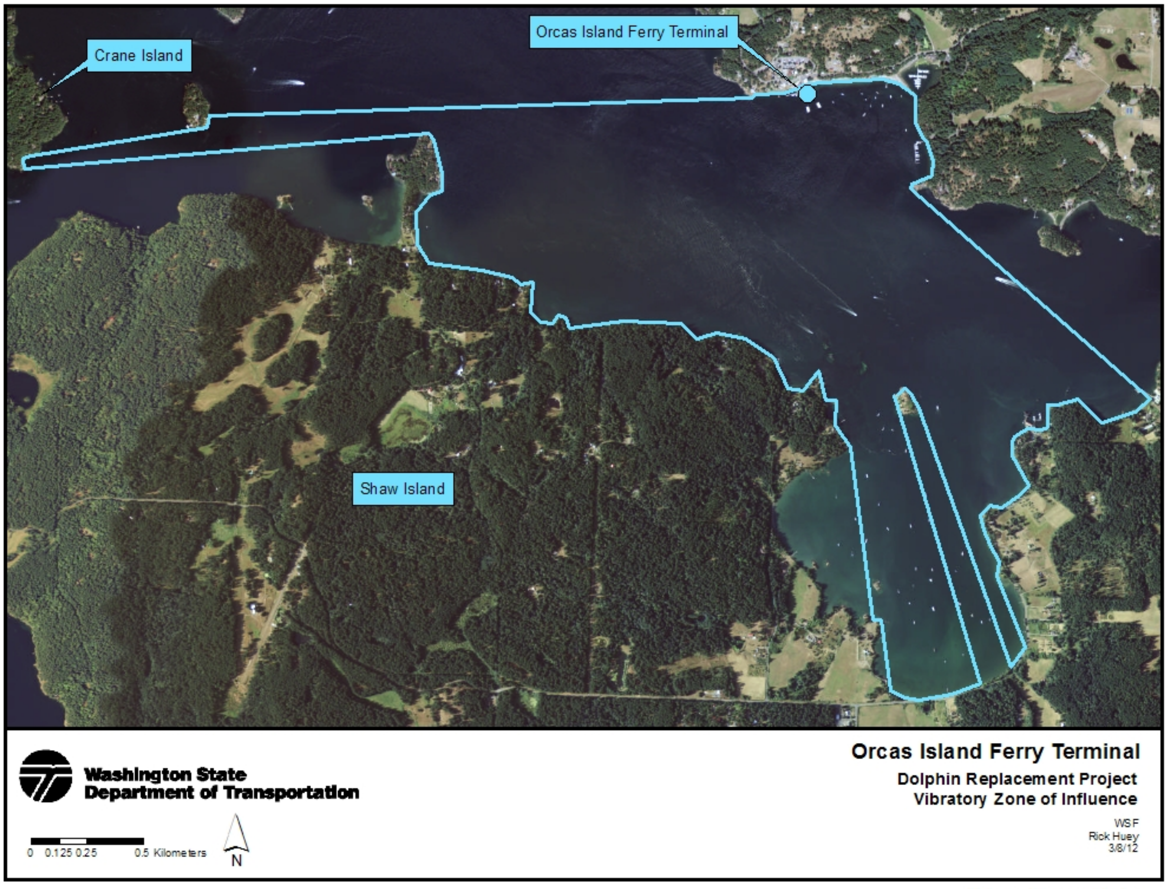

Figure 1 – Orcas Dolphin Replacement Vibratory ZOI

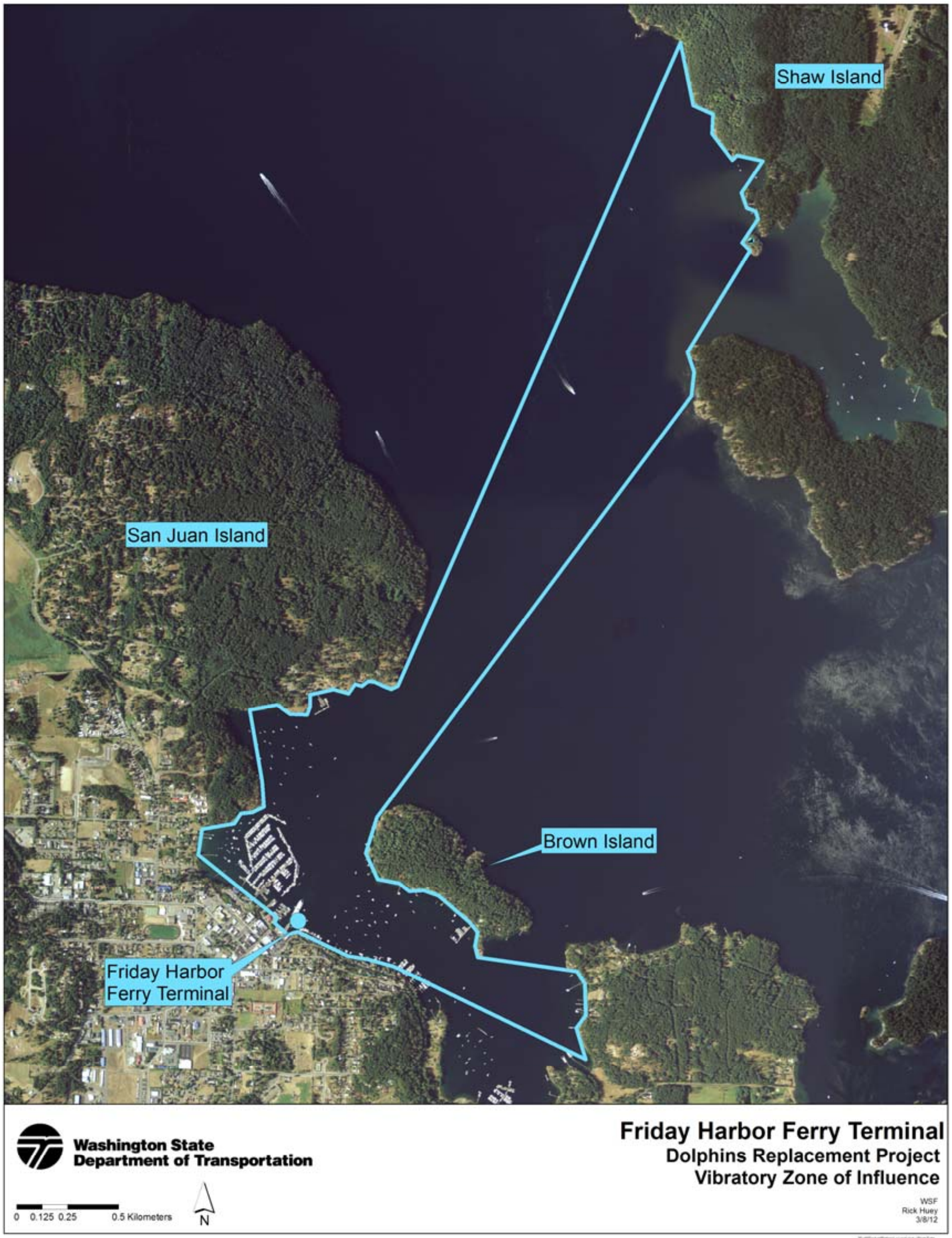

Figure 2 – Friday Harbor Dolphins Replacement ZOI

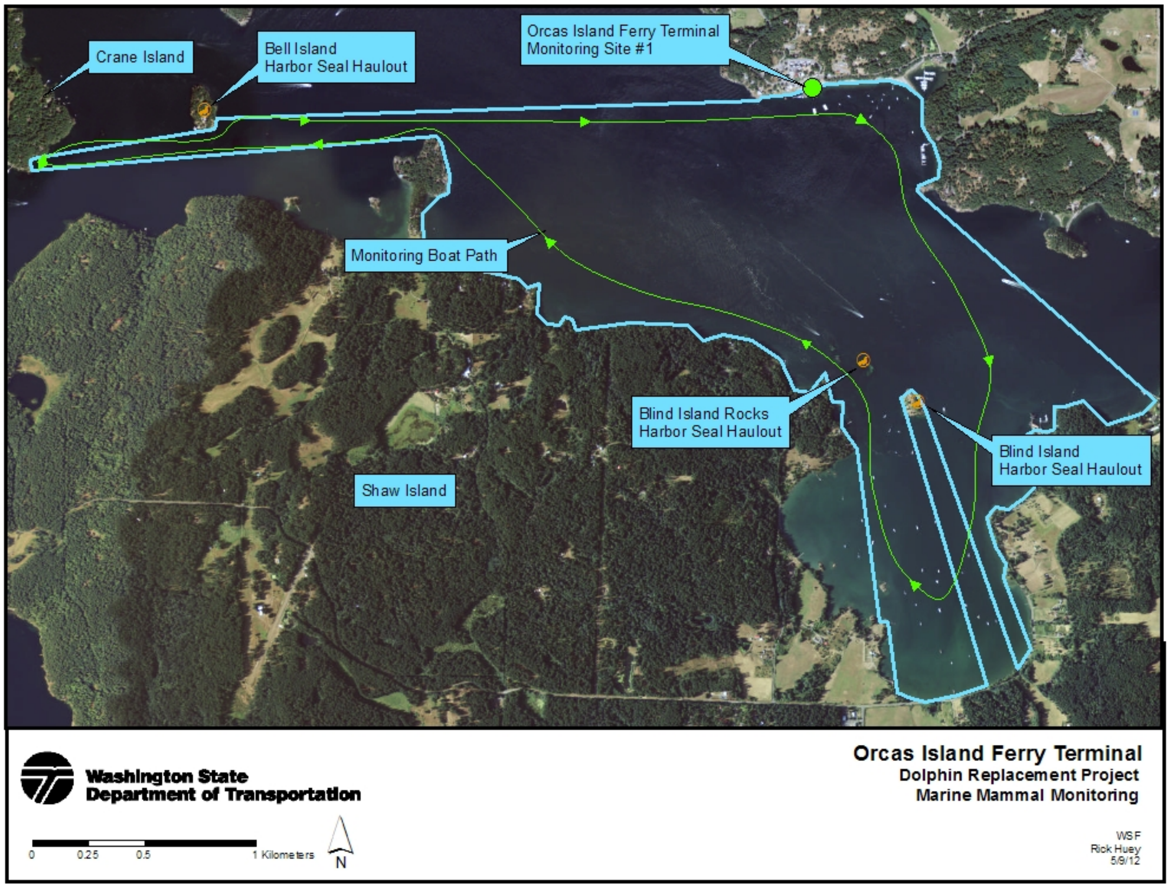

Figure 3 – Orcas Dolphin Replacement Marine Mammal Monitoring

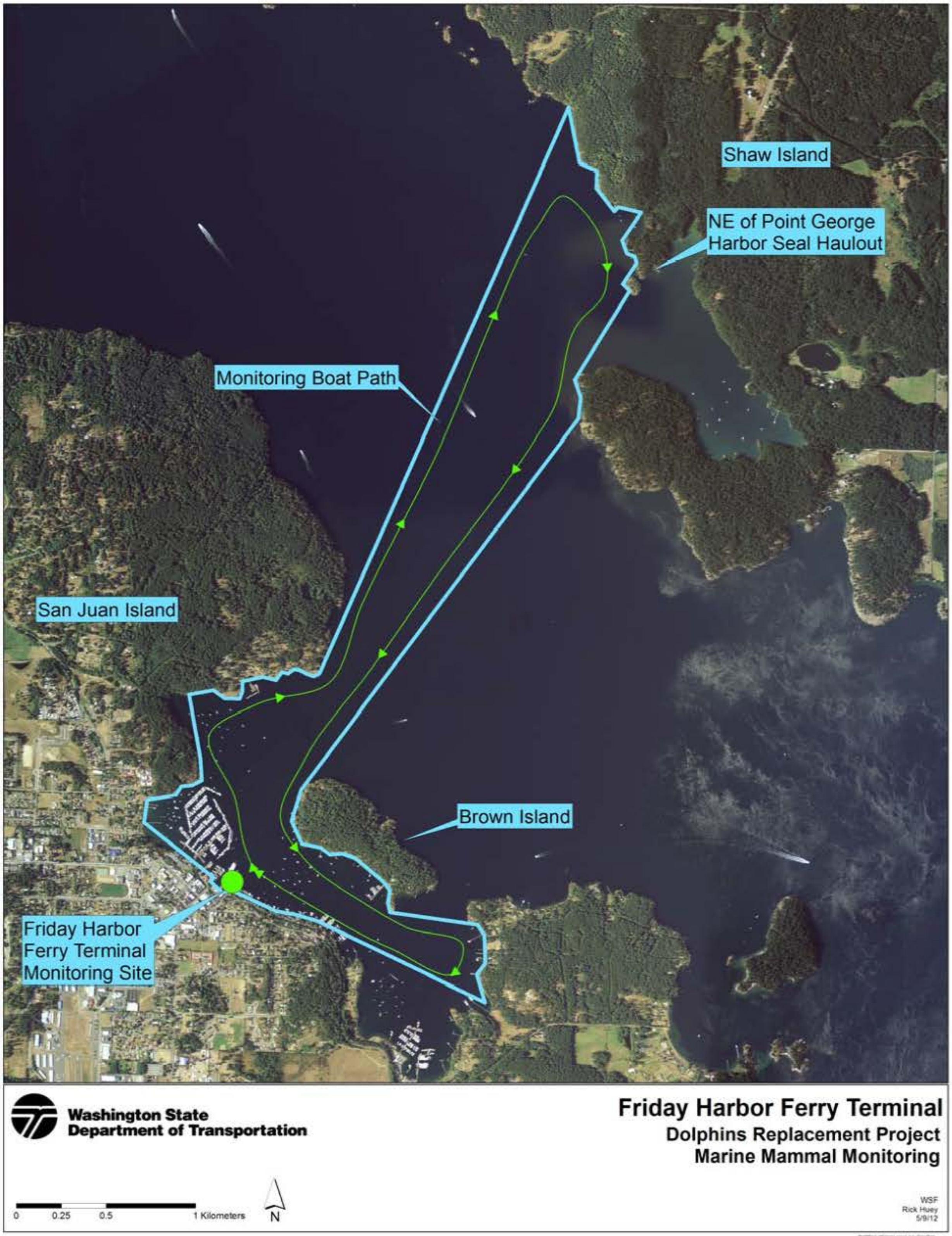

Figure 4 – Friday Harbor Dolphins Marine Mammal Monitoring