



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

February 26, 2010

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: National Marine Fisheries Service comments on the Draft License Application for proposed Admiralty Inlet Pilot Tidal Project (P-12690-003).

Dear Secretary Bose:

The National Marine Fisheries Service (NMFS) appreciates the opportunity to comment on Snohomish Public Utility District's (PUD) Draft License Application (DLA) for the Admiralty Inlet Pilot Tidal Project (FERC No. 12690-003). NMFS' comments on the DLA are attached.

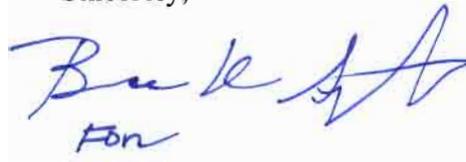
The resources in the proposed project area, including Southern Resident killer whales, seals, sea lions, salmon, steelhead, and rockfish, as well as important habitat for these species, causes NMFS to give this project close scrutiny. While we are very supportive of alternative energy projects, our responsibilities for these resources have led to extensive comments on this DLA.

While we do have concerns which are provided in our comments, we do have a suggested positive way forward. FERC's support for a second preliminary permit, if PUD requests it, would allow enough time for the PUD to address our concerns relative to resource protection during the testing of the two turbines, and develop a sufficient license application. We also recommend FERC hold a technical conference to discuss these issues and consider how to proceed. We appreciate your assistance in ensuring the information we need is included in the final license application to allow us to engage in Endangered Species Act Section 7 consultations, Marine Mammal Protection Act actions, and provide terms and conditions for the license.

We are ready to work with the PUD and other parties to arrive at mutually agreeable solutions to the issues raised in the attached comments.

Please direct your questions relating to these comments to Keith Kirkendall at 503-230-5431, or keith.kirkendall@noaa.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "Barry Thom". The signature is stylized and written in a cursive-like font. It is positioned above the printed name of the signatory.

Barry Thom,
Acting Regional Administrator

Enclosure: NMFS Comments on Snohomish PUD Draft License Application

cc: FERC service list

**NATIONAL MARINE FISHERIES SERVICE'S
COMMENTS
ON THE SNOHOMISH PUBLIC UTILITY DISTRICT'S DECEMBER 2009 DRAFT
LICENSE APPLICATION
FOR THE PROPOSED ADMIRALTY INLET PILOT TIDAL PROJECT
FERC NO. 12690-003**

NMFS has significant concerns with whether the project, as proposed in the Draft License Application (DLA), meets the Federal Energy Regulatory Commission (FERC) criteria for using the pilot project licensing procedures.

In addition, the environmental report lacks sufficient information to evaluate the existing environment or characterize effects of the project on living marine resources and their habitats. Baseline studies are not yet complete, and most of the study plans have not been definitively resolved. Project plans proposed for emergency shutdown and monitoring are insufficient to minimize potential adverse impacts, identify species responses and allow for a timely adaptive management process and decisions following the monitored events. NMFS recommends that the PUD apply for a second preliminary permit to allow more time for their development of a more complete license application responsive to NMFS' comments on the DLA.

I. PROJECT LOCATION

On the east side of Admiralty Inlet in Puget Sound, Washington, about 1 kilometer west of Whidbey Island, entirely within Island County, Washington. The project would not occupy any Federal lands.

II. PROJECT DESCRIPTION

The proposed Admiralty Inlet Pilot Tidal Project would consist of (1) two 10-meter, 500-kilowatt (kW) Open-Centre Turbines supplied by OpenHydro Group Ltd., mounted on completely submerged gravity foundations; (2) two 250-meter service cables connected to a subsea junction box or spliced to a 0.5-kilometer subsea transmission cable, connecting to a cable termination vault about 50 meters from shore; (3) two 81-meter-long buried conduits containing the two DC transmission lines from the turbines and connecting to a power conditioning and control building; (4) a 140-meter long buried cable from the control building to the grid; and (5) appurtenant facilities for operation and maintenance. The estimated annual generation of the project is 383,000 kilowatt-hours.

III. NMFS' AUTHORITIES AND RESPONSIBILITIES RELATED TO HYDROELECTRIC PROJECT RELICENSING

NMFS has statutory authority for protecting, conserving and managing marine resources including Pacific salmon, groundfish, halibut, marine mammals, and their habitats under the

Endangered Species Act (ESA) (16 USC 1531 et seq.), the Federal Power Act (FPA)(16 USC 791a et seq.), the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) (16 USC 1801 et seq.), the Marine Mammal Protection Act, (MMPA)(16 USC 1361 et seq.), and the Reorganization Plan Number 4 of 1970. In addition, NMFS has tribal trust responsibilities. All executive agencies of the Federal Government have a fiduciary duty on behalf of the United States toward American Indian tribes to be carried out in accordance with applicable treaties, statutes, judicial decisions, and executive and secretarial orders.

IV. COMMENTS

A. Criteria for Using the Pilot Project Licensing Procedures

In a number of places in its DLA filing, the PUD provides information regarding how it meets FERC's criteria for receiving a pilot project license. Rather than repeating our comments on each of those documents, NMFS is providing one set of comments on this topic. The details of our resource concerns are provided in this section on the criteria, and are applicable throughout this set of comments on different sections of the DLA filing.

The criteria set out in FERC's White Paper, Licensing Hydrokinetic Pilot Projects, are that the proposed project will be:

(1) small; (2) short term; (3) not located in sensitive areas based on the FERC's review of the record; (4) removable and able to be shut down on short notice; (5) removed, with the site restored, before the end of the license term (unless a new license is granted); and (6) initiated by a draft application in a form sufficient to support environmental analysis.

1. Small Scale

The FERC white paper states that pilot projects will be less than 5 MW. In addition, staff will also consider the number of generating units and project footprint.

The PUD proposes that their project will be small based on MW production (1.0 MW) and number of turbines (2). While it would seem that the proposed project fits the criteria, the area within which living marine resources could be affected by the project is not limited by the physical boundaries of the two turbines or the amount of power produced. The turbines will produce a source of continuous underwater sound, the magnitude of which is currently unknown because the PUD has not yet gathered this important data. Such a data gap makes it impossible to adequately evaluate the project scale as "small" at this time, for reasons described below.

From the marine mammal perspective, the scale of the project must be considered in the context of how the project site is used as habitat by the resource. Aspects of the project beyond its physical dimensions may affect the scale of the project. If the project site is preferred habitat, the scale of the project (based on its effect) may be larger than might be indicated by merely comparing it with how much habitat is not physically altered.

NMFS is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption to marine mammals in the context of the Marine Mammal Protection Act (MMPA). Until formal guidance is available, NMFS uses conservative thresholds of sound pressure levels from broadband sounds that cause behavioral disturbance (160dBrms re: 1µPa for impulse sound and 120 dBrms re: 1µPa for continuous sound) and injury (180dBrms re: 1µPa for whales and 190dBrms re: 1µPa for pinnipeds) (70 FR 1871). By application of these thresholds, NMFS views the scale of the project relative to the area within which marine mammals could be exposed to disturbing sound levels (i.e., defined by turbine sound attenuation to the 120 dB isopleth).

Depending on the source level of turbine sound and sound propagation characteristics of the site, the affected area is likely on the order of square miles in an inlet that is approximately 5 miles across. Additionally, the area affected by disturbing sound levels may displace marine mammals during much of the project; by virtue of the near-constant operation of turbines (also, see related comments on “short term” criteria). Even if marine mammals are not displaced within the affected area, exposure to elevated noises could disrupt normal behavior or otherwise contribute to stress. Considering the geographic context of the proposed project site and the sensitive nature of marine mammal species potentially excluded from this area (i.e., ESA-listed species e.g. Southern Resident killer whales with few breeding adults and high infant mortality and designated critical habitat, see related comments on “sensitive area” criteria), the scale of potential project effects on marine mammals is not small.

2. Short Term

The FERC white paper addressed the short-term criteria as follows:

“Though evaluated on a case-by-case basis, staff expects that pilot projects will have terms of five years.”

The PUD is seeking a license term of 10 years for the Admiralty Inlet Pilot Tidal Project, explaining that they need this much time to procure the equipment, test the turbines for a few years, and prepare their license application. However, FERC’s short term criterion presumably is in place as a required safeguard because of the experimental nature of the technology and lack of information on its environmental effects.

We need to know how long the PUD anticipate their turbines to be in operation. While the PUD states the license term must allow time for procurement, construction, and potential removal of the turbines, they do not explain how long they anticipate having the turbines in the water. This information is critical in determining proper monitoring and maintenance frequency, safeguards, and response protocols. Although FERC regulations require that a Notice of Intent be filed five years before the license expires if a developer wishes to pursue commercial scale build-out, FERC also states a developer can seek a waiver of this requirement, or potentially extend the

pilot license by one or more years while the applicant completes the relicensing process. This additional time is really only necessary if the applicant is seeking full build-out, and protocols are in place to deal with relicensing if that becomes necessary without the upfront extension of the pilot license.

The PUD proposes to have the turbines in the water for a few years to assess equipment performance and economic efficiency. During this time period, impacts living marine resources may be immediate as in the case of blade strike, or impacts may be more protracted as in the case of the potential habitat effects. However, in order to adequately detect the impacts, we will need an understanding of environmental baseline and the ability to detect potential effects by monitoring. In this context, FERC, the applicant, or both need to ensure that monitoring efforts are sufficient to detect environmental effects. Baseline studies provide the necessary information to know what the pre-turbine conditions were, so that we can compare post-installation conditions to determine project effects. If the PUD is seeking doubling the recommended license term, then more information is needed to explicitly outline how this would not present greater impact to marine resources, as well as providing adequate baseline information and monitoring.

While deployed, the turbines would be in virtually constant operation, and may exclude marine mammals from the sound-affected area for much of the turbine deployment, as described above under “small” criteria comments. Additionally, the risk of exposure to and interaction between marine mammals and turbine blades becomes more likely as the project duration is extended. Deployment time is therefore a critical piece of information that is currently unavailable. If deployment time could be as long as the license duration of ten years, the potential project effects on marine mammals are not short term. Likewise, the effects of the project remain insufficiently described, and the monitoring plans are not sufficient to detect species impacts during the course of the pilot project.

3. Sensitive Areas

NMFS has repeatedly identified the proposed project as being within a sensitive area for many resource reasons,¹ while also acknowledging that it has been degraded by anthropogenic activities. This area supports whales, seals, sea lions, rockfish, salmon, steelhead, and numerous other living marine resources. Some of these species are listed as threatened or endangered under the ESA, and protected under the MMPA. Admiralty Inlet is critical habitat designated under the ESA, as well as essential fish habitat and habitat areas of particular concern, designated under the MSA.

While shipping lanes go through the middle of Admiralty Inlet, it also is a narrowing between the Straits of Juan de Fuca and Puget Sound that funnels all marine animals through it as they go in and out of Puget Sound. As the PUD stated in their Pre-Application Document (PAD), “Puget Sound is one of the most diverse and

¹ NMFS PAD Comments Filed 12-8-08, and NMFS Pilot Process Comments Filed 7-6-09.

productive coastal ecosystems in the world. It supports a wide range of habitats that are home to thousands of floral and invertebrate species, as well as more than 200 species of fish, 100 species of marine birds, and nine species of marine mammals (Gustafson et al. 2000; Palsson et al. 1998).” The area also serves as a major migratory pathway for anadromous salmonids and marine mammals. Both out-migrating juvenile salmonids and returning adults pass through the preliminary project boundaries. It supports many protected marine mammals, three of which are listed as threatened or endangered under the ESA. These include Southern Resident killer whales, North Pacific Humpbacks, and Eastern Steller sea lions. It supports three ESA listed salmonids; one ESA listed species of sturgeon; and three proposed ESA listed species of rockfish. Critical habitat (CH) is designated for two species of salmon and one marine mammal species within the project boundaries. Not only does this area support listed marine species and is designated critical habitat, but it also is essential fish habitat (EFH) for Pacific groundfish, Pacific salmon, and coastal pelagics; and is within EFH Habitat Areas of Particular Concern (HAPCs) for Federally managed Pacific groundfish.

All these species are funneled through the inlet and, while the actual distribution of species remains unknown, may be concentrated in the area of the proposed project. This increases the likelihood of harm. It is unknown whether the distribution of marine wildlife is affected by traffic in the shipping lanes or whether avoidance of shipping traffic may influence the movement of animals toward the sides of the Inlet proximal to the proposed project site. It is yet to be seen whether baseline information and monitoring plans will be sufficient to detect such an effect in order to support an analysis of the potential risk for use in the license application process.

Even if FERC determines that Admiralty Inlet a sensitive area, FERC may also consider whether there is a potential use conflict with the proposed project. In this case, there is not yet enough information to make that determination because the necessary baseline information on potential harm to marine resources is not complete. Additionally, this information is necessary for many reasons provided throughout our comments, such as for ESA consultation and MMPA actions.

The PUD proposes that the project is not located in a sensitive area. The applicant however, has not put forward any substantiated justification or independent risk assessment to support their stated conclusion that they do not anticipate the proposed project will adversely affect critical habitat or EFH. They remained silent on potential effects to listed species. The PUD suggests that marine mammals are highly sensitive to their surroundings and because of this expects that they will avoid the turbines. NMFS points out that a large body of marine mammal research is available related to behavioral response from sources of human disturbance. The literature on response does not support the applicant’s assumption of general avoidance. Marine mammal responses can vary by species, within a species, by disturbance-type and other environmental parameters (i.e., Southall et al. 2007, Richardson and Wursig 1997). The turbines would be novel objects in the marine environment that Southern Residents and other marine mammals would not have experienced before. Given the

novel nature of hydrokinetic turbine technology and the ESA Section 7(a)(2) standards for evaluating risk to listed species and critical habitat, NMFS concludes that the project poses a risk of injury or mortality that cannot be overlooked particularly for ESA-listed marine mammal species, as described in more detail below.

Southern Resident killer whales are listed as endangered under the ESA and their designated critical habitat include Admiralty Inlet and the two water bodies connected by this inlet, the Strait of Juan de Fuca to the north and Puget Sound to the south. Southern Residents use Admiralty Inlet in all seasons of the year to travel through their critical habitat, and the PUD has documented all behavior states, including foraging and socializing, in the project vicinity. Water depth of the proposed deployment location is well within the dive capabilities of Southern Residents (Review in pgs. II-15 – II-16 of NMFS 2008, Baird and Hanson 2004, Baird et al. 2005). The applicant has documented dive depths of Southern Residents between 42 and 69 m proximate the proposed turbine deployment location. Additionally, interactions between killer whales generally and Southern Residents specifically with rotating propeller blades have caused injury and mortality (Attachment 1 “Known Vessel Strike Effects,” pg. 3-20 of NMFS 2009).

Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of listed species or result in the adverse modification or destruction of critical habitat. “Jeopardize the continued existence of” means to engage in an action that would reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.2). The Southern Resident population is sufficiently small (fewer than 90 members) and the probability of quasi-extinction is sufficiently likely (Krahn et al. 2004) that all individuals of the three pods are important to the survival and recovery of the Distinct Population Segment (DPS). Representation from all three pods is necessary to meet biological criteria for Southern Resident down listing and recovery (NMFS 2008). For these reasons, it is NMFS opinion that any Federal action that is likely to hinder the reproductive success or increase the risk of mortality of a single Southern Resident killer whale is likely to appreciably reduce the survival and recovery of the DPS.

Considering NMFS consultation standard for Southern Resident killer whales, NMFS cannot see a way for the project to go forward unless the applicant modifies the proposed action to include a turbine operations plan that mitigates project risk to Southern Resident killer whales. The plan must incorporate killer whale detection and alert systems, which trigger temporary turbine shutdown, thereby eliminating the risk of injury or mortality by interaction with rotating turbine blades. This plan is necessary to avoid a potential use conflict, as FERC states in its white paper.

4. Emergency Shut Down or Removal

Emergency shut down or removal ability is an important consideration and safe guard because the proposed project would be in a sensitive area, and presents a risk of injury or mortality to marine resources with particular concern regarding the endangered Southern Resident killer whales.

The PUD states the project is removable and able to shut down on short notice in the event of unacceptable risks to the public or environment. Their justification is based on OpenHydro design, and a near-field monitoring plan that is under development. This plan needs to allow for early detection of potential impacts so they can be avoided. The technological capability to shut down on short notice should allow the PUD to craft an operations plan that mitigates project risk to living marine resources, including Southern Resident killer whales.

Emergency shut downs or removals are based on harm to resources. The PUD claims that its monitoring program will allow it to detect substantial harm, however monitoring will not begin until the turbines are placed on the seabed. This kind of monitoring may inform us of actual strikes to marine animals, but will not allow for comparative evaluation of habitat use patterns or harm to habitat. In order to determine the effects of the turbines, pre-installation, or baseline, studies are needed so that the use, number of species and individuals present, and current condition of the habitat are known. Then the pre-installation conditions can be compared to post-installation conditions. Comparing the two will allow us to determine some of the project effects. For example, the area may be heavily used by certain rockfish as a feeding ground before installation. However, if the turbines scare away the prey species, then rockfish will no longer be present. This effect would not be seen by just post-installation monitoring harm to this species would not be detected because the species would be absent.

The PUD must conduct sufficient baseline or pre-installation studies as well as post-installation monitoring to allow for determination of adverse project effects and potential mitigation or removal to address those effects.

Marine Mammal Considerations: The problematic nature of unmitigated risk of injury or mortality for Southern Resident killer whales is provided earlier in our “sensitive area” criteria comments. For Southern Residents in particular, emphasis needs to be placed on preemptive avoidance of unacceptable risk through the development of a turbine operations plan, as previously described. The fact that the OpenHydro design allows for shut down on short notice should aid in the development of a feasible plan to this end.

The near-field monitoring plan is not detailed enough and the adaptive management plan is not substantive enough to evaluate whether the PUD will be able to adequately monitor project risks to marine mammals or be able to shut down the project shortly

after a risk-prone event is observed. More care needs to be taken by the PUD to preemptively avoid project risks to Southern Resident killer whales and account for the timeliness of shut down in the event of a monitored risk to other marine mammal species. Until that time, NMFS cannot agree that the project is able to be shut down on short notice to avoid harm to Southern Resident killer whales and other marine mammals and fish.

5. Removed, with Site Restored, Before the End of the License Term

No comments on this section.

6. Adequate Information for Environmental Analysis

While the PUD provides a list of studies, these studies are not yet adequate to address living marine resources. NMFS responded with comments on the PUD's pre-installation study plans in March 2009; followed by additional comments from the Northwest Fisheries Science Center in April 2009 (both attached). The PUD submitted revised study plans to the resource agencies in May 2009, and NMFS responded again with comments on July 2009 (attached). Despite these efforts, the revised study plans continue to be insufficient for a number of reasons.² Issues remain with the following studies:

- Geophysical and Bathymetric Study Plan
- Aquatic Species Study Plan

These insufficiencies will be explained in further detail below in specific comments to Appendix A.

In addition, the PUD has yet to complete their pre-installation studies, including their marine mammal study plan, aquatic species study plan, and underwater noise study plan, and therefore has not adequately incorporated information about the project site and environmental baseline. Monitoring and adaptive management plans which are vital to understanding the applicant's ability to evaluate project risk to marine mammals, fish and other living marine resources are incomplete and have not been adequately vetted with stakeholders, including NMFS, and modified to address NMFS's concerns. The environmental report lacks an independent risk assessment for marine resources, as addressed above. Additional comments are provided on the environmental report below, which further address insufficiencies in the license application related to marine mammals, fish and other living marine resources.

² The PUD inappropriately cites NMFS' scientists Nash et al. as developing frameworks for environmental risk analyses absent the level of data which Snohomish has gathered (2005). However, this document explicitly states that its guidelines are applicable only to the risk assessment of marine fish aquaculture.

B. Information in the draft license application is incomplete

In its white paper, FERC asserts:

The pilot project draft license application must be sufficient to support environmental analysis. The application should include (1) a thorough description of the existing environment; (2) details of the project proposal; (3) potential effects of the proposal; (4) proposed plans for (a) monitoring, (b) safeguarding the public and environmental resources, (c) and assuring financing to remove the project and restore the site; and (5) consultation record.

The PUD's environmental report and appendices attempt to address information needs (1) through (4) above. NMFS provides detailed comments below regarding the insufficiency of the information provided. Most of NMFS' comments are best supported by direct reference to page numbers throughout the environmental report and appendices. Comments on the environmental report specific to marine mammals, fish and other living marine resource considerations detail NMFS' concerns and highlight insufficiencies in descriptions of (1) existing environment – specific comments on Environmental Report, Section 3, Environmental Analysis and Appendices A and F, Pre-installation studies; (2) details of the project proposal – specific comments on Environmental Report, Section 2, Proposed Action; (3) potential effects of the proposal – specific comments on Environmental Report, Section 3, Environmental Analysis; (4) proposed plans for (a) monitoring – specific comments on Appendix B, Monitoring, (b) safeguarding the public and environmental resources – specific comments on Appendix C, Safeguard Plan; and (5) consultation record – specific comments on consultation on the PUD's *Draft Discussion Document* is listed below Section 1, Statutory and Regulatory Requirements.

C. Comments on Draft Environmental Report

1. Section 1. Statutory and Regulatory Requirements

- Pgs. 16-17 – Endangered Species Act: In this section, the PUD states that they are preparing a draft biological assessment for inclusion in their Final License Application (FLA). For FERC's information, it is unlikely that the proposed action will be well enough defined at this stage to support initiation of formal Section 7 consultation. The proposed action would not include agency mandatory conditions and recommended conditions, and would not include appropriate modifications based on public comment on both the FLA and NEPA document.
- Pgs. 23-24 – Public Review and Comment: The PUD provides a long list of meetings they have had with various project stakeholders, which is good. However, the implication that the PUD has met this requirement is incorrect because while the PUD has had many meetings, critical issues have not reached resolution. It is not the number of meetings that makes for adequate consultation; it is the substance of the discussions and results that are important.

Stakeholders were not provided the draft monitoring plans in detail prior to the submission of the DLA. This did not allow sufficient time to contribute to monitoring plans, and additional time is needed for the PUD to provide sufficient detail, and to reach agreement on appropriate methodologies, analysis, and adaptive management planning, and reporting. The PUD did not provide monitoring plans on October 30, 2009, but discussed broad overview of what could be done. Stakeholders requested detailed methodology, since this was noted as a particular obstacle in the pre-installation study plans. Stakeholders provided verbal comments on the “Draft Discussion Document: Aquatic Species and Project Operations Monitoring,” at the November 6, 2009 meeting, but the majority of the meeting was spent discussing the pre-installation marine mammal study plan. Verbal comments on the discussion document included:

- Request that the PUD expand Monitoring Goals and Objective to Include:
 - modification of the project or project operations to avoid or mitigate for impacts;
 - assess near-turbine fish behavior and how it varies during project operation;
 - assess near-turbine species composition;
 - assess near-turbine acoustic signature;
 - assess near-turbine species avoidance; and
 - evaluate projects impacts to habitat in the project site and along the cable route
- Concern that depending on how the DIDSON camera is calibrated they might miss juvenile salmon interaction; and
- Request that a detailed Maintenance Plan be included with proposed maintenance intervals.

The PUD said they had not finished their project safety plan or removal plan. Stakeholders did not see these until the DLA. The PUD also stated that they intended for their monitoring effort to include the use of hydroacoustic technology.

Marine Mammal Considerations:

- Pg. 19 – The DLA introduces the Marine Mammal Protection Act (MMPA) in Section 1.3.6 of the Environmental Report, and states “Snohomish will be working with NMFS to ensure compliance with the MMPA.” NMFS Northwest Region has advised the PUD to seek MMPA authorization from the Office of Protected Resources Division small take program at NMFS headquarters. The application requires rigorous review and NEPA process prior to issuance. Processing time is dependent on adequacy of the application, responsiveness to meet additional information needs, and type of authorization requested. If longer-term coverage is needed, i.e., longer than one year, then rule making may be

necessary. Timing the MMPA permit process with the ESA consultation will be necessary for the project to obtain permits and meet requirements of both MMPA and ESA federal regulations.

NMFS Northwest Region has advised the PUD about the data needs for a permit application, including the source level for sound produced by the turbines, duration of turbine operations and the ability to estimate marine mammal density within the area of effect. In addition, monitoring and adaptive management plans will be essential components of the MMPA application. There is insufficient information contained in the DLA to prepare or support an application for MMPA authorization.

2. Section 2. Proposed Action

- Pg. 30 – No-action Alternative: The no action alternative discussion should also mention the positive effect on living marine resources by not constructing the project. Additionally, a reasonable range of alternative needs to be provided in addition to the no action and proposed action alternatives (e.g. change in location or change in licensing term, etc.). The alternatives considered but eliminated from detailed study are not a substitute for consideration of alternatives at the Admiralty Inlet site.
- The PUD proposes the use of Horizontal Directional Drilling (HDD) to deploy the transmission cable from a depth of 20 meters to shore. More information should be provided concerning the directional drilling method. The PUD needs to provide bathymetric information along the cable route to ensure that fractures do not exist, which could lead to fracout (escapement of drilling fluids). The PUD also needs to describe what kind of lubricant will be used for drilling, how they intend to cleanup bentonite slurry/dredging spoils (particularly the seaward exit point), and what the sound output from drilling will be? More information should be provided on the cable route, and other potential impacts from drilling.
- Additionally, although the PUD has mentioned in stakeholder meetings that they anticipate the turbines will operate most of the time, because of the current strength through the project site, the proposed action description does not include the anticipated operation time over a 24-hr tidal or current cycle. This information is also necessary to assess risk and evaluate effects on marine resources.
- Pg. 60 -- Under Turbine Maintenance, the PUD should include repair or replacement of monitoring systems if required.
- Adaptive Management Process (AMP) – Please refer to specific comments on the AMP listed below under Appendix B.

Marine Mammal Considerations:

- Information is insufficient regarding sound produced by the 10 meter turbines, a necessary piece of information to evaluate effects on marine mammals and key to MMPA permitting and ESA consultation.

- Pg. 56 -- More information should be provided about the turbine brake system, including performance metrics for any effect of brake application, including brakes per interval of time, on long-term operation or maintenance. Such information will be necessary to incorporate turbine operation plans with additional environmental measures specific to marine mammals.
Pg. 61-64 -- Environmental measures identified are insufficient to preemptively avoid project risk to Southern Resident killer whales, as described above. Other monitoring and adaptive management plans include insufficient detail to adequately evaluate the applicant's ability to monitor project risks to marine mammals and timely response, as necessary. If the PUD is not able to address NMFS' concerns, including modifying the proposed action to include a turbine operations plan that mitigates project risk to Southern Resident killer whales, then the pilot process is inappropriate for this project.

3. Section 3. Environmental Analysis

- Pg. 70 – Pre-installation environmental studies referenced here are ongoing, and the results of efforts to date do not adequately characterize the existing environment or meaningfully evaluate project risk and effects on marine mammals, fish and other living marine resources. The PUD needs to correct this, and include this information.
- Pg. 71 – Stakeholders have yet to see the information that the PUD collected from the collaboration with POST. In addition, NMFS is gathering information from tagged fish species from our Science Center counterparts, and the PUD needs to include it.
- Pgs. 89-94 – Current velocity is characterized, but there is no context placed on amount of time the turbines would be in operation over a time interval, given the current velocity on site.
- Pg. 131 - The Biosonic report referenced in this section was not provided to stakeholders until after the DLA was filed. However, upon review of the draft segments of the report provided at meetings, the acoustic imaging information provided does not allow one to distinguish salmonids from comparably sized fishes (for that matter, we cannot differentiate between fish or debris). This imaging only offers a qualitative measure of target abundance and, possibly, some indication of the spatial positioning of targets within the surveyed area, but cannot distinguish among individual species—a necessary prerequisite for a quantitative estimate of abundance. The information presented in the Environmental Report does not provide a metric with which to measure the detected “fish” density against.
- Pgs. 154-165 – Blade Strike: The PUD has not evaluated the project risk posed by potential interaction between marine mammals and fish and rotating turbine blades in a meaningful way. Just because water velocities at the turbine face will decrease, does not mean that fish will not be entrained. The PUD provides no justification for the assumption that marine life will be drawn to the outside of the

turbine. Lack of evaluation and planning to address this project risk is a shortcoming of the DLA.

- Pgs. 155-157 – Flow analysis: The PUD proposes that marine life will be drawn to the outside of the turbine or through the center, based on anticipated particle flow patterns around the device. The PUD does not provide any justification for why this assumption would be true for marine species. This leads the reader to an unsafe conclusion. While design features of the turbine may reduce risk of injury to fish, most of the flow that approaches the turbine will go through the blades and provide a significant risk of injury for fish that are entrained in this flow. Just because the turbine design is different from that of a ship's propeller, does not mean that the turbine poses no risk to fish. The PUD has also not provided the references they cite in this section.
- Pgs. 163-164 – Near field monitoring plan: Neither of the sub-objectives being proposed for the near-field monitoring plan addresses the prevention of harmful interaction between NMFS' marine resources and the turbine. The proposed monitoring techniques would provide a narrow field of view, not appropriate for prevention. The plan itself is not substantive enough to evaluate whether the PUD will be able to adequately monitor project risks to marine mammals and fish resources or be able to shut down the project shortly after a risk-prone event is observed. The PUD needs to provide sufficient plan detail to allow NMFS to evaluate it and provide comments to address resource conservation needs.
- Pg. 169 – The PUD states that it is “unknown how rockfish and other structure-oriented species will react to the presence of the turbines.” However, the PUD is currently not proposing any pre-installation studies to gather rockfish information and previous surveys do not provide site-specific information. In addition, the monitoring plans being proposed are insufficient in gathering rockfish information, as cameras will be aimed at the turbine face, not the anchoring structure. NMFS reiterates the need for a pre-installation, and subsequent post-installation quantitative remotely operated vehicle (ROV) survey to quantify the abundance of various rockfishes, describe their habitat associations, and potential changes associated with project operation.
- Pg. 170 – Marine Debris: The PUD needs to explain why ROV deployment is the preferred retrieval method for marine debris, and how this will be done successfully. The PUD needs to describe this technique, and show how this is consistent with generally accepted practices in the scientific community. Based on the ROV footage that the PUD has provided during their pre-installation studies, the ROV they are currently using does not appear capable of maneuvering around the project site, nor capable of retrieving derelict gear.
- Pgs. 186-189 – Electromagnetic Fields (EMF): The PUD should explain whether the service cables will be armored (similar to the trunk cable) in order to withstand installation, seafloor hazards, and EMF emission. The PUD states that EMF may be emitted from the subsea cable. The PUD needs to determine the physical characteristics of EMF likely to be generated by two turbines. They need to determine which marine organisms may be adversely affected and estimate the magnitude of that potential effect. With proper shielding of the cables, and burying the cable the emission of EMF can be significantly reduced. However,

the PUD is not burying all of the cable, and it remains unclear if all of the exposed cable will have conventional shielding in order to prevent EMF emissions. We have no guarantee that EMF will be entirely eliminated and the PUD isn't proposing any means of gathering information on how this will impact marine mammals and fish resources. The World Health Organization (2005) reports that "none of the studies performed to date assess the impact of undersea cables on migratory fish (e.g., salmon and eels)." Previous studies have identified the need to measure the response of electro-sensitive species with the characteristics and magnitude of cabling associated with offshore energy projects (Centre for Marine and Coastal Studies 2005).

- Pgs. 294-296 – Summary of Potential Environmental Effects: The PUD should add a column looking at the "Likelihood of Effect". For a number of the Potential Effects, the likelihood of occurrence might be small, but that does not mean that the potential for effect is negligible (ex: blade strike, marine debris entanglement, EMF, etc.). Saying that these effects are negligible is a mischaracterization.
- Pg 297-299 and Pg 304 – Unavoidable Adverse Effects and Finding of No Significant Impact: This section incorporates summary of the applicants past assumptions related to the potential project impacts to marine mammals, fish and other living marine resources. NMFS maintains that additional conservation measures, as previously described in referenced comments, should be incorporated as part of the action to avoid adverse effects. Without additional measures, NMFS does not support the finding of no significant impact.

Marine Mammal Considerations:

- Pg. 132 – Non-ESA listed marine mammal species that occur in central Puget Sound should include transient killer whales, and data referenced as Tollit et al. 2009 and through other sources of information being collected in the pre-installation marine mammal study (i.e., recordings from the Port Townsend buoy) should have included characterization of transient killer whale occurrence in the project vicinity.
- Pg. 134 – The PUD should provide NMFS with the reference Tollit et al. 2009, identified as results of the ongoing pre-installation marine mammal study. It is unclear how the data presented are meant to characterize the existing environment in the project vicinity (i.e., lone harbor seals observed, or two single California sea lions observed). Data referenced as Tollit et al. 2009 do not adequately characterize the existing environment.
- Pg. 134 – Additionally, NMFS is aware of a sizable group of California sea lions (80-100 individuals) and Steller sea lions (40-50 individuals), that Washington Department of Fish & Wildlife (WDFW) has monitored in recent years near the NMFS Manchester field station in Central Puget Sound, within the project vicinity. The PUD should follow up with Steve Jeffries of WDFW to investigate additional sources of information that represent recent pinniped occupation in the project vicinity and the greater Puget Sound. Note that sea lions that enter and exit Puget Sound travel through Admiralty Inlet.

- Pg. 138 – NMFS has not been provided with the reference Tollit, Philpott, and Thompson 2009, identified as results of the ongoing pre-installation marine mammal study, specific to porpoise detections. Also, more reference was made to Tollit et al. 2009, related to surface observations of porpoises. Same comment as above, it is unclear how data reported are meant to characterize the existing environment in the project vicinity (i.e., how do the dives per minute (DPMs) and percent of time reported relate to the compressed duty cycle of the passive acoustic monitoring effort, and how are the sightings meant to represent variation in density/occurrence?). Data referenced do not adequately characterize the existing environment.
- Pg 139-140 – Same comment as above, data referenced as Tollit et al. 2009 for Dall's porpoise, minke whale, and gray whale do not adequately characterize the existing environment.
- Pg 152 – Fluid leakage: The PUD states that the risk of fluid leakage is low because the fluid will be self-contained, and if it did leak, the risk of environmental harm is small because the fluid is 150 liters. A leak of this size would still be a concern if marine mammals were proximate and exposed. The PUD needs to have a way to remotely monitor the turbine fluid level, and detect low levels that would indicate a leak is occurring. Such capability would be necessary to incorporate timely response measures and minimize the potential for marine mammal exposure to the leak.
- Pg 154-165 – Blade strike: The PUD has not evaluated the project risk posed by potential interaction between marine mammals and rotating turbine blades in a meaningful way. Please see above comments specific to marine mammal considerations for sensitive area and emergency shutdown or removal criteria that describe the insufficient environmental analysis, measures and safeguards to mitigate project risk. Lack of adequate evaluation and planning to address this project risk is a blatant shortcoming of the DLA and needs to be addressed. See specific comments below.
- Pgs. 155-156 – Flow analysis: Snohomish proposes that marine life will be drawn to the outside of the turbine or through the center, based on anticipated particle flow patterns around the device. The PUD should provide justification for why this assumption would be true for marine species such as marine mammals that are not obligate to the current flow, because of their physiological capabilities, including swim speed and physical strength. The PUD should also provide the references they cite in this section.
- Pg 157 – Design characteristics that minimize the potential for blade strike: The PUD suggests that the 4-meter opening at the turbine center will allow marine life to pass through the center of the turbine, and minimize the risk of blade strike. See above comment that explains why this assumption does not apply to marine mammals. Additionally, the PUD assumes marine mammals and fish will detect noise from turbine operations and avoid direct impact. NMFS has previously pointed to the variable nature of marine mammal response (see above comments on sensitive area criteria, marine mammal considerations). It is possible that potential curiosity could draw a marine mammal toward the center, but if spooked at close range by heightened noise, vibration, sudden flashes or lighting (i.e., if

lighting is part the a monitoring plan), change in camera or video aperture (i.e., if part of monitoring) or otherwise, a sudden change in direction at close range could well result in direct interaction with rotating blades, adjacent the center opening. The 4-meter opening would be too small for investigation at short-range by large cetaceans, but pinnipeds and smaller odontocetes, including Southern Resident killer whales (head widths are less than 1m, with breadth up to 1.2 m; Durban et al. 2009) could approach the center. This example is provided to point out that general avoidance of or passive movement around or through the turbine cannot be assumed without adequate supporting data that are currently unavailable.

- Pg 157-158 -- Project scale and context: The PUD describes the project as small scale and low risk of blade strike compared to maritime traffic travelling through the inlet. Please see above comments specific to “small” and “short term” criteria and marine mammal considerations that indicate why the project risks and effects to marine mammals are not small or short term. The PUD does not substantiate their assumptions regarding the comparative risk of blade strike from maritime traffic and the proposed turbines. Regardless, any risk of blade strike is not acceptable.
- Pg 159-160 – Abilities of fish and marine mammals to detect large underwater features: The PUD assumes that marine mammals will detect and avoid the turbines. Please review NMFS comments above specific to “sensitive area” criteria and marine mammal considerations that indicate why NMFS cannot rely on an assumption that is not supported by data when evaluating the project risks, including the risk of blade strike.
- Pg 160-163 – Past blade strike analyses: The PUD infers that the risk of turbine strike on marine mammals is low because environmental assessments conducted for other projects and areas have concluded that the strike risk is low, and monitoring at the European Marine Energy Centre (EMEC) test location has not identified near-field interactions. NMFS points out that the available information is extremely limited. The only actual data are collected at the EMEC test deployment of a smaller OpenHydro turbine in a dissimilar environmental setting to Admiralty Inlet. The differences include dissimilar marine mammal species occurrence, status and habitat use. Additionally, the PUD points out that the OpenHydro turbine at EMEC was deployed near the surface; another difference from the proposed deployment location in Admiralty Inlet, which would be in deeper water. The PUD has not put forward any substantiated justification or independent risk assessment to support their stated conclusion, and it is inappropriate to draw inferences from EMEC test site because of the dissimilarities mentioned above.
- Pg 163-164 – Near field monitoring plan: The near field-monitoring plan is proposed to test the hypothesis that marine mammals avoid being struck by turbines. NMFS reiterates that considering our consultation standard for Southern Resident killer whales, we cannot see a way for the project to go forward unless the applicant modifies the proposed action to include a turbine operations plan that mitigates project risk to Southern Resident killer whales. The plan should incorporate killer whale detection and alert systems, which trigger temporary

turbine shutdown, thereby eliminating the risk of injury or mortality by interaction with rotating turbine blades. Additionally, the near-field monitoring plan is not detailed enough and the adaptive management plan is not substantive enough to evaluate whether the PUD will be able to adequately monitor project risks to marine mammals or be able to shut down the project shortly after a risk-prone event is observed.

- Pg 175 – Noise/Vibration: Snohomish states that they will conduct a post-deployment noise study that will involve conducting in situ measurements of the acoustic emissions of the operating OpenHydro turbines. Although this study will be a useful component of monitoring, the PUD should be seeking ways to collaborate with the Bay of Fundy project where a 10 m OpenHydro turbine is currently deployed to insure that acoustic emission data are available for environmental risk analysis and project planning that should include estimating sound effects on marine mammals prior to deployment.
- Pg. 176-178- Noise Exposure Criteria and Noise and Marine Life: NMFS restates for Snohomish that NMFS policy on exposure criteria for marine mammals remains the same as expressed in previous letters to the applicant, dated July 23, 2009, (see Attachment 2) and as reiterated above in “small” criteria comments for marine mammal considerations: NMFS is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption to marine mammals in the context of the MMPA. Until formal guidance is available, NMFS uses conservative thresholds of sound pressure levels from broadband sounds that cause behavioral disturbance (160dBrms re: 1 μ Pa for impulse sound and 120 dBrms re: 1 μ Pa for continuous sound) and injury (180dBrms re: 1 μ Pa for whales and 190dBrms re: 1 μ Pa for pinnipeds) (70 FR 1871). By application of these thresholds, the area defined by turbine sound attenuation to the 120 dB isopleth is the area within which marine mammals could be exposed to disturbing sound levels.
- Pg. 178-183- Ambient Noise Conditions: On page 185, the PUD suggests that the mean total sound pressure level (SPL) ambient condition is 122.3 dB; however, on pages 178-183, summary of the data indicate 113.6 dB is the mean total SPL representative of ambient conditions. 113.6 is well below the Level B harassment threshold. Representing ambient or background sound conditions based on maximum, total sound pressure levels is not consistent with NMFS regional guidance on development of background sound estimates, which were provided to the applicant and are appended (Attachment 2) to the comments here.
- Pg. 183-186- Project Noise: The PUD indicates that noise data from the 10 m turbine deployed in the Bay of Fundy should be available for their incorporation into the final license application. It is not clear when the data will become available, and the PUD has not clarified this to NMFS. As described in comments above, this data is key to evaluating effects on marine mammals in the context of ESA consultation as well as MMPA authorization. Once the PUD provides this information to NMFS, we will need sufficient time to consider its effects. In the conclusions, the PUD makes the assumption that their two 10 m turbines will produce noise equivalent to that produced by one 6 m turbine, or a source level of 162 dB at 1m. It is highly unlikely that this assumption is true, and more likely

that the sound source of two 10 m turbines is greater than sound produced by one 6 m turbine. The PUD used a simple spherical spreading propagation loss model until the depth of the deployment site is reached; however, the turbines would be located close to the bottom and vibration from their bases would contribute to interference and bounce in the immediate field of the turbine. Therefore, the PUD should have used the practical spreading loss model for the entire estimated field of attenuation and used a source level higher than 162 dB at 1 m. If the source level was even 5 dB greater, or 167 dB at 1 m and by application of the practical spreading loss model, the area of effect would be much larger than the PUD estimate, at least 2.0 mi². The PUD concludes that project operations will not create noise at levels that will negatively affect marine life overall in the project area. NMFS disagrees. The project will cause a near constant source of continuous noise that could inundate an area of at least 2.0 square miles with sound above the NMFS disturbance threshold, thereby potentially causing the displacement or otherwise disrupt the normal behavior of marine mammals in this area for the project duration. As NMFS has pointed out above, Admiralty Inlet is a sensitive area that allows Southern Resident killer whales to pass through their designated critical habitat. Passage is a principle constituent element of Southern Resident killer whale critical habitat.

- Pg 186-189 – Electromagnetic Fields: The PUD should estimate noise produced by horizontally directional drilling, and include conservation measures to avoid harassment of marine mammals from the sound source.
- Pg 189-190 -- Cumulative Effects: There is a potential for cumulative effects of anthropogenic noise through the inlet. Although shipping traffic would represent a transient source of continuous sound, the project represents a near constant source of continuous sound. The PUD should evaluate how often both sources- turbine and shipping noise- would be present in Admiralty Inlet and the effective area of potential displacement across the inlet during those times.
- Pgs 220-226 – Southern Resident killer whales: NMFS clarifies that critical habitat within the three marine areas is within water greater than 20 feet deep relative to mean higher high water level (MHHW). Although data collected to date represent good efforts on behalf of the applicant to understand habitat use by Southern Residents through the project site, sampling is still in the early stages and not yet adequate. The characterization of existing environment for Southern Residents will be much improved after additional data are collected and when the pre-installation marine mammal study plan is completed.
- Pgs 227-229 – Steller sea lions: As described earlier relevant to the existing environment for harbor porpoise and pinnipeds, it is unclear how data reported from Tollit et al. 2009 are meant to characterize the existing environment in the project vicinity for Steller sea lions. Reports indicate lone or groups of Steller sea lions observed and some occupation of a proximate haul out. The current characterization is insufficient to adequately evaluate Steller sea lion use of the project area.
- Pgs 237-246 – Project effects and ESA-listed Marine Mammals: This section on project effects for ESA-listed marine mammals repeats the applicants characterization of project effects for marine mammals identified in pages 152 to

190 above. NMFS comments to the above pages 152 to 190 also apply to the ESA-listed marine mammals. Also, note NMFS comments above specific to sensitive area criteria and emergency shutdown criteria, marine mammal considerations are also relevant here.

- Pgs 297-299 and Pg 304 – Unavoidable Adverse Effects and Finding of No Significant Impact: This section incorporates summary of the applicants past assumptions related to the potential for marine mammal blade strike. NMFS maintains that additional conservation measures, as previously described in referenced comments, should be incorporated as part of the action to avoid adverse effects. Without additional measures, NMFS does not support the finding of no significant impact.

D. Comments on Comments on DLA Appendices

1. Appendix A Pre-installation Study Plans

Marine Mammal Considerations:

- The PUD has incorporated all of NMFS past requested changes to the marine mammal pre-installation study plan. Reference should be made to this study plan where the PUD calls attention to marine mammal observation and passive monitoring in the Aquatic Species Study Plan and Underwater Noise Study Plan later in the appendix. Additionally, the Underwater Noise Study Plan should incorporate collaboration with the Bay of Fundy project to insure that turbine sound data become available for a 10 m OpenHydro turbine in the near term.

Aquatic Species Study Plan

1. **Hydroacoustic Survey-** NMFS stated in its letter dated July 23, 2009 that the proposed Hydroacoustic Fish Assessment needed to include a trawl survey. However, the study plan still does not have a provision to include a trawl survey. Such surveys are standard for assigning species composition to hydroacoustic surveys. As previously stated, if trawling is not an option, the PUD should propose another method with which to truth test what they are detecting through hydroacoustic signals. The Biosonics split-beam survey information was provided after the DLA was filed, and the information presented in the Environmental Report does not provide a metric with which to measure the detected “fish” density against.

NMFS also requested that the PUD propose another method with which to truth test what they were detecting through hydroacoustic signals if a trawl was not possible. The PUD did not respond to this request.

The Biosonic report was provided after the DLA was filed. However, using the draft segments of the report provided at meetings, we know the acoustic imaging information provided does not allow us to distinguish salmonids from comparably

sized fishes. This imaging only offers a qualitative measure of target abundance and, possibly, some indication of the spatial positioning of targets within the surveyed area, but cannot distinguish among individual species—a necessary prerequisite for a quantitative estimate of abundance. While NMFS recognizes that every surveying technique is going to have its limitations, we also feel that information that is more useful could have been gathered if a trawling survey had been done concurrently. The current hydroacoustic data provides no way that we can differentiate between targets (ex: difficult to differentiate between similar sized fish, jellyfish or even debris).

- **Timing and Duration-** The PUD incorrectly stated that their third hydroacoustic survey would be conducted in November 2010. The PUD conducted the third survey in November 2009. However, survey data has not been provided to stakeholders. The PUD should delay their FLA submittal until all baseline information has been collected and analyzed.
 - **Data Analysis-** The PUD did not describe the data analysis method used. It is acknowledged that some number of acoustic targets may represent other marine life or possibly debris, but the PUD did not describe how the data analysis method minimized this potential. The PUD did not describe how the raw data was processed. There was no description of what assumptions were made. Did the PUD filter out invertebrates from the analysis? What size? The PUD did not describe how fish density was calculated. The PUD needs to provide information on fish distribution at the depth range the turbine will be operating at (ex: fish density at 60m-45m from the bottom). Since the PUD was not targeting concentrations of fish, the data on fish density provided should be considered a conservative estimate. How the information is currently presented, we have no metric with which measure the results against. For example, each of these sub surveys was conducted over 3 hours and 20 minutes. However, there is no way to tell if the number of targets detected over that period of time, for that time of day, and season is what is expected. In previous comments we recommended narrowing targets to focus on salmon size, timing, depth distribution, etc. It is unclear if this will be incorporated into the November or January study results.
2. **Tagged Fish Assessment-** NMFS stated in its letter dated July 23, 2009 that the Tagged Fish Assessment does not describe the number of fish tagged, or the species of fish tagged. When NMFS suggested the deployment of a receiver at the site installation location, it was anticipated to be in concert with the two lines of receivers deployed north and south of the project location by Pacific Ocean Tracking Shelf Tracking (POST). However, this is not the current deployment strategy. There is also no scientific support provided which indicates that the deployment of one receiver is sufficient. NMFS previously stated that if the PUD cannot provide the necessary methodology and detail required for the tagged fish assessment, and then an alternate study is required. This could involve the PUD placing an array of receivers sufficient to characterize the use of the project area

by migrating fish and tagging additional fish. The PUD has not proposed a study alternative, and has not addressed methodology insufficiencies to make the tagged fish assessment useful.

In addition, the PUD has not provided the information gathered from the Vemco receiver that has been in place at the project site since August 2009. PUD says in the plan that they coordinated with POST- this information has not been provided.

3. **Addition Surveys-** In our July 23, 2009 comments,³ NMFS requested, as part of the baseline studies, that the PUD gather information on rockfish. The proposed studies are insufficient to gather rockfish information and previous surveys do not provide site-specific information. NMFS stated that a “quantitative ROV or video assessment survey would be necessary to both quantify the abundance of various rockfishes and describe their habitat associations. The proposed hydroacoustic survey will not be useful for quantifying rockfish abundance. Based on conversations with the Northwest Fisheries Science Center, there are no tagged rockfish currently in Puget Sound (the batteries have expired on previously tagged fish). Even if there are current tagging studies being conducted, the battery life in rockfish-sized tags is around six months. Since several species rockfish are proposed to be listed in Puget Sound, it is essential that the PUD be able to produce species-specific information. A ROV or video assessment study is essential here.”⁴ This baseline information has yet to be gathered, and the monitoring protocol being proposed will be unable to provide species specific information. Additional comments on monitoring protocols are provided below.

Geophysical and Bathymetric Study Plan

1. **Characterization of Benthic Environment at the Project Site and Along Cable Route-** In this study plan, the PUD stated objectives included:
 - Characterization of eelgrass and marine macroalgae distributions (multibeam echosounder (MBES) sonar and side scan sonar backscatter imaging over the cable route, and diver survey in the near shore area of the cable route);
 - Substrate characterizations sufficient to describe habitat suitability for Dungeness crab, rockfish, and geoduck in the study area and cable route (using MBES sonar/sidescan sonar backscatter imaging); and
 - ROV video sampling of the cable route and project installation site- ROV videography will be conducted in the turbine deployment site and the proposed cable route. This method will complement the sonar evaluation to help determine the presence of eelgrass and macroalgae and, in conjunction with the grab samples, allow for evaluating habitat suitability for Dungeness crab, rockfish, and geoduck in the study area and cable route. In addition, the video will be reviewed to document any other visible marine life (e.g., fish and other invertebrates).

³ NMFS Revised Pre-Installation Study Plan Comments Filed July 23, 2009.

⁴ NMFS Revised Pre-Installation Study Plan Comments Filed July 23, 2009.

To date, this information has not been provided along the proposed cable route or near shore environment.

NMFS requested in our comments on PUD's PAD document,⁵ Pre-Installation Study Plan document,⁶ and Revised Study Plan documents,⁷ that the micro-siting study provide information on habitat types that are currently located within (and surrounding) the micro-siting area and cable route. NMFS also requested a pre-installation determination of habitat use (feeding, sheltering, migrating, resting, etc) by species that are likely to be present in the project area. The PUD has attempted to answer the first question, with the use of grab samples, ROV and sonar. However, the cable route surveyed in Figure 1 (Geophysical/Site Study Plan) is not the same route the PUD finalized (Figure 1.1-1 Draft Environmental Report), and there is currently no information on habitat types or acoustic data to document the distribution and relative abundance of marine macroalgae and eelgrass along the new cable route. The second issue of determining how the habitat is currently being used has been left unanswered, and needs to be addressed. The studies done by Fugro may be able to answer some of these questions. However their Figure 4-1 (Exhibit E), does not show the project location or proposed cable route so it is difficult to determine if they covered that area or not. Based off their survey only a small area of the near shore was surveyed and documented the kelp limit appears to reach out to 8m, but it is unclear if this overlaps the proposed cable route. NMFS requests a map showing depth ranges, project location, and cable route, and the habitat types located within those locations.

NMFS wishes to reiterate that if sensitive habitat types are discovered in the project area or along the cabling route, that an alternate location should be considered for turbine placement and subsea cable routing. The study needs to encompass a large enough area that allows the PUD to consider an alternative cable route if the area currently being considered is inappropriate due to potential harm to marine resources.

- 2. Survey Procedures and Data Presentation-** Under this section, PUD states that even though they do not expect macroalgae and eelgrass to occur at the turbine installation location due to the depth, "the cable route extends from the turbine to shore, and the [PUD] will evaluate benthic habitat resources along the cable route, with particular focus on eelgrass, macroalgae, and shellfish..." The PUD proposed using the following methods to gather this information: multibeam echosounder (MBES) surveys, split-beam surveys, ROV videography, and dive surveys.

⁵ NMFS Pre-Application Document Comments, Filed December 8, 2008.

⁶ NMFS Pre-Installation Study Plan Comments, Filed March 9, 2009.

⁷ NMFS Revised Pre-Installation Study Plan Comments, Filed July 23, 2009.

The Geophysical/Site Study Plan states that for MBES, “An additional survey line will follow the proposed cable route from the 1 km² survey area as far shoreward as can be safely done” Again, the proposed cable route in this plan is in a different location than the finalized cable route. The information provided from the Fugro study does not clearly provide the detection of eelgrass and macroalgae presence along the cable route (as the data presentation section said it would), and only appears to go to the 20 m contour, not covering the nearshore environment.

The Biosonics split-beam survey information was provided after the filing of the DLA. This split-beam sonar survey was not only suppose to document fish in the project area, but was also suppose to document, “the distribution and relative abundance of marine macroalgae and eelgrass along the cable route within all waters accessible by boat (Snohomish 2009).” Based on the sampling grid provided in Figure 2 (Aquatic Species Study Plan), the hydroacoustic survey does not appear to sample any of the cable routes closer than the 20m contour. Once again, the nearshore area remains un-surveyed.

The next survey method proposed was ROV videography. “ROV operations to obtain seafloor video/photography of the seabed will be evaluated with particular focus on identifying eelgrass, macroalgae, shellfish, and other visible marine life. Because of limitations of vessel-mounted sonar in near-shore areas, the ROV videography will allow evaluation of the seafloor in the nearshore area of the cable route (Snohomish 2009).” Clearly, this method was supposed to cover nearshore areas. However, to date these surveys have not been conducted in the nearshore environment, and those surveys that have been conducted at the project location are conducted without any clear survey method. Despite NMFS request,⁸ that the PUD clarify: when the ROV surveys will be conducted, what transects will be surveyed, and how many ROV surveys have been conducted to date; this information has not been provided. The ROV imagery that has been provided only shows a few minutes of video. The PUD needs to further explain ROV survey methodology, and explain what addition ROV analysis will be conducted (in conjunction with sonar evaluation) and describe how this meets a scientifically backed methodology sufficient to characterize the benthic habitat at the project site and along the cable route which is the PUD’s stated objective.

The final survey method proposed was a diver survey. “A diver survey will be conducted to characterize eelgrass and macroalgae distributions along the nearshore areas of the proposed cable route. The survey will follow 2008 WDFW Eelgrass/Macroalgae Habitat Interim Survey Guidelines, unless otherwise directed.” To date, no diver surveys have been conducted, nor has the PUD stated when they intend to conduct these surveys.

3. **Data Analysis and Reporting-** The PUD stated in the study plan that the “Survey Report will describe the survey standards and procedures and provide a timeline of field operations. Specifics of data acquisition methods, navigation precision,

⁸ NMFS letter dated July 23, 2009, “Revised Study Plan Comments.”

sonar data processing, and blending with preexisting data will be documented (Snohomish 2009).” Despite the fact that the Fugro survey was completed in June 2009, the first time stakeholders got to review the survey report was in the DLA, nearly six months later.

2. Appendix B Monitoring Plans

1. **General Considerations-** Monitoring plans lack strategies to detect environmental effects of the project, and performance standards and thresholds at which observed risk or environmental harm would trigger project modification, shutdown or removal. The PUD needs to add this to their monitoring plans to make them effective for this purpose.
 - **Technical Hurdles-** The PUD states that while there are a number of technical hurdles facing monitoring, “it is important to note that no method to address these challenges is currently identified, which may substantially affect PUD’s monitoring abilities and technology decisions (Draft Monitoring Plan pg.3).” However, the PUD provides no method of dealing with these issues. While it is understood that challenges are inevitable when dealing with nascent technologies, the PUD has not established monitoring criteria or thresholds, that when aren’t met, trigger the Adaptive Management Plan (AMP). It is unacceptable to state that technology failures are likely and would lead to the absence of monitoring or ability to detect environmental harm if it were to occur. In Addition, gear retrieval and redeployment methods need to have criteria agreed upon by the technical group, and if these criteria are not met, the AMP needs to be triggered.
 - **Scientifically Accepted Methodology-** The PUD needs to describe their preferred data collection and analysis techniques, and show how this is consistent with generally accepted practices in the scientific community. Didson technology is not new, and yet the PUD provides no references to other studies that have successfully used this monitoring protocol.
 - **Feasibility Testing-** The PUD has not defined when monitoring feasibility testing will occur; only that it will be prior to project installation. The PUD needs to state when this information will be available. When will these studies be conducted? What are the testing objectives (ex: determining optimal camera angle, deployment strategies, interference issues, depth of field, etc.)? This information needs to be provided.
 - **Rockfish Monitoring Plan-** The PUD needs to incorporate a method for gathering rockfish information.
 - **Reference Sites-** Reference sites (control sites) need to be incorporated into both pre- and post-installation study plans. The reference site should contain similar habitat features as the installation site and surveys should be

coordinated to occur, as much as possible, simultaneously at both sites. NMFS has repeatedly requested the use of Before-After/Control (a.k.a. reference)-Impact (BACI) study design in the PUD's study plans.⁹ This study design has been laid out for other renewable ocean energy projects in the region.

2. **Adaptive Management Approach-** The PUD has not really defined what they mean by "adaptive management." The PUD states that they expect, "technological advances and the development of new information regarding the potential effects of hydrokinetic turbines during the course of pre-installation licensing efforts for the Project (Snohomish 2009)." However, the PUD does not connect these advances in technology and information in with their AMP. The AMP should provide the ability to adjust management and monitoring of the project in light of new data. In addition, AMP should allow for the addition of new studies as new methods are developed. The PUD also needs to clarify the effective date of the AMP.

The PUD intends to set up a technical review and discussion by a technical working group to deal with issues as they arise. However, the PUD does not describe how this will be done, when it will be set up, and who will be involved in the working group. NMFS would like to be involved as this framework is developed. The PUD has not laid out how the feedback mechanism of the technical group will work in the AMP. They need to describe the organizational structure for the technical group. The PUD should consider establishing an overarching coordinating committee and sub committees for each of the study plans that will oversee implementation of studies and monitoring plans as well as provide recommendations of changes that need to be made, as this type of process has been laid out for other renewable ocean energy projects in the region. In addition, the PUD states that this "group would oversee and evaluate results of pre-installation and monitoring studies (Snohomish 2009)." The AMP should allow the technical group to address issues outside those initially studied, including all issues involving potential impacts of the project, whether those are study evaluation; changes in construction method or operations; project removal and restoration; implementation of those changes; and dispute resolution processes. The PUD needs to clearly state timeframes on when the technical group will be notified as new information becomes available, when decisions will be made, etc. The key topics that the technical working group would administer needs to be expanded to include:

- review of quarterly reports containing status reports on the ongoing monitoring and studies as well as study plans for coming quarter;
- determine resource management objectives and formulate criteria to detect environmental effects of the project, and modify criteria where warranted;

⁹ NMFS letter dated April 16, 2009, "Pre-Installation Study Plans Regarding Marine Mammal Issues," and a letter dated July 23, 2009, "Revised Study Plan Comments."

- determine whether a change in the project is required as a result of meeting a threshold at which observed risk or environmental harm would trigger project modification, shutdown, or removal, or whether existing practices continue to be appropriate;
- evaluate response plans proposed by the PUD where the technical group has determined that a change in the project is required, and determining whether or not to adopt, modify or propose an alternative to the PUD's response plan;
- where critical adverse effects require immediate response, agreeing on actions that applicant can take to address those effects;
- providing input to the PUD's annual report to FERC that summarizes study results and technical group decisions and describes study plan for the next year; and
- participate in dispute resolution when unable to reach a consensus on issues before the technical group.

The PUD should consider using a facilitator at the first of each technical group meetings, and thereafter on request of the group for the first year after the license term, as has been proposed for other renewable ocean energy projects in the region.

3. **Aquatic Species and Project Operations Monitoring Plan**

- **Duration of Monitoring-** According to FERC in its white paper, "The purpose of licensing hydrokinetic pilot projects are to test new hydrokinetic technology devices; to determine the appropriate sites for hydrokinetic projects; and to gather information on environmental and other effects of the devices." The PUD reiterates this purpose in saying the pilot process "require[es] a rigorous project operations monitoring effort, as well as shutdown and removal if significant adverse environmental impacts occur and cannot be mitigated."¹⁰ Despite the acknowledgement that monitoring efforts should be rigorous, the PUD is requesting a license term of 10 years, and only requiring one year of monitoring with the potential of additional monitoring if warranted. The PUD states that the "primary goal of the pilot plant is to conduct research and gather data, with energy production playing a secondary role," that statement in and of itself warrants collecting as much information as possible for the duration of project operation (Snohomish 2009). The project needs to be monitored for the duration that it is in the water.

¹⁰ Testimony of Craig Collar to the U.S. House of Representatives House Committee on Science and Technology Subcommittee on Energy and Environment. Hearing: "Marine Hydrokinetic Energy Technology: Finding the Path to Commercialization. December 3, 2009.

- **Monitoring Objectives and Goals-** The PUD only lists a few of the potential effects of the project. NMFS provided the PUD with a draft effects matrix in January 2009 with a detailed list of potential impacts (see Attachment 3). The PUD has not considered many of these including, EMF effects, directional drilling effects, maintenance, etc.
- **Near-Turbine Monitoring and Identification of Aquatic Species-** The PUD stated in its letter dated August 19, 2009, that “Snohomish is currently preparing a near-field monitoring plan that would combine split-beam and multi-beam sonar to detect and quantify fish and marine mammal use, if any, of the local vicinity of the project turbines.” In their current monitoring plans, no split-beam sonar work will be done which narrows the range around the project with which information can be gathered and keeps the monitoring to such narrow parameters that it would be difficult to determine how species are interacting around the turbine such as avoidance.

The Navy is proposing a combination of multi-beam acoustic cameras and up to 10 hydroacoustic transducers as a means of near-turbine monitoring for aquatic species for their tidal energy project in Admiralty Inlet. Split-beam hydroacoustic technology can cover a much wider area than just the use of multi-beam acoustic cameras like those that the PUD is proposing. The combination of split-beam hydroacoustic sonar and the multi-beam acoustic cameras could be helpful in determining if species are avoiding the area and provide vertical distribution data.

Based on discussion with the PUD, there appear to be technical concerns over video, multi-beam acoustic camera, and single-beam acoustic transducer coupling. The PUD needs to test the capabilities of their monitoring protocol prior to project operation in order to determine effectiveness. The monitoring plans should be tied in with the AMP. If technical difficulties arise, there needs to be a process in place to address these issues and make the necessary changes to the project.

- **Monitoring Configuration-** the PUD proposes to employ “paired multi-beam acoustic cameras to detect and observe marine species on either side of a turbine face during sampling intervals.” Based on this description it is difficult to determine if the PUD intends to have two cameras per turbine (a total of 4 cameras) or one camera per turbine (a total of 2 cameras)? The PUD needs to be able to detect marine species approaching and leaving the turbine area for each turbine. There are a number of potential camera arrangements that could be made for monitoring. The PUD does not describe how they intend to setup this monitoring protocol, or what the potential pros and cons of various arrangements would be. The PUD needs to provide this information. One way of clarifying the monitoring arrangement could be if the PUD provided a figure showing how the

mounting configuration of the video, multi-beam transducer, and single-beam transducer would be aligned, and the area each monitoring device will cover. We need to fully understand the area captured by the cameras. A number of questions remain:

- Does the camera beam cover the entire turbine surface;
- How much of the surrounding turbine area is covered;
- To what extent can species be discerned at various distances;
- Will the cameras be able to detect species avoiding the turbine or only direct interaction;
- Is continuous video recording possible vs. the few seconds of recording being proposed; and
- When has this method been previously used successfully and what species were targeted?

The PUD needs to describe their preferred data collection and analysis techniques, and show how this is consistent with generally accepted practices in the scientific community. Didson technology is not new, and yet the PUD provides no references to other studies that have successfully used this monitoring protocol. The PUD states, “The range of visibility for underwater video will be influenced by the concentration of particulates and air bubbles in the water column, a variable that will require evaluation during system testing (Snohomish 2009).” This is another example of where the PUD needs to tie in potential complications with the AMP. The technical group should decide on appropriate criteria for the video range. Monitoring methods should be able to make detections out to the projected distance of effect. Equipment can be tested ahead of time to see if it meets criteria and then incorporated into project planning. If the equipment is not capable of making detections to the extent of the proposed zone of effect then this should trigger the AMP.

Key considerations for near-turbine monitoring and identification of marine species, needs to be expanded to include:

- Criteria for gear retrieval and redeployment methods agreed upon by the technical group, and a stipulation that if these criteria are not met, the AMP will be triggered.
- New Monitoring Techniques

○ **Acoustic Monitoring-**

- **Duration-** Following review of the collected data, if sound levels produced by the tidal turbine prove to be at levels of concern or if additional monitoring is deemed necessary, the technical working group will determine appropriate steps through the AMP.

- **Hydrodynamic Effects Monitoring-** The PUD intends to include a pair of Acoustic Doppler Current Profiler (ADCP) transducers as part of the monitoring package in order to define the maximum extent of project-related hydrodynamic effects. One of the key considerations for this monitoring plan is compatibility with sonar arrays. The PUD states that while a multi-beam camera is fully compatible with ADCP data collection, split-beam arrays cannot be used in conjunction with an ADCP. It is not clear why the use of multi-beam, and single-beam equipment (such as that being proposed as a camera trigger), can be used in concert with ADCP, but split-beam cannot. The PUD needs to further explain the technical difficulties. In addition, the PUD is only intending on using the ADCP for three months of post-installation monitoring. The PUD needs to explain why a split-beam array could not be installed prior to operation and then triggered to start collecting data once ADCP measurements are complete.

- **Derelict Gear Monitoring-** The PUD proposes to monitor for derelict fishing gear during ROV deployments required as part of standard operations and maintenance procedures. During the first year of deployment, ROV observations are expected every 2-3 months. The PUD needs to clearly state when monitoring reports will be provided to the technical working group. If ROV observations are expected every 2-3 months, the PUD needs to provide quarterly updates. Following the first year of deployment, the technical working group needs to determine if inspection frequency is appropriate for subsequent years of project operation or if changes are required. This should be tied in with the PUD's AMP.

The PUD cited the Good et al. paper as having recovered derelict gear in Puget Sound at a maximum depth of 42.7 meters (2009). Good used divers to recover derelict gear in the Sound. While it is noted that the PUD's turbine anchor will be placed at 58 meters, the turbine itself goes up to 38 meters. This seems to be in the acceptable range for diver retrieval of derelict gear. If this is still beyond the safe scope of recovery efforts for divers, then the PUD needs to explain why ROV deployment is the preferred retrieval method, and how this will be done successfully. The PUD needs to describe this technique, and show how this is consistent with generally accepted practices in the scientific community. Based on the ROV footage that the PUD has provided during their pre-installation studies, the ROV they are using does not appear capable of maneuvering around the project site, nor capable of retrieving derelict gear.

- **Benthic Habitat Monitoring-** The PUD needs to state how much cable will be laid on the seabed vs. the amount of cable that will be directionally drilled. The PUD needs to explain how the cable that is laid on the seabed will be secured.

- **ROV Surveys-** The PUD proposes to monitor for changes to the benthic environment by conducting ROV surveys around the base of the turbine and portions of the subsea cable route (Snohomish 2009). However, the PUD does not provide any methodology for these surveys other than to say they will be conducted every 2-3 months. The PUD needs to describe how this technique is consistent with generally accepted practices in the scientific community. A number of questions remain:

- What transects will be run;
- How wide of an area will be surveyed;
- Why not survey the entire cable route to determine potential effects of directional drilling and laying the cable on the surface;
- What type of equipment will be used (the ROV the PUD is currently using appears unable to perform quantitative surveys and is often tossed around by the current);
- How much footage will be gathered per survey; and
- Has this method been previously used successfully?

As previously stated above, the PUD has not conducted ROV surveys along the cable route. Without baseline information, how will the PUD be able to make comparisons between changes in seafloor habitat caused from the project installation and laying the cable vs. what was there previously?

- **Construction and Removal Monitoring-** The PUD anticipates that the predominant source of noise during project installation and maintenance would originate from the vessels' propellers. The PUD needs to provide information on what they expect the peak underwater sound intensity generated by a vessel fully underway would be.
 - **Horizontal Directional Drilling Impacts-** The PUD has not provided any information concerning the directional drilling method. The PUD needs to provide bathymetric information along the cable route to ensure that fractures do not exist, which could lead to fracout (escapement of drilling fluids). The PUD also needs to describe what kind of lubricant will be used for drilling, how they intend to cleanup drilling debris, and what the sound output from drilling will be.
- **Need for Additional Monitoring-**
 - **Rockfish Monitoring-** The monitoring protocol needs to be expanded to include a quantitative ROV survey. This could perhaps be done in conjunction with the ROV work being done on marine debris surveys, but would need to be expanded with specific transects for rockfish. The proposed monitoring methods are insufficient to gather rockfish

information as they are focused on the turbine face and not the benthic environment.

Marine Mammal Considerations:

- These comments iterate why the near-field monitoring plan lacks detail necessary to understand monitoring system capabilities for timely response to observed risk-prone events, does not indicate what types of events would classify as risk-prone and if the chosen monitoring systems are capable of detecting the extent of those events, does not provide adequate description of the mechanism and timeliness for incorporating project changes through adaptive management, and is wholly inadequate to avoid strike risks that will not be tolerated in an ESA Section 7 consultation for Southern Resident killer whales. The monitoring program does not minimize project risks to the extent necessary for Southern Resident killer whales, and the applicant gives no assurance that the monitoring systems are capable of detecting, nor the applicants capable of adaptively managing the project in a timely manner in the event of realized project risk to other marine mammals. A specific point, the PUD recognizes the potential for gear malfunction, but does not indicate backup systems or operation modifications to respond to gear malfunction. Additionally, although the applicant has not made their intent clear regarding application for MMPA authorization, the addition of a land-based monitoring program and passive acoustic monitoring system would likely be a requirement of any MMPA permit to insure the applicant can monitor any authorized take of marine mammals, i.e., harassment by noise.

4. Appendix C Safeguard Plan

- **Emergency Response-** The PUD states “following project shutdown, analysis and decision on immediate measure will be made by the PUD and reported to FERC (Snohomish 2009).” Stakeholders should be involved in this process. In the Reedsport project, within 6hrs of shutdown, a call to emergency contacts is made and cooperation is initiated with relevant stakeholders to allow them to collect dead animals or perform life saving measures. Within 10 days a committee meeting occurs to allow initiation of AMP if appropriate. Finally, a copy of this plan is provided to FERC and stakeholders. NMFS recommends that the PUD follow a similar emergency plan as those being proposed for other renewable ocean energy projects in the region.

Marine Mammal Considerations:

- Refer to NMFS comments above regarding marine mammal considerations for sensitive area and emergency shutdown criteria. These comments describe why additional operations plans need to be incorporated to preemptively avoid the risk of blade strike for Southern Resident killer whales. It is not sufficient to indicate that emergency shutdown will occur if a Southern Resident killer whale is injured or killed by blade strike.

5. **Appendix F Marine Mammal Pre-Installation Study – Review of Historical Information and Site-Specific Synthesis:**

Marine Mammal Considerations:

- On page 17, the report indicates that a lag time of three days might be more appropriate than two days given that sightings are likely under-reported during winter months, because of poor weather and visibility. However, such factors also diminish the potential for one-way entrances to be sighted during winter months. This being the case, one-way entrances may be as under estimated as lack of secondary sightings the day after a detected on-way entrance. On this account, characterizing forays with 2-day time lags should be further considered. On page 22, the report assumes that no behavioral information indicates the whales were traveling, and admits that results from these data should be interpreted with caution. It is unclear why “travel” was assumed, given the variability in reporting details generally for voluntary and non-standardized data recording. Page 24, charts sport catch against whale days. Sport catch may not be a reliable indicator of prey availability if sport catch effort is not evenly distributed throughout the year, among other factors. On page 26, the synopsis highlights that 70 percent of the whale days in Puget Sound were concentrated during the months from October through January, but it should also be pointed out that whale days occurred in all seasons. The report estimates 1,442 animal transits through Admiralty Inlet in a year using the 3-day time lag assumption and pod associations per sightings that were not summarized or characterized with further detail in the report. Suggest incorporating a range of animal transits, including use of 2-day lag assumption, better characterize pod associations and any assumptions with regard to those data that are used to support annual transit estimates.

E. Conclusions

Due to the species and habitats located in the proposed project area, and the constraints of an expedited pilot project licensing process, NMFS has given this project close scrutiny. To highlight one of its many issues, NMFS has concerns about a proposed project that is likely to increase the risk of mortality of a single Southern Resident killer whale.

This is why we have extensive comments on the DLA, while at the same time, as an agency, support alternative energy projects. As highlighted above, the DLA does not meet five of the six criteria as the project is currently proposed. The PUD needs to address these concerns and explain how their project fits the established criteria by the time they file their FLA. NMFS also has significant concerns with the PUD’s environmental report and appendices. The environmental report lacks sufficient information to evaluate the existing environment or characterize effects of the project on marine resources. Baseline studies are not yet complete, and most of the study plans have not been resolved. Project plans proposed for emergency shutdown and monitoring are insufficient to minimize potential adverse impacts, identify species responses and

allow for a timely adaptive management process and decisions following the monitored events.

We also highlight the need for additional mitigation measures to address project impacts. Specifically, NMFS recommends that the PUD develop a project operations plan to avoid the risk of blade strike to Southern Resident killer whales.

F. Recommendations

A potential way forward would be for the PUD to request a second preliminary permit. This would allow enough time for the PUD to address our concerns relative to resource protection and conservation during the testing of the two turbines, and develop a sufficient license application. We recommend that FERC hold a technical conference to discuss our issues, and consider how to proceed. NMFS also requests that FERC ensure that the information NMFS needs is included in the FLA to ensure conservation of marine resources, and allow NMFS to engage in ESA Section 7 consultations, MMPA actions, and provide terms and conditions for the license.

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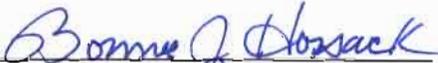
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Snohomish County Public Utility District No. 1)	Admiralty Inlet Pilot
)	Tidal Project
_____)	FERC No. 12690-003

CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by electronic or first class mail, a letter to Kimberly D. Bose, Federal Energy Regulatory Commission, from the National Marine Fisheries Service, regarding National Marine Fisheries Service's comments on the proposed Admiralty Inlet Pilot Tidal Project (P-12690-003) and this Certificate of Service to each person designated on the official service list compiled by the Commission in the above captioned proceeding.

Dated on February 26, 2010



Bonnie J. Hossack

DRAFT ENVIRONMENTAL ASSESSMENT

**New Regulations to Protect Killer Whales
from Vessel Effects in Inland Waters of Washington**



**National Marine Fisheries Service
Northwest Region**



January 2009

COVER SHEET

Title of Environmental Review: DRAFT ENVIRONMENTAL ASSESSMENT
New Regulations to Protect Killer Whales from Vessel Effects in Inland Waters of Washington

Listed Species (ESA):
Southern Resident killer whale DPS (endangered)

Responsible Agency Official:
Barry A. Thom, Acting Regional Administrator
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way NE
Seattle, WA 98115

Responsible Agency Contact:
Lynne Barre
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way NE
Seattle, WA 98115

Cooperating Agencies:
U.S. Coast Guard
Washington Department of Fish and Wildlife
Department of Fisheries and Oceans, Canada

Legal Mandates:
Endangered Species Act of 1973 (ESA, 16 U.S.C. 1531 et seq.)
Marine Mammal Protection Act (MMPA, 16 U.S.C. 1361 et seq.)
National Environmental Policy Act (NEPA, 42 U.S.C. 4321 et seq.)

Location of Proposed Action:
Inland waters of Washington State

Proposed Action:
Adopting regulations to protect killer whales from vessel impacts, which will support recovery of Southern Resident killer whales.

Cover photos: Land-based viewing of killer whale; Jeff Hogan, killer whales and whale watch vessel; Dawn Noren, and kayak with killer whales; Jeff Hogan.

LIST OF ACRONYMS

ANPR	Advance Notice of Proposed Rulemaking
CCG	Canadian Coast Guard
CEQ	Council on Environmental Quality
CTC	Pacific Salmon Commission Joint Chinook Technical Committee
CVTS	Co-operative Vessel Traffic System
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEIS	Final Environmental Impact Statement
IEC	Industrial Economics, Incorporated
ISAB	Independent Scientific Advisory Board
MMPA	Marine Mammal Protection Act
MRC	Marine Resources Committee
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NMPAC	National Marine Protected Areas Center
OMB	Office of Management and Budget
OSP	Optimum Sustainable Population
PTS	Permanent Threshold Shift
RCW	Revised Code of Washington
RIR/RIA	Regulatory Impact Review/Regulatory Impact Assessment
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
USCG	United States Coast Guard
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WWOANW	Whale Watch Operators Association Northwest

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1 **1.0 PURPOSE AND NEED FOR ACTION**

2 **1.1 Introduction**

3
4 The National Marine Fisheries Service (NMFS) has prepared this environmental assessment in accordance
5 with the National Environmental Policy Act (NEPA). The document considers the environmental
6 consequences of alternative actions to protect killer whales from vessel effects in inland waters of
7 Washington State. The analysis of alternatives and consequences will inform NMFS' decisions on actions
8 to reduce the impact of vessels on endangered Southern Residents and other protected killer whales under
9 the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA). The Southern Resident
10 killer whale Distinct Population Segment (DPS) was listed as endangered in November 2005 and the
11 recovery plan includes actions to reduce the impact from vessels.

12 **1.2 Background**

13
14 Killer whales (*Orcinus orca*) in the eastern North Pacific have been classified into three forms, or ecotypes,
15 termed residents, transients, and offshore whales. Resident killer whales live in family groups, eat salmon,
16 and include the Southern Resident and Northern Resident communities of killer whales. Transient killer
17 whales have a different social structure, are found in smaller groups and eat marine mammals. Offshore
18 killer whales are found in large groups and their diet is largely unknown. The Southern Resident killer
19 whale population contains three pods – J pod, K pod, and L pod – and frequently visits inland waters of the
20 Pacific Northwest. During the spring, summer, and fall, the Southern Residents' range includes the inland
21 waterways of Puget Sound, Strait of Juan de Fuca, and Southern Strait of Georgia. Little is known about the
22 winter movements and range of Southern Residents. Their occurrence in coastal waters extends from the
23 coast of central California to the Queen Charlotte Islands in British Columbia. The home ranges of
24 transients, offshore whales, and Northern Residents also include inland waters of Washington and overlap
25 with the Southern Residents.

26
27 Viewing wild marine mammals is a popular recreational activity for both tourists and local residents. In
28 Washington, killer whales are the principal target species for the commercial whale watch industry (Hoyt
29 2001). NMFS listed the Southern Resident killer whale DPS as endangered under the ESA on November
30 18, 2005 (70 FR 69903). In the final rule announcing the listing, NMFS identified vessel effects, including
31 direct interference and sound, as a potential contributing factor in the recent decline of this population.
32 NMFS is concerned that some whale watching activities may cause harassment, harm killer whales or
33 cause detrimental individual and population level impacts.

34
35 There is a growing body of evidence documenting effects from vessels on small cetaceans and other marine
36 mammals. The variety of whale responses include stopping feeding, resting, or social interaction (Baker et
37 al. 1983; Bauer and Herman 1986; Hall 1982; Krieger and Wing 1984; Lusseau 2003a; Constantine et al.
38 2004); abandoning feeding, resting, and nursing areas (Jurasz and Jurasz 1979; Dean et al. 1985; Glockner-
39 Ferrari and Ferrari 1985, 1990; Lusseau 2005; Norris et al. 1985; Salden 1988; Forest 2001; Morton and
40 Symonds 2002; Courbis 2004; Bejder 2006a, 2006b); altering travel patterns to avoid vessels (Constantine
41 2001; Nowacek et al. 2001; Lusseau 2003b, 2006); relocating to other areas (Allen and Read 2000); effects
42 on acoustic behavior (Van Parijs and Corkeron 2001); or not reacting to vessels (Watkins 1986; Nowacek
43 et al. 2003). One study found that marine mammals exposed to human-generated noise released increased
44 stress hormones with the potential to negatively affect their nervous and immune systems (Romano et al.
45 2004).

46

1 Several scientific studies have documented human disturbance of resident killer whales by vessels engaged
2 in whale watching in the Pacific Northwest. Short-term behavioral changes in Northern and Southern
3 Residents have been observed and studied by several researchers (Kruse 1991; Kriete 2002; Williams et al.
4 2002a, 2002b, 2006, 2009; Foote et al. 2004; Bain et al. 2006; Noren et al. 2007, In Press; Lusseau et al.
5 2009), although it is not well understood whether it is the presence and activity of the vessel, the sounds the
6 vessel makes, or a combination of these factors that disturbs the animals. Individual animals can react in a
7 variety of ways to whale watching, including swimming faster, adopting less predictable travel paths,
8 making shorter or longer dive times, moving into open water, and altering normal patterns of behavior at
9 the surface (Kruse 1991; Williams et al. 2002a, 2009; Bain et al. 2006; Noren et al. 2007, In Press). High
10 frequency sound generated from recreational and commercial vessels moving at high speed in the vicinity
11 of whales may mask echolocation (signals sent by the whales that bounce off objects in the water and
12 provide information to the whales) and other signals the species rely on for foraging (Erbe 2002; Holt
13 2008), communication (Foote et al. 2004, Holt et al. 2009), and navigation.

14
15 In rare instances, killer whales are injured or killed by collisions with passing ships and powerboats,
16 primarily from being struck by the hull or turning propeller blades (Visser 1999; Ford et al. 2000; Visser
17 and Fertl 2000; Baird 2001; Carretta et al. 2001, 2004). Some injuries are minor while others are severe and
18 may result in death. Some animals with severe injuries eventually make full recoveries, such as a female
19 described by Ford et al. (2000) that showed healed wounds extending almost to her backbone, however,
20 several mortalities of resident killer whales in British Columbia in recent years have been attributed to
21 vessel collisions (Gaydos and Raverty 2007).

22
23 As human populations in coastal areas of Washington grow, increases in vessel traffic are also expected in
24 the future (Interagency Committee for Outdoor Recreation 2003), and current protections under the MMPA
25 and ESA may not be sufficient to address the threat of vessels to killer whales.

26 **1.3 Current MMPA and ESA Prohibitions, Regulations, and NMFS Guidelines**

27
28 The Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et seq., generally prohibits take of marine
29 mammals. Section 3(13) of the MMPA defines the term take as “to harass, hunt, capture, or kill, or attempt
30 to harass, hunt, capture, or kill any marine mammal.” Except with respect to military readiness activities
31 and certain scientific research activities, the MMPA defines the term harassment as “any act of pursuit,
32 torment, or annoyance which: (i) has the potential to injure a marine mammal or marine mammal stock in
33 the wild, [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal
34 stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration,
35 breathing, nursing, breeding, feeding, or sheltering [Level B harassment].”

36
37 In addition, NMFS’ regulations implementing the MMPA further describe the term take to include: “the
38 negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional
39 act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine
40 mammal in the wild” (50 CFR 216.3). The MMPA provides limited exceptions to the prohibition on take
41 for activities such as scientific research, public display, and incidental take in commercial fisheries. Such
42 activities require a permit or authorization, which may be issued only after a thorough agency review.
43 Similar to the MMPA, the ESA generally prohibits the taking of endangered species. The ESA defines take
44 to mean “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in
45 any such conduct.”

46
47 Both the ESA and MMPA require wildlife viewing to be conducted in a manner that does not cause take.
48 For particular species in specific locations, NMFS has promulgated regulations to provide additional

1 protection to marine mammals that are the subject of wildlife viewing activities. NMFS has regulated close
2 vessel approaches to large whales in Hawaii, Alaska, and the North Atlantic. In 1995, NMFS published a
3 final rule to establish a 100 yard (91.4 meters) approach limit for humpback whales in Hawaii (60 FR 3775,
4 January 19, 1995). In 2001, NMFS published a final rule (66 FR 29502, May 31, 2001) to establish a 100
5 yard (91.4 meters) approach limit for humpback whales in Alaska that included a speed limit when a vessel
6 is near a whale. In 1997, a final rule was published to prohibit approaching critically endangered North
7 Atlantic right whales closer than 500 yards (457.2 meters) (62 FR 6729, February 13, 1997). To reduce
8 impacts to North Atlantic right whales from collisions with ships, a final rule was recently published to
9 implement speed restrictions of no more than 10 knots applying to all vessels 65 feet (19.8 meters) or
10 greater in overall length in certain locations and at certain times of the year along the east coast of the U.S.
11 Atlantic seaboard (73 FR 60173; October 10, 2008).

12
13 In September 2007 the San Juan County Council enacted a local ordinance (No. 35-2007) designed to
14 prevent boaters from harassing Southern Resident killer whales that frequent county waters. The ordinance
15 makes it unlawful to feed killer whales or “knowingly” approach within 100 yards of a killer whale within
16 San Juan County. In addition, a state bill with similar language to current guidelines described below (HB
17 2514) to protect killer whales in Washington State waters was approved March 28, 2008 and became
18 effective June 12, 2008. The county ordinance expired when the Washington State Department of Fish and
19 Wildlife established regulations regarding the operation of vessels in proximity to Southern Resident killer
20 whales.

21
22 NMFS has also provided general guidance on how to conduct wildlife viewing that does not cause take
23 under the MMPA and ESA. This is consistent with the philosophy of responsible wildlife viewing
24 advocated by many agencies and national advocacy groups to unobtrusively observe the natural behavior of
25 wild animals in their habitats without causing disturbance (see <http://www.watchablewildlife.org/> and
26 http://www.watchablewildlife.org/publications/marine_wildlife_viewing_guidelines.htm). Each of the six
27 NMFS Regions has developed recommended viewing guidelines to educate the general public on how to
28 responsibly view marine mammals in the wild and avoid causing a take. These guidelines are available
29 online at:

30 http://www.nmfs.noaa.gov/prot_res/MMWatch/MMViewing.html

31
32 The “Be Whale Wise” guidelines developed for marine mammals by the NMFS Northwest Regional Office
33 and partners are also available at:

34 http://www.nwr.noaa.gov/Marine_Mammals/upload/BeWhaleWise.pdf

35
36 Be Whale Wise is a transboundary effort to develop and periodically revise guidelines for viewing marine
37 wildlife. NMFS has partnered with the Soundwatch boater education program, Straitwatch, commercial
38 operators, whale advocacy groups, and United States and Canadian government agencies and enforcement
39 divisions over the past several years to promote safe and responsible wildlife viewing practices through the
40 development of outreach materials, training workshops, on-water education, and public service
41 announcements. The 2006 version of the Be Whale Wise guidelines recommends that boaters parallel
42 whales no closer than 100 yards (about 100 meters), approach animals slowly from the side rather than
43 from the front or rear, and avoid putting the vessel within 400 yards (400 meters) in front of or behind the
44 whales. The Be Whale Wise guidelines are used in U.S. and Canadian waters and use meters and yards
45 interchangeably. Reference to distances in the guidelines and alternatives in this document will appear in
46 yards. Vessels are also recommended to reduce their speed to less than 7 knots (13 km/h) within 400 yards
47 (400 meters) of the whales, and to remain on the outer side of the whales near shore. Two voluntary no-go
48 zones off San Juan Island are recognized by San Juan County, although this is separate from the Be Whale
49 Wise guidelines. The first is a 1 mile (800 meter)-wide zone along a 2 mile (3 kilometer) stretch of shore

1 centered on the Lime Kiln lighthouse. The second is a 1/4 mile (400 meter)-wide zone along much of the
2 west coast of San Juan Island from Eagle Point to Mitchell Point. These areas were established to facilitate
3 shore-based viewing and to reduce vessel presence in an area used by the whales for feeding, traveling, and
4 resting.

5
6 NMFS supports the Soundwatch program, an on-water stewardship and monitoring group, to promote the
7 Be Whale Wise guidelines and to monitor vessel activities in the vicinity of whales. Soundwatch reports
8 (Koski 2004, 2006, 2007) characterize trends in incidents when the guidelines are not followed and when
9 there is the potential for disturbance of the whales. Incidents are frequently observed involving both
10 recreational and commercial whale watching vessels. The Soundwatch staff also educate boaters, providing
11 information on viewing guidelines as boats are approaching areas with whales.

12
13 Southern and Northern Resident killer whales are listed as endangered and threatened, respectively, under
14 the Species at Risk Act in Canada and the Be Whale Wise guidelines for viewing have been coordinated to
15 ensure consistency on both sides of the border. Recovery planning and implementation of management
16 actions, such as protective regulations, will continue to be coordinated with Canada to achieve consistency
17 whenever possible.

18 **1.4 Purpose and Need for Action**

19
20 Despite the regulations, guidelines, and outreach efforts currently in place, NMFS is concerned that the
21 level of disturbance caused by vessels surrounding these popular whales may have harmful effects on
22 individuals and the population. NMFS has identified vessel effects as a risk factor in the decision to list the
23 Southern Residents and in the *Recovery Plan for Southern Resident Killer Whales (Orcinus orca)* (NMFS
24 2008a). The recovery plan includes a variety of management actions to recover Southern Resident killer
25 whales. One goal of the plan is to minimize disturbance of Southern Residents from vessels. To achieve
26 this goal, the recovery plan recommends the following actions:

- 27
- 28 1. Continue to evaluate and improve voluntary whale-watching guidelines,
- 29 2. Evaluate the need to establish regulations regarding vessel activity in the vicinity of killer
30 whales, and
- 31 3. Evaluate the need to establish areas with restrictions on vessel traffic.
- 32

33 During the listing and recovery planning processes, NMFS received a number of complaints from the
34 public alleging that killer whales are routinely being disturbed by people attempting to closely approach
35 and interact with the whales by vessel (motor powered, non-motorized or self-propelled) particularly along
36 the west side of San Juan Island. Additional reports from Soundwatch (Koski 2004, 2006, 2007) and
37 researchers (Bain 2007; Noren et al. 2007, In Press) indicate that vessels do not always follow the
38 guidelines and may impact the behavior of whales. Despite the current ESA and MMPA regulations
39 prohibiting take, and the guidelines and outreach efforts currently in place, interactions between vessels and
40 killer whales continue to occur in Puget Sound and Georgia Basin. Advertisements for whale watch tours
41 appear on the Internet and in local media in the Pacific Northwest depicting or appearing to promise
42 activities that are inconsistent with what is recommended in the Be Whale Wise guidelines. NMFS has
43 received letters from the Marine Mammal Commission, members of the scientific research community,
44 environmental groups, and members of the general public expressing the view that some types of
45 interactions with wild marine mammals have the potential to harass and/or disturb the animals by causing
46 injury or disruption of normal behavior patterns. Soundwatch reports continue to include high numbers of
47 incidents where guidelines to avoid harassment are not being followed. Violations of current ESA and

1 MMPA prohibitions are routinely reported to NOAA's Office for Law Enforcement, however, the current
2 prohibitions are difficult to enforce.

3
4 Based on internal scoping, external scoping through an Advance Notice of Proposed Rulemaking,
5 monitoring reports, and scientific information, NMFS has determined that existing prohibitions,
6 regulations, and guidelines do not provide sufficient protection of killer whales from vessel impacts. Vessel
7 effects may limit the ability of the endangered Southern Resident killer whales to recover and may impact
8 other killer whales in inland waters of Washington. NMFS therefore deems it necessary and advisable to
9 adopt regulations to protect killer whales from vessel impacts, which will support recovery of Southern
10 Resident killer whales.

11 **1.5 Advance Notice of Proposed Rulemaking**

12
13 To begin implementing the actions identified in the recovery plan to minimize vessel effects on Southern
14 Resident killer whales, NMFS published an Advance Notice of Proposed Rulemaking (ANPR) on March
15 22, 2007. The ANPR initiated a public comment period to gather information on whether regulations were
16 needed and, if so, what type of regulations might be appropriate (72 FR 13464) (Appendix A). NMFS also
17 received input on potential measures to address vessel impacts during the ESA listing and throughout the
18 recovery planning process. Based on previous comments received, and regulations implemented for other
19 marine mammals, NMFS developed a preliminary list of options for consideration and comment. Five
20 potential preliminary alternatives were provided in the ANPR:

- 21 1. Codify the current guidelines
- 22 2. Establish an approach rule
- 23 3. Prohibit particular vessel activities of concern
- 24 4. Establish time-area closures
- 25 5. Create a permit or certification program for whale watching

26
27
28 The ANPR invited information from the public on the advisability of regulations, on the preliminary list of
29 options, and on other possible measures that will help the agency decide what type of regulations, if any,
30 would be most appropriate to consider for protecting killer whales in the Pacific Northwest. In particular,
31 information and comments were solicited on the following issues:

- 32 • The advisability of and need for regulations;
- 33 • The geographic scope of regulations;
- 34 • Management options for regulating vessel interactions with killer whales, including but not
35 limited to the options listed in the notice;
- 36 • Scientific and commercial information regarding the effects of vessels on killer whales and
37 their habitat;
- 38 • Information regarding potential economic effects of regulating vessel interactions; and
- 39 • Any additional relevant information that NMFS should consider should it undertake
40 rulemaking.

41
42
43 Comments were submitted by e-mail and by mail. The comment period closed on June 20, 2007. Two
44 public meetings were held during the public comment period, which included a presentation providing an
45 overview of the information in the ANPR. Additionally, NMFS answered questions, accepted written
46 comments, and provided the opportunity for individuals to record oral statements. A total of 84 letters and
47 e-mails were received during the comment period. Comments were submitted by concerned citizens; whale

1 watch operators; research, conservation and education groups; Federal, state and local government entities;
2 and various industry associations. All comments received during the comment period were posted on the
3 NMFS Northwest Regional web page

4 [http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/Orca-](http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/Orca-Vessel-Regs.cfm)
5 [Vessel-Regs.cfm](http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/Orca-Vessel-Regs.cfm).

6
7 The majority of comments explicitly stated that regulations were needed to protect killer whales from
8 vessel effects. Most other comments generally supported protection of the whales. Six comments explicitly
9 stated that no regulations were needed. There was support for each of the options in the preliminary list of
10 alternatives published in the ANPR, and many comments supported multiple approaches. Some additional
11 alternatives were also suggested. Suggestions for the geographic scope included the entire United States
12 range of the Southern Residents (including coastal waters of Washington, Oregon, and California) and a
13 more limited application in inland waters of Washington. NMFS also received comments supporting
14 regulations that apply to all whales, to all killer whales, and to only the listed Southern Resident killer
15 whales. Comments on what type of vessels should be regulated varied, and some suggested that regulations
16 should apply to all types of vessels (motorized and non-motorized) from both the United States and
17 Canada. Other commenters supported regulation of only certain types of vessels, such as commercial whale
18 watchers, or requested exemptions for certain classes of vessels (tankers and shipping, over a certain size,
19 in the course of official duties). In addition, comments were also received supporting regulations to address
20 aircraft.

21
22 Public comments were used to identify a range of actions, alternatives, environmental effects, methods of
23 assessment, and mitigation measures to be analyzed in-depth, and assisted in eliminating issues that were
24 not important. The ANPR process also provided an opportunity for active participation from a variety of
25 audiences, including proponents and opponents of vessel regulations.

26 **1.6 Description and Scope of the Proposed Action**

27
28 NMFS is proposing to adopt regulations that would prohibit motorized, non-motorized, and self-propelled
29 vessels in navigable inland waters of Washington from:

- 30
- 31 • Causing a vessel to approach within 200 yards of any killer whale
- 32 • Entering a restricted zone along the west coast of San Juan Island during a specified season
- 33 • Intercepting the path of any killer whale in inland waters of Washington
- 34

35 The proposed regulations will be published in the Federal Register for public comment along with this draft
36 Environmental Assessment and supporting documents, such as the Draft Regulatory Impact Review (IEC
37 2008). The following discussion describes the basis for the scope of the proposed regulations.
38

39 **1.6.1 Inland Waters of Washington**

40
41 The action area for this analysis is limited to navigable inland waters of Washington under United States
42 jurisdiction. Inland waters include a core summer area around the San Juan Islands, as well as a fall
43 foraging area in Puget Sound and transit corridor along the Strait of Juan de Fuca. These three areas make
44 up over 2,500 square miles and were designated as critical habitat for Southern Resident killer whales (71
45 FR 69054; November 29, 2006). Most whale watching occurs in the action area, with whale watching
46 vessels originating from nearby inland water ports in the United States and Canada (Hauser 2006). The

1 presence of Southern Residents and other killer whales in inland waters is predictable and reliable, which is
2 the basis for the success of the local commercial whale watch industry. In addition to the whale watching
3 activity, all vessel monitoring and most whale research also takes place in the action area. There is active
4 enforcement in inland waters as well, with enforcement vessels originating from similar ports. Based on the
5 distribution of commercial and recreational whale watching and enforcement effort, NMFS has determined
6 that vessel regulations would have the largest effect in inland waters, and have accordingly limited the
7 geographic scope of this analysis. In addition, limiting regulations to the inland waters would also allow for
8 continued and consistent monitoring to assess the effectiveness of the regulations in comparison to previous
9 years.

10 **1.6.2 Application to All Killer Whales**

11
12 Under the MMPA and ESA the proposed regulations would apply to all killer whales. Although killer
13 whales are individually identifiable through photo-identification, individual identification requires
14 scientific expertise and resources (i.e., use of a catalog) and cannot always be done immediately at the time
15 of the sighting. It would be difficult for boaters, especially recreational boaters without expertise and
16 experience with killer whales, to identify the individuals in the ESA-listed Southern Resident DPS or even
17 to identify killer whales to ecotype (resident, transient, offshore). Requiring boaters to know which killer
18 whales they are observing is not feasible. Section 11(f) of the ESA provides NMFS with broad rulemaking
19 authority to enforce the provisions of the ESA. In addition, providing protection of all killer whales in
20 inland waters of Washington is appropriate under the MMPA. Section 112(a) of the MMPA provides
21 NMFS with broad authority to prescribe regulations that are necessary to carry out the purposes of the
22 statute.

23 **1.6.3 Application to Motorized and Non-motorized Vessels**

24 Commercial and recreational whale watch vessels include motorized, non-motorized, and self-propelled
25 (i.e., motor boats, sail boats and kayaks), which can both cause disturbances to whales. While kayaks are
26 small and quiet, they have the potential to disturb whales as obstacles on the surface, and they may startle
27 whales by approaching them without being heard (Mathews 2000). Some kayakers may be less likely to
28 follow rules (Jelinski et al. 2002) and more likely to approach wildlife closely because they may be more
29 apt to overestimate distance because of their low aspect on the water, and assume they are less likely to
30 disturb wildlife than other vessels (Mathews 2000). In studies comparing effects of motorized and non-
31 motorized effects on dolphins, the type of vessel did not matter as much as the manner in which the boat
32 moved with respect to the dolphins (Lusseau 2003b). Some dolphins' behavioral responses to vessels (e.g.,
33 avoidance, increased dive times, changes in social cohesion) were specific to kayaks or occurred more
34 often when kayaks were present compared to motorized vessels (Lusseau 2006; Gregory and Rowden
35 2001; Duran and Valiente 2008). Several studies that have documented changes in behavior of dolphins
36 and killer whales in the presence of vessels include both motorized and non-motorized vessels in their
37 analysis (Lusseau 2003b; Nichols et al. 2001; Trites et al. 2007; Noren et al. 2007, In Press). Effects of
38 vessels on marine mammals and killer whales are discussed in Subsection 3.2.1.5, Vessel Interactions.

39 **1.6.4 Exceptions**

40
41 NMFS considered specific categories of vessels that should be exempted from any vessel regulation. The
42 exceptions are based on the likelihood of certain categories of vessel having impacts on the whales and the
43 potential adverse effects involved in regulating certain vessels or activities. Six categories are proposed for
44 exceptions: (1) government vessels, (2) cargo vessels transiting in the shipping lanes, (3) research vessels,

1 (4) fishing vessels actively engaged in fishing, (5) vessels limited in their ability to maneuver safely, and
2 (6) privately owned vessels accessing private property by landowners.
3

4 Available data on vessel effects on whales from Soundwatch (Koski 2007) and Bain (2007) indicate that
5 commercial and recreational whale watch vessels have the greatest potential to affect killer whales. This is
6 because operators of whale watching vessels are focused on the whales, track the whales' movements,
7 spend extended time with the whales, and are therefore most often in close proximity to the whales. Other
8 vessels such as government vessels, commercial and treaty fishing boats, cargo ships, tankers, tug boats,
9 and ferries do not target whales in their normal course of business. Soundwatch (Koski 2007) and Bain
10 (2007) report that these types of vessels combined comprise only 6 percent or less of vessels within 1/2
11 mile of the whales. In addition, these vessels generally move slowly and in usually predictable straight
12 paths, which reduces the risk of strikes to whales. While NMFS recognizes that sound from large vessels
13 has the potential to affect whales even at great distances, the primary concern at this time is the sound from
14 small, fast moving vessels moving in close proximity to the whales.
15

16 Vessels engaged in scientific research do closely approach killer whales to obtain photographs, collect a
17 variety of samples, and observe behavior. Takes from these activities are authorized in research permits
18 under section 10 of the ESA and their effects are evaluated in section 7 consultations on issuance of
19 permits. Because researcher expertise, operating procedures, and permit terms and conditions reduce the
20 potential impacts to whales, specific research activities authorized by NMFS would be exempt from the
21 vessel regulations.
22

23 In addition, regulating these categories of vessels could cause adverse impacts. Government vessels are
24 often critical to safety missions, such as search and rescue operations, enforcement, and activities critical to
25 national security. A small number of Navy vessels operate specific sonar that has been reported to disturb
26 killer whales (NMFS 2004a) and there are current processes under the MMPA and ESA to address
27 potential impacts of sonar to Southern Resident killer whales. Based on the exemption for government
28 vessels there will be no change from any of the Alternatives to military operations and Navy sonar issues
29 are not discussed further in this document. Large cargo ships transiting in the navigation lanes have limited
30 maneuverability. If they were required to make sudden or unpredictable movements to avoid close
31 approaches to whales, it could increase the risk of collisions and pose safety hazards. If fishing vessels were
32 required to follow regulations while actively engaged in fishing, it could compromise gear or catch.
33 Exempting treaty fishing vessels is consistent with treaty fishing rights and use of Usual and Accustomed
34 fishing areas. Research vessels, of necessity, will often closely approach the whales. NMFS considers
35 ongoing research essential to its efforts to recover the whales. NMFS is also proposing to exempt vessels
36 from any regulations if the exemption is required for safe operation of the vessel to avoid adverse effects to
37 public safety. There are private landowners with property adjacent to the no-go zone. NMFS is proposing
38 to exempt the personal use of privately owned vessels for access to their shoreline by landowners adjacent
39 to the no-go zone.
40

41 Based on these considerations, NMFS is proposing the following exceptions to regulations. The burden
42 would be on the vessel operator to prove the exemption applies. These exceptions would not exempt any
43 vessel operators from harassment or take prohibitions under the MMPA or ESA. The following exceptions
44 would apply to any regulations. Additional exceptions considered for individual alternatives are presented
45 under each alternative in Subsection 2.2, Alternatives.
46

- 47 1. The regulations would not apply to Federal, state, and local government vessels operating
48 in the course of official duty.
49

1 **2.0 ALTERNATIVES**

2 **2.1 Introduction**

3 In the ANPR, NMFS provided a preliminary list of alternative regulations to protect killer whales from
4 vessel impacts (Subsection 1.5, Advance Notice of Proposed Rulemaking). The notice requested public
5 comment on the preliminary list of alternatives, as well as any other reasonable alternatives. NMFS
6 received information on a number of potential alternatives, including suggestions for new alternatives,
7 exceptions, potential resource impacts, and enforcement and education issues associated with alternatives.
8 To select alternatives for analysis, NMFS developed 11 decision criteria from issues raised from public
9 comments, internal scoping, and applicable law. NMFS and its cooperating agencies met to evaluate the
10 extent to which each potential regulation would meet the decision criteria as a reasonable alternative. There
11 were two tiers of criteria 1) criteria that must be met by the proposed alternative and 2) criteria that should,
12 if possible, be met by the proposed alternative.

13
14 Alternative Selection Criteria
15 Regulations must:

- 16
17 1. Meet the Purpose and Need: Protect killer whales from vessel impacts, which will support recovery
18 of Southern Resident killer whales
19 2. Be administratively feasible
20 3. Be enforceable (violations can be easily identified)
21 4. Be consistent with existing statutes and regulations (MMPA, ESA, Inland Navigation Rules and
22 International Regulations for Preventing Collisions at Sea 1972)
23 5. Be consistent with Indian treaty fishing rights
24 6. Have scientific support

25
26 Regulations should if possible:

- 27
28 7. Be easily understood and implemented by those being regulated
29 8. Provide opportunities to evaluate their effectiveness
30 9. Minimize impacts to resources (economic, transportation)
31 10. Minimize impacts to tribes, consistent with trust responsibilities
32 11. Be compatible with regulations across the United States/Canadian border

33
34 The alternatives analyzed here are individual components of possible regulations, which for the most part
35 could be promulgated singly or in combination with one another. The components selected for analysis are
36 those that meet all or most of the selection criteria. In addition to the No-action Alternative, this
37 environmental assessment considers seven action alternatives. Alternatives that did not meet all or most of
38 the criteria are also discussed briefly in Subsection 2.3, Alternatives Considered but Not Analyzed in
39 Detail.

40 **2.1.1 Elements Common to All Alternatives**

41
42 The regulations considered in the seven action alternatives all include certain elements in common. As
43 described in Subsection 1.6, Description and Scope of the Proposed Action, NMFS has identified the
44 geographic location, application of regulations, and categories of vessels that would be exempt from the
45 vessel regulations. The following nine elements are common to all alternatives, and will, therefore, be
46 included in the analysis of each alternative in Section 4.0, Environmental Consequences:

- 1
- 2 1. All regulations would apply to activities in the navigable inland waters of Washington State. The
- 3 specific protected areas within inland waters are identified.
- 4
- 5 2. The regulations would apply to all killer whales, not just endangered Southern Residents.
- 6
- 7 3. The regulations would not exempt any vessel operators from the harassment or take prohibitions
- 8 under the MMPA or ESA.
- 9
- 10 4. The regulations would apply to motorized, non-motorized, and self-propelled vessels.
- 11
- 12 5. The regulations would not apply to Federal, state, and local government vessels operating in the
- 13 course of their official duties.
- 14
- 15 6. The regulations would not apply to vessels participating in the Vessel Tracking System and
- 16 operating within the defined Traffic Separation Scheme shipping lanes.
- 17
- 18 7. The regulations would not apply to activities, such as scientific research, authorized under permit
- 19 by NMFS.
- 20
- 21 8. The regulations would not apply to treaty fishing vessels lawfully engaged in actively setting,
- 22 retrieving, or closely tending fishing gear.
- 23
- 24 9. The regulations would not apply to any vessel where the operator could prove the vessel maneuver
- 25 resulting in a violation was required for safety.
- 26
- 27 10. The no-go zone regulation would not apply to personal use of private vessels for access to private
- 28 property by landowners adjacent to the no-go zone.
- 29
- 30 Additional exceptions considered for individual alternatives are presented under each alternative in
- 31 Subsection 2.2, Alternatives.

32 **2.2 Alternatives**

33 **2.2.1 Alternative 1: No-action**

34
35 The MMPA prohibits take of all marine mammals, including killer whales, and the ESA prohibits the take
36 of listed marine mammals, including endangered Southern Resident killer whales. NMFS promotes
37 responsible viewing through a “Be Whale Wise” education campaign that includes a set of voluntary
38 guidelines designed to help boaters avoid harassment. Under the No-action Alternative, NMFS would not
39 promulgate any new regulations but would continue the education and outreach program with all of the
40 partners involved in Be Whale Wise. The elements common to all alternatives above are specific to
41 regulations and would not apply to the No-action Alternative.

42 **2.2.2 Alternative 2: 100 Yard Approach Regulation**

43
44 The Be Whale Wise guidelines described in Subsection 1.3, Current MMPA and ESA Prohibitions,
45 Regulations, and NMFS Guidelines, advise boaters to stay 100 yards (100 meters) away from killer whales.

1 The Be Whale Wise guidelines are used in United States and Canadian waters and use meters and yards
2 interchangeably. Reference to distances in the guidelines and alternatives in this document will appear in
3 yards. NMFS received comments supporting the current 100 yard distance in the guidelines as well as
4 comments suggesting greater distances. Under this alternative, NMFS would promulgate a regulation
5 prohibiting vessels from approaching any killer whale closer than 100 yards. This would include
6 approaching by any means, including by interception (i.e., placing a vessel in the oncoming path of a killer
7 whale, so that the whale surfaces within 100 yards of the vessel, or positioning a vessel so that wind or
8 currents carries the vessel to within 100 yards). In addition to the exceptions listed in Subsection 2.1.1,
9 Elements Common to All Alternatives described above, this regulation would not apply to commercial
10 fishing vessels (non-treaty) lawfully engaged in actively setting, retrieving, or closely tending fishing gear.

11 **2.2.3 Alternative 3: 200 Yard Approach Regulation**

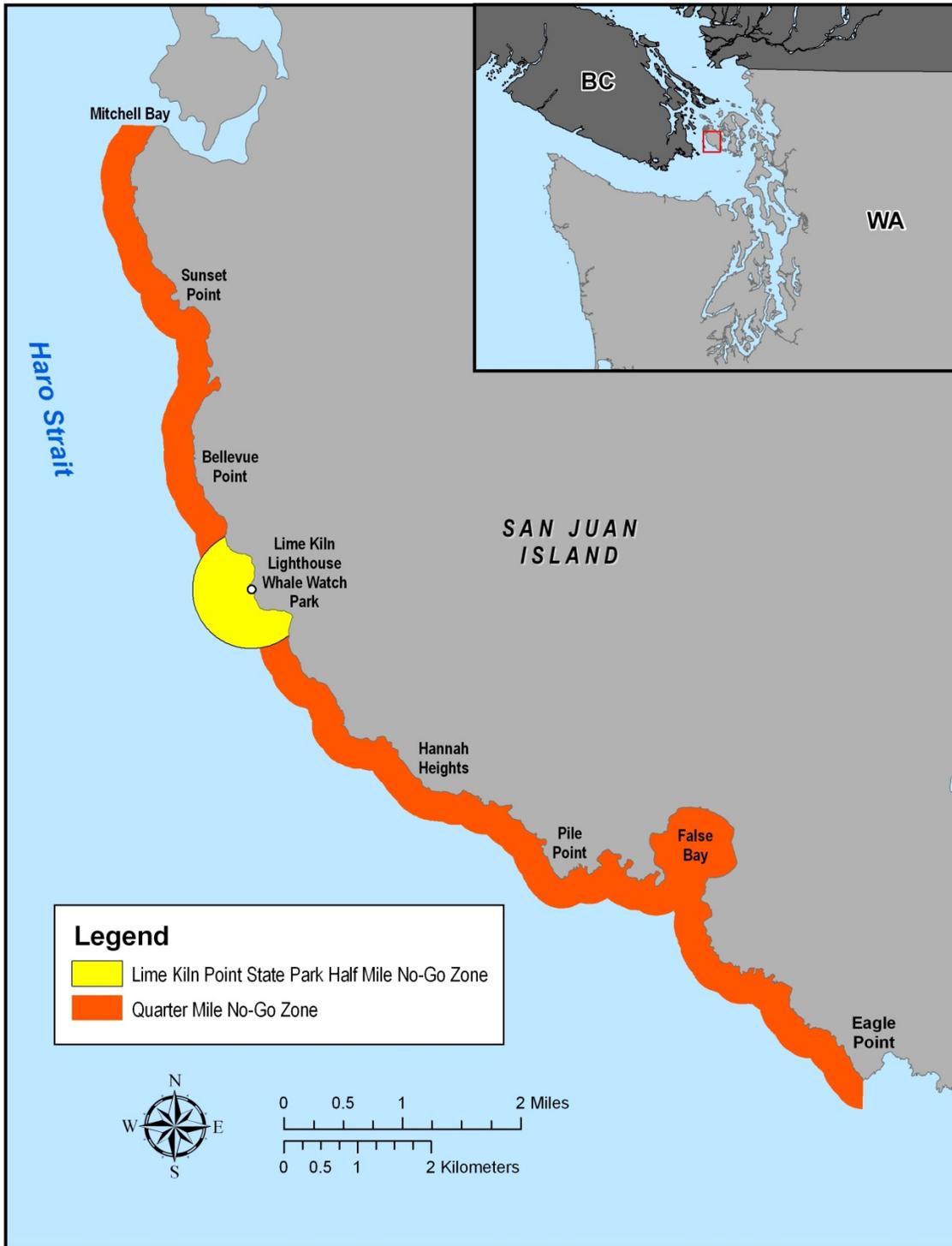
12
13 This alternative is the same as Alternative 2, but the rule would prohibit vessel approaches within 200 yards
14 of all killer whales.

15 **2.2.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

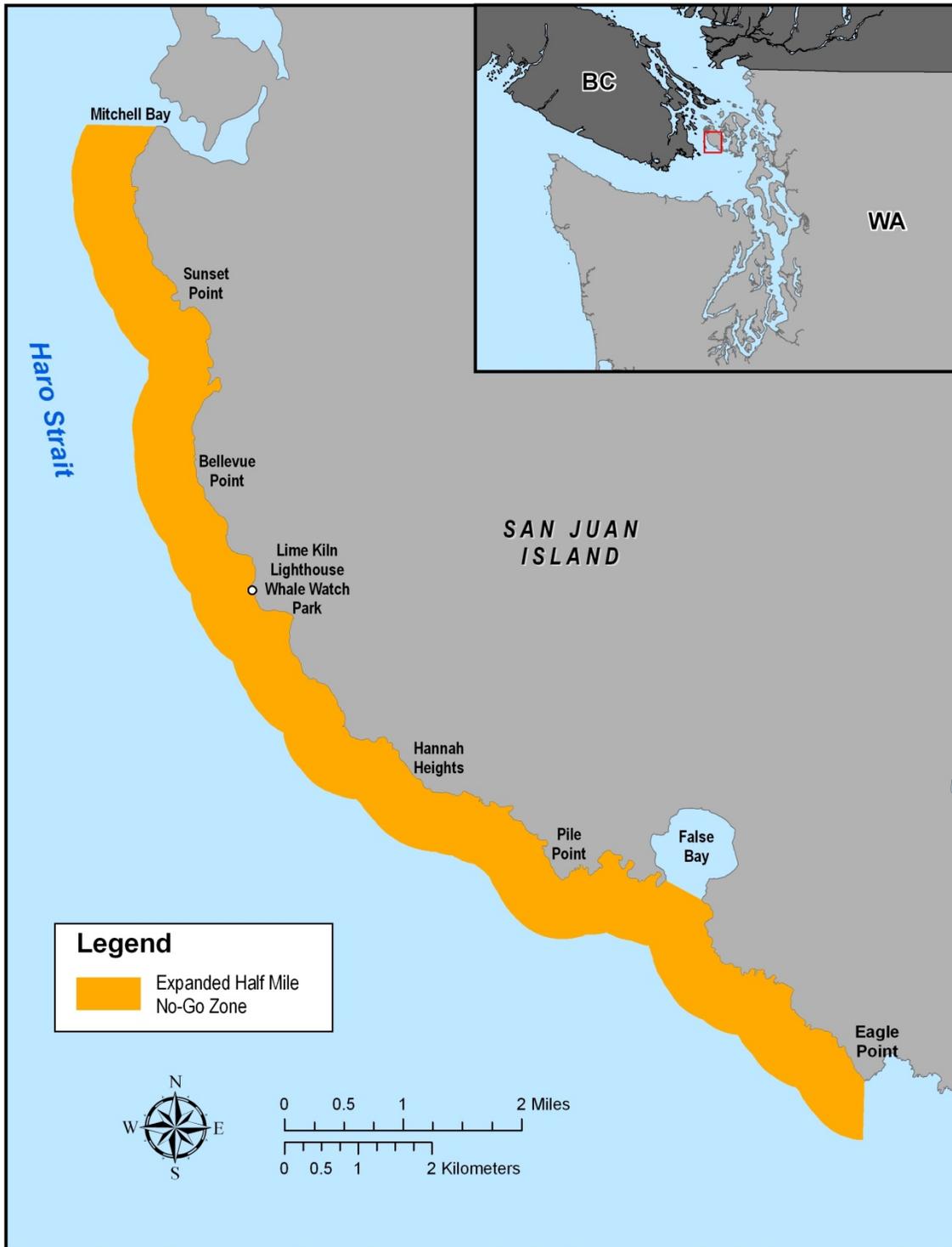
16
17 Under this alternative, NMFS would formalize the current voluntary no-go zone along the west side of San
18 Juan Island. This includes a 1/2 mile (800 meter)-wide zone centered on the Lime Kiln lighthouse and a 1/4
19 mile (400 meter)-wide zone from Eagle Point to Mitchell Point (Figure 2-1). No vessels would be permitted
20 inside the protected area from May 1 through September 30. This area would not overlap with shipping
21 lanes or ferry routes and would not be directly adjacent to the Canadian border.

22 **2.2.5 Alternative 5: Protected Area – Expanded No-go Zone**

23
24 Under this alternative, NMFS would formalize a no-go zone along the west side of San Juan Island. The
25 area would extend 1/2 mile (800 meter) offshore from Eagle Point to Mitchell Point (Figure 2-2). This is a
26 larger, but simplified area compared to the no-go zone described under Alternative 4 (Figure 2-1). No
27 vessels would be permitted inside the protected area from May 1 through September 30. This area would
28 not overlap with shipping lanes or ferry routes and would not be directly adjacent to the Canadian border.



1
2 **Figure 2-1. Current voluntary no-go zone, a 1/2 mile (800 meter)-wide zone centered on the Lime**
3 **Kiln lighthouse and a 1/4 mile (400 meter)-wide zone from Eagle Point to Mitchell Point**
4 **(approximately 3.8 square miles).**



1
2 **Figure 2-2. Expanded no-go zone 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point**
3 **(approximately 6.2 square miles) not including False Bay.**
4

1 **2.2.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

2
3 The current guidelines recommend that vessels limit speed to 7 knots when within 400 yards of the whales.
4 Under this alternative, NMFS would promulgate a regulation prohibiting vessels from operating at speeds
5 over 7 knots when within 400 yards of killer whales. In addition to the exceptions listed in Subsection
6 2.1.1, Elements Common to All Alternatives described above, this regulation would not apply to
7 commercial fishing vessels lawfully engaged in actively setting, retrieving, or closely tending fishing gear.

8 **2.2.7 Alternative 7: Keep Clear of the Whales' Path**

9
10 The current guidelines recommend that vessels keep clear of the whales' path and cautiously move out of
11 the way if whales are approaching within 400 yards. There is also a Washington State regulation that
12 includes a prohibition of intercepting the path of the whales. Under this alternative, NMFS would
13 promulgate a regulation requiring vessels to keep clear of the whales' path. Violations of this regulation
14 would include intercepting or placing a vessel in the oncoming path of a killer whale or positioning a vessel
15 so that wind or currents carry the vessel into the path of the whales. In addition to the exceptions listed in
16 Subsection 2.1.1, Elements Common to All Alternatives described above, this regulation would not apply
17 to commercial fishing vessels lawfully engaged in actively setting, retrieving, or closely tending fishing
18 gear.

19 **2.2.8 Alternative 8: Proposed Action**

20
21 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
22 and 7. The regulation package would:

- 23
24 1. Prohibit vessels from approaching any killer whale closer than 100 yards. This would
25 include approaching by any means, including by interception (i.e., placing a vessel in the
26 oncoming path of a killer whale, so that the whale surfaces within 100 yards of the vessel,
27 or positioning a vessel so that wind or currents carries the vessel to within 100 yards). In
28 addition to the exceptions listed in Subsection 2.1.1, Elements Common to All
29 Alternatives, this regulation would not apply to commercial fishing vessels (non-treaty)
30 lawfully engaged in actively setting, retrieving, or closely tending fishing gear.
31
32 2. Formalize a no-go zone along the west side of San Juan Island. The area would extend 1/2
33 mile (800 meter) offshore from Eagle Point to Mitchell Point (Figure 2-2). This is a larger,
34 but simplified area compared to the no-go zone described under Alternative 4 (Figure 2-1).
35 No vessels would be permitted inside the protected area from May 1 through September
36 30.
37
38 3. Require vessels to keep clear of the whales' path. Violations of this regulation would
39 include intercepting or placing a vessel in the oncoming path of a killer whale or
40 positioning a vessel so that wind or currents carry the vessel into the path of the whales. In
41 addition to the exceptions listed in Subsection 2.1.1, Elements Common to All
42 Alternatives, this regulation would not apply to commercial fishing vessels lawfully
43 engaged in actively setting, retrieving, or closely tending fishing gear.
44
45

1 **2.3 Alternatives Considered but Not Analyzed in Detail**

2
3 Several alternatives that were suggested in the ANPR, in public comments, or during internal scoping did
4 not meet all or most of the selection criteria. For example, some of the alternatives have no scientific
5 support to show they would actually protect the whales, and some would have substantial economic
6 impacts. Other alternatives would not be feasible to administer. These additional alternatives are described
7 below with brief explanations of why they did not meet the selection criteria and were not considered for
8 further analysis in this environmental assessment.

9 **2.3.1 Moratorium on All Vessel-based Whale Watching**

10
11 A whale watching moratorium would be difficult to enforce against both commercial and recreational
12 vessels. Commercial operators could still conduct tours focusing on other species, which would make it
13 difficult to prove they were engaged in prohibited activity. Similarly, recreational boaters could be engaged
14 in a variety of activities in the vicinity of killer whales, making it difficult to determine at what point they
15 are engaged in prohibited whale watching. Such a moratorium would also be overly broad, as there is
16 information indicating that some vessel operations around killer whales can occur without affecting the
17 whales. This alternative could also have a substantial economic impact on commercial whale watch
18 operators.

19 **2.3.2 Reroute Shipping**

20
21 There are well-defined traffic lanes within the Strait of Juan de Fuca and Haro Strait that make up the
22 Traffic Separation Scheme. This alternative would require large ships that are part of the Vessel Tracking
23 System to deviate from the established Traffic Separation Scheme or find alternate routes to ports. Shipping
24 vessels are rarely within 1/2 mile of the whales, and very few incidents are reported in the shipping lanes
25 (Koski 2006, 2007). The Traffic Separation Scheme is specifically designed to identify an efficient route
26 and reduce impacts to public safety from vessel collisions. Restricting the shipping lanes or rerouting
27 shipping away from Haro Strait would have substantial economic and public safety impacts.

28 **2.3.3 Establish Routes to Fishing Areas**

29
30 This alternative would direct fishing vessels to take specific routes to reach fishing areas. Information
31 collected by Soundwatch (Koski 2006, 2007) including the types of vessels that are in close proximity to
32 whales indicates that fishing vessels make up a very small percentage of vessels within 1/2 mile of the
33 whales and are rarely involved in incidents where the whales may be closely approached. Therefore,
34 because there is a low likelihood of fishing vessels affecting whales, requiring fishing vessels to adhere to
35 specific routes would not provide additional protection for the whales.

36 **2.3.4 Establish a Quota System for Takes and Allocate to Different User Groups**

37
38 This alternative would allocate a certain quota for “takes” of whales to different user groups that may be
39 impacting the whales such as research, whale watching, and fishing groups. The takes would include close
40 approaches as well as other harmful activities. There is no scientific information to identify how many
41 takes from different activities would be acceptable. Consequently, an allocation process for different
42 activities would be arbitrary and not administratively feasible. The MMPA and ESA prohibit takes and do
43 not include exceptions of this prohibition for viewing activities.

1 **2.3.5 Certification or Permit Program**

2
3 Under this alternative, NMFS would issue certificates or permits to commercial whale watch boats that
4 meet certain requirements. Trained and permitted operators would be allowed to approach whales closer
5 than non-permitted boaters. Recreational boaters often follow the example of commercial operators, and it
6 would be confusing to have two sets of rules for different vessels. A certification program is also not
7 feasible because there is currently no infrastructure to administer, monitor, or enforce a certificate or permit
8 program for whale watching activities. In addition, the MMPA and ESA do not provide exemptions on take
9 for viewing activities. Therefore, permits could not be issued to whale watch operators if viewing activities
10 result in take.

11 **2.3.6 Prohibit Whale Watching One Day Each Week**

12
13 Under this alternative, whale watching would be prohibited one day each week to reduce harmful impacts
14 to whales for this 24 hour period. It would be difficult to educate recreational boaters regarding when they
15 could or could not watch whales and what vessel activities constitute “whale watching” prohibited on
16 certain days. As described under Subsection 2.3.1, Moratorium on All Vessel-based Whale Watching, it
17 would be difficult to enforce this type of regulation.

18 **2.3.7 Time of Day Restrictions on Whale Watching**

19
20 Similar to the alternative described above, this alternative would prohibit whale watching during certain
21 times of each day. It would be difficult to educate recreational boaters regarding what times they could or
22 could not watch whales and what vessel activities constitute “whale watching” prohibited at certain times.
23 As described under Subsection 2.3.1, Moratorium on All Vessel-based Whale Watching, it would be
24 difficult to enforce this type of regulation.

25 **2.3.8 Noise Level Standards for Vessels**

26
27 There are currently noise level standards for vessels (RCW 88.12.040); however, under this alternative,
28 these standards would become more restrictive. While it might be possible to implement more restrictive
29 noise level standards for commercial whale watching vessels that are only used for observing whales, there
30 would likely be a substantial economic cost to retrofitting vessels to meet the new standards. It would not
31 be feasible to regulate recreational vessels that are used for multiple activities, such as fishing, in addition
32 to viewing wildlife. New noise standards targeting whale impacts would also be difficult to enforce and
33 could have substantial economic impacts on vessel manufacturers and owners if they were required to
34 design new engines, purchase specific engines, or retrofit current vessels.

35 **2.3.9 Killer Whale Sanctuary**

36
37 Under this alternative, a killer whale sanctuary would be established; however, it is not administratively
38 feasible at this time to create a sanctuary for killer whales. Only the Secretary of the Department of
39 Commerce and the United States Congress have the authority to designate National Marine Sanctuaries. A
40 National Marine Sanctuary was considered for northern Washington State waters in the 1980s and 1990s,
41 but was not designated (Hoyt 2005). Additionally, the protected areas described under Subsections 2.2.4
42 Protected Area – Current Voluntary No-go Zone and 2.2.5 Alternative 5: Protected Area – Expanded No-go
43 Zone, would provide some of the protection of a sanctuary.

1 **2.3.10 Protected Areas - No-go Zones All Year**

2
3 This alternative would prohibit vessels from entering no-go zones, but doing so when the whales are not
4 likely to be present (i.e., seasonal periods of the year) would not protect the whales. Although it would
5 simplify the implementation and education of boaters to have an area identified on maps and charts as
6 closed all the time, there would likely be increased resource impacts without providing any additional
7 benefit to the whales. The whales may be present in a protected area during any month of the year, but the
8 sighting data show strong seasonal patterns indicating when a protected area would provide the most
9 benefit to the whales. Along the west side of San Juan Island there are four sighting quadrants. Unique
10 sightings of Southern Residents in those quadrants from May to September (total of 3,881) range from 592
11 to 1,053 days per month for the 1990 through 2005 data. Sightings in October to April (total of 543) range
12 from 19 to 238 days per month for the 1990 through 2005 data. In addition, there are seasonal patterns of
13 vessel presence along the west side of San Juan Island. The largest numbers of vessels were observed from
14 June to August (1,233 to 2,262), with fewer vessels observed in May and September (398 and 822,
15 respectively).

16 **2.3.11 Protected Area - No-go Zones Only When Whales are Present**

17
18 Under this alternative, vessels would be prohibited from entering an area only when whales were present in
19 that area. It is not feasible at this time to notify boaters in real time when whales are present in a protected
20 area and when they are not. There is currently no infrastructure to monitor an area for presence of whales or
21 to broadcast the information to alert boaters that a protected area is in effect. Enforcement would be
22 dependent on boaters being aware of the whales' presence, which would not provide efficient and
23 maximum protection of whales.

24 **2.3.12 Protected Areas Along All Shorelines**

25
26 This alternative would establish all shoreline areas in inland waters of Washington as protected areas for
27 Southern Resident killer whales. Killer whales use shoreline habitat for traveling, foraging, and socializing,
28 however not all shoreline areas are equally as important to the whales. Of the total 15,540 sightings in
29 inland waters from 1990 through 2005, 4,424 (over 28 percent) were recorded in the four quadrants along
30 the west side of San Juan Island. Protecting all shoreline areas in inland waters of Washington would
31 adversely affect vessels that often stay close to the shoreline, mainly recreational vessels and paddle craft,
32 by restricting these areas to use. There would also likely be economic impacts to marinas and boat launch
33 areas that are adjacent to shoreline areas. Because of the many miles of coastal areas, it would be difficult
34 to enforce protection of all shorelines without considerable increases in enforcement resources.

35 **2.3.13 Requirement to Operate at a "Slow, Safe Speed" in the Vicinity of Whales**

36
37 This alternative would require vessels to operate at a "slow, safe speed" in the vicinity of whales. Boaters
38 are familiar with the concept of slow, safe speed as described by the United States Coast Guard regarding
39 presence of other vessels and avoiding collisions. A "slow, safe speed" restriction would be subjective and
40 would be dependent on the capabilities and operating conditions of each vessel. Implementing a subjective
41 speed regulation would not improve the ability of enforcement to clearly identify violations. The current Be
42 Whale Wise guidelines include a recommendation to reduce speed to less than 7 knots when within 400
43 yards of the nearest whale. Monitoring groups such as Soundwatch have collected several years of data on
44 incidents when vessels are not following the speed guideline and are "fast within 400 yards of whales."
45 This has largely been a subjective measure, and Soundwatch has not had equipment such as radar to

1 quantify speed of other vessels. Monitoring adherence to a slow, safe speed would continue to be
2 subjective, and it would be difficult to assess effectiveness of this regulation.

3 **2.3.14 Establish a Specific Zone with a Speed Limit**

4
5 This alternative would include a designated area with a specific speed limit zone. A speed zone would
6 provide some protection for foraging whales close to shore from the sound of vessels passing by at high
7 speed, although it would not be as protective as a no-go zone, which is analyzed as Alternatives 4 and 5.
8 Analyzing this alternative would not provide any additional information than the specific speed limit
9 (Subsection 2.2.6, Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales) or the no-go
10 protected area alternatives (Subsection 2.2.4, Alternative 4: Protected Area – Current Voluntary No-go
11 Zone and Subsection 2.2.5, Alternative 5: Protected Area – Expanded No-go Zone).

12 **2.3.15 Codify All Be Whale Wise Guidelines**

13
14 This alternative would codify the Be Whale Wise guidelines in their entirety into regulations. The current
15 Be Whale Wise guidelines include recommendations for a variety of activities. Some of the guidelines are
16 general (be cautious and courteous) and do not lend themselves to regulations. Others would be difficult to
17 interpret or to enforce. For example, the guideline to stay on the offshore side of whales when they are
18 traveling close to shore does not specify what “close to shore” means, and it would be difficult to determine
19 when vessels were engaged in whale watching to enforce limits on viewing time. Those aspects of the
20 guidelines that are enforceable, measurable, and objective are included in the alternatives being analyzed.

21 **2.3.16 Establish Regulations in Coastal Waters**

22
23 Under this alternative, protective vessel regulations would be established in the coastal waters of
24 Washington, Oregon, and California where the whales spend time, particularly in winter months. Most
25 whale watching occurs in inland waters of Washington (as described in Subsection 1.6.1, Inland Waters of
26 Washington), with whale watching vessels originating from nearby inland water ports in the United States
27 and Canada. The presence of Southern Residents and other killer whales in inland waters is predictable and
28 reliable, which is the basis for the success of the local commercial whale watch industry. In addition to the
29 whale watching activity, all vessel monitoring and most whale research also takes place in inland waters.
30 There is active enforcement in inland waters as well, with enforcement vessels originating from similar
31 ports. Based on the distribution of commercial and recreational whale watching and enforcement effort,
32 regulating vessel activities in coastal waters would not provide additional protection for the whales or
33 increase enforcement opportunities.

34 **2.3.17 Aircraft Approach Regulations**

35
36 This alternative would prohibit aircraft from closely approaching whales. Aircraft regulations would be
37 beyond the scope of minimizing impacts from vessels as identified in Subsection 1.4, Purpose and Need for
38 Action.

39 **2.4 Comparison of Alternatives**

40
41 Table 2.4-1 summarizes the comparison of the No-action and action alternatives. The alternatives compared
42 here are individual components of possible regulations, which for the most part could be promulgated
43 singly or in combination with one another.
44

1 **Table 2.4-1 Comparison of Alternatives**

Alternative	1 (No Action)	2	3	4	5	6	7	8
Approach Restriction	N/A, 100 yard approach guideline remains in place	100 yards	200 yards	N/A	N/A	N/A	N/A	200 yards
Protected Area	N/A, Voluntary 3.8 square mile no-go zone remains in place	N/A	N/A	3.8 square mile no-go zone	6.2 square mile no-go zone	N/A	N/A	6.2 square mile no-go zone
Prohibited Activity	N/A, guidelines remain in place	N/A	N/A	N/A	N/A	7 knot speed limit within 400 yards	Parking in the path prohibited	Parking in the path prohibited

2 N/A = Not Applicable

1 **3.0 AFFECTED ENVIRONMENT**

2 **3.1 Introduction**

3
4 Carved by glaciers and fed by 10,000 rivers and streams, the Puget Sound basin, with its varied terrestrial,
5 freshwater, and marine habitats, is a highly productive and diverse ecosystem. Puget Sound's waters
6 support numerous residential and migratory marine species, including over 150 species of marine birds,
7 230 species of fish, 20 mammal species, over a thousand species of plants and algae, and numerous
8 unclassified invertebrates and microbes (Puget Sound Partnership 2006). Puget Sound is part of the natural
9 environment that attracts people to the region. The inland waters of Washington including Puget Sound are
10 home to approximately 4.1 million people who live in the 12 counties bordering Puget Sound (Figure 3-1).
11 This figure includes about 1.6 million who live in the 90 cities and towns that directly border the Sound
12 (Washington Department of Ecology 2008). The Sound provides the basis for \$20 billion in economic
13 activities.

14
15 This section describes those resources that may be affected by the proposed action and its alternatives, to
16 the extent necessary to understand potential impacts. NMFS identified eight resources that could be
17 affected by the proposed action or alternatives: Marine Mammals, Listed and Non-listed Salmonids,
18 Socioeconomics, Recreation, Environmental Justice, Noise, Aesthetics, and Transportation. A description
19 for each resource follows and provides the context for understanding potential effects of each alternative,
20 which are analyzed in corresponding sections in Section 4.0, Environmental Consequences.

21 **3.2 Marine Mammals**

22
23 There are several species of marine mammals that occupy the inland waters of Washington. The description
24 of killer whales below focuses on the endangered Southern Resident killer whales. The information
25 presented in Subsection 3.2.1, Killer Whales, provides an overview of killer whale natural history, the
26 status of Southern Residents and other types of killer whales, information on foraging behavior and habitat
27 use. The status section includes information on population trends and threats to the whales. The section on
28 foraging reviews what the whales eat, where important foraging areas are located, and how they use sound
29 to find prey. The description of foraging provides background information to understand how this behavior
30 is vulnerable to interference from vessels, which is analyzed in Section 4.0, Environmental Consequences.
31 The discussion of distribution and habitat use identifies where and when the whales may be most
32 vulnerable to vessel effects. The sections on status, foraging, and habitat use provide background
33 information that sets the stage for the discussion on vessel effects.

34
35 The vessel effects section in this chapter covers several types of existing effects on killer whales. There is a
36 description of vessel activities around the whales and the known effects are grouped into vessel strikes,
37 behavioral disturbance, and acoustic impacts. In addition, the known physiological effects of the different
38 types of impacts are introduced to provide a context for understanding potential effects of each alternative.
39
40



1
2
3
4
5

Figure 3-1. Map of inland waters of Washington and surrounding counties.

1 Killer whales other than Southern Residents occasionally visit the inland waters of Washington and they
2 are described generally to provide a context for potential effects of each alternative. While vessels engaged
3 in whale watching focus on the Southern Residents, other types of killer whales are viewed
4 opportunistically, particularly when Southern Residents are not present. This is also the case for other
5 marine mammals. While many boaters seek out the Southern Residents, there are tours that incorporate
6 other marine wildlife into their programs including whales, porpoises, seals, and sea lions. Recreational
7 boaters also view marine mammals opportunistically as they come across them out on the water. The scope
8 of this analysis is on impacts to Southern Resident killer whales. However, because other killer whales and
9 marine mammals may be indirectly affected by the alternatives, they are addressed below, although not at
10 the same level of detail as for Southern Resident killer whales.

11 **3.2.1 Killer Whales**

12
13 In January 2008 NMFS released a *Recovery Plan for Southern Resident Killer Whales (Orcinus orca)*
14 (NMFS 2008a), which contains a full description of killer whale natural history with a focus on Southern
15 Residents. Below is a summary of information from the recovery plan including information particularly
16 relevant to this analysis.
17

18 **3.2.1.1 Description and Natural History**

19
20 Killer whales are the largest cetacean in the dolphin family, delphinidae. There are three identified ecotypes
21 of killer whales in the northeastern Pacific Ocean: residents, transients, and offshores. While there is
22 considerable overlap in their geographic range, these ecotypes are genetically distinct and do not appear to
23 interbreed. The differences between ecotypes also extend to their morphology, foraging ecology, behavior,
24 and acoustic repertoire. For example, residents are generally fish-eaters while transients are generally
25 mammal-eaters (Ford et al. 2000). Residents tend to live in larger, more stable groups consisting of
26 multigenerational, matrilineal-related kin while transients live in smaller, less stable groups usually
27 consisting of females and a few offspring (Ford et al. 2000). Residents tend to be more vocal, particularly
28 when foraging and socializing, while transients are quiet presumably because their prey can hear within the
29 frequency range of their sound emissions (Barrett-Lennard et al. 1996; Deecke et al. 2004; Deecke et al.
30 2002).
31

32 Along the U.S. and Canadian west coast, there are currently four communities of resident killer whales that
33 have been identified: Northern, Southern, Southern Alaska, and Western Alaska Residents (Krahn et al.
34 2004). The Southern Resident killer whale population consists of three pods, J, K, and L pod, and during
35 the spring, summer, and fall, their range includes the inland waterways of Puget Sound, Strait of Juan de
36 Fuca, and Southern Strait of Georgia. Little is known about the winter movements and range of Southern
37 Residents. Their occurrence in coastal waters extends from the coast of central California to the Queen
38 Charlotte Islands in British Columbia. The home ranges of West Coast Transients, offshore whales and
39 Northern Residents also include inland waters of Washington and overlap with the Southern Residents.
40

41 Members are individually identified based on natural markings from photo-identification records allowing
42 for population counts of some populations. Like all marine mammals, they are long-lived and slow to
43 mature. Both male and female resident killer whales of the area do not become sexually mature until the
44 average age of 15 years and females produce an average of 5.5 surviving offspring (Olesiuk et al. 1990).
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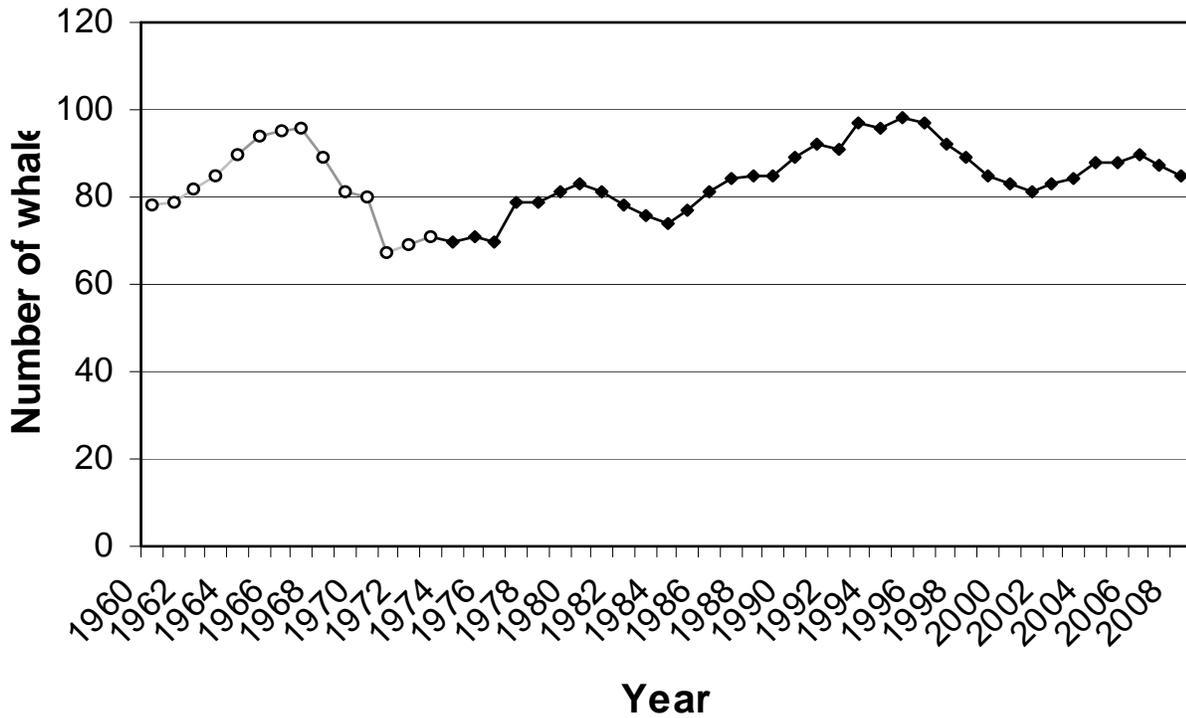
1 **3.2.1.2 Status**

2
3 *Southern Resident Killer Whales.* The Southern Residents experienced a population decline in the mid- to
4 late 1990s. NMFS listed the Southern Resident killer whale distinct population segment (DPS) as
5 endangered under the ESA on November 18, 2005 (70 FR 69903). The final rule identified several
6 potential factors that may have resulted in the decline or may be limiting recovery of Southern Resident
7 killer whales including: quantity and quality of prey, toxic chemicals which accumulate in top predators,
8 and disturbance from sound and vessel traffic. The rule further identified oil spills as a potential risk factor
9 for the small population of Southern Resident killer whales. It is unknown which of the threats may have
10 caused the population decline or may have the most significant impact on recovery. A combination of
11 threats or cumulative effects is likely contributing to risk factors for Southern Resident killer whales. For
12 example, poor nutrition resulting from insufficient prey base or vessel interference with foraging could lead
13 to mobilization of fat stores, which can introduce stored contaminants into the whales' systems and affect
14 reproduction or immune function (NMFS 2008a).

15
16 At present, the Southern Resident population has declined to essentially the same size that was estimated
17 during the early 1960s, when it was considered as likely depleted (Olesiuk et al. 1990) (Figure 3-2). Since
18 censuses began in 1974, J and K pods have increased their sizes by 60 percent (mean of 1.9 percent per
19 year) and 38 percent (mean of 1.2 percent per year), respectively. The largest pod, L pod, has grown 28.6
20 percent (mean of 0.9 percent per year) during this period, but more importantly, experienced a 10-year
21 decline from 1994 through 2003 that threatened to reduce the pod's size below any previously recorded
22 level. During the 2007 census there were 87 Southern Resident killer whales and in 2008 there were 85
23 counted in the census with two more whales disappearing since the summer count (Figure 3-2).

24
25 *Northern Resident Killer Whales.* As with the Southern Residents, this population was also in a depleted
26 condition when researchers recorded 132 whales during an initial census in 1975. Although count data are
27 not available before this date, modeling by Olesiuk et al. (1990) suggests that the community expanded
28 from about 97 to 120 whales between 1960 and 1968, then declined by an estimated 10 percent to about
29 108 whales by 1970 due to removals of whales for display at zoos and aquaria (Figure 3-3). Causes of
30 declines before 1960 probably resembled those for Southern Residents, with indiscriminate shooting and
31 other human-related factors most likely involved (Olesiuk et al. 1990).

32
33 Annual censuses of the Northern Residents have been conducted since 1975 (Bigg et al. 1990; Ford et al.
34 2000). These censuses documented fairly steady growth in the population at a mean rate of 3.0 percent per
35 year from 1975 through 1997, when numbers expanded from 132 to 220 whales (Figure 3-3) (Ford et al.
36 2000; J. K. B. Ford, unpubl. data). This rate of growth was similar to the predicted intrinsic rate of the
37 population and was substantially higher than the observed rate of the Southern Residents during the same
38 time (Olesiuk et al. 1990; Brault and Caswell 1993). Several factors were presented as possible reasons for
39 the relatively stable growth of the Northern Residents through 1997, including 1) the population's larger
40 size in comparison to the Southern Residents, which made it less sensitive to random environmental
41 changes; 2) the smaller number of removals from live-captures for display at zoos and aquaria (Olesiuk et
42 al. 1990); and 3) possibly fewer threats in the Northern Residents geographic range compared to Southern
43 Residents (e.g., fewer vessels, less pollution). The population experienced an 8.6 percent decline in
44 numbers from 1997 through 2001, falling to 201 whales. Possible explanations for this decrease are similar
45 to those put forth for the Southern Residents (Killer Whale Recovery Team 2008). Abundance has
46 rebounded since then, with 219 whales counted in 2004 (Olesiuk et al. 2005).



1
 2 **Figure 3-2. Population size and trend of Southern Resident killer whales, 1960-2008.** Data from 1960
 3 to 1973 (open circles, gray line) are number projections from the matrix model of Olesiuk et al. (1990).
 4 Data from 1974 through 2007 (diamonds, black line) were obtained through photo-identification surveys of
 5 the three pods (J, K, and L) in this community and were provided by the Center for Whale Research
 6 (unpubl. data in NMFS 2008a). Data for these years represent the number of whales present at the end of
 7 each calendar year except for 2008, when data extend only through July.

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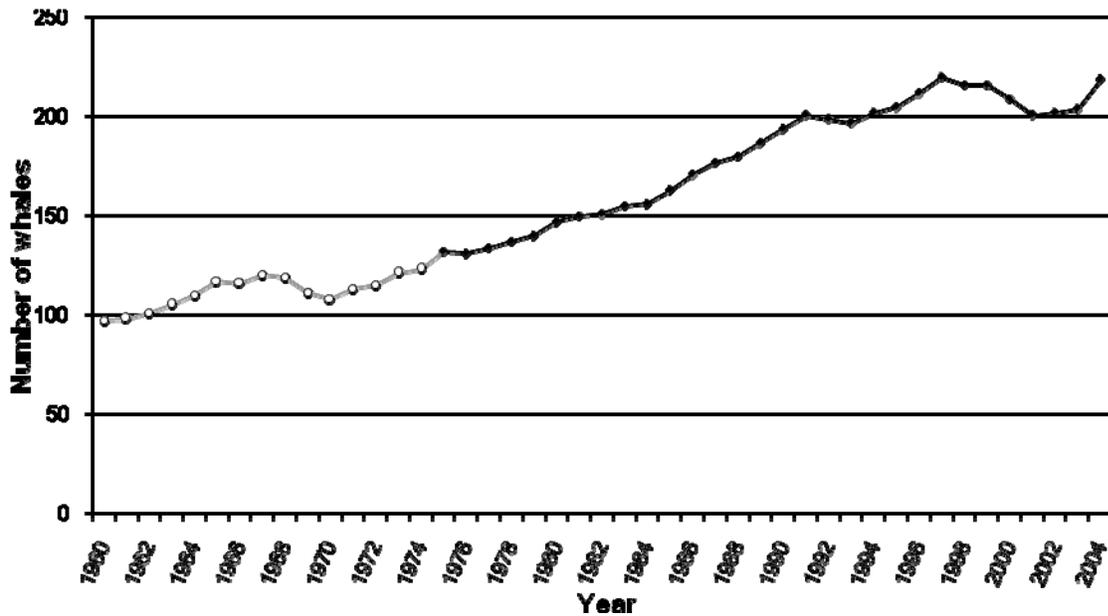


Figure 3-3. Population size and trend of Northern Resident killer whales, 1975-2004. Data from 1960 to 1974 (open circles, gray line) are number projections from the matrix model of Olesiuk et al. (1990). Data from 1975 through 2004 (diamonds, black line) were obtained through photo-identification surveys of the 16 pods in this community and were provided by J. K. B. Ford (unpubl. data in Killer Whale Recovery Team 2008) and Olesiuk et al. (2005). Data for these years represent whale numbers for entire calendar years; animals are counted through their last year seen.

West Coast Transient Killer Whales. This community of mammal-eating transient killer whales suffered serious prey losses between the late 1800s and late 1960s, and very likely experienced a sizable decrease in population size as a result (Ford and Ellis 1999; Springer et al. 2003). During this period, overhunting caused dramatic declines or extirpations in pinniped (seals and sea lions) and large whale populations along much of western North America. With the recovery of some pinniped populations in the last several decades, Ford et al. (2000) believe that transient whales no longer face a scarcity of prey.

Cumulative numbers of photographically identified West Coast transients expanded throughout the 1980s and 1990s as efforts to document the population continued (Bigg et al. 1987; Black et al. 1997; Ford and Ellis 1999). To date, about 320 individuals have been identified in the population, which includes about 225 transients in Washington, British Columbia, and southeastern Alaska (Ford and Ellis 1999; J. K. B. Ford, unpubl. data) and 105 animals off California (Black et al. 1997). At least 10 whales have been seen in both regions. Efforts to determine population size are complicated by the lack of a complete registry of individuals and the difficulty in establishing deaths over time (Ford and Ellis 1999; Baird 2001; Angliss and Outlaw 2005). Based on current information, the population probably totals about 300 to 400 whales. Trend information is lacking for the population because accurate assessments of abundance have not been made.

Offshore Whales. Two partial population estimates are available for offshore killer whales, but are not directly comparable because of differences in methodology and geographic coverage. Carretta et al. (2007) calculated a minimum estimate of 331 offshore whales along the coasts of Washington, Oregon, and California, as determined from shipboard line-transect surveys conducted in 1996 and 2001 and the

percentage of offshore animals among all killer whales photographed off California (Black et al. 1997). This figure is considered a minimum estimate of total numbers due to the continued detection of new individuals over time and because photographic records from British Columbia, Washington, and Oregon were not included in the analyses. Difficulties in substantiating mortalities and recognizing previously identified individuals not seen for long periods further complicate efforts to determine the size of this community using this technique. Trend information is lacking for the population because accurate assessments of abundance have not been made.

3.2.1.3 Foraging

Southern and Northern Resident Killer Whales. Fish are the major dietary component of resident killer whales in the northeastern Pacific, with 22 species of fish and one species of squid (*Gonatopsis borealis*) known to be eaten (Scheffer and Slipp 1948; Ford et al. 1998, 2000; Saulitis et al. 2000; Ford and Ellis 2006). Observations from this region indicate that salmon are preferred as prey for resident killer whales. Ford and Ellis (2006) found that salmon represent at least 96 percent of the prey consumed during the spring, summer, and fall. Chinook salmon were selected over other species, comprising 71.5 percent of the identified salmonids taken. This preference occurred despite the much lower abundance of Chinook in the study area in comparison to other salmonids and is probably related to the species' large size, high fat and energy content and year-round occurrence in the area (Ford and Ellis 2006). Killer whales also captured older (i.e., larger) than average Chinook. Other salmonids eaten in smaller amounts include chum (23 percent of the diet), and pink, coho, sockeye, and steelhead (less than 6 percent combined) (Ford and Ellis 2006). This work suggested an overall preference of these whales for Chinook during the summer and fall, but also revealed extensive feeding on chum salmon in the fall. Additional studies also provide support for the whales' salmon preference, including a contaminant analysis by Krahn et al. (2004, 2007) and a prey sampling study focusing on Southern Residents conducted by the Northwest Fisheries Science Center (Hanson et al. 2005; NWFSC, unpubl. data).

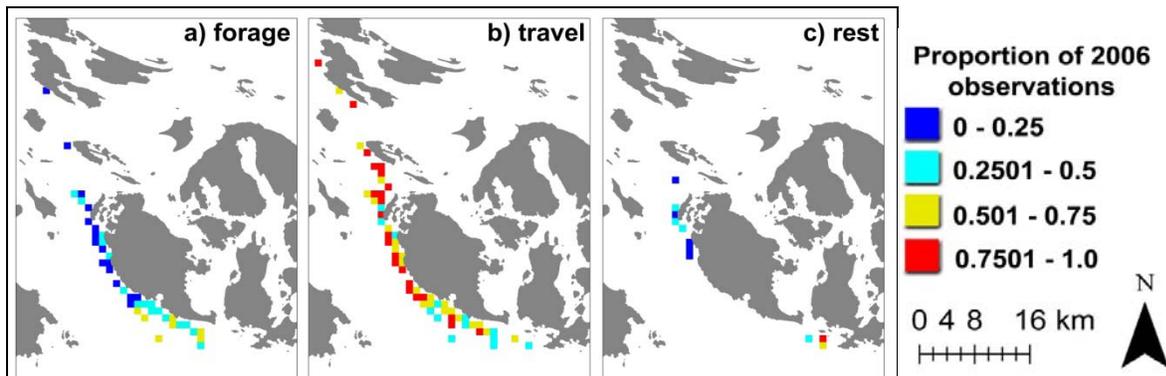
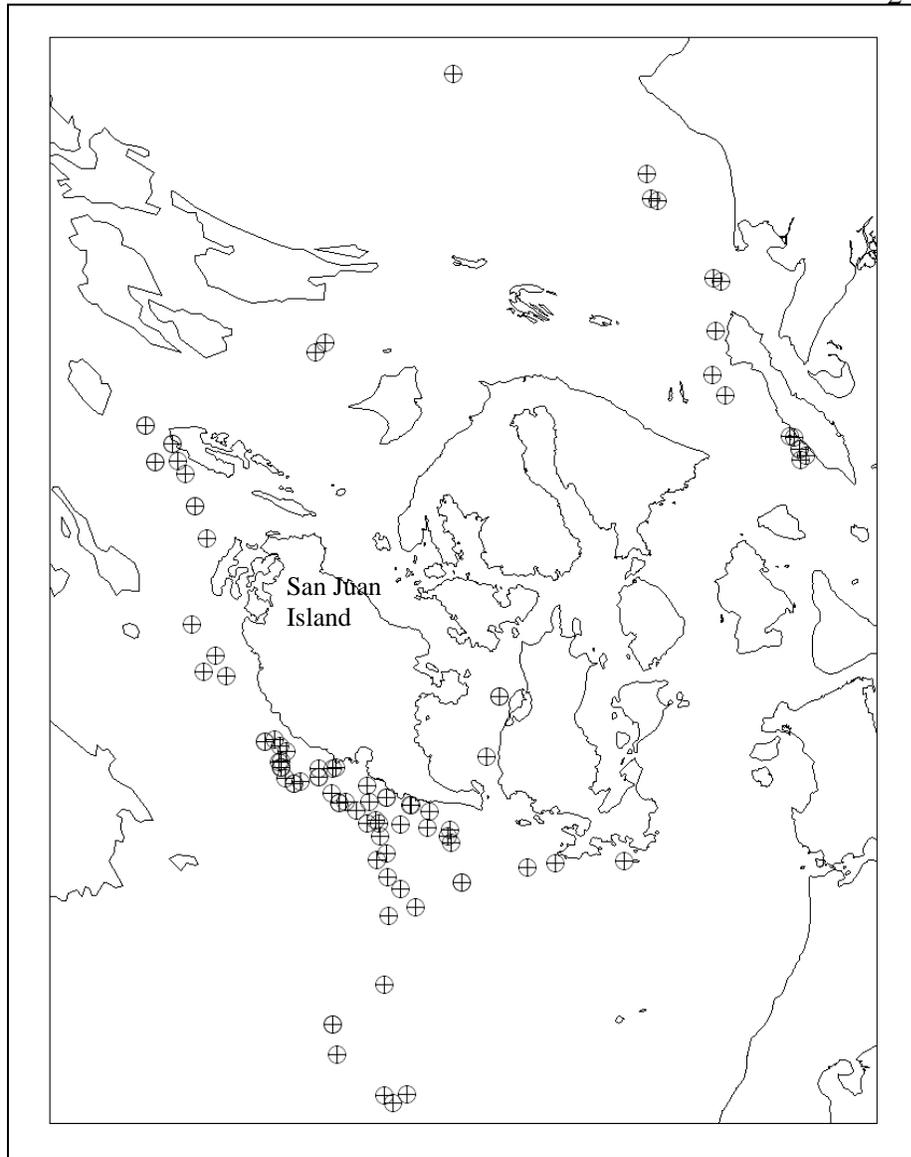


Figure 3-4. Proportion of observations of (a) forage, (b) travel, (c) rest behavior states for 2006 scan samples.

A fine-scale analysis of geographic distribution of foraging behavior in 2006 found localized regions of foraging concentrated along the west side of San Juan Island, particularly in the southwest portion (Noren and Hauser in prep.) (Figure 3-4). Scientists have also made many direct observations of the whales feeding on salmon along the west side of San Juan Island (Figure 3-5). The whales are often seen feeding along the steep shoreline and may be using this topography to assist in capturing prey because fish aggregate along the steep shorelines as they swim through the Strait of Juan de Fuca and into Haro Strait.

1

2



37

38 **Figure 3-5. Locations of predation event observations for Southern Resident killer whales in the San**
 39 **Juan Islands area, 2006-2007. NWFSC, unpubl. data.**

40
 41 Resident whales spend about 50 to 67 percent of their time foraging (Heimlich-Boran 1988; Ford 1989;
 42 Morton 1990; Felleman et al. 1991). Groups of animals often disperse over several square miles while
 43 searching for salmon, with members moving at roughly the same speed (range of 3 to 10 km/hr, mean = 6
 44 km/hr) and direction (Ford 1989, 2002; Ford et al. 1998). Daily foraging episodes usually cover areas of 3
 45 to 10 square kilometers and last 2 to 3 hours, but may extend up to 7 hours. Most information on time spent
 46 foraging is from studies conducted during summer months.

47
 48 Prey are detected through a combination of echolocation and passive listening (Barrett-Lennard et al.
 49 1996), whereas vision and echolocation are probably used during prey capture. Echolocation signals

1 emitted by the whales bounce off objects in the environment and provide information to the whales about
2 size, location, direction and speed of prey. The signals are described in detail in Holt (2008). Using
3 echolocation, whales can detect salmon out to distances of about 100 yards (Au et al. 2004) and
4 echolocation signals are directional and focused in a forward direction (Bain and Dahlheim 1994). Foraging
5 animals produce rapid series of evenly spaced echolocation clicks, but whistles and pulsed calls are also
6 emitted during this activity (Ford 1989).

7
8 Foraging by resident killer whales often involves cooperation among kin-related group members. Whales
9 often spread out over large areas and coordinate their movements when searching for prey. Northern
10 Resident killer whales frequently share prey items at the surface after a capture. Ford and Ellis (2006)
11 observed or strongly suspected sharing in 76 percent of 235 feeding events. Adult males shared prey much
12 less often than females and juveniles. Prey sharing was unrelated to prey size (Ford and Ellis 2005). The
13 occurrence of prey sharing in Southern Residents is also strongly suspected and research is underway to
14 learn more about cooperation and coordination during foraging (NWFSC, unpubl. data; Cascadia Research,
15 unpubl. data).

16
17 *West Coast Transient Killer Whales.* Unlike resident whales, transients feed almost entirely on marine
18 mammals. Harbor seals (*Phoca vitulina*) are the most important prey item in much of the northeastern
19 Pacific, but other species are regularly taken as well, including Dall's porpoises (*Phocoenoides dalli*), harbor
20 porpoises, Steller's sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*)
21 (Matkin and Saulitis 1994; Baird and Dill 1996; Ford et al. 1998; Saulitis et al. 2000; Heise et al. 2003).
22 Transients spend 60 to 90 percent of daylight hours foraging and commonly hunt in both nearshore and
23 open-water habitats (Heimlich-Boran 1988; Morton 1990; Baird and Dill 1995; Ford and Ellis 1999).
24 Transients usually forage in smaller groups than residents, with mean group size numbering from three to
25 five whales depending on the prey species (Baird and Dill 1996; Ford et al. 1998, 2005a). Transients are
26 stealthy hunters and often rely on surprise to capture unsuspecting prey. Unlike residents, they are much
27 quieter while foraging, which probably allows them to avoid acoustical detection by their mammalian prey
28 (Morton 1990; Felleman et al. 1991; Barrett-Lennard et al. 1996; Ford and Ellis 1999). Transients may
29 instead rely heavily on passive listening to detect the sounds of swimming prey (Barrett-Lennard et al.
30 1996).

31
32 *Offshore Killer Whales.* Little is known about the diets of offshore killer whales. They are suspected to feed
33 primarily on fish and squid, based on their frequent use of echolocation, large group sizes, the stomach
34 contents of a few animals, a single feeding observation and very limited testing of fatty acid concentrations
35 (Ford et al. 2000; Heise et al. 2003; Herman et al. 2005; Jones 2006). Prey may include sharks, halibut, and
36 migratory fish (Krahn et al. 2004a; Jones 2006). However, preliminary analyses of chemical signatures in
37 the skin and blubber of offshore whales suggest the possibility that marine mammals are also eaten
38 (Herman et al. 2005).

39 40 **3.2.1.4 Distribution and Habitat Use**

41
42 *Southern Resident Killer Whales.* The Whale Museum in Friday Harbor, Washington has maintained a
43 database since the 1970s that includes sightings from researchers as well as opportunistic observations from
44 a variety of sources, such as the public, the commercial whale watching industry pager system, the
45 Soundwatch Boater Education Program, and land-based sighting from Lime Kiln Point State Park (The
46 Whale Museum 2003, 2005). The Whale Museum data set is the most comprehensive long-term data set
47 available on broad-scale whale distribution in inland waters and NMFS has mapped all the sightings of
48 Southern Residents (Figure 3-6). In late spring to early autumn, all three Southern Resident pods are
49 regularly present in the Georgia Basin (defined as the Georgia Strait, San Juan Islands, and Strait of Juan de

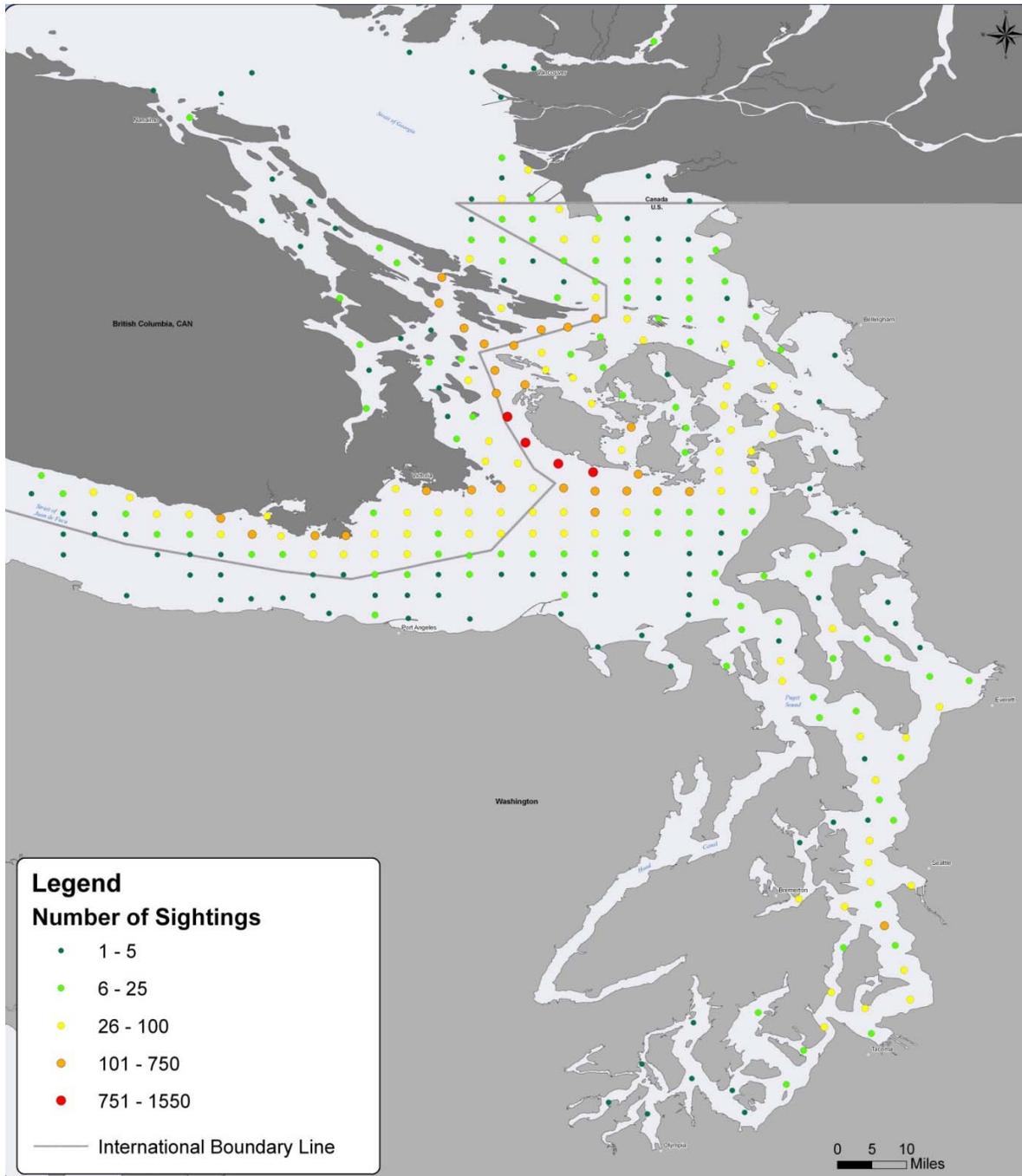
1 Fuca) (Heimlich-Boran 1988; Felleman et al. 1991; Olson 1998; Osborne 1999; Hauser 2006, 2007),
2 typically arriving in April or May and spending most of their time there until departing in October or
3 November. In recent years (2003-2007) the whales spent from 60 to 90 percent of their time in inland
4 waters during May through September (NWFSC, unpubl. data). While in inland waters during warmer
5 months, all of the pods concentrate their activity from the south side of the San Juan Islands through Haro
6 Strait northward to North and South Pender Islands and Boundary Passage (Hauser 2006) (Figure 3-6). The
7 four sighting quadrants along the west side of San Juan Island have the highest numbers of sightings (note
8 red dots on Figure 3-6) that make up over 28 percent of the total 15,540 sightings in the 1990 through 2005
9 data set. Less time is generally spent elsewhere, including other sections of the Georgia Strait, Strait of
10 Juan de Fuca, and San Juan Islands and the Southern Gulf Islands, Rosario Strait, Admiralty Inlet west of
11 Whidbey Island, and Puget Sound.

12
13 During early autumn, Southern Resident pods, especially J pod, expand their routine movements into Puget
14 Sound to likely take advantage of chum and Chinook salmon runs (Osborne 1999). During the late fall,
15 winter, and early spring, the ranges and movements of the Southern Residents are less well known. J pod
16 continues to occur intermittently in the Georgia Basin and Puget Sound throughout this time.

17
18 In 2006 NMFS designated critical habitat for Southern Resident killer whales (71 FR 69054, November 29,
19 2006). NMFS designated three specific areas, (1) the Summer Core Area in Haro Strait and waters around
20 the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca, which comprise approximately
21 2,560 square miles of marine habitat within the area occupied by Southern Resident killer whales in
22 Washington (Figure 3-7). There was insufficient information to consider Hood Canal as occupied at the
23 time of listing and insufficient data to designate critical habitat in the Pacific Ocean. Critical habitat
24 includes all waters relative to a contiguous shoreline delimited by the line at a depth of 20 feet relative to
25 extreme high water. Some of these areas overlap with military sites, which are not designated as critical
26 habitat because they were determined to have national security impacts that outweigh the benefit of
27 designation and were therefore excluded.

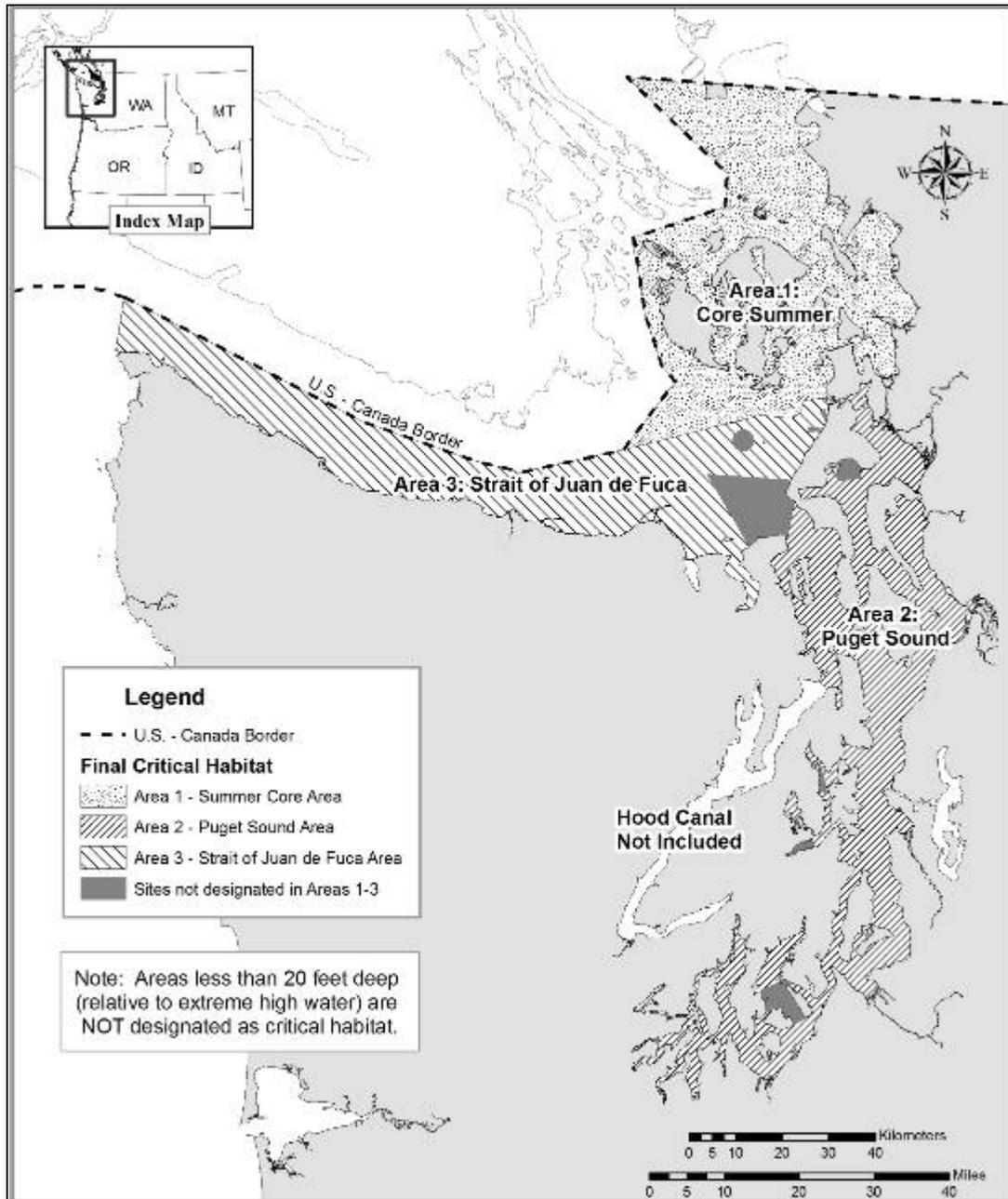
28
29 *Northern Resident, West Coast Transient, and Offshore Killer Whales.* Northern Residents are occasionally
30 seen in inland waters of Washington although the timing of these visits does not overlap with the presence
31 of Southern Residents. Most transient sightings in Washington and around Vancouver Island occur in the
32 summer and early fall, when viewing effort is greatest and harbor seals pup (Morton 1990; Baird and Dill
33 1995; Olson 1998; Ford and Ellis 1999). Observations in the Georgia Basin and Puget Sound are
34 concentrated around southeastern Vancouver Island, the San Juan Islands, and the southern edge of the
35 Gulf Islands (Olson 1998; K. C. Balcomb, unpubl. data). Transient and offshore sightings are also tracked
36 through the Whale Museum and other sighting networks. Offshore killer whales primarily inhabit offshore
37 locations, but are also seen in nearshore coastal waters and occasionally in inland waters (Wiles 2004).

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Figure 3-6. Distribution of Southern Resident killer whale sightings from 1990-2005 (The Whale Museum 2005). Multiple sightings of whales in the same location on the same day were eliminated to reduce bias and resulted in 15,540 unique sightings.

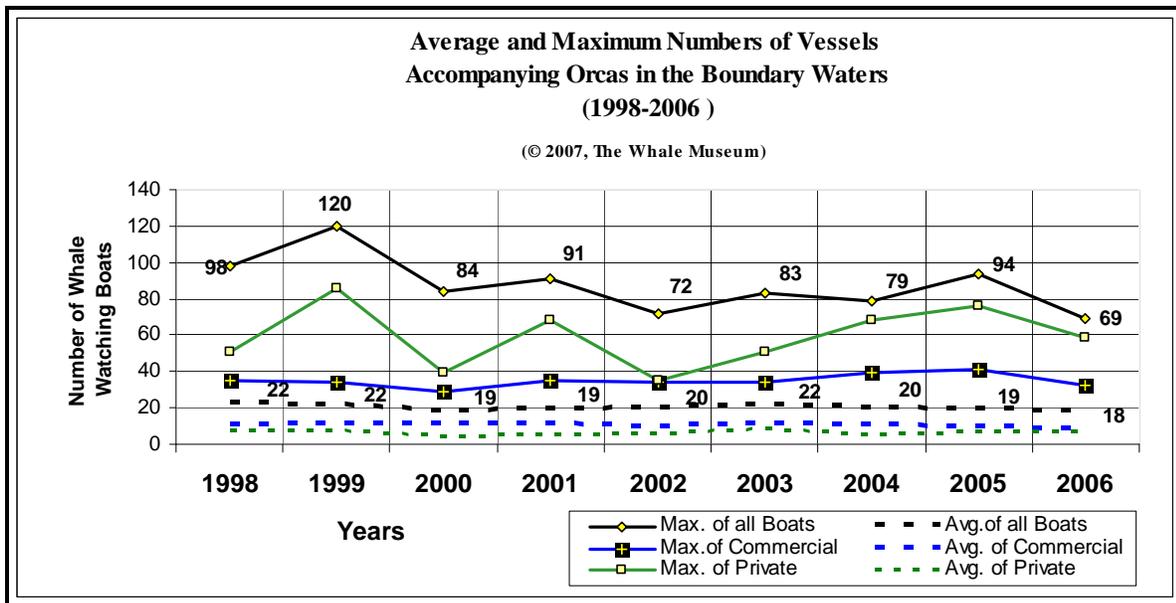


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Figure 3-7. Designated critical habitat for Southern Resident killer whales.

1 **3.2.1.5 Vessel Interactions**

2
 3 Monitoring groups have reported that the mean number of vessels following a given group of whales
 4 increased from five boats in 1990 to an average of about 20 boats within 1/2 mile of the whales during May
 5 through September, for the years 1998 through 2006 (Osborne et al. 1999; Baird 2001; Erbe 2002; Marine
 6 Mammal Monitoring Project 2002; Koski 2004, 2006, 2007) (Figure 3-8), with a peak of 22 vessels around
 7 the whales in 1998 and 2003. At any one time, the observed numbers of commercial and recreational whale
 8 watch boats around killer whales can be much higher. For example, 107 vessels followed one Southern
 9 Resident pod (Lien 2000); 76 boats simultaneously positioned around a group of 18 whales from K pod
 10 (Baird 2002); and up to 500 vessels came out on the weekends to view a group of whales from L pod in
 11 Dyes Inlet during the fall of 1997. Although the average number of whale watch vessels within 1/2 mile is
 12 lower than what was observed in these three cases, the extreme nature of these events illustrates the degree
 13 to which killer whales can captivate the public’s interest in the Pacific Northwest and the level of vessel
 14 effects that may occur.
 15



16
 17
 18 **Figure 3-8. Average number of vessels accompanying whales from Soundwatch vessel monitoring**
 19 **program (Koski 2007).**

20
 21 Over the last several years, the whale watch season has extended in length, with vessels accompanying
 22 whales for more hours of the day and more days of the year. It is not uncommon for Southern Residents or
 23 transient killer whales to be accompanied by many boats throughout much or all of the day with peak
 24 numbers of attending vessels in late morning and mid-afternoon during the busiest whale watching months
 25 of July and August (Koski 2007). In recent years, U.S. and Canadian commercial whale watch vessels have
 26 made up over 50 percent of the vessels observed within a 1/2-mile radius of the whales (Koski 2007). In
 27 addition to the commercial and recreational whale watch vessels, other vessel types including kayaks,
 28 private and commercial fishing, research and shipping vessels, and aircraft are also monitored in the
 29 vicinity of the whales.

30
 31 Because of concerns over the growing number of vessels around the whales, and the potential for them to
 32 disrupt the whales’ essential behaviors, government agencies, whale-watch operators, and conservation

1 organizations collaborated to develop guidelines for viewing the whales, known as the Be Whale Wise
2 guidelines. Two common methods of approaching and viewing killer whales in accordance with the
3 guidelines are paralleling and repositioning. Paralleling is a viewing method that involves slowly bringing
4 the boat alongside the whales at least 100 yards away. The Be Whale Wise guidelines recommend this
5 parallel approach and the 100 yard approach limit to avoid harassment of the animals, while allowing
6 passengers to see the whales and their behavior. Commercial whale watch vessels engaging in paralleling
7 are generally able to maintain a distance greater than 100 yards and set an example that private vessels
8 often follow.

9
10 Repositioning is another technique applicable to viewing after whales pass the vessel by at least 800 yards.
11 The vessel then slowly engages its engines and travels at 5 to 7 knots until it is well behind and outside of
12 the whales by about 1,500 yards. The vessel then speeds up and makes an arc outside of the whales,
13 traveling about a mile ahead whereupon it moves back towards the whales' anticipated route. About 1,500
14 yards from the whales' path, the vessel slows to 5 to 7 knots and travels forward to position itself about 100
15 yards outside of their expected path. The vessel then waits for the whales to arrive, but continues to adjust
16 its position, as necessary, to stay at least 100 yards from their route. Sometimes, vessels either intentionally
17 or unintentionally end up in the path of the whales, which is not consistent with the Be Whale Wise
18 guidelines. Parking in the path of the whales involves intentionally positioning a vessel in the path of
19 whales and/or not moving out of the path of whales when there is time and space to do so, so that whales
20 pass closer than 100 yards when whales are traveling in a relatively predictable pattern (Koski 2004).

21
22 A third viewing method, known as "leapfrogging," was commonly used until about 1999, when its use was
23 discouraged because of the potential for adverse impacts to the whales. "Leapfrogging" involves a vessel
24 that moves ahead of the whales by paralleling them for some distance at a speed faster than the whales
25 (Williams et al. 2002b). After speeding ahead of the whales, the vessel makes a 90 degree turn to put itself
26 directly in the whales' anticipated travel path and waits for the whales to approach while sitting in a
27 stationary position with the engines idle or turned off. If the whales maintain their approximate travel
28 course, they often swim closely past the awaiting vessel or even underneath it, providing the passengers
29 with a close-up viewing opportunity.

30
31 Leapfrogging is not consistent with the recommended viewing guidelines because of the potential for
32 disturbing the animals. For example, vessels speeding up to leapfrog emit greater sound levels at a higher
33 frequency, which have a greater potential to mask the whales' communication than slower paralleling
34 vessels (Bain 2002; Bain et al. 2006). In addition, masking is more likely to occur from vessels in front of
35 the whales than vessels paralleling the whales (Bain and Dahlheim 1994; Bain 2002; Bain et al. 2006).
36 Although paralleling and leapfrogging maneuvers have the potential to induce similar evasive responses
37 from the whales, leapfrogging appears to cause more path deviation than paralleling (Williams et al.
38 2002a). Leapfrogging also increases the risk of direct contact with killer whales, which although rare,
39 resulted in a collision between a Southern Resident and a whale watch vessel off the San Juan Islands in
40 July 2005.

41
42 Monitoring groups such as Soundwatch have collected several years of data, including information on
43 incidents when vessels are not adhering to the guidelines (Table 3-1 and Table 3-2).

1 **Table 3-1. Types and relative occurrence of incidents of voluntary whale-watching guidelines not**
 2 **being followed as witnessed by the Soundwatch Boater Education Program in Washington and**
 3 **southern British Columbia, 1998-2006 (from Koski 2004, 2006, 2007).** Incidents were committed by
 4 commercial and recreational vessels, kayaks, and aircraft in the act of whale watching, as well as research
 5 vessels.

Type of Incident	Percent of Incidents ^a								
	1998	1999	2000	2001	2002	2003	2004	2005	2006
Within the 400-m-wide San Juan Island no-boat zone	39	26	17	17	7	13	4	8	4
Leapfrogging	37	31	23	1	na	na	na	na	na
Under power within 100 m of whales	6	4	5	4	5	12	9	10	12
Inshore of whales	5	29	24	25	19	16	22	18	17
Crossing the path of whales	4	3	5	2	4	7	6	4	5
Aircraft within 300 m of whales	4	2	4	7	14	6	6	4	6
Chasing or pursuing whales	3	1	3	2	<1	4	3	1	2
Within the 800-m-wide Lime Kiln no-boat zone	2	2	2	1	2	5	1	2	1
Within 180 m of the San Juan Islands National Wildlife Refuge	0	1	3	1	2	2	1	0	<1
Other ^b		1	3	3	14	5	15	11	10
Repositioning to be within 100 m of whales ^b			7	7	na	na	na	na	na
Within 200 m of shore with whales present ^b			4	4	2	<1	4	1	2
Parked in the path of whales ^b				26	24	17	19	27	26
First approach of whales from head-on, behind, or shore ^b					4	2	1	<1	1
Traveling fast (greater than 5-7 knots) within 400 m of whales ^b					3	4	9	10	11
Kayaks spread out with whales present ^b					<1	3	0	<1	1
Kayaks with whales outside the 400-m-wide San Juan Island no-boat zone ^b					<1	1	0	<1	1
Kayaks paddling within 100 m of whales ^b						3	0	<1	1
TOTAL (percent)	100	100	100	100	100	100	100	96	100
Total number of observed incidents	398	791	653	533	259	373	761	957	1281
Estimated observation time (hours)	426	510	426	486	378	312	486	564	516

^a During 1998-2001, Soundwatch operated an average of 7 days per week from May to September. During 2002, it operated an average of 3 days per week from May to September. During 2003-2005, it operated an average of 5 days per week from June to September.

^b Category was not used during all years.

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1 **Table 3-2: 2006 Summary of vessel incidents by incident and vessel type (from Koski 2007).**

*SOUNDWATCH
Whale Watching Incidents 2006 Annual Summary*

From 5/20/06 To 9/24/06

<i>Behavior</i>	<i>Total</i>	<i>CWW US</i>	<i>CWW Can</i>	<i>Private</i>	<i>Kayak</i>	<i>Research</i>	<i>Aircraft</i>	<i>Other</i>
Parked in path of whales	330	44	142	121	14	5		4
Inshore of whales	220	12	37	153	4	7		7
Under power within 100 yds/m of whales	159	7	11	126		8		7
Fast within 1/4 mile	139	5	14	112		4		4
Other	129	29	47	16	1		34	2
Airplane within 1000 feet	71						69	2
Crossing path of whales	67	11	6	42		3		5
Within 440 yards of SJI No-Boat Zone	52		2	44		4		2
Within 220 yards of shore; whales present	28		6	21		1		
Chasing/pursuing whales	23	2		19	2			
Within 880 yards of Lime Kiln	17			13		1		3
1st approach head-on, behind, or inshore	13	1	1	11				
Kayaks spread out	10				10			
Kayak paddling within 100 yds of whales	10				10			
Kayaks w/whales outside 1/4 mile SJI zone	8				8			
Within 200 yards of National Wildlife Refuge	5	1	3			1		
TOTAL:	1,281	112	269	678	49	34	103	36

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2

In 2006, there were 1,281 incidents of vessels not following the guidelines reported during the time the observers were present. Observers were not present during all days and all hours, thus it is likely there were more incidents than those reported. Soundwatch effort (estimated observation time) has fluctuated in recent years and trends in incident data can be difficult to interpret. There was an increasing trend in the number of incidents from 1998 to 2006, which is not based only on increasing hours of observation time (Industrial Economics, Incorporated 2008). An average of 1.2 incidents was observed per hour in 2003, while an average of 2.48 incidents were observed per hour in 2006.

As in the past several years, the top Soundwatch observed vessel incident percentage categories in 2006 were:

1. vessels parking in the path of whales (Parked in path) at 26 percent of all incidents,
2. vessels motoring inshore of whales (Inshore of whales) at 17 percent,
3. vessels motoring within 100 yards of whales (Under power within 100 yards of whales) at 12 percent, and
4. vessels motoring fast within 400 yards of whales (Fast within 1/4 mile of whales) at 11 percent of all incidents.

Of the 1,281 incidents in 2006, the majority were committed by private boaters (53 percent), Canadian commercial operators (21 percent), and U.S. commercial operators (9 percent) (Figure 3-9). The top incidents also reflect this pattern and are most often committed by private boaters, Canadian commercial whale watch vessels, and U.S. commercial whale watch vessels respectively (Figure 3-10).

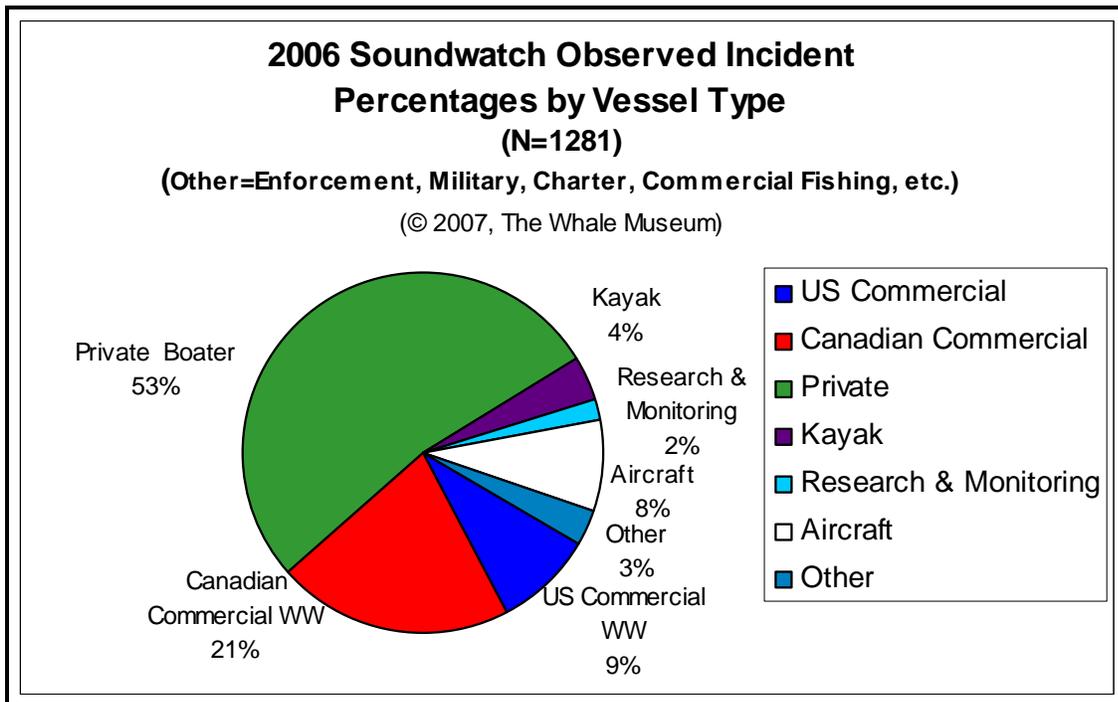
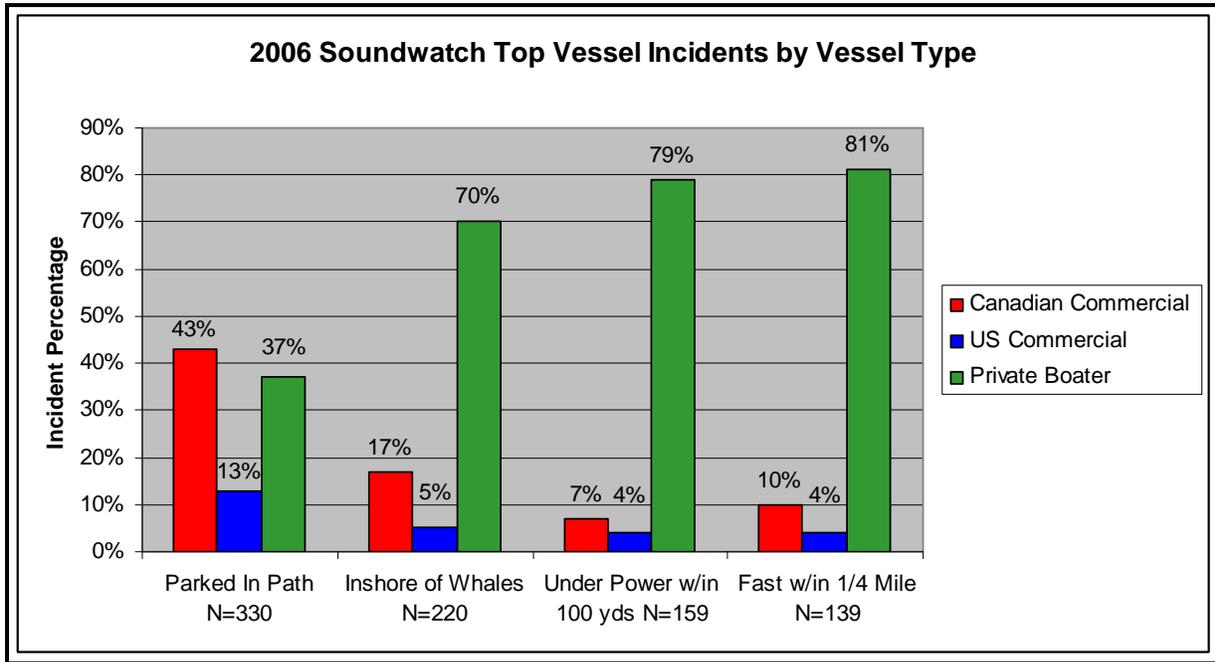


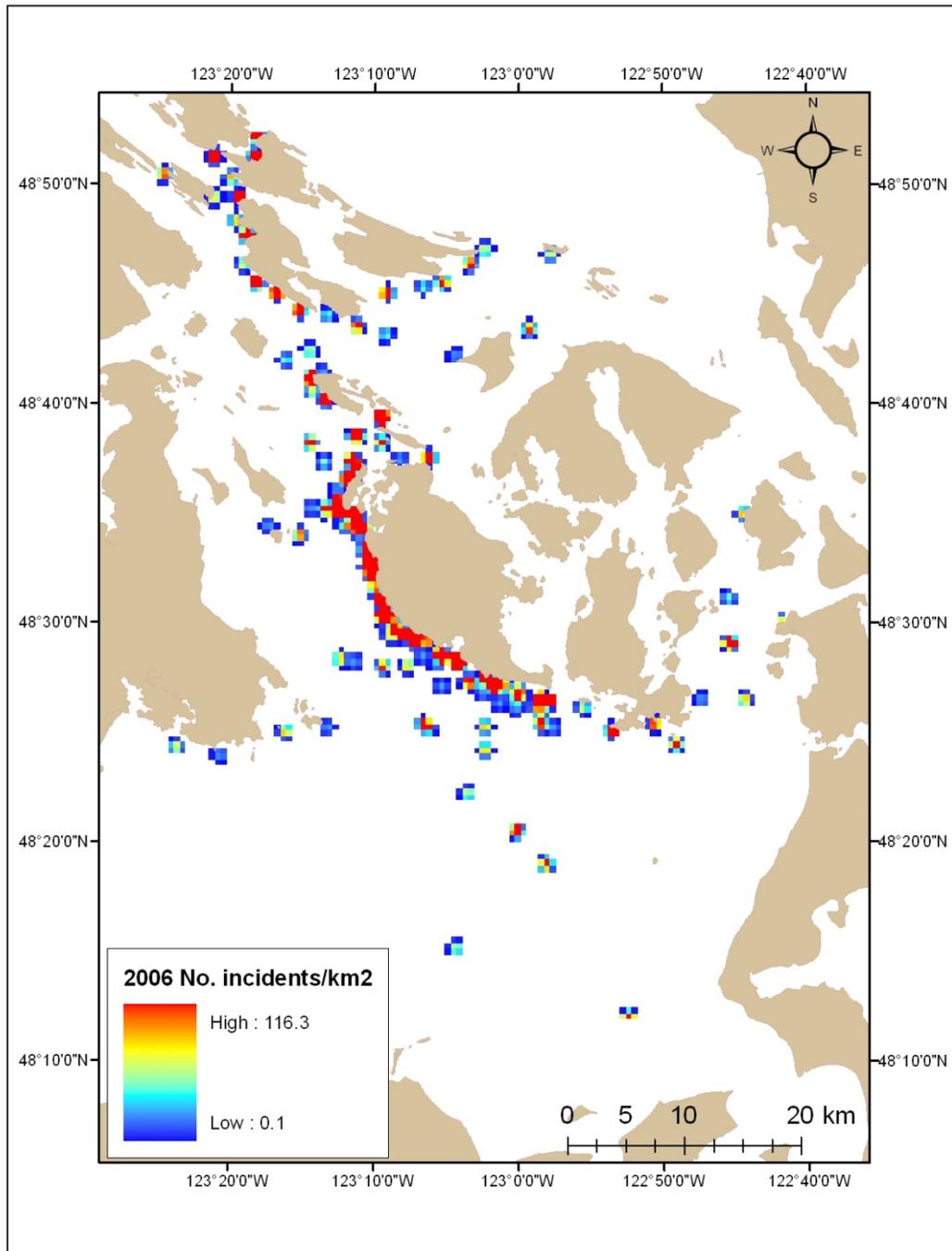
Figure 3-9. Percentage of incidents by vessel type observed in 2006 (from Koski 2007).

1
2



3
4 **Figure 3-10. Top vessel incidents by vessel type for 2006 (from Koski 2007).**

5
6 In addition to the specific guidelines in the Be Whale Wise materials, Soundwatch records incidents when
7 vessels are within a voluntary no-go zone. There is currently a voluntary no-go zone along the west side of
8 San Juan Island, which is recognized by San Juan County and described as part of the San Juan County
9 Marine Stewardship Areas (Figure 2-1). Whale watching vessels complying with the voluntary no-go zone
10 often park or travel along the edge of the zone to view whales when they are within the zone (Giles 2008).
11 The west side of San Juan Island has the highest number of Southern Resident killer whale sightings
12 (Figure 3-6) and likely because of this the west side of San Juan Island is the location of the highest number
13 of vessel incidents recorded by Soundwatch (Koski 2006, 2007) (Figure 3-11).
14



1
2 **Figure 3-11. Vessel incident density for 2006 (from Koski 2007).**

3
4 The ESA and MMPA prohibit take and harassment of Southern Resident killer whales. While vessel
5 incidents are recorded and reflect vessel behavior that has the potential to harass and take the whales,
6 translating this information into enforcement cases and successful prosecutions under the MMPA and ESA
7 can be difficult. In addition to Soundwatch incident information, the Office for Law Enforcement receives
8 numerous reports from the public regarding potential violations. In recent years a small number of cases

1 where negligent operation of a vessel resulted in harassment have been successfully pursued. In 2005 (prior
2 to the ESA listing) one case of harassment of killer whales under the MMPA through the negligent
3 operation of a vessel resulted in a \$1,000 fine. Following the ESA listing in 2005, NMFS assessed an
4 additional violation for negligent operation of a vessel in 2006, which resulted in settlement and imposition
5 of a higher fine based on the endangered status of the whales and was settled for \$2,000. Both cases were
6 settled in 2007. Whether incidents reported by Soundwatch or enforcement cases, vessels can affect the
7 whales by increasing the risk of vessel strikes and causing behavioral disturbance and auditory masking,
8 which are described below.

9
10 *Known Vessel Strike Effects.* A subset of the total number of incidents including 1) parking in the path, 2)
11 head on approaches, 3) crossing the path of whales, and 4) chasing/pursuing whales are risky vessel
12 behaviors that have the highest likelihood of resulting in vessel strikes. In 2006 there were 433 incidents
13 involving these types of activities out of the total 1,281 monitored incidents (Table 3-2). Vessel strikes can
14 result in direct injury or mortality and even small injuries can be a path for infections (Dierauf and Gulland
15 2001). Killer whales have been injured or killed by collisions with vessels, primarily from being struck by
16 propeller blades (Visser 1999; Ford et al. 2000; Visser and Fertl 2000; Baird 2001; Carretta et al. 2001,
17 2004). Some killer whales that have sustained severe injuries from collision with vessels eventually made
18 full recoveries. For example, a female killer whale observed by Ford et al. (2000) healed from wounds
19 extending almost to her backbone. One of the violations described above resulted in a vessel collision and a
20 minor injury to one Southern Resident whale, which subsequently healed. Only one killer whale mortality
21 was caused by a vessel strike from the 1960s through the 1990s in the region (Baird 2002). However,
22 several additional mortalities since then have been reported. In March of 2006, a lone Southern Resident
23 killer whale (L98) residing in Nootka Sound, British Columbia for several years, was killed by the engine
24 of a tug boat. Although L98 exhibited unusual behavior and often interacted with vessels, his death
25 demonstrates the risk of vessel accidents. In July 2006, the death of a stranded Northern Resident female
26 was attributed to blunt trauma, likely caused by a vessel strike (Gaydos and Raverty 2007).

27
28 *Known Behavioral Disturbance.* Killer whales in the Pacific Northwest are well documented to respond to
29 vessels engaged in whale watching with short-term behavioral changes (Kruse 1991; Kriete 2002; Williams
30 et al. 2002a, 2002b, 2006, 2009; Noren et al. 2007, In Press; Foote et al. 2004; Bain et al. 2006; Lusseau et
31 al. 2009). Examples of short-term behavioral responses of Northern and Southern Resident killer whales in
32 the Pacific Northwest include faster swimming speed (Williams et al. 2002a) and a less direct swimming
33 path (Williams et al. 2002a; Bain et al. 2006, Williams et al. 2009). Northern Resident killer whales in the
34 presence of vessels spent more time resting, traveling, and socializing and less time feeding and rubbing
35 their bodies on smooth pebble beaches than in the absence of vessels (Williams et al. 2006) and were more
36 likely to leave a protected reserve area when vessels were present (Trites et al. 2007). Southern Residents
37 also spent less time foraging in the presence of vessels (Bain et al. 2006, Lusseau et al. 2009).

38
39 Vessels in the path of the whales can interfere with important social behaviors such as prey sharing (Ford
40 and Ellis 2006) or with behaviors that generally occur in a forward path as the whales are moving, such as
41 nursing (Kriete 2007). A subset of the total number of incidents from 2006, listed in Table 3-2, involve 1)
42 approaching closer than 100 yards, 2) operating at high speeds (less than 7 knots) within 400 yards of the
43 whales, 3) parking in the path, 4) crossing the path, 4) chasing or pursuing whales, and 5) approaching
44 head-on. In 2006, there were 731 of these specific types of incidents.

45
46 Some studies have looked at the effects on behavior at specific vessel distances. In those studies, vessels
47 were underway during active approaches or may have been parked in the path or stopped close to the
48 whales as part of a leapfrogging sequence as described above.

1 Approaches within 100 yards: Research results indicate that killer whale behavior changes from vessel
2 approaches within 100 yards include changes in swimming patterns, changes in respiratory patterns,
3 reduced time spent foraging, and increased surface active behaviors such as tail slaps (Bain et al. 2006,
4 Noren et al. 2007, In Press; Williams et al. 2002a, Lusseau et al. 2009). Noren et al. (2007, In Press)
5 reported the highest frequency of surface active behaviors when the nearest vessel was within 75 to 99
6 meters in 2005. Bain (2006) reported a significant decrease in the time spent foraging when vessels were
7 present within 100 yards. Williams et al. (2002a) found that experimental vessel approaches at 100 meters
8 (about 100 yards) resulted in whales covering 13 percent more distance along a less direct route than before
9 the vessel approached. Female whales swam 25 percent faster and changed direction more often when
10 approached by the experimental boat.

11
12 Approaches within 200 to 400 yards: Research results also indicate that killer whale behavior can be
13 affected by approaches at distances greater than 100 yards (Bain et al. 2006; Noren et al. 2007, In Press;
14 Williams et al. 2009). One study reported similar types of effects (i.e., increased direction changes,
15 increased respiratory intervals and transitions between activity states) from vessels within 400 yards of
16 whales as compared to vessels within 100 yards, although to a lesser degree. This study did not report if
17 these effects were from vessels close to the 100 yard distance, at a 200 yard distance or further away (Bain
18 et al. 2006). Bain et al. (2006) and Lusseau et al. (2009) also reported a reduction in time spent foraging
19 when vessels were within 400 yards. Noren et al. (2007, In Press) reported the highest frequency of surface
20 active behaviors when vessels were within 100 yards in 2005 and the highest frequency of surface active
21 behaviors when the closest vessel was within 125 to 149 yards in 2006.

22
23 The average viewing distance of vessels is greater than the 100 yard guideline. In 2007 a new research
24 program collected detailed information on the distance of vessels from the whales and found that the
25 average point of closest approach for all vessels is over 200 meters (Giles 2008). Bain (2007) reported that
26 commercial vessels remained more than 300 meters in some areas. This may reflect a cautious approach by
27 vessel operators who do not want to get too close to the recommended viewing distance. Recreational
28 vessels tended to approach more closely than the commercial vessels, which is consistent with the higher
29 level of incidents for these vessels (Giles 2008) (Table 3-2). Noren et al. (2007, In Press) also reported that
30 the distance of closest approach to the whales was closer for private than for commercial vessels although
31 this difference was not significant.

32
33 Some studies have looked at the behavioral effects from different types of vessels as presented in
34 Subsection 1.6.3., Application to Motorized and Non-motorized Vessels. In studies comparing effects of
35 motorized and non-motorized effects on dolphins, the type of vessel did not matter as much as the manner
36 in which the boat moved with respect to the dolphins (Lusseau 2003b). Some dolphins' responses to vessels
37 were specific to kayaks or were greater for kayaks than for motorized vessels (Lusseau 2006; Gregory and
38 Rowden 2001; Duran and Valiente 2008). Several studies that have documented changes in behavior of
39 dolphins and killer whales in the presence of vessels include both motorized and non-motorized vessels in
40 their analysis (Lusseau 2003b; Nichols et al. 2001; Trites et al. 2007; Noren et al. 2007, In Press).

41
42 The long term effects of these behavioral responses are less well known (Williams et al. 2006), although
43 researchers have estimated the physiological consequences of behavioral responses by calculating the
44 energetic costs of the behaviors observed when vessels are present. Williams et al. (2006) estimated that
45 killer whales expended slightly more energy in the presence of vessels. The behavior exhibited in the
46 presence of vessels would require approximately 3 percent more energy than behavior in the absence of
47 vessels. The increased energy expenditure may be less important than the reduced time spent feeding and
48 the resulting likely reduction in prey consumption. From their observations, Williams et al. (2006)

49

1 calculated that killer whales spent 18 percent less time foraging in the presence of vessels than when
2 vessels are absent.

3
4 Increased energetic costs from behavioral disturbance and reduced foraging can decrease the fitness of
5 individuals (Lusseau and Bejder 2007). Increased energy expenditure or disruption of foraging could result
6 in poor nutrition. Poor nutrition could lead to reproductive or immune effects or, if severe enough, to
7 mortality (Dierauf and Gulland 2001; Trites and Donnelly 2003). Interference with foraging and nutritional
8 stress can affect growth and development, which in turn can affect the age at which animals reach
9 reproductive maturity, fecundity, and annual or lifetime reproductive success (Trites and Donnelly 2003).
10 Interference with behaviors including prey sharing and communication could also change social cohesion
11 and foraging efficiency and therefore the growth, reproduction, and fitness of individuals.

12
13 Other responses to vessel presence and activity can also result in population level effects. Past studies
14 indicate that repeated short-term avoidance behaviors by whales can cause habitat displacement leading to
15 reduced fitness of a whale population (review in Williams et al. 2006). Abandonment of preferred habitat
16 because of high disturbance levels has been demonstrated in other locations with other species (Bejder
17 2006a, 2006b; Forest 2001; Courbis 2007; Norris et al. 1985). Northern and Southern Resident killer
18 whales continue to show strong site fidelity to their traditional summer ranges despite the more than 25
19 years of whale watching and increasing vessel traffic in the Pacific Northwest. Thus, the current level of
20 vessel traffic including whale watching does not appear to cause habitat displacement for killer whales in
21 this region.

22
23 The extent to which killer whales inhale diesel fumes or ingest oil is unknown, as is whether they suffer
24 harmful effects from these sources.

25
26 *Known Acoustic Effects.* Vessel sound has the potential to interfere with important biological functions for
27 killer whales. The 731 incidents described above under *Behavioral Disturbance* that result in changes to the
28 whales' behavior also likely create sound levels that interfere with the whales' communication and foraging
29 by masking their acoustic signals. Killer whales generally have a range of hearing from 1 to 100 kHz
30 (Szymanski et al. 1999) and this wide frequency range of hearing makes killer whales susceptible to effects
31 from a wide range of sounds, including sound produced by vessels. Sound modeling has been used to
32 estimate distances at which vessel sound would cause behavioral responses for killer whales (Erbe 2002).
33 Erbe (2002) predicted that the sounds of fast boats (greater than 50 km/h [31 miles/hour]) would be audible
34 to killer whales at distances of up to 16 kilometers (10 miles) and cause behavioral responses within 200
35 meters (0.12 miles or 219 yards). For boats moving at slow speeds (10 km/h [6.2 miles/hour]), sound
36 would be audible within 1 kilometer (0.62 miles or 1,094 yards) and cause behavioral changes within 50
37 meters (55 yards).

38
39 Human-generated sounds may mask or compete with and effectively drown out clicks, calls, and whistles
40 made by killer whales, including echolocation used to locate prey and other signals the whales rely upon
41 for communication and navigation. Masking of echolocation would reduce foraging efficiency (Holt 2008),
42 which may be particularly problematic if prey resources are limited. Additionally, prey sharing has recently
43 been identified as an important feature of Northern Resident killer whale foraging (Ford and Ellis 2005).
44 Masking sound from vessels could affect the ability of whales to coordinate their feeding activities,
45 including searching for prey and prey sharing. A study conducted by Foote et al. (2004) with Southern
46 Resident killer whales in the San Juan Islands identified that all three pods increased the duration of their
47 primary communication call when vessels were present. This appears to be a recent development, which
48 Foote et al. (2004) attributed to increased vessel traffic and subsequent engine noise reaching a threshold
49

1 above which whales compensated with longer duration of calls to overcome the vessel noise (Foote et al.
2 2004). Holt et al. (2008) found that killer whales increase their call amplitude in response to vessel noise.

3
4 In addition to the potential for vessel sound to mask calls of killer whales, sound can also damage killer
5 whale hearing. For example, if exposed to a sound intensity within the frequency range of hearing for a
6 long enough duration, hair cells that affect sensitivity of hearing in mammalian ears may fatigue and take
7 time to return to their normal shape. As long as the sound level is below a threshold or critical level of
8 energy, the hair cell will return to normal shape, and any loss of hearing sensitivity will return to normal.
9 The temporary loss of hearing sensitivity is called temporary threshold shift (TTS) and in the event that the
10 loss of hearing sensitivity is not recovered (for sound levels above a critical level) permanent hearing loss
11 can occur (or a permanent threshold shift (PTS)). Although direct study of auditory damage to killer whales
12 has not been conducted, sound modeling predicted that the sounds of fast boats (greater than 50 km/h [31
13 miles/hour]) would mask killer whale calls up to 14 kilometers away, and cause TTS after 30 to 50 minutes
14 of exposure within 450 meters (0.28 miles or 492 yards) (Erbe 2002). For boats moving at slow speeds (10
15 km/h [6.2 miles/hour]), the estimated ranges fall to 1 kilometer (0.62 miles or 1,094 yards) for masking and
16 20 meters (22 yards) for TTS. It is unlikely that one animal would remain within these distances of moving
17 vessels for the extended periods (30 to 50 minutes) that would result in temporary effects on hearing, and it
18 is difficult to estimate cumulative effects of multiple vessels and different distances. Erbe (2002) and
19 Hildebrand (2006) recorded boat source levels of 110 to 169 dB that would not reach the estimated
20 threshold for injury to the whales and their hearing (approximately 180 dB). Where whales do not respond
21 to vessel noise, the lack of response does not necessarily indicate the animal is not affected; animals may be
22 habituated to the vessels or have decreased hearing sensitivity from TTS or PTS damage from a variety of
23 potential sources (Erbe 2002).

24
25 Holt (2008) reviewed the current knowledge and data gaps regarding sound exposure in Southern Resident
26 killer whales. The review provides an overview of acoustic concepts, killer whale sound production,
27 ambient sound levels in Haro Strait (Veirs and Veirs 2006), sound propagation in killer whale habitats,
28 effects of sound exposure, and assessment of likely acoustic impacts on the Southern Residents. Holt used
29 data on ambient sound and characteristics and sound levels of several different types of vessels (Hildebrand
30 et al. 2006) to analyze impacts on the effective range of killer whale echolocation in detecting a salmon.
31 The vessel sounds were recorded at idle, when powering up, and at cruise speeds (17 to 31 knots). The
32 review concluded that vessel noise was predicted to significantly reduce the range at which echolocating
33 killer whales could detect salmon in the water column. Holt (2008) reported that the detection range for a
34 killer whale echolocating on a Chinook salmon could be reduced 88 to 100 percent by the presence of a
35 moving vessel within 100 yards of the whale. The detection range was reduced 38 to 90 percent when
36 different vessels were operating at different speeds 200 and 400 yards from the whales. Reduction in
37 detection ranges decreased with greater distance from the whales and this was the case for both fast (cruise)
38 and slower (powering up) vessels. Reduced foraging efficiency could have physiological effects, such as
39 poor nutrition, and effect fitness of individuals as described above under *Behavioral Disturbance*.

40
41 Commercial and recreational boaters also target transient killer whales when they are present in Georgia
42 Basin and Puget Sound (Baird 2001). No studies have focused on their behavioral responses to whale-
43 watching vessels to determine whether they resemble those of residents. Because transients may depend
44 heavily on passive listening for sounds made by their marine mammal prey (Barrett-Lennard et al. 1996),
45 their foraging success is likely affected to a greater degree by vessel presence than with residents (Ford and
46 Ellis 1999; Baird 2001).

3.2.2 Other Marine Mammals

In addition to killer whales, there are a variety of other cetacean and pinniped species commonly found in inland waters of Washington (Table 3-3). Some species are abundant and commonly found, such as harbor porpoise and harbor seals, whereas others are listed under the ESA or only visit inland waters rarely (humpback whales). Killer whales remain the focus of the whale watch industry in the region; however, when killer whales are not present or when viewing of killer whales has been completed, commercial and recreational boaters often seek out other marine species. The Be Whale Wise campaign includes information on responsible viewing of all whales, porpoises and dolphins, seals, sea lions, and birds. The monitoring groups, however, do not record incidents of vessels not following the guidelines in regard to marine mammal species other than killer whales.

In addition to the Be Whale Wise guidelines there are several National Wildlife Refuges in inland waters of Washington where boaters are advised to stay 200 yards away to avoid disturbing all marine mammals and birds.

Table 3-3. Common marine mammals in inland waters of Washington.

Cetaceans	Population Status
Harbor Porpoise, <i>Phocoena phocoena</i>	Not listed, trends unknown
Dall's Porpoise, <i>Phocoenoides dalli</i>	Not listed, trends unknown
Gray Whale, <i>Eschrichtius robustus</i>	Not listed, at carrying capacity
Humpback Whale, <i>Megaptera Novaeangliae</i>	Endangered under ESA
Minke Whale, <i>Balaenoptera acutorostrata</i>	Not listed, trends unknown
Pinnipeds	
Harbor Seal, <i>Phoca vitulina</i>	Not listed, at carrying capacity
California Sea Lion, <i>Zalophus californianus</i>	Not listed, at carrying capacity
Steller Sea Lion, <i>Eumetopias jubatus</i>	Threatened under ESA

3.2.2.1 Cetaceans

Cetaceans include porpoises, whales, and dolphins. Harbor porpoise, Dall's porpoise, gray whales, humpback whales, and minke whales are found in inland waters of Washington (Table 3-3). Harbor porpoises are small, dark gray, shy animals. In the eastern North Pacific Ocean, harbor porpoise are found in coastal and inland waters from Point Barrow, along the Alaskan coast, and down the west coast of North America. Harbor porpoise are known to occur year-round in the inland transboundary waters of Washington and British Columbia, Canada (Osborne et al. 1988), and the estimated abundance for the Washington Inland Waters stock of harbor porpoise is 10,682 animals. This is an increase in the population estimate for 1996 (Carretta et al. 2004). The status of this stock relative to its Optimum Sustainable Population (OSP) level and population trends is unknown. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.

1 Dall's porpoises are black with a striking white patch on the belly and flank. Dall's porpoises only live in
2 the North Pacific Ocean from Japan to Southern California and as far north as the Bering Sea. Their
3 distribution and abundance in this region varies seasonally (Carretta et al. 2003). The population estimate
4 for the outer coast of California, Oregon, and Washington and inland Washington waters is 75,915 Dall's
5 porpoise. There is no information available regarding trends in abundance of Dall's porpoise in California,
6 Oregon, and Washington and their status relative to OSP is not known. They are not listed as "threatened"
7 or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA.
8

9 Gray whales are the only bottom feeding baleen whales. Each fall, the North American gray whales migrate
10 south to Baja California, in Mexico, most of them starting in November or December. They winter mainly
11 along the west coast of Baja California, where calves are born in lagoons and bays from early January to
12 mid-February. The northbound migration generally begins in mid-February and continues through May,
13 with cows and newborn calves migrating northward primarily between March and June. Most of the North
14 American whales spend the summer feeding in the northern Bering and Chukchi Seas. However, some are
15 observed in the summer, feeding in waters off of Southeast Alaska, British Columbia, Washington, Oregon,
16 and California. A small number of gray whales enter inland waters of Washington primarily in spring. In
17 1994 this gray whale stock was removed from the List of Endangered and Threatened Wildlife, as it was no
18 longer considered endangered or threatened under the ESA. The Eastern North Pacific stock of gray whales
19 has been increasing in recent years. The minimum population estimate for this stock is 17,752 (Angliss and
20 Outlaw 2005) and it is considered to be at carrying capacity.

21
22 Humpback whales are moderately large baleen whales that feed on krill and small schooling fishes in the
23 summer in productive, high-latitude waters. In winter, most humpback whales occur in the subtropical and
24 tropical waters of the Northern and Southern Hemispheres. Detailed studies of humpback populations in the
25 North Pacific began in the mid-seventies, and from these it appears that this population is slowly recovering
26 from impacts of whaling, although likely remains below pre-whaling numbers (Calambokidis and Barlow
27 2004). The North Pacific total may now exceed 6,000 humpback whales (Carretta et al. 2005). With this
28 recovery, humpbacks are returning to areas from which they were historically reported but have not been
29 seen for decades. The inland waters of Washington State and Southern British Columbia is one such region,
30 and reports of humpback whales there have increased dramatically in recent years after a long absence
31 (Falcone et al. 2005).
32

33 Minke whales are the smallest species of baleen whale in the North Pacific. Minke whales feed by side-
34 lunging into schools of prey and opportunistically feed on krill, plankton, and small schooling fish. Minke
35 whales in Alaskan waters are migratory, but animals in waters off central California and in inland waters of
36 Washington are considered "residents" because they establish home ranges. Minke whales are regularly
37 seen around the San Juan Islands. The number of minke whale off California, Oregon and Washington
38 (including inland waters) is estimated at 898 (Carretta et al. 2007). No abundance estimate for inland
39 waters is available. There is no information available regarding trends in abundance of minke whales in
40 California, Oregon, and Washington. They are not listed as "threatened" or "endangered" under the
41 Endangered Species Act nor as "depleted" under the MMPA.
42

43 **3.2.2.2 Pinnipeds**

44
45 Pinnipeds include seals and sea lions and are marine mammals that spend some time out of the water on
46 shore. Common pinnipeds in inland waters of Washington include harbor seals, California sea lions and
47 Steller sea lions (Table 3-3). Harbor seals, members of the family phocidae, inhabit coastal and estuarine
48 waters and shoreline areas from Baja California to western Alaska. They haul out on rocks, reefs, and

1 beaches, and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-
2 migratory, with local movements associated with such factors as tides, weather, season, food availability,
3 and reproduction. The current population estimate for the inland waters of Washington State (including
4 Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery) is 14,612 (Carretta et al.
5 2003). The Washington inland harbor seal population is stable and very close to carrying capacity (Jeffries
6 et al. 2003).

7
8 California sea lions, members of the family otariidae, are found from southern Mexico to southwestern
9 Canada. The breeding areas of the California sea lion are on islands located in southern California in the
10 United States, and in western Baja California and the Gulf of California in Mexico. In Puget Sound,
11 California sea lions feed principally on Pacific whiting, spiny dogfish, Pacific herring, and Pacific cod
12 (Schmitt et al. 1995). The current population estimate for the United States stock of California sea lions is
13 238,000 (Carretta et al. 2007) and has now reached carrying capacity.

14
15 Steller sea lions, the largest members of the family otariidae, are found around the Pacific Rim from
16 California to Japan. The breeding range of the eastern United States stock of Steller sea lions extends from
17 southeast Alaska through British Columbia and Oregon to northern California. There are no rookeries in
18 Washington. Steller sea lions were listed as threatened under the ESA on November 26, 1990 (55 FR
19 49204) across their entire range. Continued declines in the western portion of the population led to a listing
20 of the western stock as endangered on May 5, 1997 (62 FR 24345), however the eastern stock remained
21 listed as threatened. Steller sea lions in Washington are from the eastern stock. The eastern DPS was
22 estimated to number between 46,000 and 58,000 animals in 2002, and has been increasing at approximately
23 3 percent per year since the late 1970s (Pitcher et al. 2007). The current population estimate for the eastern
24 United States stock of Steller sea lions is 47,885 (Angliss and Outlaw 2007). The 2008 *Recovery Plan for*
25 *Steller Sea Lions* (NMFS 2008b) reported that no threats to recovery have been identified and the
26 population has been increasing for over 25 years, new rookeries have been created, and the population is at
27 historically high levels. The plan recommends that NMFS should initiate a status review and determine
28 whether the eastern DPS has met the recovery criteria found in the plan and should be removed from the
29 list of threatened species.

30 **3.3 Listed and Non-listed Salmonids**

31
32 As described in Subsection 3.2.1.3, Killer Whales, Foraging, the best available information indicates
33 Chinook salmon are the preferred prey of killer whales while in Puget Sound during the summer months,
34 with chum salmon predation increasing during the fall. The whales may also feed on other salmon such as
35 chum, pink, coho, sockeye, and steelhead and other marine species to a more limited extent.
36 Comprehensive reviews of the status of wild salmonid populations in Washington, Oregon, Idaho, and
37 California have resulted in the listing of 26 evolutionarily significant units (ESU) of Pacific salmon and
38 steelhead as endangered or threatened under the ESA since the 1990s.

39
40 Wild salmon have declined due to a variety of human-induced causes (generally grouped by habitat,
41 hatchery, hydropower, and harvest activities) and as a result of periods of poor ocean conditions. While
42 wild stocks have declined in many areas, hatchery production has been generally strong. Trends in salmon
43 stocks have been mixed although collectively the abundance of salmon moving through the Georgia Basin
44 remains in the millions. Wild Chinook and chum escapement has been generally stable, averaging
45 approximately 300,000 and 2.4 million respectively for the 2000 through 2005 period (CTC 2005, 2007,
46 unpubl. data). Wild coho escapements have declined in recent years. The total abundance of salmon in
47 Puget Sound has been roughly stable or increasing for the past several decades, due largely to the strong

1 performance of wild pink salmon populations, and robust adult returns of natural- and hatchery-origin fall-
 2 run chum salmon. The total return of adult salmonids to the Puget Sound region based on recent year run
 3 size estimates is at least 5,142,005 salmonids, of which at least 25 percent are hatchery-origin fish
 4 (steelhead abundance is currently unknown; Table 3-4).
 5

6 Abundance of the whales' preferred prey, Chinook, has varied in abundance in the last several decades.
 7 Using information from 1990 to 2006, the abundance of all ages of Puget Sound and Canadian stocks of
 8 Chinook available in inland waters ranged from 2 to 4 million Chinook depending on the season and
 9 whether it was a good or poor year for Chinook (Table 3-5). Not all ages of Chinook may be equally
 10 selected by the whales. The best available information indicates that Southern Residents prefer adult-sized
 11 Chinook (Ford and Ellis 2006) and immature fish may not be selected by the whales. The abundance of
 12 age four and five Chinook range from approximately 350,000 to 675,000 depending on the season and
 13 whether it is a good or poor year for Chinook. In coastal waters the abundance of all ages of a variety of
 14 U.S and Canadian Chinook stocks available ranged from over 5 to over 12 million Chinook depending on
 15 the season and whether it was a good or poor year for Chinook (Table 3-6). The abundance of age four and
 16 five Chinook in coastal waters range from approximately 1 to 1.8 million depending on the season and
 17 whether it is a good or poor year for Chinook. These estimates include seasonal reductions in prey
 18 available from fisheries harvest and some degree of natural mortality. Harvest levels are managed on an
 19 annual basis, and can fluctuate depending on forecast methods and in-season indicators of run-strength.
 20
 21

22 **Table 3-4. Recent year average total adult salmon run size estimates and the proportion of total adult**
 23 **run sizes resulting from hatchery production in the Puget Sound region¹.**

Species	Average Adult Return to Puget Sound (PS catch plus escapement)	Hatchery-Origin Adult Return to Puget Sound	Hatchery-origin Adult Percent of Total Return
Chinook salmon ²	221,649	163,496	74%
Coho salmon ³	960,006	447,285	47%
Chum salmon ⁴	1,866,594	534,145	29%
Sockeye salmon ⁵	337,767	101,330	30%
Pink salmon ⁶	1,755,989	24,255	1.4%
Steelhead ⁷	Unavailable	Unavailable	Unavailable

24 ¹ Table source: T. Tynan, NMFS, Northwest Region, Propagation and Tributary Fisheries Branch, unpubl. data.

25 ² Data for 2000 through 2004 from WDFW 2005 Stock Strength Summaries (B. Sanford, pers. comm., WDFW, June, 2005).

26 ³ Puget Sound coho salmon run reconstruction data for 1999 through 2004 from J. Haymes, pers. comm., WDFW, July, 2005.

27 ⁴ Data for Puget Sound summer, fall, and winter chum salmon for 1998 through 2002 from WDFW chum salmon web-site, <http://wdfw.wa.gov/fish/chum/chum-5e.htm>

28 ⁵ Estimated percent contribution of hatchery-origin sockeye to the total Puget Sound return (Cedar River and Baker River) provided by Kyle Adicks, pers. comm., WDFW, October, 2005. Total adult return data from Baker Lake sockeye trap counts and Ballard Lock fish counts for 2000 through 2004 accessed from WDFW sockeye salmon website, <http://wdfw.wa.gov/fish/sockeye/index.htm>.

29 ⁶ Data for Puget Sound pink salmon for 1989 through 2003 from K. Adicks, pers. comm., WDFW, October 17, 2005.

30 ⁷ Complete data for Puget Sound steelhead populations, in particular for summer steelhead and most hatchery populations that contribute to natural spawning, is unavailable.

1 **Table 3-5. Estimated annual range in Chinook abundance in inland waters (Georgia Strait, Strait of**
 2 **Juan de Fuca, and Puget Sound), after preterminal fishing and natural mortality.**

Year ¹	Chinook ²	Abundance ³		
		October-April	May-June	July-September
Good Chinook year (2002)	Age 2	2,247,281	2,057,867	1,793,906
	Age 3	1,424,868	1,317,362	1,142,409
	Age 4	610,112	556,483	483,556
	Age 5	76,333	69,330	59,183
	Age 2-5	4,358,594	4,001,041	3,479,055
Poor Chinook year (1994)	Age 2	1,811,633	1,655,595	1,436,465
	Age 3	772,359	713,320	597,179
	Age 4	393,705	360,968	310,235
	Age 5	49,303	44,201	37,691
	Age 2-5	3,027,000	2,774,084	2,381,569

3 ¹ Based on the range in past Chinook abundance years from 1990 to 2006, where 1994 (low) and 2002 (high) represent
 4 the range in past variability (CTC 2008).

5 ² Abundance estimates are presented by cohort, as well as the sum of all cohorts per time period.

6 ³ Abundance estimates are based on likely levels of fishing modeled in FRAM, incorporating fishery management
 7 constraints of the Pacific Salmon Treaty and more stringent constraints for ESA compliance, based on harvest levels
 8 in the recent past (NMFS 2008c). Abundances are not additive across time periods.

9
 10 **Table 3-6. Estimated annual range in Chinook abundance in coastal waters (from California to**
 11 **Southeast Alaska), after preterminal fishing and natural mortality.**

Year ¹	Chinook ²	Abundance ³		
		October-April	May-June	July-September
Good Chinook year (2002)	Age 2	5,921,314	5,393,737	4,665,461
	Age 3	5,087,025	4,407,465	3,468,790
	Age 4	1,613,186	1,343,474	1,140,275
	Age 5	254,280	206,917	166,076
	Age 2-5	12,875,805	11,351,594	9,440,601
Poor Chinook year (1994)	Age 2	4,333,019	3,943,355	3,412,785
	Age 3	1,663,671	1,448,265	1,139,228
	Age 4	1,062,804	933,319	794,053
	Age 5	331,376	278,856	235,111
	Age 2-5	7,390,871	6,603,795	5,581,177

12 ¹ Based on the range in past Chinook abundance years from 1990 to 2006, where 1994 (low) and 2002 (high) represent
 13 the range in past variability (CTC 2008).

14 ² Abundance estimates are presented by cohort, as well as the sum of all cohorts per time period.

1 ³ Abundance estimates are based on likely levels of fishing modeled in FRAM, which reflect fishery management
2 constraints of the Pacific Salmon Treaty and more stringent constraints for ESA compliance, based on harvest levels
3 in the recent past (NMFS 2008c). Abundances are not additive across time periods.
4

5 NMFS has recently adopted a recovery plan for the listed Puget Sound Chinook salmon ESU (Shared
6 Strategy 2007) and has proposed a recovery plan for the Hood Canal summer-run chum salmon ESU (Hood
7 Canal Coordinating Council 2006). Both of these documents provide detailed information on limiting
8 factors for individual watersheds, including proposed recovery actions. NMFS has also completed status
9 reviews, which contain detailed information on coho, pink, sockeye and steelhead populations found in the
10 area (Wietkamp et al. 1995; Gustafson et al. 1997; Johnson et al. 1997; Goode et al. 2005).
11

12 **3.4 Socioeconomics**

13 **3.4.1 Overview of Puget Sound Economy**

14
15 The Washington Department of Ecology (2008) and Cleveland (2007) have described the Puget Sound
16 economy including a number of Puget Sound Facts:
17

Puget Sound is part of the natural environment that attracts people to the region. The Sound helps drive \$20 billion in economic activities annually.

Population – Approximately 4.3 million people live in the 12 counties bordering Puget Sound. This figure includes about 1.6 million who live in the 90 cities and towns that directly border the Sound.

Fishing – The recreational fishery in Puget Sound is valued conservatively at \$57 million a year. Output from commercial fishing has been estimated at over \$900 million annually in Washington with \$646 million from inland waters.¹

Tourism – The Puget Sound area provides \$9.5 billion in tourism revenue, including 68,000 tourism-related jobs and \$3 billion in income each year. The Puget Sound area generates approximately 80 percent of statewide tourism revenues.

¹ Commercial fishing numbers were estimated for 2000 (NMFS 2004, FEIS on Puget Sound Chinook Harvest Management Plan)

18
19
20 In addition to the Ports of Seattle and Tacoma, the Port of Vancouver, situated to the north of the greater
21 Puget Sound area, ranks number one on the west coast of North America in terms of total cargo volume.
22 Thus, the Puget Sound waterways are some of the busiest in the world. The major types of vessels that
23 operate in the Puget Sound region include tankers, cargo/freighters, government, fishing, tug boats, ferries,
24 and other passenger vessels including recreational vessels and commercial whale watchers. Additional
25 information on the number of vessels operating in Puget Sound is provided below under Subsection 3.9,
26 Transportation. The commercial whale watch industry is the only industry focused on the whales and
27 economically dependent on them. The whale watch industry is described in detail in this section, but also
28 mentioned in Subsections 3.5, Recreation and 3.9, Transportation. Commercial fishing in inland waters is
29 described under Subsection 3.4, Socioeconomics, and recreational fishing is discussed under Subsection
30 3.5, Recreation.

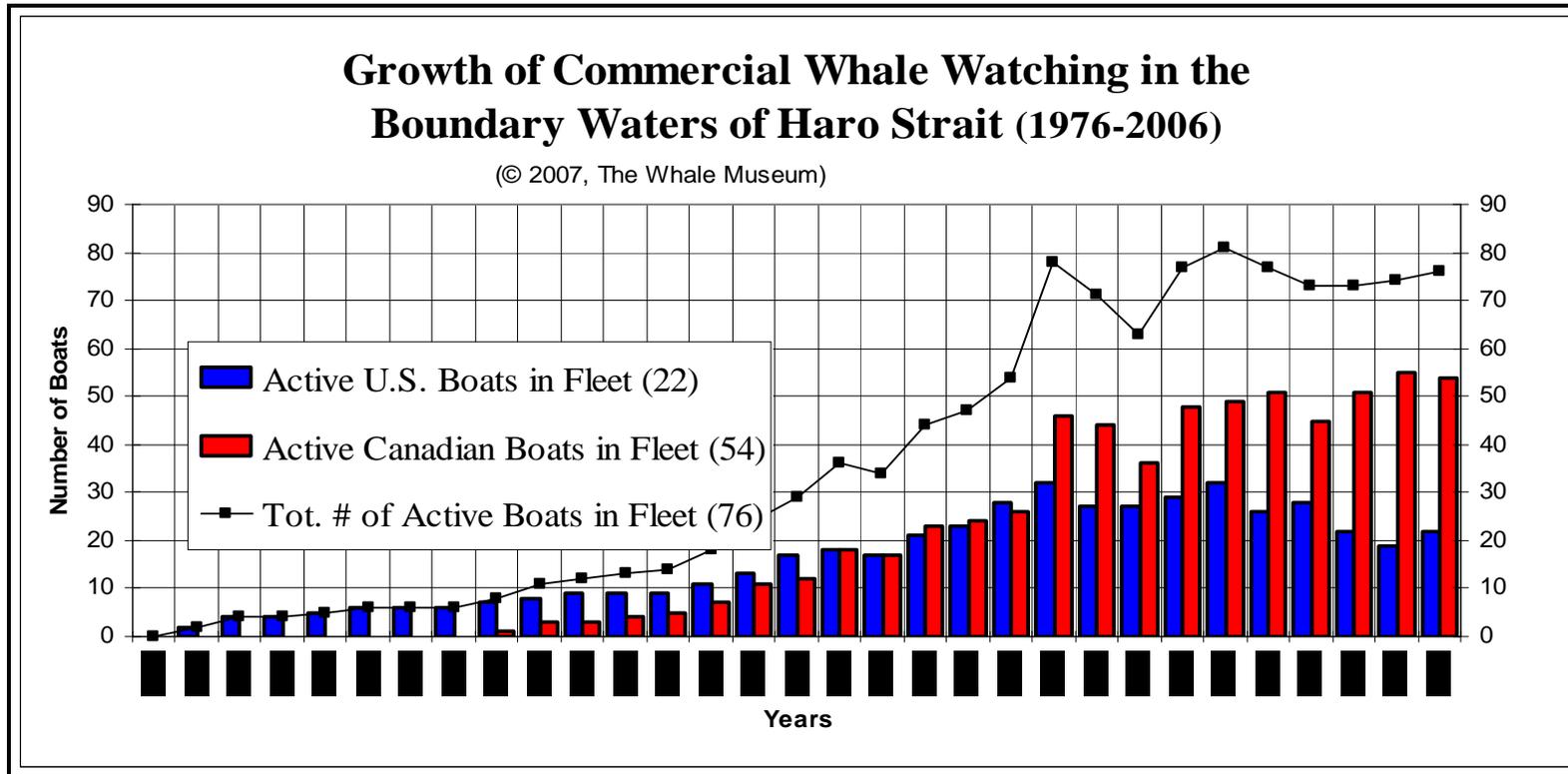
1 **3.4.2 Whale Watch Industry in Puget Sound**

2
3 Since the early 1980s, whale watching has developed into a popular and economically viable tourist
4 industry in many localities around the world, and the whale watching industry in the Pacific Northwest has
5 been recognized as one of the fastest growing (Hoyt 2001, 2002). In Washington and British Columbia,
6 killer whales are the principle target species for the commercial whale watching industry, easily surpassing
7 other species such as gray whales, porpoises, and pinnipeds (Hoyt 2001). The popularity and demand for
8 whale watching activities gradually increased in the inland waters of Washington from 1976 to 1991,
9 followed by a period of rapid growth through 1997 (Bain 2002; Koski 2004). The commercial whale watch
10 fleet peaked in 2001 with over 80 vessels before a slight reduction in fleet size, and appears to have leveled
11 off in recent years (Figure 3-12). In 2006, 76 active commercial whale watch vessels (22 U.S. and 54
12 Canadian) from 41 companies (19 U.S. and 22 Canadian) were operating in Haro Strait (Koski 2007). Data
13 available from 2005 for U.S. companies (17 companies and 19 vessels in 2005) was used to estimate the
14 number of trips operated by the U.S. fleet (Russell and Schneidler, In Preparation). Based on the number of
15 trips offered per day (37), the number of days in three seasons (peak 42 days, low 10 days, and off season
16 165 days) and the estimated occupancy during those seasons (approximately 70 percent in high season,
17 approximately 50 percent in low season, and approximately 30 percent in off season), NMFS estimated the
18 number of U.S. commercial whale watch trips at approximately 6,264 per year. Based on capacity of U.S.
19 vessels, Russell and Schneidler (In Preparation) also estimated that each trip had an average of 55
20 passengers.

21
22 Killer whale watching became a multi-million dollar industry over a relatively short period of time. Ticket
23 sales for vessel-based whale watching first broke the million dollar mark in 1991, and were approaching
24 \$5.7 million by the end of 1997 (Koski 2006). Hoyt (2001) estimated that 52,000 (boat-based) participants
25 in commercial whale watching tours in Washington State spent a total of \$9.59 million in 1998;
26 \$3.31million in tickets for whale watching, and the remainder on indirect expenditures such as food, travel,
27 lodging, and souvenirs. Approximately 80 percent of this is estimated to be spent in Puget Sound and
28 Georgia Basin. Approximately 30 percent of the participants were from Washington, while 70 percent were
29 from out of state. The current whale watching industry in Puget Sound is estimated to contribute
30 approximately \$18.4 million annually and 205 jobs to the 19 counties adjacent to the whales' habitat area
31 through direct, indirect, and induced expenditures related to the industry (IEC 2008).

32
33 As the industry grew, concerns surfaced about the constant presence of vessels around the whales. In 1994,
34 a collection of commercial whale watch companies in Washington and British Columbia organized to
35 create a trade association called the Whale Watch Operators Association Northwest or Pacific Whale
36 Watch Association (association). As one of their first official duties, the association established an
37 additional set of voluntary guidelines to instruct commercial operators on appropriate viewing practices.
38 The association's set of guidelines is consistent with Be Whale Wise and includes additional detailed
39 guidelines for particular whale watching situations. For example, the association guidelines include
40 information on viewing distances for transient killer whales. The guidelines have been regularly reviewed
41 and updated since 1994, and the association now develops annual guidelines and best practices for
42 commercial whale watching operators posted on their website: www.pacificwhalewatch.org/guidelines.
43 They have also developed a system to internally track incidents by member organizations and notify U.S.
44 and Canadian enforcement agencies of repeated incidents by particular individuals. The association along
45 with a number of other organizations are partners in the Be Whale Wise campaign. In addition, other
46 vessels such as the Washington State ferries also follow the guidelines (Washington State Department of
47 Transportation 2007).

1



2
3

Figure 3-12. Growth of commercial whale watching 1976-2006 (from Koski 2007).

1
2 Commercial whale watch companies have identified the potential benefits of whale watching. Whale
3 watching is a form of ecotourism that results in firsthand encounters with killer whales in their natural
4 habitat, and educates and inspires passengers by enhancing awareness about the species, the threats
5 impeding recovery, and the actions being taken to address these threats. To facilitate these benefits, many
6 whale watch companies have naturalists on board to educate passengers and answer questions.
7

8 Several studies have assessed the value that whale watching participants have for wildlife viewing and
9 provide data on the factors that lead to an enjoyable or memorable whale watching trip, and how satisfied
10 participants are with various aspects of their trip (Dufus and Deardon 1993; Orams 2000; Andersen 2004;
11 Andersen and Miller 2006; Malcolm 2004). Survey results of whale watch participants indicate that
12 proximity to the whales is not the most important part of the whale watchers' experience and that seeing
13 whales and whale behavior was much more important (Andersen 2004; Malcolm 2004). In addition
14 Malcolm (2004) found participants were most satisfied with the respect their vessels gave the whales. The
15 number of whales, whale behavior, and learning also received higher satisfaction than the distance from
16 which whales were observed. The participants also strongly agreed with statements related to protection of
17 the whales.

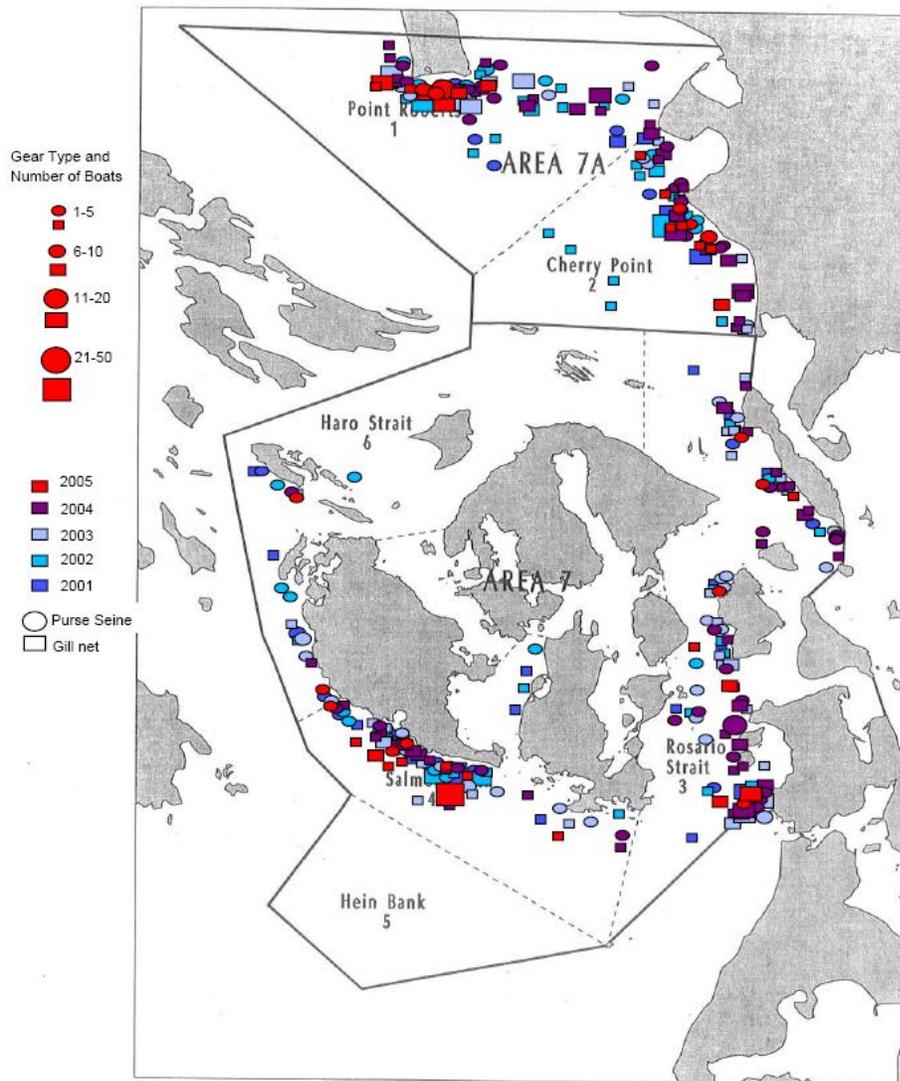
18 **3.4.3 Recreational Boating in Washington**

19
20 In addition to commercial whale watching, many recreational boaters also engage in wildlife viewing. It is
21 estimated that recreational boaters contribute nearly \$100 million each year directly to the economy of the
22 State of Washington through vessel registration fees, watercraft excise taxes, vessel sales taxes, gas taxes,
23 fishing licenses, grants and assistance from the Federal government, and other miscellaneous fees
24 (Northwest Marine Trade Association 2007) and \$489 million in combined boat, motor, trailer and
25 accessory purchases (Washington Department of Ecology 2008). The most common activity for
26 recreational boaters is fishing, however, viewing wildlife is also a popular activity for boaters (Subsection
27 3.5, Recreation). No data are available on the total expenditure from recreational boaters derived
28 specifically from whale watching.

29 **3.4.4 Commercial Fisheries in Inland Waters of Washington**

30
31 Commercial fisheries in Puget Sound include troll, set net, drift gill, purse/roundhaul seines, beach seines,
32 and reef net gear and occur in both marine and terminal freshwater areas. Major fisheries in summer
33 months (July through August) occur in Fishing Areas 7 and 7A (Figure 3-13) when sockeye and pink
34 salmon fisheries are open. The commercial fishing fleet has been greatly reduced in recent years due to
35 factors such as decreased number of fishing days allowed and high costs of fuel, and currently has about
36 150 vessels participating (NMFS 2007). During aerial surveys of vessels in all San Juan County waters,
37 observers counted 50 to 60 commercial fishing vessels per day (Table 3-12). Some of the fleet uses areas
38 along the west side of San Juan Island and Salmon Bank, while most of the commercial fishing fleet
39 utilizes other areas congregating near Point Roberts, Cherry Point, and in Rosario Strait (Figure 3-13).
40

41 Estimates of the total output of commercial fisheries in inland waters of Washington were analyzed in the
42 Final Environmental Impact Statement for the Puget Sound Chinook Harvest Resource Management Plan
43 (NMFS 2004b). For the Strait of Juan de Fuca/North Hood Canal, Northern Puget Sound, and Southern
44 Puget Sound/South Hood Canal the output of commercial fisheries was over \$646 million for the year 2000
45 (NMFS 2004b). This did not include additional value from fish/seafood processing in the region. Estimates
46 of the value of all commercial fisheries in Washington in 2000 were estimated at over \$900 million per
47 year (NMFS 2004b). This estimate followed a declining trend in fisheries catch for the previous decade.



1
2 **Figure 3-13. Distribution and number of non-tribal fishing boats during U.S. Fraser Panel fisheries**
3 **in the San Juan Islands in 2001-2005 (right) time periods (WDFW, unpublished data presented in**
4 **NMFS 2007).**
5

6 **3.5 Recreation**

7
8 About 390,000 people participate in recreation activities in the waters or on the beaches of Puget Sound at
9 least once a year (Washington Department of Ecology 2008). These activities include fishing, swimming,
10 boating, rafting, kayaking, and other water sports. Puget Sound has:

- 11
12 • 2,800 square miles of inland marine waters
13 • 2,500 miles of shoreline
14 • 2.1 million acres of state-owned submerged saltwater lands

1 There are 68 state parks and 8 national parks, wildlife refuges, forests and other uses that border Puget
2 Sound. Local governments provide another 16 regional parks along the Sound (Washington Department of
3 Ecology 2008).

4
5 As described in Subsection 3.4, Socioeconomics, the commercial whale watch industry is the predominant
6 tourism activity focused on the whales. In 2006, 76 active commercial whale watch vessels (22 U.S. and 54
7 Canadian) from 41 companies (19 U.S. and 22 Canadian) were operating in Haro Strait and approximately
8 500,000 people participate in commercial whale watching each year (Koski 2007). In addition to
9 commercial whale watching there is considerable recreational whale watching. One study has estimated
10 that between 350,000 and 400,000 Washington residents of all ages boat for recreation, either owning a
11 boat directly, renting or chartering a boat, or accompanying friends and family on a boat (Beckwith
12 Associates 2002).

13
14 There are approximately 280,000 registered boats in Washington (only boats 16 feet or more in length or
15 with 10 or more horsepower are required to be registered). Eighty percent of recreational boats registered in
16 Washington are registered in Western Washington. Most boaters in western Washington focus on cruising
17 Puget Sound, thus, of the maximum of 400,000 boaters in Washington, up to 320,000 likely boat in inland
18 waters of Washington. Koski (2007) estimated that the recreational vessels encountered during Soundwatch
19 activities carried an average of 3.42 individuals per vessel. Kayaks are estimated to carry two individuals.

20
21 In Puget Sound there are 256 marinas with 39,400 moorage slips and another 331 launch sites for smaller
22 boats (Washington Department of Ecology 2008). San Juan County Park operates a public boat launch used
23 by recreational boaters, and both recreational and commercial kayakers. The launch is a free public launch
24 for motorized vessels and kayaks, however the park does not currently track use by recreational boaters.
25 The park does track the use of the campground, and in 2007 the State collected fees for approximately
26 26,000 camper nights. Both campers and local residents likely use the boat launch.

27
28 A recent study by Responsive Management (2007) for the Washington State Recreation and Conservation
29 Office consisted of focus groups of boating services providers, a telephone survey of boating services
30 providers, a telephone survey of the general public in Washington, and a telephone survey of registered
31 boaters in Washington. The assessment included information on the types of boats used most often,
32 motivations for boating and preferred locations for boating. The majority of boaters (64 percent) used
33 vessels 16 to 25 feet in length, 10 percent used vessels 26 feet or more, 24 percent used vessels 0 to 15 feet
34 and others did not know the length of their vessels (Responsive Management 2007). Motor boat was, by
35 far, the type of boat used most often (68 percent), the next nearest was kayak with 8 percent.

36
37 Fishing was the most common activity in which boaters participated while boating in Washington (53
38 percent of boaters fished). Other common activities included sight-seeing/fish and wildlife viewing (34
39 percent), water skiing (19 percent), relaxing or entertaining friends (17 percent), being with family and
40 friends (17 percent), and water tubing (15 percent). When asked to say what motivates them to boat,
41 boaters most commonly answered for relaxation (49 percent), followed by fishing (29 percent), to be with
42 friends and family (26 percent), for general recreation (14 percent), and to be close to nature (11 percent).
43 To be close to nature as a motivation to boat was higher among paddlers than among the other types of
44 boaters.

45
46 In addition to vessel-based opportunities for tourism related to killer whales, there are several land-based
47 whale watching locations adjacent to inland waters of Washington (Subsection 3.8, Aesthetics). The most
48 popular site is Lime Kiln Point State Park/Whale Watch State Park on San Juan Island which has

1 approximately 200,000 visitors annually and has an interpretive center with information about killer whales
2 (Koski 2006). The Whale Museum conducts shore-based wildlife tours that include whale watching and
3 stops at Lime Kiln Point State Park.

4 **3.6 Environmental Justice**

5
6 This section was prepared in compliance with Presidential Executive Order 12898, Federal Actions to
7 Address Environmental Justice in Minority Populations and Low Income Populations (Executive Order
8 12898), dated February 11, 1994, and Title VI of the Civil Rights Act of 1964. Both Executive Order
9 12898 and Title VI address persons belonging to the following target populations:

- 10
11 • Minority – all people of the following origins: Black, Asian, American Indian and Alaskan
12 Native, Native Hawaiian or Other Pacific Islander, and Hispanic.
- 13
14 • Low income – persons whose household income is at or below the U.S. Department of
15 Health and Human Services poverty guidelines.

16
17 Definitions of minority and low income areas were established on the basis of the Council on
18 Environmental Quality (CEQ) document, Environmental Justice Guidance under the Environmental Policy
19 Act of December 10, 1997. CEQ’s guidance states that “minority populations should be identified where
20 either (a) the minority population of the affected area exceeds 50 percent or (b) the population percentage
21 of the affected area is meaningfully greater than the minority population percentage in the general
22 population or other appropriate unit of geographical analysis.” The CEQ further adds that “The selection of
23 the appropriate unit of geographical analysis may be a governing body’s jurisdiction, a neighborhood, a
24 census tract, or other similar unit that is chosen so as not to artificially dilute or inflate the affected minority
25 population.” The CEQ guidelines do not specifically state the percentage considered meaningful in the case
26 of low income populations. For this environmental analysis, the assumptions set forth in the CEQ
27 guidelines for identifying and evaluating impacts on minority populations are used to identify and evaluate
28 impacts on low income populations. More specifically, potential environmental justice impacts are assumed
29 to occur in an area if the percentage of minority, Hispanic, and low income populations are meaningfully
30 greater than the percentage of minority, Hispanic, and low income populations in the general population.

31
32 In addition, U.S. Environmental Protection Agency guidance specifically addresses environmental justice
33 effects on Indian tribes:

34
35 Federal duties under the Environmental Justice E.O., the Presidential directive on
36 government-to-government relations, and the trust responsibility to Indian tribes may
37 merge when the action proposed by a Federal agency or EPA potentially affects the natural
38 or physical environment of a tribe. The natural or physical environment of a tribe may
39 include resources reserved by treaty or lands held in trust; sites of special cultural,
40 religious, or archeological importance, such as sites protected under the National Historic
41 Preservation Act or the Native American Graves Protection and Repatriation Act; other
42 areas reserved for hunting, fishing, and gathering (usual and accustomed), which may
43 include “ceded” lands that are not within reservation boundaries. Potential effects of
44 concern...may include ecological, cultural, human health, economic, or social impacts
45 when those impacts are interrelated to impacts on the natural or physical environment.

1 Through the NEPA process, NMFS will ensure that the requirements of Executive Order 12898 regarding
2 environmental justice are implemented, including all appropriate tribal consultation activities.

3
4 Minority data used for this Environmental Assessment analysis were derived from the 2000 U.S. Census
5 (www.census.gov,) and income data are 2004 estimates from the Annual Social and Economic
6 Supplements of the Current Population Survey (www.census.gov). Of the overall total population within
7 the 12 counties that border the inland waters of Washington (Table 3-7), a county average of 13.63 percent
8 are minority, a county average of 4.85 percent are of Hispanic origin, and county average of 10.6 percent
9 are low income (Table 3-8). The distribution of minority, Hispanic, and low income populations for several
10 surrounding counties and the state, are also shown in the two tables. These values were used to determine if
11 the presence of these populations in the affected counties are meaningfully greater than those in the general
12 populations. Using the CEQ guidelines, the percentage of minority, Hispanic, and low income populations
13 in the affected counties is not meaningfully greater than the proportion of these populations in several
14 surrounding counties or in the State.

15
16
17

1 **Table 3-7. Minority and Hispanic populations in counties bordering inland waters of Washington from the 2000 U.S. Census**
 2 **(www.census.gov).**

	Total	White	Black or African American	American Indian and Alaska Native	Asian	Hawaiian and Other Pacific Islander	Some other Race	Two or more races	Hispanic or Latino (of any race)	Percent Hispanic (%)	Percent minority (%)
Counties Bordering inland Waters of Washington											
Clallam County	64,525	57,505	545	3,303	731	104	761	1,576	2,203	3.41	10.88
Island County	71,558	62,374	1,691	693	3,001	314	1,025	2,460	2,843	3.97	12.83
Jefferson County	25,953	23,920	110	599	309	34	197	784	535	2.06	7.83
King County	1,737,034	1,315,507	93,875	15,922	187,745	9,013	44,473	70,499	95,242	5.48	24.27
Kitsap County	231,969	195,481	6,648	3,760	10,192	1,805	3,309	10,774	9,609	4.14	15.73
Mason County	49,405	43,705	587	1,840	519	221	1,036	1,497	2,361	4.78	11.54
Pierce County	700,820	549,369	48,730	9,963	35,583	5,922	15,410	35,843	38,621	5.51	21.61
San Juan County	14,077	13,372	36	117	125	12	128	287	338	2.40	5.01
Skagit County	102,979	89,070	450	1,909	1,538	163	7,381	2,468	11,536	11.20	13.51
Snohomish County	606,024	518,948	10,113	8,250	35,030	1,705	11,629	20,349	28,590	4.72	14.37
Thurston County	207,355	177,617	4,881	3,143	9,145	1,078	3,506	7,985	9,392	4.53	14.34
Whatcom County	166,814	147,485	1,150	4,709	4,637	235	4,159	4,439	8,687	5.21	11.59
County Average										4.79	13.62
Other Counties											
Gray's Harbor County	67,194	59,335	226	3,132	818	73	1,527	2,083	3,258	4.85	11.70
Yakima County	222,581	146,005	2,157	9,966	2,124	203	54,375	7,751	79,905	35.90	34.40
State											
Washington	5,894,121	4,821,823	190,267	93,301	322,335	23,953	228,923	213,519	441,509	7.49	18.19

3

Table 3-8. Low income information for Washington counties from 2004 estimates from the Annual Social and Economic Supplements of the Current Population Survey (www.census.gov).

Counties Bordering Inland Waters of Washington	2004 Population Estimate	Number in Poverty	Percent in Poverty (%)
Clallam County	67,867	8,446	12.3
Island County	79,293	6,442	8.3
Jefferson County	28,110	3,076	10.9
Mason County	1,777,143	6,429	12.2
King County	239,138	176,928	10
Kitsap County	53,637	21,616	9.3
Pierce County	745,411	87,131	11.8
San Juan County	15,190	1,279	8.4
Skagit County	111,064	13,660	12.2
Snohomish County	644,274	61,500	9.5
Thurston County	224,673	21,309	9.4
Whatcom County	180,167	23,742	13.2
County Average	347,163	35,963	10.6
Surrounding Counties			
Gray's Harbor	70,338	10,807	15.8
Yakima	229,094	42,704	18.6
State			
Washington	6,203,788	715,271	11.6

3.7 Noise

3.7.1 Underwater Noise

Several sources of sound contribute to underwater noise in the ocean and coastal marine environments (Richardson et al. 1995). Natural sounds include those produced from activities related to weather, such as wind, waves, and rain, seismic activity, underwater slides, currents, and animals like shrimp and marine mammals that make sounds. Some of these sources can substantially increase ambient noise levels, such as heavy precipitation (Wenz 1962; Nystuen et al. 1993). Human sources of underwater sound include oil drilling, construction, and vessel traffic as well as military sonar, seismic surveys, fisheries, and oceanographic research. The intensity (dB) and frequency (Hz) of sound as well as the environmental conditions (e.g., water depth, bottom type) influence the propagation of sound through the water.

Current underwater noise levels in Haro Strait range from 95 to 130 dB with overall average sound pressure level of 115 dB in broad frequency band 0.1 to 15 kHz (Veirs and Veirs 2006). Veirs and Veirs (2006) conclude that vessel noise is the main anthropogenic contribution to sound in Haro Strait. The contribution of natural and anthropogenic sound to current conditions can vary, particularly due to weather conditions. For example, at passive aquatic listeners off of Cape Flattery, Washington, shipping noise dominated the sound field approximately 10 to 30 percent of the time, depending on weather—that is, when the weather was poor, shipping noise was a smaller percentage of the total (Nystuen 2006).

1 A variety of vessel types pass through Haro Strait, and the noise they make varies depending on the vessel
2 size, engine type, and speed. Individual passing large vessels (i.e., commercial ships) generate between 20
3 to 25 dB for 10 to 30 minutes, whereas smaller vessels (motorboats) generate 15 to 20 dB (Veirs and Veirs
4 2006). In summer months during whale watch operations, these smaller vessels contributed more to the
5 overall ambient levels during the day, raising average ambient sound conditions in Haro Strait by 3 dB
6 compared to non-summer daytime hours. Hildebrand et al. (2006) reported source level measurements for a
7 variety of vessels and also concluded that during cruise and power acceleration operating conditions, whale
8 watch vessels were capable of increasing ambient sound levels by 20 dB at about 200 yards.
9

10 Underwater sound levels generally increase with speed (Bain 2002; Erbe 2002). Idling whale watch vessels
11 at 200 meters produce sound levels that are comparable to ambient levels (Hildebrand et al. 2006).
12 Outboard motorboats operating at full speed produce sound levels of about 160 to 175 dB (Bain 2002; Erbe
13 2002). Additionally, sound produced by inflatables with outboard engines is more intense or louder than
14 rigid-hull powerboats with inboard or stern-drive engines (Erbe 2002).
15

16 The frequency content of sound exposure is important to consider given that killer whales have peak
17 hearing sensitivity between 18 to 42 kHz and the most relevant frequency range for communication and
18 echolocation is 1 to 100 kHz. Ambient noise levels expressed as sound pressure spectrum levels gives the
19 sound level per one Hz band as a way to describe the distribution of sound levels across frequency
20 (Richardson et al. 1995). Spectrum levels in Haro Strait illustrated that the greatest increases in sound
21 levels at higher frequencies (greater than 1 kHz) occurred in July and in the middle of the day which
22 coincide with larger numbers of small recreational and commercial whale watching vessels (Veirs and
23 Veirs 2006). Large commercial container ships have higher source levels at low frequency (below peak
24 hearing sensitivity), however, they still produce significant levels of noise at high frequencies (greater than
25 2 kHz).

26 **3.7.2 Atmospheric Noise**

27
28 Atmospheric noise is generated in the action area by wind, waves, vessels, and aircraft and is heard by
29 people in boats as well as on land. In-air noise (which commonly is frequency-weighted to approximate
30 human hearing) is measured on an A-weighted scale, denoted as dBA. The A-weighted decibel scale begins
31 at zero, which represents the faintest noise that humans can hear. Decibels are measured on a logarithmic
32 scale, a noise level of 70 dBA is twice as loud to the listener as a noise of 60 dBA (USDOT 1995). Noise
33 conditions vary depending on site conditions which vary greatly throughout Puget Sound. Urban areas
34 have the highest baseline noise levels, with daytime levels of approximately 60 to 65 dBA, suburban or
35 residential areas have baseline levels around 45 to 50 dBA, and rural areas are the quietest with noise levels
36 of 35 to 40 dBA (EPA 1978 in WSDOT 2008). For example, a WSDOT noise assessment on the San Juan
37 Islands identified a baseline of about 35 dBA at a bald eagle nest site, with regular noise intrusions from
38 traffic and aircraft overflights ranging from 45 to 72 dBA (WSDOT 1994).
39

40 Atmospheric sound from vessels is regulated in Washington State waters. Under RCW 79A.60.130 all
41 motorized vessels must have an effective muffler that limits sound levels to 90 dBA or 88 dBA depending
42 on the year the engine was manufactured. In addition, no person may operate a vessel on waters of the state
43 in such a manner as to exceed a noise level of 75 dBA measured from any point on the shoreline of the
44 body of water. Small motor boat engine noise levels are generally in the 65 to 75 dBA range when
45 stationary, and full throttle pass by sound levels generally are in the range of 75 to 85 dBA when measured
46 at a distance of 50 feet (Lanpheer 2000). Moving vessels are considered line sources of noise and the
47 standard reduction for line source noise is 3 dB per doubling of distance from the source. Some vessels

1 operating at high speeds may need to be further than 50 feet from shore to reduce sound levels for
2 individuals on shore (such as visitors to Lime Kiln Point State Park) and to comply with regulations.
3

4 **3.8 Aesthetics**

5
6 In addition to vessel-based opportunities to view killer whales in the inland waters of Washington, there are
7 several land-based locations valued by local residents and tourists (www.thewhaletrail.org). The most
8 reliable areas to view killer whales from land are located in the San Juan Islands where the whales spend
9 considerable time, particularly in summer months. There are five main locations on San Juan Island to view
10 killer whales and other wildlife (San Juan Island County Park, Lime Kiln Point State Park, San Juan
11 National Historic Park American Camp, and Cattle Point), and the most popular place is Lime Kiln Point
12 State Park, also called Whale Watch State Park. Just 9 miles from Friday Harbor, this 36-acre day-use park
13 is surrounded by approximately 200 acres of county land that is available to the public and supported by
14 local transit.
15

16 A goal of the park is to preserve and interpret the natural and cultural resources of the area. In 1985, the
17 lighthouse and surrounding sea were dedicated as a whale sanctuary and research station for marine
18 mammal scientists. Under the direction of the Whale Museum in Friday Harbor, scientists based in the
19 lighthouse track the movements and behavior of local killer whales. Three webcams and a hydrophone are
20 located at the lighthouse to facilitate remote tracking of the whales. An Interpretive Center was officially
21 opened in August of 2006 to offer information on the natural history of the whales. The Interpretive Center
22 was created in partnership with The Whale Museum, the Center for Whale Research, and researchers like
23 Dr. Bob Otis of Ripon College. There are interpretive programs and representatives from the Whale
24 Museum on hand during the summer months to provide information to visitors, and the Whale Museum
25 conducts wildlife tours incorporating land-based whale watching. The Coast Guard still maintains the
26 lighthouse as an active aid to navigation in Haro Strait, but the building is used for killer whale research,
27 interpretation and lighthouse tours.
28

29 Shore-based whale watching at Lime Kiln Point State Park/Whale Watch State Park steadily increased
30 from the park dedication in 1985 through 1996. Since then, visitors to the park have maintained steady at
31 nearly 200,000 visitors annually (Koski 2006). In part to preserve the land-based viewing at Lime Kiln
32 Point, a voluntary no-go zone was established along the west side of San Juan Island. Whale watching from
33 shore is enhanced by having fewer vessels around the whales or in between land-based viewers and the
34 whales. Malcolm (2004) surveyed commercial whale watch participants and they ranked “see marine
35 wildlife in an uncrowded setting” as having high importance in their expectations. This is consistent with
36 reports of land-based viewers raising concerns about the presence of boats disturbing the whales and also
37 their own experiences. The noise and maneuvering of the whale watch boats were specifically identified as
38 concerns for land-based viewers (Finkler and Higham 2004). In addition to visitors to Lime Kiln Point
39 State Park and other land-based sites, approximately 500,000 people view killer whales from commercial
40 whale watch vessels, and an unknown number of people view them from recreational vessels.

41 **3.9 Transportation**

42
43 The two largest and busiest ports in Puget Sound are the Ports of Seattle and Tacoma, which, combined,
44 represent the second largest port in terms of volume of container traffic in North America, after Los
45 Angeles/Long Beach (IEC 2008). Moreover, the Port of Vancouver, British Columbia, situated to the north
46 of the greater Puget Sound area, ranks number one on the west coast of North America in terms of total

1 cargo volume (IEC 2008). Thus, the Puget Sound waterways are some of the busiest in the world. The
2 major types of vessels that operate in the Puget Sound region include tankers, cargo/freighters, government,
3 fishing, tug boats, ferries and other passenger vessels including recreational vessels.
4

5 Oil tankers serve major oil terminals located in the northern section of Puget Sound, which receive
6 shipments from Alaska and elsewhere. Vessels transporting containerized cargo and loose and other bulk
7 goods are the most frequent large vessel types in the region. In addition, the Puget Sound region is also
8 home to a large deep-sea and local fishing fleet, a substantial coastal freighter fleet, and several major U.S.
9 Navy installations.

10
11 As indicated by the large number of ferry transits in Table 3-9, many passenger and car ferries operate
12 throughout the region. While ferry systems in the Sound are both publicly and privately owned, the largest
13 is the Washington State Ferry system, which is the third largest system in the world, serving eight counties
14 in the Puget Sound and San Juan Islands area in Washington, as well as the Province of British Columbia in
15 Canada. Washington State Ferries maintains a fleet of 28 vessels, making 500 trips per day to serve 20
16 terminal points along ten ferry routes. Depending on their design, the ferries may carry between 100 to 200
17 vehicles, and between 1,000 to 2,500 passengers.
18

19 Puget Sound is popular for recreational boating, and whale watching is popular, especially near the western
20 shores of San Juan Islands, where most whale sightings are known to occur (Figure 3-6). Recreational and
21 commercial whale watching vessels are most active between May and September in Haro Strait near the
22 San Juan Islands, with the highest densities occurring June through August (Koski 2004, 2006, 2007).
23 Commercial whale watching is described in detail above (Subsection 3.4, Socioeconomics). Recreational
24 vessels also engage in fishing, sightseeing, transport, and other activities (Subsection 3.5, Recreation).
25

26 Because Puget Sound is a water system that is important to the economies of both the United States and
27 Canada, which share ownership of Puget Sound waters, vessel traffic is monitored at all times by the U.S.
28 Coast Guard (USCG) and the Canadian Coast Guard (CCG). In 1979, the USCG and CCG established the
29 Co-operative Vessel Traffic System (CVTS) by formal agreement to manage the movement of vessels in
30 the shared waters of the two countries. The purpose of the CVTS is to manage vessel movements
31 efficiently, to promote the safety of vessels, and to minimize the risk of marine pollution. The commercial
32 vessels that participate in the system generally follow a series of well defined navigation lanes called the
33 Traffic Separation Scheme (TSS). The TSS comprises two traffic lanes with a separation zone in between.
34

35 U.S. and Canadian regulations mandate that a) all powered vessels that are more than 40 meters in length,
36 b) tug boats that are more than eight meters in length, or c) vessels carrying 50 or more passengers,
37 participate in the monitoring and reporting system set in place by the CVTS. The vessel tracking databases
38 are a useful source of information on the types of vessels and the number of vessel transits through the
39 region.
40

41 Estimated transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are presented in
42 Table 3-9 and Table 3-10 and average over 165,000 per year. The ratio of the number of transits per vessel
43 is considerably smaller for tankers and cargo ships when compared to the number of transits made by the
44 smaller vessels such as tug boats and ferries. Tug boats are servicing vessels that make many more transits
45 to assist the primary vessels transporting goods. Ferries are engaged in shipping of daily passengers to and
46 from the metropolitan areas of Vancouver and Seattle. Given the nature of service provided by tug boats
47 and ferries, the number of transits made by each tug boat and ferry will be substantially higher than the
48 number of transits made by other vessel types.
49

1 Although data on the actual number of vessels by type that operate in the area are not available, the
 2 Victoria Vessel Traffic Center has recently started tracking the number of vessels in addition to the number
 3 of transits. Total vessel counts are available beginning in April 2007. Table 3-11 lists the monthly vessel
 4 counts for April to December 2007 for the areas managed by the Victoria center.
 5
 6

7 **Table 3-9. Estimated transits through Haro Strait, Boundary Pass, and Strait of Georgia Waterways**
 8 **(April through September).**

Vessel Type	2007– 2008	2006– 2007	2005– 2006	2004– 2005	2003– 2004	Average
Tanker	306	363	405	321	321	343
Cargo	3,125	4,037	4,190	4,549	4,523	4,085
Government	2,126	2,689	2,728	2,474	2,351	2,474
Fishing	875	1,301	1,571	1,865	1,418	1,406
Passenger Vessels	1,065	1,416	1,600	1,492	2,461	1,607
Other Vessels ¹	3,841	3,981	4,182	4,163	3,672	3,968
Subtotal Movements	11,338	13,787	14,676	14,864	14,746	13,882
Tug	22,858	29,525	29,773	28,877	25,876	27,382
Ferry	48,968	50,211	51,447	51,201	49,570	50,279
Grand Total Movements	83,164	93,523	95,896	94,942	90,192	91,543

¹"Other vessels" includes all vessels that participate in the VTS System in addition to vessel types defined in this table, including charter vessels, whale watching vessels or other kinds of recreation or private vessels. These vessel types are not tracked uniquely and this analysis cannot further break down this category.
 Source: Ian Wade, Regional Program Specialist Marine Communications and Traffic Services (MCTS), Canadian Coast Guard, Pacific Region.

9
 10 **Table 3-10. Estimated Transits Through Haro Strait, Boundary Pass, and Strait of Georgia**
 11 **Waterways (October through March).**

Vessel Type	2007– 2008 ¹	2006– 2007	2005– 2006	2004– 2005	2003– 2004	Average
Tanker	136	316	287	290	266	259
Cargo	1,536	3,615	4,177	4,178	4,347	3,571
Government	902	2,174	2,261	2,092	1,939	1,874
Fishing	323	935	1,146	1,523	1,731	1,132
Passenger Vessels	91	95	121	158	306	154
Other Vessels ²	1,816	3,471	3,454	3,722	3,782	3,249
Subtotal Movements	4,804	10,606	11,446	11,963	12,371	10,238
Tug	10,528	25,348	28,934	27,130	24,775	23,343
Ferry	22,412	44,111	45,664	45,846	45,314	40,669
Grand Total Movements	37,744	80,065	86,044	84,939	82,460	74,250

¹ For 2007-2008 data were only available on vessel counts for October, November, and December 2007.
² "Other vessels" includes all vessels that participate in the VTS System in addition to vessel types defined in this table, including charter vessels, whale watching vessels or other kinds of recreation or private vessels. These vessel types are not tracked uniquely and this analysis cannot further break down this category.
 Source: Ian Wade, Regional Program Specialist Marine Communications and Traffic Services (MCTS), Canadian Coast Guard, Pacific Region.

1 No information is available on the extent to which any of these vessel types currently adjust course or
 2 speed to comply with the Be Whale Wise guidelines. It is likely, however, that adjustments by these vessels
 3 is low given the fact that they make up less than 3 percent of vessels observed violating the guidelines
 4 (Figure 3-9).
 5
 6

7 **Table 3-11. Daily average number of vessels participating in CVTS for Haro Strait, Boundary**
 8 **Pass, and the Strait of Georgia waterways.**

Month	Daily Average Number of Participating Vessels
April	143
May	153
June	158
July	159
August	159
September	151
October	140
November	132
December	115
AVERAGE	146

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San Juan County conducted a pilot vessel study August through September 2006 to quantify peak season marine vessel traffic in the San Juan Islands (Dismukes/MRC 2007). This study includes information on many smaller vessels not participating in CVTS. Aerial surveys documented different categories of vessels that were underway, at anchor or moored, excluding all vessels which were at dock or in marina slips, under 16 feet in length, or paddle-powered. The report includes maps of vessel locations and distributions, which reveal patterns such as whale watching vessels in a typical spot along the western coast of San Juan Island, and obvious salmon fishing clusters off the southwestern shores of Cattle Point. In addition, bays and harbors appear to be dominated by sailing vessels while the open waters appear to be somewhat more populated with power vessels.

There was an average total of 963 vessels on water at any given daylight time for weekend/holiday days and 667 for week days (Table 3-12). Vessel quantities increased during weekend/holiday periods of peak summer season due to increased recreational use. Commercial use remained relatively constant throughout the week.

Table 3-12. Average vessel compositions for any given time between 9 a.m. and 6 p.m.

**2006 Peak Season Weekday Sea Vessel Composition
9 A.M. – 6 P.M.**

	Power	Sail	Commercial Fishing	Ferry	Cargo	TOTAL
Average	351	260	50	3	3	667
Standard Error	+/- 29.68	+/- 7.17	+/- 5.42	+/- .56	+/- .56	+/- 32.43

**2006 Peak Season Weekend/Holiday Sea Vessel Composition
9 A.M. – 6 P.M.**

	Power	Sail	Commercial Fishing	Ferry	Cargo	TOTAL
Average	554	343	59	4	4	963
Standard Error	+/- 33.88	+/- 17.94	+/- 9.37	+/- .44	+/- .53	+/- 54

Note: From Dismukes/MRC 2007 Figure 4.

1 **4.0 ENVIRONMENTAL CONSEQUENCES**

2 **4.1 Introduction**

3
4 The following analyses address the eight resources identified as having a potential to be impacted by the
5 alternatives: Marine Mammals, Listed and Non-listed Salmonids, Socioeconomics, Recreation,
6 Environmental Justice, Noise, Aesthetics, and Transportation. The analyses describe expected conditions
7 under the various alternatives when compared to the existing conditions described in Section 3.0, Affected
8 Environment. Resource impacts are summarized in Table 4-1. Impacts to some resources have been
9 avoided or reduced by exempting certain classes of vessels or activities under all of the alternatives. A
10 description of the exceptions and the resource impacts that are reduced or avoided are included in
11 Subsection 1.6.4, Exceptions.

12
13 The terms “effect” and “impact” are used synonymously under NEPA, consequently both terms may be
14 used in the following analyses. Impacts include effects on the environment that are direct, indirect, or
15 cumulative. Direct effects are caused by the action itself and occur at the same time and place. Indirect
16 effects are caused by the action and are later in time or farther removed in distance, but are still reasonably
17 foreseeable. Cumulative impacts are those impacts on the environment that result from the incremental
18 impact of the action when added to other past, present, and reasonably foreseeable future actions,
19 regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative
20 impacts can result from individually minor but collectively significant actions taking place over a period of
21 time. Cumulative effects are analyzed in Section 5.0.

22 **4.1.1 Nature of the Alternative Analysis**

23
24 Under the No-action Alternative, NMFS would continue to promote boater education through the voluntary
25 guidelines designed to protect killer whales from vessel effects. Under all of the action alternatives, NMFS
26 would promulgate enforceable regulations. Some of the alternative regulations analyzed here are mutually
27 exclusive, but others could be adopted in combination. For example, Alternatives 2 and 3 consider 100 yard
28 and 200 yard approach limits, respectively, which are mutually exclusive regulatory provisions. Similarly,
29 Alternatives 4 and 5 consider two different no-go zones. In comparison, either Alternatives 2 or 3 could be
30 promulgated in combination with either Alternatives 4 or 5. To inform the decision about what combination
31 of provisions to include in regulations, if any, the following analysis examines each potential regulatory
32 provision separately. Each provision is compared to the No-action Alternative, to describe the effect of
33 adopting that provision by itself. The analysis also discusses how the various provisions compare with each
34 other where that comparison is relevant and informs decision-making.

35
36 To assist in the analysis of effects under each alternative, Subsections 4.1.2 and 4.1.3 provide general
37 information on compliance with regulations and protected areas. Subsection 4.1.2, Effects of Enforceable
38 Regulations Compared to Voluntary Guidelines, explains how and why the number of vessel incidents
39 might change if NMFS adopts specific mandatory rules compared to the current voluntary guidelines. This
40 informs the analysis of impacts under each of the action alternatives (Subsections 4.2.2 through 4.2.8).
41 Subsection 4.1.3, Protected Areas, reviews information on the effectiveness of protected areas for marine
42 mammals and elements of successful protected areas. This information provides a basis for the effects
43 analyzed under Alternatives 4 and 5. The analysis of each of the eight resources potentially impacted by the
44 alternatives follows this overall information relevant to the analysis.

1 **4.1.2 General Effects of Enforceable Regulations Compared to Voluntary Guidelines**

2
3 Under the No-action Alternative, existing general prohibitions under the MMPA and ESA would continue,
4 and NMFS would continue promoting specific voluntary guidelines. Alternatives 2 through 7 each consider
5 an individual mandatory regulation. Some of these mandatory regulations are mutually exclusive and some
6 could be adopted in combination. Alternative 8, the Proposed Action, considers a combination of
7 regulations. The observed levels of compliance by commercial and recreational boaters under the current
8 program are described in Subsection 3.2.1.5, Vessel Interactions, and reflected in Table 3-1 and Table 3-2
9 and Figure 3-11. For the reasons described in that subsection, the monitoring data represents a minimum
10 number of incidents between vessels and whales.

11
12 To estimate how the number of incidents might change if NMFS adopts specific mandatory rules, this
13 analysis considers those elements that might influence the level of compliance with such rules as compared
14 with the current program. The analysis considers both the ability and willingness of individuals to comply
15 with mandatory rules. The ability of individuals to comply with rules depends on their awareness of the
16 rules' existence and whether the rules are clear and easy to follow. Information on clarity of the different
17 alternatives is described in Subsection 4.2, Marine Mammals, for each alternative. Once aware of rules (and
18 assuming they are clear and easy to follow), citizens may be willing to comply with them out of a sense of
19 civic duty or obligation, social influences, fear of sanctions, or economic consequences associated with
20 non-compliance (Keane et al. 2008; May 2005; National Marine Protected Areas Center 2005). These
21 factors may affect compliance differently for commercial and recreational vessel operators as discussed
22 below.

23
24 A sense of civic duty and social influences can motivate compliance with both voluntary guidelines and
25 mandatory rules. Both voluntary and mandatory programs can create a sense of duty particularly when
26 education emphasizing the importance of the rules is part of the program. May (2005) studied compliance
27 of boatyard and marina operators with water quality rules and found no significant difference between
28 voluntary and mandatory rules in the operators' sense of duty to address the problem. Good public
29 relations, market differentiation, and other social influences can also motivate compliance with both
30 voluntary and mandatory programs (Keane et al. 2008; May 2005; National Marine Protected Areas Center
31 2005). Maintaining reputation among peers is one example of social influences that can positively influence
32 compliance.

33
34 Fear of sanctions is a stronger motivation for compliance with mandatory rules rather than voluntary
35 guidelines, which generally do not have sanctions associated with non-compliance. For example, May
36 (2005) found that traditional regulations were more effective than the voluntary approach alone in
37 achieving compliance with water quality rules. May (2005) found deterrent fears were more strongly
38 activated by mandatory regulations, which is consistent with a criminal law model, in which compliance is
39 based on fear of the consequences of a violation. Inspections and enforcement actions, as well as
40 publicizing or "showcasing" enforcement actions, which may cause embarrassment, can contribute to
41 effective deterrence.

42
43 Economic consequences of non-compliance aside from sanctions can also motivate citizens to comply with
44 or disregard rules. Because these are primarily associated with commercial whale watch operators, they are
45 discussed further below.

46
47 *Commercial Whale Watch Operators.* The ESA and implementing regulations prohibit take and the MMPA
48 and implementing regulations prohibit harassment (Subsection 1.3, Current MMPA and ESA Prohibitions,

1 Regulations, and NMFS Guidelines). These general prohibitions apply to all endangered species and
2 marine mammals, respectively, and do not include detailed descriptions of what specific activities
3 constitute take or harassment. NMFS officials have provided some general guidance about what types of
4 activities may constitute take or harassment (67 FR 4379, January 30, 2002), however, this guidance does
5 not identify specific actions or circumstances that cause take or harassment. Commercial operators know
6 about and understand the purpose of the general prohibitions on take and harassment, but the lack of clarity
7 of the general prohibitions led whale watch operators, governments, and whale advocates to develop the
8 more specific voluntary Be Whale Wise guidelines to provide specific advice on how to operate vessels in
9 order to avoid causing harassment or take. The Whale Watch Operators Association Northwest
10 (association) has described its commitment to responsible wildlife viewing and created its own set of best
11 practices guidelines. These best practices complement the Be Whale Wise guidelines for all boaters, and
12 contain specific direction for commercial operators.

13
14 The first element of compliance – ability to comply – depends on knowledge of the regulations and how
15 easy it is to follow them. Commercial whale watch operators would likely be aware of any new mandatory
16 regulations. The association provides a ready mechanism for educating the operators. NMFS and
17 Soundwatch both communicate regularly with the association members. The commercial operators are well
18 informed about the potential for new mandatory regulations, commented on the ANPR, and participated in
19 the scoping sessions preceding development of this Environmental Assessment (Subsection 1.5, Advanced
20 Notice of Proposed Rulemaking). NMFS is confident that the commercial operators, particularly members
21 of the association, would be aware of the existence of any new regulations and their details. While
22 commercial operators have expertise and experience (as compared to many recreational boaters) that would
23 enable them to follow regulations, the clarity and ease of following any particular specific regulation is
24 discussed under each alternative.

25
26 Commercial operators would have strong motivation to comply with new mandatory regulations based on
27 their stated sense of obligation to protect the whales and social influences, similar to their motivations
28 under the current voluntary guidelines. Social pressures within an association, as well as within a close-knit
29 community such as the San Juan County area, can also contribute to compliance (NMPAC 2005).
30 Maintaining reputation among peers is a social influence that can motivate compliance. Groups concerned
31 with reputation, such as trade associations, have a greater likelihood of compliance than individuals (May
32 2005).

33
34 Commercial operators would also have a business motivation to comply with new mandatory regulations,
35 again just as they do with the voluntary guidelines. Association members use their membership in the
36 association as a market differentiation tool and have a “Look Before You Book” program to identify
37 member companies as safe, professional, and respectful of wildlife. They use the association logo as an
38 indication of assurance of adherence to responsible practices to attract customers. Violation of mandatory
39 regulations or voluntary guidelines may harm a commercial operator’s reputation, and therefore harm their
40 ability to attract customers. The current specific voluntary guidelines do not result in fines or imprisonment,
41 nor are there cases of members being publicly embarrassed or excluded from the association because of
42 guideline incidents. In contrast to violations of voluntary guidelines, violations of a mandatory regulation
43 would likely be publicized and therefore cause more severe harm to reputation and therefore to business
44 success. This element of motivation for commercial operators is the primary one that is different for
45 specific mandatory regulations than for specific voluntary guidelines.

46
47 Commercial operators would also be motivated to avoid monetary impacts on their economic status from
48 penalties charged for violations of regulations. There may, however, also be economic incentives for
49 commercial whale watch operators not to comply with mandatory regulations. They may believe they will

1 attract more customers or that customers would be willing to pay more if their tours result in close contact
2 with the whales, closer than is allowed by guidelines or rules. This belief is suggested by the pictures and
3 text included in the websites and other advertising by commercial whale watch operators showing close
4 approaches to killer whales and guaranteeing customers encounters with killer whales. It is also suggested
5 by incidents committed by commercial operators, which are designed to get customers close to the whales.
6

7 *Recreational Boaters.* Like commercial operators, recreational boaters are subject to the mandatory ESA
8 and MMPA rules and penalties, and are a target of the Be Whale Wise education campaign. Of all incidents
9 between the whales and vessels, about 57 percent are committed by recreational vessels, compared with 30
10 percent by commercial whale watch operators (Figure 3-9). This may be because recreational boaters are
11 less likely to know about the current general mandatory prohibitions or the specific voluntary guidelines –
12 they do not belong to associations whose members all make a business of watching whales, are likely to be
13 on the water less frequently than commercial operators, and are likely to have less contact with whale
14 advocates and government regulators. Recreational boaters may also not be aware that whales are nearby
15 and/or may be less able to judge distance from the whales than the more experienced whale-watch
16 operators.
17

18 Motivation for compliance by recreational boaters who are aware of voluntary or mandatory programs may
19 be driven by a sense of obligation to help killer whales and a fear of penalties, and less by social influences,
20 such as reputation among peers or embarrassment from a publicized violation. Fear of the consequences of
21 violation of mandatory rules, such as fines, would likely be a motivating factor for recreational boaters.
22 This motivation, however, would not be as strong for recreational boaters compared to commercial
23 operators who would fear additional consequences, such as damage to reputation and potential economic
24 losses. Recreational boaters do not have business incentives to comply with rules, such as market
25 differentiation, as compared to commercial operators.
26

27 *General Conclusions.* From this information NMFS concludes that in general, vessel operators are more
28 likely to adhere to mandatory specific regulations than to the current voluntary guidelines. This likelihood
29 for any particular rule would be affected by the clarity of the rules, motivations to comply, and the level of
30 monitoring and enforcement. It is reasonable to assume that commercial operators would know about
31 mandatory regulations, for the same reasons that they are familiar with the current specific voluntary
32 guidelines (discussed above). Recreational boaters are also more likely to comply with mandatory
33 regulations, although they may be less likely to know the details of mandatory regulations than are
34 commercial operators. Thus in general, promulgation of specific mandatory regulations is likely to result in
35 fewer incidents between vessels and whales than occurs under the current regime. For each of the potential
36 mandatory rules examined under each of the action alternatives, this analysis considers both the ability to
37 comply (awareness of rules and if they are easy to follow) and motivations likely to influence compliance
38 (civic duty, social influences, fear of sanctions). Because it is not possible to predict the extent to which
39 either commercial or recreational vessel operators would comply with mandatory regulations, the following
40 discussion describes the current observed minimum number of incidents associated with each potential
41 rule, and evaluates potential changes in the number of incidents between whales and vessels qualitatively.
42

42 **4.1.3 Protected Areas**

43
44 Protected areas for marine species including marine mammals have rarely been evaluated for effectiveness
45 and have received mixed reviews (Reeves 2000; Hoyt 2005). In protecting a specific population, the
46 optimal protected area would encompass the populations' year-round distribution, however, this is often not
47 practical for wide ranging and transboundary marine mammals. Small protected areas, however, can still

1 help conserve species. Several models for fishery reserves have included migration and movement of
2 animals and show benefits of small protected areas even to highly mobile species (Apostolaki et al. 2002;
3 Roberts and Sargant 2002). Protected areas that are identified with coordinates on navigation charts are
4 easy to understand and education regarding the location and reasons for protection can increase compliance
5 (NMPAC 2005). A history of protected sites in nearby waters also improves compliance rates for newly
6 established protected areas (NMPAC 2005). Some protected areas have been criticized for failure to engage
7 the community, reluctance to regulate activities like fisheries or vessel traffic, and lack of coordination with
8 local jurisdictions (Reeves 2000). Regardless of the regulatory impact of a protected area, they all have
9 some value in education and outreach. Protected areas for marine mammals have been effective in raising
10 awareness of important areas for species, encouraging coordination and funding of research, and other non-
11 regulatory activities (Reeves 2002).

12
13 The basis for setting and designating sites should rest on an evaluation of the needs of the population at
14 risk, its distribution, sensitive activities (i.e., breeding, feeding), and threats. Where spatial components of
15 threats can be identified, establishment of marine protected areas can be useful for conservation (Reeves
16 2000; Hooker and Gerber 2004). Even if an animal only uses the protected area for part of the time,
17 protected areas reduce the frequency of exposure to certain threats and diminish the overall cumulative
18 impact of other threats (Hooker and Gerber 2004). A review of threats to marine predators suggests they
19 may be most at risk during foraging activities (Hooker and Gerber 2004) and this has been suggested
20 specifically for killer whales (Williams et al. 2006). This review of information on protected areas for
21 marine mammals provides background information to help evaluate individual alternatives, particularly
22 Alternatives 4 and 5.

23 **4.1.4 Effects on Southern Resident Killer Whale Critical Habitat**

24
25 While the alternatives evaluated in this analysis might affect the distribution of vessels in the action area,
26 none would affect the number of vessels in the action area, for reasons explained under each alternative
27 below (all of the alternatives consider the behavior of vessels around whales – such as proximity, speed,
28 and direction – rather than numbers of vessels). For this reason, none of the alternatives is expected to
29 affect designated critical habitat of Southern Resident killer whales. Features of killer whale critical habitat
30 include water quality, prey availability, and passage. Some of these features could be affected by the
31 number of vessels present in the action area, but would not be affected by changes in vessel distribution.

32 **4.2 Marine Mammals**

33
34 Similar to the discussion of the affected environment presented in Subsection 3.2.1, Killer Whales, the
35 analysis in this section focuses on Southern Resident killer whales and, secondarily, on other killer whales.
36 It also mentions other marine mammals where indirect effects would occur. The information on marine
37 mammals in Subsection 3.2, Marine Mammals, begins with information on the status of the killer whale
38 populations (3.2.1.2). There was also specific information on foraging behavior (3.2.1.3), habitat use
39 (3.2.1.4), and vessel interactions (3.2.1.5) presented in the discussion of the affected environment for killer
40 whales. The analysis of environmental consequences for marine mammals in Subsection 4.2 is presented in
41 a different order to aid the reader in understanding the effects on each of these aspects of killer whales. For
42 each alternative, the discussion begins with information on vessel activities and those changes in vessel
43 interactions or incidents that would be expected under each alternative. The changes in vessel interactions
44 or incidents are then discussed in terms of the three types of impacts to the whales—vessel strikes,
45 behavioral disturbance, and acoustic masking—as presented in Subsection 3.2.1.5, Vessel Interactions. The
46 discussion of impacts incorporates specific effects on foraging behavior as described in Subsection 3.2.1.3,
47 Foraging.

1 Subsection 4.2, Marine Mammals, also provides a description of expected effects under each alternative,
2 which is presented in the context of the whales' habitat use as described in Subsection 3.2.1.4, Distribution
3 and Habitat Use. Following the information on impacts from vessels, there is a discussion of how those
4 impacts are expected to affect the fitness of the whales and their population status.
5

6 Affected Environment information on the status of other killer whales and marine mammals is presented in
7 Subsection 3.2, Marine Mammals. Less detail is provided on killer whale populations other than Southern
8 Residents (Northern Residents, transients, and offshore whales) in both Chapters 3 and 4 as they are only
9 occasionally found in inland waters. There is less detail for other marine mammals, which are much more
10 numerous than the endangered Southern Resident killer whales and less often the subject of vessel viewing
11 activities.

12 **4.2.1 Alternative 1 (No Action)**

13
14 Under the No-action Alternative, NMFS would not promulgate specific vessel regulations. NMFS would
15 continue the education and outreach program with all of the partners involved in the Be Whale Wise
16 campaign. Existing laws under the ESA and MMPA would continue to prohibit take and harassment, and
17 NMFS would continue to enforce those prohibitions. It is likely that uncertainty over whether certain vessel
18 activities constitute take or harassment would continue to result in levels of prosecution under these statutes
19 that are similar to current levels (Subsection 3.2.1.5, Vessel Interactions). The average and maximum
20 numbers of vessels within 1/2 mile of the whales has remained stable in recent years and would likely
21 continue at current levels under the No-action Alternative. The structure of the commercial whale watch
22 industry (numbers of boats, length of season, viewing hours per day) would also likely continue at current
23 levels.
24

25 In the absence of specific regulations, it is likely that incidents (when vessels do not adhere to
26 recommended guidelines and could be harming or harassing the whales) would continue at least at the level
27 shown for recent years (Table 3-1 and Table 3-2) and could continue to increase based on recent trends. As
28 discussed in Subsection 3.2.1.5, Vessel Interactions, the observed 1,281 incidents in 2006 represent a
29 minimum estimate because monitoring does not occur during all hours on all days and the monitoring
30 groups are not able to record all incidents, particularly when there are multiple groups of whales and
31 vessels in different locations.
32

33 *Vessel Strikes.* A subset of the total number of incidents including 1) parking in the path, 2) head on
34 approaches, 3) crossing the path of whales, and 4) chasing/pursuing whales are risky vessel behaviors that
35 have the highest likelihood of resulting in vessel strikes. In 2006 there were 433 incidents involving these
36 types of activities out of the total 1,281 monitored incidents (Table 3-2). In 2005 a vessel operator who
37 repeatedly positioned his vessel in the path of the whales (i.e., leapfrogging or repositioning) caused a
38 collision with and injury to a whale (Subsection 3.2.1.5, Vessel Interactions). The operator was cited for
39 negligent operation of a vessel under the MMPA in 2005.
40

41 Under the No-action Alternative, it is reasonable to expect incidents that would result in vessel strikes
42 would occur at the same level, and may continue to increase based on recent trends. While it is not possible
43 to predict the number of vessel strikes in future years under the No-action Alternative, it is likely they
44 would occur. It is also not possible to quantify the level of risk associated with a vessel strike. Major
45 injuries can be lethal and even minor injuries can be a path for infection and result in immune system
46 impacts. Any injury to a member of the Southern Resident killer whale population is serious because of the
47

1 small population size. An injury or mortality to a single individual could have population level impacts,
2 particularly for reproductive females.

3
4 *Behavioral Disturbance.* Under the No-action alternative the continued and potentially increasing level of
5 vessel incidents is expected to continue to disturb Southern Resident killer whales. During these incidents
6 the whales respond to vessels by changing course and direction, altering breathing patterns, increasing
7 energetically expensive surface active behaviors and decreasing foraging behavior (Subsection 3.2.1.5,
8 Vessel Interactions). The physiological effects of these responses and potential effects on the status of the
9 whales are discussed below. A subset of the total number of incidents from 2006 listed in Table 3.2 involve
10 1) approaches closer than 100 yards, 2) operating at high speeds (greater than 7 knots) within 400 yards of
11 the whales, 3) parking in the path, 4) crossing the path, 4) chasing or pursuing whales, and 5) approaching
12 head-on are expected to continue causing the same level of behavioral response currently experienced by
13 the whales. In 2006, there were 731 of these specific types of incidents.

14
15 It is not possible to estimate the total amount of energy expended or the amount of foraging behavior
16 disrupted by these 731 incidents (under current conditions and expected under the No-action Alternative)
17 because the monitoring groups recording these incidents do not identify the individual whales involved.
18 Thus it is not possible to track the total incidents for each individual whale or the population as a whole.
19 Although it is also not possible to estimate the current total level of disruption for individual whales or the
20 population as a whole under the No-action Alternative, available data on behavior and foraging disruption
21 provide information on the level of effects for each whale per incident. For example, Williams (2006)
22 predicted a 3 percent increase in energy expenditure and an 18 percent decrease in time spent foraging
23 when vessels are within 100 meters (about 100 yards). Physiological effects of energy shifts are analyzed
24 below (*Overall Physiological Effects on Individuals and Effects on the Status of the Population*).

25 *Acoustic Masking.* The 731 incidents described above under *Behavioral Disturbance* that currently result in
26 behavioral disturbance also would likely continue under the No-action Alternative and would create sound
27 levels that interfere with the whales' communication and foraging by masking their acoustic signals. They
28 do not likely rise to a level that would damage the whales' hearing. Parking in the path, particularly if part
29 of a leapfrogging sequence and head-on approaches may have the largest effect due to the directional
30 nature of echolocation. In addition, as vessel speed increases (high speed vessels within 400 yards), so does
31 the sound level. Holt (2008) concluded that some fast moving vessels within 100 yards of the whales can
32 decrease the distance at which whales can detect salmon by 88 to 100 percent. Physiological effects of
33 acoustic masking are related to foraging, and are analyzed below (*Overall Physiological Effects on*
34 *Individuals and Effects on the Status of the Population*).

35
36 Transient killer whales use passive listening when foraging and sounds from their marine mammal prey
37 may be masked during opportunistic whale watching when Southern Residents are not present. There is no
38 information available on the current level of foraging disturbance from vessels for transient or other types
39 of killer whales, other than the Southern Residents as described above. Any interference from vessels with
40 transient foraging is likely to be short-term and intermittent based on the limited time transients spend in
41 inland waters and the opportunistic nature of whale watching.

42
43 *Habitat Use.* The effects described above (risk of vessel strike, vessel disturbance, and acoustic masking)
44 would occur throughout the Puget Sound area under the No-action Alternative. In particular, vessel
45 presence and noise would continue to interfere with the whales' ability to forage along the steep shoreline
46 along the west side of San Juan Island, the area with the highest number of whale sightings (Figure 3-6). In
47 2006 there were a minimum of 289 incidents of vessels inshore of the whales or in the current voluntary
48 no-go zone along the west side of San Juan Island when whales were present (Table 3-2). It is reasonable to

1 anticipate that, at a minimum, the current levels of vessel traffic and resulting levels of incidents would also
2 occur under the No-action Alternative; traffic and incident levels may also increase based on past trends.
3 However, it is not possible to estimate the potential effect on use of important feeding habitats that would
4 result from the expected levels of vessel activity in these shoreline areas for several reasons. Researchers
5 have not estimated energy expenditure or foraging efficiency impacts associated with vessel presence in the
6 no-go zone. Southern Resident killer whales continue to show strong site fidelity to their traditional
7 summer ranges despite greater than 25 years of whale watching and increasing vessel traffic in the Pacific
8 Northwest. Thus, the level of vessel traffic including whale watching under the No-action Alternative
9 would not likely cause habitat displacement for killer whales in this region.

10
11 *Overall Physiological Effects on Individuals and Effects on the Status of the Population.* Because it is not
12 possible to quantify the physiological effects on individual whales under the current level of vessel
13 incidents (which are likely to continue at least at the same level under the No-action Alternative), the above
14 discussion qualitatively describes the responses of whales to specific types of vessel incidents, and the
15 general consequences (energy expended and disruption of foraging) as a result of those responses. These
16 responses and consequences can, in turn, have physiological effects on Southern Resident killer whales. For
17 example, energy expenditure or disruption of foraging could result in poor nutrition (Subsection 3.2.1.5,
18 Vessel Interactions). Poor nutrition could lead to reproductive or immune effects or, if severe enough, to
19 mortality. Interference with foraging can affect growth and development, which in turn can affect the age at
20 which animals reach reproductive maturity, fecundity, and annual or lifetime reproductive success.
21 Interference of behaviors including prey sharing and communication could also impact social cohesion and
22 foraging efficiency for Southern Resident killer whales, and, therefore, the growth, reproduction, and
23 fitness of individuals. Some of these effects would occur in important habitats of the whales and where they
24 are frequently sighted, but based on past trends, it is not likely that these effects would cause habitat
25 displacement for Southern Resident whales.

26
27 It is not possible to estimate the point at which vessel impacts could trigger effects on reproduction or
28 survival of individuals. Vessel impacts could also work in concert with other threats to produce an effect.
29 For example, poor nutrition resulting from vessel interference with foraging could lead to mobilization of
30 fat stores, which can introduce stored contaminants into the whales' systems and affect reproduction or
31 immune function.

32
33 Concern about behavioral and physiological effects from the current level of vessel incidents led NMFS to
34 identify vessel incidents as a potential threat to Southern Resident killer whales in the ESA listing and in
35 the *Recovery Plan for Southern Resident Killer Whales*. Because the Southern Residents are such a small
36 population, physiological effects on even a small number of individual whales could lead to population
37 level effects, changing their status. The Southern Residents have had a variable growth trend in recent
38 years, and continued vessel effects under the No-action Alternative would likely have a negative impact on
39 the status of Southern Resident killer whales. Both Southern and Northern Residents are listed as
40 endangered and threatened, respectively, in Canada based on similar threats, including vessel disturbance.
41 Northern Resident killer whales rarely visit inland waters of Washington and experience low levels of
42 vessel effects further north in Canadian waters. Under the No-Action Alternative, Northern Residents
43 would experience a similar low level of intermittent vessel disturbance during their rare visits to inland
44 waters and these effects would not be likely to affect their stable population status.

45
46 Little is known about the current population trends for other killer whales, and there are no data on vessel
47 incidents for other killer whales, so it is not possible to estimate impacts on their status under the No-action
48 Alternative.

1 *Other Marine Mammals.* For other marine mammals, it is reasonable to expect that vessel incidents would
2 continue at present levels. Under the No-action Alternative, it is likely that whale watch operators would
3 continue to target killer whales, focusing on other species only when killer whales are absent. The Be
4 Whale Wise campaign, which includes information on responsible viewing of all marine mammals, would
5 continue under the No-action Alternative. Most other marine mammals that are opportunistically viewed
6 from vessels have increasing or stable population levels, including the threatened population of Steller sea
7 lions and endangered humpback whales (Subsection 3.2, Marine Mammals). Monitoring groups are not
8 currently recording vessel incidents for other marine mammal species, so current levels of disturbance are
9 unknown. Continued disturbance at current levels under the No-action Alternative has not been identified
10 as a limiting factor for other marine mammals in inland waters and would not be likely to affect their status.

11 **4.2.2 Alternative 2: 100 Yard Approach Regulation**

12
13 Under this alternative, NMFS would promulgate a regulation prohibiting approach closer than 100 yards.
14 The current Be Whale Wise guidelines include a recommendation to keep vessels at least 100 yards from
15 killer whales, and Table 3-1 reports that there were a minimum of 56 to 169 incidents annually from 2003
16 through 2006 where vessels were closer than 100 yards to the whales. This represents between 9 and 12
17 percent of all incidents. Most incidents of vessels within 100 yards of Southern Resident killer whales
18 involved recreational vessels (151 in 2006), compared to commercial whale-watch vessels (18 observed in
19 2006) (Table 3-2 and Figure 3-9).

20
21 A 100-yard mandatory approach regulation would not likely change the average and maximum numbers of
22 vessels within 1/2 mile of killer whales. These numbers have remained stable in recent years with the 100
23 yard voluntary guideline promoted through Be Whale Wise. These numbers would not be expected to
24 change as a result of a 100 yard mandatory regulation under Alternative 2 because most boats are already
25 following the guidelines and maintaining a distance of 100 yards. Commercial whale watch vessels adhere
26 particularly well to this guideline (Table 3-2). For the same reasons, the structure of the commercial whale
27 watch industry (numbers of boats, length of season, viewing hours per day) would also likely continue at
28 current levels.

29
30 A regulation prohibiting approaches closer than 100 yards would be clear to whale watch operators. These
31 operators would likely know about such a regulation and be able to accurately judge the distance of their
32 vessels from whales (as indicated by their current high levels of compliance with this guideline).
33 Recreational boaters would be less likely to know about such a regulation, though over time it is reasonable
34 to expect that familiarity with the regulation would increase, particularly with education and if any
35 prosecutions are well-publicized. Recreational boaters are less likely to know when whales are present and
36 are less likely to be able to judge distance from whales on the water. Some recreational boaters may also
37 follow the example of commercial operators to determine the proper viewing distance.

38
39 As described in Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary
40 Guidelines, fear of penalties would likely deter whale watch operators and recreational boaters from
41 violating the regulation. This incentive would be stronger for commercial operators than for recreational
42 boaters as violations could also result in loss of reputation and associated loss of business. For these
43 reasons, it is likely that a 100 yard approach regulation would reduce the number of incidents in which
44 commercial whale-watch vessels approach within 100 yards of the whales, compared to the No-action
45 Alternative. Such a regulation is also likely to reduce the number of approaches within 100 yards by
46 recreational boaters, though probably to a lesser extent than for whale watch operators as described in
47 Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines. Other

1 vessel incidents (e.g., parking in the path, in the no-go zone, fast within 400 yards of whales) would likely
2 continue at levels similar to those described under the No-action Alternative.

3
4 *Vessel Strikes.* The reduction in incidents of vessels approaching closer than 100 yards would reduce the
5 risk of vessel strikes, compared to the No-action Alternative. Vessel operators remaining 100 yards or
6 further from the whales would be able to see the location of whales and their movements, have more room
7 to maneuver and, therefore, more room to avoid collisions. A reduction in close approaches would in turn
8 reduce the risk of a killer whale being injured or killed by collision with a vessel compared to incident
9 results expected under the No-action Alternative.

10
11 Any injury to a member of the Southern Resident killer whale population is serious because of the small
12 population size. As under the No-action Alternative, an injury or mortality to a single individual could have
13 population-level impacts, particularly for reproductive females.

14
15 *Behavioral Disturbance.* The reduction in incidents of vessels approaching closer than 100 yards would
16 reduce the amount of behavioral disturbance of killer whales, compared to the No-action Alternative. This
17 in turn would decrease energy expended and increase time spent foraging, compared to the No-action
18 Alternative. Subsection 3.2.1.5, Vessel Interactions, describes one researcher's estimate that vessel
19 presence within 100 yards increases an individual whale's energy expenditure by 3 percent and decreases
20 foraging time by 18 percent (compared to no vessels being present within 100 yards). Because monitoring
21 groups do not record which whales are currently exposed to vessel incidents, it is not possible to quantify
22 the total number of behavioral responses, either of individual whales or the population as a whole, and
23 therefore not possible to quantify the change from the No-action Alternative.

24
25 Nevertheless, the data on whale behavior and energetic costs support a conclusion that a reduction in the
26 number of incidents of behavioral disturbance would decrease the energy expended by whales, compared to
27 the No-action Alternative. The behavior budgets of the whales (that is, time allocated to various activities)
28 would more closely resemble an undisturbed state, which would include more time spent foraging when
29 compared to conditions without 100 yard approach regulations. Thus, compared to the No-action
30 Alternative, in which close approaches would continue at current levels and may increase, adoption of a
31 mandatory 100 yard approach prohibition would likely reduce the whales' energetic costs and increase the
32 time and energy available for foraging, resting, and other important functions.

33
34 *Acoustic Masking.* Similar to the No-action Alternative, vessel sound is not expected to damage the hearing
35 of Southern Resident killer whales. Available information suggests that sound generated by vessels can
36 mask the echolocation and communication of the whales (Subsection 3.2.1.5, Vessel Interactions). The
37 closer a moving vessel is to a whale, the louder the sound received by the whale. Holt (2008) concluded
38 that some fast moving vessels within 100 yards of the whales can decrease the distance at which whales can
39 detect salmon by 88 to 100 percent. Because a mandatory 100 yard approach regulation is likely to reduce
40 the number of vessels coming within 100 yards of the whales, it is also likely to reduce the level of vessel-
41 generated noise received by the whales, compared to the No-action Alternative where there would be no
42 mandatory 100 yard approach regulation. This reduction, in turn, is likely to increase the Southern Resident
43 killer whales' ability to communicate and to forage as compared to the No-action Alternative. Transient
44 killer whales use passive listening when foraging and sounds from their marine mammal prey may be
45 masked by vessel sounds. The reduction of vessel sound would also reduce any short-term or intermittent
46 interference from vessels with transient killer whale foraging compared to the No-action Alternative.

47
48 *Habitat Use.* Because an approach regulation would apply wherever Southern Resident killer whales are
49 found, the protection would occur throughout the entire inland waters area (including along the west coast

1 of San Juan Island) and at all times of year. As under the No-action Alternative, no changes to habitat use
2 would be expected for killer whales in this region under Alternative 2 because the overall number of
3 vessels in the action area would not be expected to change from implementing a 100 yard approach
4 regulation. As described under the No-action Alternative, there is insufficient information to estimate the
5 effect of the current level of vessel traffic on use of particular feeding habitats. Although under Alternative
6 2 there would be fewer approaches within 100 yards, there would be no changes in total vessel traffic
7 expected under Alternative 2 as compared to the No-action Alternative, or changes to use of important
8 foraging areas.

9
10 *Overall Physiological Effects on Individuals and Effects on the Status of the Population.* As described
11 above, a mandatory 100 yard approach regulation under Alternative 2 is likely to reduce behavioral
12 responses associated with vessel disturbance and acoustic masking, compared to the No-action Alternative.
13 Also as described under the No-action Alternative and in Subsection 3.2.1.5, Vessel Interactions, vessel
14 disturbance and acoustic masking can have physiological effects on individual whales and the population as
15 a whole (e.g., reproductive rates). However, it is not possible to quantify the physiological effects of the
16 current level of disturbance and acoustic masking, for the reasons described under the No-action
17 Alternative. For the same reasons, it is not possible to quantify the reduction in physiological effects, and
18 associated improvement in individual and population fitness, that would result from a reduction in the
19 number of close approaches by vessels. Nevertheless, the reduction in behavioral disturbance and acoustic
20 masking is likely to have physiological effects that increase the fitness of individual whales and the
21 population as a whole when compared to conditions under the No-action Alternative that would not include
22 an approach regulation. Some behavioral disturbance and acoustic masking would likely continue from
23 other vessel incidents (e.g., parking in the path, in the no-go zone, fast within 400 yards of whales) that
24 would likely continue at levels similar to those described under the No-action Alternative.

25
26 Because Southern Residents are such a small population, improvements to the fitness of even a small
27 number of individual whales could lead to population level effects, improving their status compared to the
28 No-action Alternative. The Southern Residents have had a variable growth trend in recent years and
29 reduced vessel effects under Alternative 2 as compared to the No-action Alternative would likely have a
30 positive impact on the status of Southern Resident killer whales. Such benefits to the status of Southern
31 Resident whales would begin to address concerns that led NMFS to list this DPS as endangered under the
32 ESA (Subsection 3.2.1.2, Status).

33
34 *Other Marine Mammals.* A 100 yard approach regulation for killer whales would apply to all killer whales,
35 including transient and off-shore killer whales, because the regulation would not distinguish among the
36 different types. Thus all killer whales would experience some reduction in close vessel approaches. A 100
37 yard approach regulation may also result in vessel operators avoiding close approaches to other marine
38 mammals, because the regulation might create awareness about vessel effects on marine mammals
39 generally. The Be Whale Wise campaign, which includes information on responsible viewing of all marine
40 mammals, would continue similar to the No-action Alternative. The vessel monitoring groups do not
41 collect information on when the guidelines are not followed for other marine mammals. Compared to the
42 No-action Alternative, a 100 yard approach regulation for killer whales could reduce the number of close
43 approaches to other marine mammals and reduce the risk of vessel strikes and the number of behavioral
44 responses associated with close approaches. This reduction cannot be quantified.

45
46 Most other marine mammals that are opportunistically viewed from vessels have increasing or stable
47 population levels, including the threatened population of Steller sea lions and endangered humpback
48 whales. Reduced vessel impacts to other killer whales and marine mammals would likely have a positive
49

1 but small impact on their population status, which would remain similar to their status under the No-action
2 Alternative.

3 **4.2.3 Alternative 3: 200 Yard Approach Regulation**

4
5 Under this alternative, NMFS would promulgate a regulation prohibiting approach closer than 200 yards. In
6 recent years there has been on average about 20 vessels within 1/2 mile of the whales during daylight hours
7 from May through October (Subsection 3.2.1, Killer Whales). The majority of these are whale watch
8 operators, who largely observe the current 100-yard approach limit guideline (Table 3-2). Incidents of
9 vessels approaching within 100 yards are mostly committed by recreational vessels and make up 9 to 12
10 percent of all incidents in recent years. Because a 200 yard approach limit is not part of the current
11 guidelines, Soundwatch does not collect data on vessel incidents at this distance. Although there are
12 incidents of close approaches, the average viewing distance of vessels is greater than the 100 yard guideline
13 and the average point of closest approach for all vessels is about 200 yards. Recreational vessels tended to
14 approach more closely than the commercial vessels, which is consistent with the higher level of incidents
15 for these vessels (Table 3-2 and Figure 3-9).

16
17 The average and maximum numbers of vessels within 1/2 mile of the whales have remained stable in recent
18 years and would likely continue at current levels under Alternative 3, for the reasons described under
19 Alternative 2. The structure of the commercial whale watch industry (numbers of boats, length of season,
20 viewing hours per day) would also likely continue at current levels also for the reasons described under
21 Alternative 2. However, most whale watching would occur from a greater distance (at least the mandatory
22 200 yards) as compared to the No-action Alternative (at least 100 yards, as contained in the voluntary
23 guidelines, which most commercial and recreational whale watch operators observe). Additional
24 information on potential changes to the whale watch industry from viewing from 200 yards is discussed
25 under Subsection 4.4.3, Alternative 3: 200 Yard Approach Regulation.

26
27 Based on the ability of most vessel operators to maintain a distance greater than 100 yards to view whales,
28 it is reasonable to assume that there would be a similar or even greater level of compliance with a 200 yard
29 regulation compared to what is currently observed for the 100 yard guideline. Compared to the No-action
30 Alternative, an enforceable 200 yard regulation would result in the majority of vessels moving from a
31 perimeter greater than 100 yards around the whales to a perimeter greater than 200 yards around the
32 whales. It is likely that some proportion of recreational boaters would be familiar with the approach
33 regulation and observe it or follow the example of the commercial fleet.

34
35 For those vessel operators not currently observing the 100 yard guideline, NMFS anticipates that they
36 would be more likely to observe specific mandatory regulations than the current voluntary guidelines, for
37 the reasons described under Alternative 2, and as described in Subsection 4.1.2, General Effects of
38 Enforceable Regulations Compared to Voluntary Guidelines. Thus it is likely that adoption of a 200 yard
39 approach regulation would reduce the number of vessels within 200 yards of the whales, compared to the
40 No-action Alternative (just as it is likely that adoption of a 100 yard mandatory approach regulation under
41 Alternative 2 would result in greater compliance than the current voluntary guidelines under the No-action
42 Alternative). As described above, Soundwatch does not record the current number of approaches within
43 200 yards, so it is not possible to quantify the number of approaches within 200 yards under the No-action
44 Alternative versus a reduced number under Alternative 3. Other vessel incidents (e.g., parking in the path,
45 in the no-go zone, fast within 400 yards of whales) would likely continue at levels similar to those
46 described under the No-action Alternative.

47

1 *Vessel Strikes.* As a result of the majority of vessels staying at least 200 yards away from the whales,
2 Alternative 3 would reduce the risk of vessel strikes compared to the No-action Alternative. Assuming that
3 both a 100 and 200 yard approach limit would enjoy similar rates of compliance, Alternative 3 would have
4 similar effects as Alternative 2 regarding the risk of vessel strikes. As under Alternative 2, a reduction in
5 close approaches would in turn reduce the risk of a killer whale being injured or killed by collision with a
6 vessel compared to incident results expected under the No-action Alternative. Any injury to a member of
7 the Southern Resident killer whale population is serious because of the small population size. As under the
8 No-action Alternative, an injury or mortality to a single individual could have population level impacts,
9 particularly for reproductive females.

10
11 *Behavioral Disturbance.* The reduction in incidents of vessels approaching closer than 200 yards would
12 reduce the incidents of behavioral disturbance of killer whales, compared to the No-action Alternative. This
13 in turn would decrease energy expended and increase time spent foraging, compared to the No-action
14 Alternative. Subsection 3.2.1.5, Vessel Interactions, describes one researcher's estimate that vessel
15 presence within 100 yards increases an individual whale's energy expenditure by 3 percent and decreases
16 foraging time by 18 percent (compared to no vessels being present within 100 yards). Other researchers
17 have reported behavioral disturbance at distances greater than 100 yards. Because monitoring groups do not
18 record which whales are currently exposed to vessel incidents, it is not possible to quantify the total number
19 of behavioral responses, either of individual whales or the population as a whole. In addition, current
20 monitoring records only vessels within 100 yards of the whales. For these reasons it is not possible to
21 quantify the change from the No-action Alternative.

22
23 Nevertheless, the data on whale behavior and energetic costs support a conclusion that a reduction in the
24 number of incidents of behavioral disturbance would decrease the energy expended by whales, compared to
25 the No-action Alternative. The behavior budgets of the whales (that is, time allocated to various activities)
26 would more closely resemble an undisturbed state, which would include more time spent foraging. Thus,
27 compared to the No-action Alternative, in which close approaches would continue at current levels and
28 may increase, adoption of a mandatory 200 yard approach prohibition would likely reduce the whales'
29 energetic costs and increase the time and energy available for foraging, resting, and other important
30 functions.

31
32 Compared to Alternative 2 (100 yard approach regulation), it is likely that Alternative 3 would result in
33 fewer instances of behavioral responses, based on research indicating that whale response to vessels is
34 greater the closer vessels approach (Subsection, 3.2.1.5 Vessel Interactions).

35
36 *Acoustic Masking.* Similar to the No-Action alternative, vessel sound is not expected to damage the hearing
37 of Southern Resident killer whales. Available information suggests that sound generated by vessels can
38 mask the echolocation and communication of the whales (Subsection 3.2.1.5, Vessel Interactions). The
39 closer a vessel is to a whale, the louder the sound received by the whale. Holt (2008) concluded that some
40 fast moving vessels within 200 yards of the whales can decrease the distance at which whales can detect
41 salmon by 75 to 95 percent. Because a mandatory 200 yard approach regulation is likely to reduce the
42 number of vessels coming within 200 yards of the whales, it is also likely to reduce the level of vessel-
43 generated noise received by the whales, compared to the No-action Alternative where there would be no
44 200 yard approach regulation. This reduction, in turn, is likely to increase the Southern Resident killer
45 whales' ability to communicate and to forage as compared to the No-action Alternative. Transient killer
46 whales use passive listening when foraging and sounds from their marine mammal prey may be masked by
47 vessel sounds. The reduction of vessel sound would also reduce any short-term or intermittent interference
48 from vessels with transient killer whale foraging compared to the No-action Alternative.

1 Compared to Alternative 2 (100 yard approach regulation), Alternative 3 is likely to result in less acoustic
2 masking, because vessel noise decreases as distance from the whale increases. This reduction in noise, in
3 turn, is likely to increase the Southern Resident and transient killer whales' ability to communicate and to
4 forage, compared to Alternative 2.

5
6 *Habitat Use.* Because an approach limit would apply wherever Southern Resident killer whales are found,
7 the protection would occur throughout the entire inland waters area (including along the west coast of San
8 Juan Island) and at all times of year. As under the No-action Alternative, no changes to habitat use would
9 be expected for killer whales in the action area under Alternative 3 because the overall number of vessels
10 would not be expected to change from implementing a 200 yard approach regulation. As described under
11 the No-action Alternative, there is insufficient information to estimate the effect of the current level of
12 vessel traffic on use of particular feeding habitats. Although under Alternative 3 there would be fewer
13 approaches within 200 yards, there would be no changes in total vessel traffic expected under Alternative 3
14 as compared to the No-action Alternative, or changes to use of important foraging areas.

15
16 *Overall Physiological Effects on Individuals and Effects on the Status of the Population.* As described
17 above, a mandatory 200 yard approach regulation under Alternative 3 is likely to reduce behavioral
18 responses associated with vessel disturbance and acoustic masking, compared to the No-action Alternative.
19 Also as described under the No-action Alternative and in Subsection 3.2.1.5, Vessel Interactions, vessel
20 disturbance and acoustic masking can have physiological effects on individual whales and the population as
21 a whole (e.g., reproductive rates). However, it is not possible to quantify the physiological effects of the
22 current level of disturbance and acoustic masking, for the reasons described under the No-action
23 Alternative. For the same reasons, it is not possible to quantify the reduction in physiological effects, and
24 associated improvement in individual and population fitness, that would result from a reduction in the
25 number of close approaches by vessels. Nevertheless, the reduction in behavioral disturbance and acoustic
26 masking is likely to have physiological effects that increase the fitness of individual whales and the
27 population as a whole, compared to the No-action Alternative that would not include an approach
28 regulation. Some behavioral disturbance and acoustic masking from other vessel incidents (e.g., parking in
29 the path, in the no-go zone, fast within 400 yards of whales) would likely continue at levels similar to those
30 described under the No-action Alternative.

31
32 As described above, Alternative 3 (200 yard approach prohibition) is likely to result in less behavioral
33 disturbance and acoustic masking when compared to Alternative 2 (100 yard approach prohibition), and
34 therefore a 200 yard approach regulation would result in increased fitness of individual whales and the
35 population as a whole compared to a 100 yard approach regulation.

36
37 Because the Southern Residents are such a small population, improvements to the fitness of even a small
38 number of individual whales could lead to population level effects, improving their status. The Southern
39 Residents have had a variable growth trend in recent years and reduced vessel effects under Alternative 3 as
40 compared to the No-action Alternative would likely have a positive impact on the status of Southern
41 Resident killer whales. Such benefits to the status of Southern Resident whales would begin to address
42 concerns that lead NMFS to list this DPS as endangered under the ESA (Subsection 3.2.1.2, Status).

43
44 *Other Marine Mammals.* A 200-yard approach regulation for killer whales would apply to all killer whales,
45 including transient and off-shore killer whales, because the regulation would not distinguish among the
46 different types. Thus all killer whales would experience some reduction in close vessel approaches. A 200
47 yard approach regulation may also result in vessel operators avoiding close approaches to other marine
48 mammals, because the regulation might create awareness about vessel effects on marine mammals
49 generally. The Be Whale Wise campaign, which includes information on responsible viewing of all marine

1 mammals, would continue similar to the No-action Alternative. The vessel monitoring groups do not
2 collect information on when the guidelines are not followed for other marine mammals. Compared to the
3 No-action Alternative, a 200 yard approach regulation could reduce the number of close approaches to
4 other marine mammals and reduce the risk of vessel strikes and the number of behavioral responses
5 associated with close approaches. This reduction cannot be quantified.

6
7 Most other marine mammals that are opportunistically viewed from vessels have increasing or stable
8 population levels, including the threatened population of Steller sea lions and endangered humpback
9 whales. Reduced vessel impacts to other killer whales and marine mammals would likely have a positive
10 but small impact on their population status, which would remain similar to their status under the No-action
11 Alternative.

12 **4.2.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

13
14 Under this alternative, NMFS would formalize the current voluntary no-go zone along the west side of San
15 Juan Island and prohibit vessels from entering the area from May through September. There is currently a
16 3.8 square mile voluntary no-go zone along the west side of San Juan Island (Figure 2-1). The west side of
17 San Juan Island has the highest number of Southern Resident killer whale sightings (Figure 3-6) and likely
18 because of this the west side of San Juan Island is the location of the highest number of vessel incidents
19 recorded by Soundwatch (Figure 3-11).

20
21 As shown in Table 3-1, incidents involving vessels within the no-go zone have been decreasing in recent
22 years, representing 41 percent of all incidents in 1998, 18 percent in 2003, and 5 percent in 2006. This is
23 due to a decrease in commercial whale watch operators being present in the no-go zone. Recreational vessel
24 incidents in the no-go zone, however, have increased in recent years along with an increase in overall
25 private vessel counts in the surrounding area (Koski 2007; IEC 2008). In 2006 there were two incidents of
26 commercial whale watch vessels and 57 incidents of recreational vessels observed in the no-go zone (Table
27 3-2 and Figure 3-9).

28
29 A mandatory no-go zone that is similar to the current voluntary no-go zone would probably not change the
30 average and maximum numbers of vessels recorded within 1/2 mile of killer whales wherever they go,
31 compared to the No-action Alternative. These numbers have remained stable in recent years when a
32 voluntary no-go zone has been promoted in conjunction with Be Whale Wise. This would not be expected
33 to change as a result of a mandatory no-go zone under Alternative 4 because most boats are already
34 following the guidelines and staying outside the voluntary no-go zone. Commercial whale watch vessels
35 adhere particularly well to this guideline (Table 3-2), especially in recent years, and could still be counted
36 within 1/2 mile radius even when adhering to the zone. For the same reasons, the structure of the
37 commercial whale watch industry (numbers of boats, length of season, viewing hours per day) would also
38 likely continue at current levels.

39
40 A no-go zone is clear and could be readily avoided by both commercial and recreational boaters. The area
41 would be identified using latitude and longitude coordinates and landmarks on maps and charts making the
42 regulation widely identifiable and compliance and enforcement straightforward. Commercial whale watch
43 operators already largely observe the current voluntary no-go zone, with only two observed incidents of
44 vessels in the zone during 2006, and can serve as an example of proper viewing areas for recreational
45 boaters. Ease of enforcement and fear of penalties would likely further deter whale watch operators from
46 violating the regulation, as would fear of loss of reputation and associated loss of business. A history of
47 protected sites in nearby waters also makes it likely that a newly established no-go zone would be observed
48 (NMPAC 2005) by vessel operators who know about the regulation. For these reasons, and as described in

1 Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines, it is
2 likely that adoption of a regulation creating a seasonal mandatory no-go zone would reduce the number of
3 vessels in the current (voluntary) no-go zone, compared to the No-action Alternative (69 total incidents
4 observed in 2006). Other vessel incidents (e.g., approach within 100 yards, parking in the path, fast within
5 400 yards of whales) outside the no-go zone would likely continue at levels similar to those described
6 under the No-action Alternative.

7
8 *Vessel Strikes, Behavioral Disturbance, Acoustic Masking, and Overall Physiological Effects on*
9 *Individuals and Effects on the Status of the Population.* With a decreased number of vessels in the area,
10 there would be a decrease in the likelihood of a vessel strike in the area. A reduction in close approaches
11 would in turn reduce the risk of a killer whale being injured or killed by collision with a vessel compared to
12 incident results expected under the No-action Alternative. Any injury to a member of the Southern Resident
13 killer whale population is serious because of the small population size. As under the No-action Alternative,
14 an injury or mortality to a single individual could have population level impacts, particularly for
15 reproductive females.

16
17 There would also be a reduction in the number of behavioral responses and an increase in time spent
18 foraging compared to the No-Action Alternative, although there could continue to be some disturbance
19 along the edge of the no-go zone, as vessels engaged in whale watching currently park or travel along the
20 edge of the zone to view whales (Subsection 3.2.1.5, Vessel Interactions). Fewer vessels in the no-go zone
21 would also reduce the amount of acoustic masking that would occur under the No-action Alternative. The
22 combined effect of reduced vessel disturbance and reduced acoustic masking in an area heavily used by the
23 Southern Resident killer whales is likely to result in increased fitness of individuals and the population as a
24 whole, for the reasons described under Alternatives 2 and 3. Some level of acoustic disturbance and
25 acoustic masking from other vessel incidents (e.g., approach within 100 yards, parking in the path, fast
26 within 400 yards of whales) outside the no-go zone would likely continue at levels similar to those
27 described in the No-action Alternative.

28
29 Because the Southern Residents are such a small population, improvements to the fitness of even a small
30 number of individual whales could lead to population level effects, improving their status. The Southern
31 Residents have had a variable growth trend in recent years and reduced vessel effects under Alternative 4 as
32 compared to the No-action Alternative would likely have a positive impact on the status of Southern
33 Resident killer whales. Such benefits to the status of Southern Resident killer whales would begin to
34 address concerns that led NMFS to list this DPS as endangered under the ESA (Subsection 3.2.1.2, Status).

35
36 *Habitat Use.* The effects described above would occur only in the no-go zone. The no-go zone along the
37 west side of San Juan Island meets the criteria for a successful marine protected area as described in
38 Subsection 4.1.3, Marine Protected Areas. The west side of San Juan Island has the highest number of
39 whale sightings, is an important feeding habitat, and has high levels of vessel traffic and potentially
40 harmful incidents (Figure 3-6 and Figure 3-11). A no-go zone for Southern Residents that reduces vessel
41 impacts and improves foraging opportunities addresses two of the main threats to the whales (i.e., vessel
42 effects and prey availability). Prohibiting vessels from portions of the whales' habitat along the west side of
43 San Juan Island would protect the whales 1) from multiple threats; 2) in an area the local community
44 already recognizes; and 3) provides opportunities to evaluate the effectiveness of the area. Although there
45 is insufficient information to estimate the current level of impact from vessels on use of foraging habitat
46 under the No-action Alternative, creating a no-go zone could increase use of the protected area by the
47 whales, particularly for foraging, under Alternative 4 as compared to the No-action Alternative.

48
49 *Other Marine Mammals.* By reducing the number of vessels in the no-go zone, Alternative 4 would also

1 reduce the number of interactions between vessels and other marine mammals in the no-go zone, compared
2 to the No-action Alternative. Several other marine mammals occur in the current no-go zone intermittently.
3 Transient killer whales do not frequent the no-go zone and would rarely experience reduced vessels in the
4 no-go zone under Alternative 4 as compared to the No-action Alternative. The current no-go zone overlaps
5 with National Wildlife Refuges, where boaters are advised to stay 200 yards away to avoid disturbing
6 marine mammals and birds.

7
8 The Be Whale Wise campaign, which includes information on responsible viewing of all marine mammals,
9 would continue under Alternative 4 similar to the No-action Alternative. The vessel monitoring groups do
10 not collect information on when the guidelines are not followed for other marine mammals. Compared to
11 the No-action Alternative, the no-go zone could reduce the number of close approaches to other marine
12 mammals and reduce the risk of vessel strikes and associated behavioral responses and acoustic masking
13 within a small area of the inland waters. This reduction cannot be quantified.

14
15 Other marine mammals that may be present intermittently in the no-go zone have increasing or stable
16 population levels, including the threatened population of Steller sea lions. Endangered humpback whales
17 are not likely to be in the no-go zone as it is very close to shore. Reduced vessel impacts to other marine
18 mammals in the no-go zone would likely have a positive but small impact on their population status, which
19 would remain similar to their status under the No-action Alternative.

20 **4.2.5 Alternative 5: Protected Area – Expanded No-go Zone**

21
22 Under this alternative, NMFS would formalize an expanded no-go zone along the west side of San Juan
23 Island and prohibit vessels from entering the area from May through September. The expanded area would
24 prohibit vessels 1/2 mile from shore from Eagle Point to Mitchell Point. Alternative 5 would create a no-go
25 zone that is 6.2 square miles (Figure 2-2). The Soundwatch program promotes the current zone, although it
26 is not specifically recognized in the Be Whale Wise guidelines. Soundwatch collects incident data on the
27 current zone as described in Subsection 4.2.4, Alternative 4: Protected Area – Current Voluntary No-go
28 Zone, but does not record incident data for the expanded zone. The west side of San Juan Island has the
29 highest number of Southern Resident killer whale sightings (Figure 3-6) and likely because of this the west
30 side of San Juan Island is the location of the highest number of vessel incidents recorded by Soundwatch
31 (Koski 2006, 2007) (Figure 3-11).

32
33 A mandatory no-go zone that is larger than the current voluntary no-go zone would probably not change the
34 average and maximum numbers of vessels recorded within 1/2 mile of killer whales wherever they go,
35 compared to the No-action Alternative. These numbers have remained stable in recent years when a
36 voluntary no-go zone has been promoted through Be Whale Wise. This would not be expected to change as
37 a result of an expanded mandatory no-go zone under Alternative 5 because most boats are already
38 following the guidelines and staying outside the voluntary no-go zone. Commercial whale watch vessels
39 adhere particularly well to this guideline (Table 3-2) and could still be counted within 1/2 mile radius even
40 when adhering to the expanded zone. For similar reasons, the structure of the commercial whale watch
41 industry (numbers of boats, length of season, viewing hours per day) would also likely continue at current
42 levels.

43
44 A no-go zone is clear and could be readily avoided by both commercial and recreational boaters. The area
45 would be identified using latitude and longitude coordinates and landmarks on maps and charts making
46 compliance and enforcement straightforward. Commercial whale watch operators already largely observe
47 the current voluntary no-go zone, with only two observed incidents of vessels in the zone during 2006 and
48 can set an example for recreational boaters. Ease of enforcement and fear of penalties would likely further

1 deter whale watch operators from violating the regulation, as would fear of loss of reputation and
2 associated loss of business. A history of protected sites in nearby waters also makes it likely that a newly
3 established no-go zone would be observed (NMPAC 2005) by vessel operators who know about the
4 regulation.

5
6 For these reasons, and as described in Subsection 4.1.2, General Effects of Enforceable Regulations
7 Compared to Voluntary Guidelines, it is likely that adoption of a regulation creating a seasonal mandatory
8 no-go zone would reduce the number of vessels in the current (voluntary) no-go zone and 1/4 mile beyond,
9 compared to the No-action Alternative (69 observed in 2006). Other vessel incidents (e.g., approach within
10 100 yards, parking in the path, fast within 400 yards of whales) outside the no-go zone would likely
11 continue at levels similar to those described in the No-action Alternative.

12
13 *Vessel Strikes, Behavioral Disturbance, Acoustic Masking, and Overall Physiological Effects on*
14 *Individuals and Effects on the Status of the Population.* With a decreased number of vessels in the area,
15 there would be a decrease in the likelihood of vessel strikes in the area. As described under Alternative 4, a
16 reduction in close approaches would in turn reduce the risk of a killer whale being injured or killed by
17 collision with a vessel compared to incident results expected under the No-action Alternative. Any injury to
18 a member of the Southern Resident killer whale population is serious because of the small population size.
19 As under the No-action Alternative, an injury or mortality to a single individual could have population level
20 impacts, particularly for reproductive females.

21
22 There would also be a reduction in the number of behavioral responses and an increase in time spent
23 foraging compared to the No-action Alternative, although there could continue to be some disturbance
24 along the edge of the zone, as vessels engaged in whale watching currently park or travel along the edge of
25 the zone to view whales. Fewer vessels in the no-go zone would also reduce the amount of acoustic
26 masking that would occur under the No-action Alternative. The combined effect of reduced vessel
27 disturbance and reduced acoustic masking in an area heavily used by the Southern Resident killer whales is
28 likely to result in increased fitness of individuals and the population as a whole, for the reasons described
29 under Alternatives 2 and 3. Some level of acoustic disturbance and acoustic masking from other vessel
30 incidents (e.g., approach within 100 yards, parking in the path, fast within 400 yards of whales) outside the
31 no-go zone would likely continue at levels similar to those described under the No-action Alternative.

32
33 Because the Southern Residents are such a small population, improvements to the fitness of even a small
34 number of individual whales could lead to population level effects, improving their status. The Southern
35 Residents have had a variable growth trend in recent years and reduced vessel effects under Alternative 5 as
36 compared to the No-action Alternative would likely have a positive impact on the status of Southern
37 Resident killer whales.

38
39 Alternative 5 (expanded no-go zone) would establish a larger protected area and would, therefore, result in
40 less behavioral disturbance and acoustic masking when compared to Alternative 4 (current no-go zone). A
41 larger no-go zone would result in increased fitness of individual whales and the population as a whole
42 compared to a smaller no-go zone.

43
44 *Habitat Use.* The effects described above would occur only in the no-go zone. The no-go zone along the
45 west side of San Juan Island meets the criteria for a successful marine protected area as described in
46 Subsection 4.1.3, Marine Protected Areas. The west side of San Juan Island has the highest number of
47 whale sightings, is an important feeding habitat, and has high levels of vessel traffic and potentially
48 harmful incidents. A no-go zone for Southern Residents that reduces vessel impacts and improves foraging
49 opportunities addresses two of the main threats to the whales. Prohibiting vessels from portions of the

1 whales' habitat along the west side of San Juan Island would 1) protect the whales from multiple threats; 2)
2 in an area the local community already recognizes; and 3) provide opportunities to evaluate the
3 effectiveness of the area. Although there is insufficient information to estimate the current level of impact
4 from vessels on use of foraging habitat under the No-action Alternative, creating a no-go zone could
5 increase use of the protected area by the whales under Alternative 5 as compared to the No-action
6 Alternative.

7
8 The no-go zone under Alternative 5 would create a no-go zone along the west side of San Juan Island that
9 is 6.2 square miles, which is larger than the current voluntary no-go zone (Alternative 4), which
10 encompasses 3.8 square miles. The reduction of vessel impacts and improvement in foraging opportunities
11 would be greater under Alternative 5 as compared to Alternative 4.

12
13 *Other Marine Mammals.* In addition to overlaps in National Wildlife Refuge guidelines, reducing the
14 number of vessels in the no-go zone under Alternative 5 would also reduce the number of interactions
15 between vessels and other marine mammals in the no-go zone, compared to the No-action Alternative.
16 Transient killer whales do not frequent the no-go zone and would rarely experience reduced vessel traffic in
17 the no-go zone under Alternative 5 as compared to the No-action Alternative.

18
19 The Be Whale Wise campaign, which includes information on responsible viewing of all marine mammals,
20 would continue similar to the No-action Alternative. The vessel monitoring groups do not collect
21 information on when the guidelines are not followed for other marine mammals. Compared to the No-
22 action Alternative, the no-go zone could reduce the number of close approaches to other marine mammals
23 and reduce the risk of vessel strikes and the number of behavioral responses associated with close
24 approaches. This reduction cannot be quantified.

25
26 Other marine mammals that may be present intermittently in the no-go zone have increasing or stable
27 population levels, including the threatened population of Steller sea lions. Endangered humpback whales
28 are not likely to be in the no-go zone as it is very close to shore. Reduced vessel impacts to other marine
29 mammals in the no-go zone would likely have a positive but small impact on their population status, which
30 would remain similar to their status under the No-action Alternative.

31
32 Because the no-go zone would be larger than under Alternative 4, there would also be fewer vessel
33 interactions under Alternative 5 than under Alternative 4.

34 **4.2.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

35
36 Under this alternative, NMFS would promulgate a regulation prohibiting vessels from operating at speeds
37 over 7 knots when within 400 yards of killer whales. The current Be Whale Wise guidelines include a
38 recommendation to reduce speed to less than 7 knots when within 400 yards of the nearest whale, which is
39 the current condition under the No-action Alternative. Monitoring groups such as Soundwatch have
40 collected several years of data including incidents when vessels are not following the speed guideline and
41 are "fast within 400 yards of whales" (Table 3-1 and Table 3-2). There is an increasing number of speed
42 incidents (13 to 139) in recent years (2003 through 2006) with more incidents associated with private
43 vessels (112 in 2006) compared to commercial operators (19 in 2006) (Table 3-2 and Figure 3-9).

44
45 A mandatory speed regulation under Alternative 6, which is similar to the current voluntary speed
46 regulation under the No-action Alternative, would probably not change the average and maximum numbers
47 of vessels within 1/2 mile of killer whales, compared to the No-action Alternative because speed
48 regulations have no relationship to the proximity of vessels to whales. For similar reasons, the structure of

1 the commercial whale watch industry (numbers of boats, length of season, viewing hours per day) would
2 also likely continue at current levels.

3
4 A regulation governing vessel speed within 400 yards of whales would be clear to whale watch operators.
5 These operators would likely know about such a regulation and be able to accurately judge their speed and
6 the distance of their vessels from the whales. Recreational boaters would be less likely to know about such
7 a regulation, though over time it is reasonable to expect that familiarity with the regulation would increase,
8 particularly with education and if any prosecutions are well-publicized. Recreational boaters are less likely
9 to know when whales are present and are less likely to be able to judge distance from whales on the water.

10
11 As described in Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary
12 Guidelines, fear of penalties would likely deter whale watch operators and recreational boaters from
13 violating the regulation. This incentive would be stronger for commercial operators as violations could also
14 result in loss of reputation and associated loss of business. For these reasons, it is likely that a mandatory
15 speed limit within 400 yards of the whales under Alternative 6 would reduce the number of incidents in
16 which vessels approach at a speed of over 7 knots within 400 yards of the whales, compared to the number
17 occurring with the current voluntary guidelines under the No-action Alternative. Other vessel incidents
18 (e.g., approach within 100 yards, parking in the path, in the no-go zone) would likely continue at levels
19 similar to those described under the No-action Alternative.

20
21 *Vessel Strikes.* Predicting the movements of killer whales can be difficult, particularly for boaters with little
22 or no experience operating around whales. Boaters operating at slow speeds could be more aware of the
23 position of whales and would have more time to avoid getting too close, impacting their behavior or
24 colliding with whales. Operating at slower speeds in the vicinity of whales would reduce the potential for
25 vessel strikes or serious injuries from strikes, compared to the No-action Alternative (Laist et al. 2001).
26 Any injury to a member of the Southern Resident killer whale population is serious because of the small
27 population size. As under the No-action Alternative, an injury or mortality to a single individual could have
28 population level impacts, particularly for reproductive females.

29
30 *Acoustic Masking.* Similar to the No-action Alternative, vessel sound is not expected to damage the hearing
31 of Southern Resident killer whales. Promulgation of a mandatory speed limit within 400 yards of whales
32 would reduce the amount of interference with the whales' communication and echolocation, compared to
33 the current level of compliance with voluntary guidelines under the No-action Alternative. Operating at
34 slow speeds near the whales would reduce sound emissions, which are highly dependent on the speed of a
35 vessel (Erbe 2002; Hildebrand 2006), compared to the No-action Alternative. The data on the whales'
36 reliance on acoustic signals to communicate and forage, the range in which their hearing sensitivity is
37 greatest, and the sounds generated by vessels traveling over 7 knots or more, as presented in Subsection
38 3.2.1.5, Vessel Interactions, support a conclusion that a reduction in the number of annual speed incidents
39 would decrease the level of acoustic masking associated with fast boats within 400 yards of Southern
40 Resident killer whales compared to the No-action Alternative. Transient killer whales use passive listening
41 when foraging and sounds from their marine mammal prey may be masked by vessel sounds. The reduction
42 of vessel sound under Alternative 6 would reduce any short-term or intermittent interference from vessels
43 with transient killer whale foraging compared to the No-action Alternative.

44
45 *Habitat Use.* Because a speed limit would apply wherever the whales are found, the protection would occur
46 throughout the entire inland waters area (including along the west coast of San Juan Island) and at all times
47 of year. As under the No-action Alternative, no changes to habitat use would be expected for killer whales
48 in this region under Alternative 6 because the overall number of vessels would not be expected to change
49 from implementing a speed regulation. As described under the No-action Alternative, there is insufficient

1 information to estimate the effect of the current level of vessel traffic on use of particular feeding habitats.
2 Although under Alternative 6 there would be fewer fast moving vessels within 400 yards, there would be
3 no changes in total vessel traffic expected under Alternative 6 as compared to the No-action Alternative, or
4 changes to use of important foraging areas.
5

6 *Overall Physiological Effects on Individuals and Effects on the Status of the Population.* As described
7 above, a mandatory speed regulation under Alternative 6 is likely to reduce acoustic masking, compared to
8 the No-action Alternative. As described under the No-action Alternative and in Subsection 3.2.1.5, Vessel
9 Interactions, acoustic masking can have physiological effects on individual whales and the population as a
10 whole. It is not possible to quantify the physiological effects of the current level of acoustic masking, for
11 the reasons described under the No-action Alternative. For the same reasons, it is not possible to quantify
12 the reduction in physiological effects, and associated improvement in individual and population fitness, that
13 would result from a reduction in the number of vessels operating over 7 knots within 400 yards of the
14 whales. Nevertheless, the reduction in acoustic masking is likely to have physiological effects that increase
15 the fitness of individual whales and the population as a whole. Some level of behavioral disturbance and
16 acoustic masking from other vessel incidents (e.g., approach within 100 yards, parking in the path, in the
17 no-go zone) would likely continue at levels similar to those described under the No-action Alternative.
18

19 Because the Southern Residents are such a small population, improvements to the fitness of even a small
20 number of individual whales could lead to population level effects, improving their status. The Southern
21 Residents have had a variable growth trend in recent years and reduced vessel effects under Alternative 6 as
22 compared to the No-action Alternative would likely have a positive impact on the status of Southern
23 Resident killer whales.
24

25 *Other Marine Mammals.* A speed limit for vessels observing killer whales would apply to all killer whales,
26 including transient and off-shore killer whales, because the regulation would not distinguish among the
27 different types. Thus all killer whales would experience benefits from some reduction in fast moving
28 vessels within 400 yards. A speed limit near killer whales may also result in vessel operators slowing down
29 around other marine mammals, because such a regulation might create awareness about vessel effects on
30 marine mammals generally. The Be Whale Wise campaign, which includes information on responsible
31 viewing of all marine mammals, would continue similar to the No-action Alternative. The vessel
32 monitoring groups do not collect information on when the guidelines are not followed for other marine
33 mammals.
34

35 Compared to the No-action Alternative, a speed regulation for killer whales could reduce the number of fast
36 moving vessels near other marine mammals and reduce the risk of vessel strikes and acoustic masking
37 associated with fast vessels. This reduction cannot be quantified
38

39 Most other marine mammals that are opportunistically viewed from vessels have increasing or stable
40 population levels, including the threatened population of Steller sea lions and endangered humpback
41 whales. Reduced vessel impacts to other killer whales and marine mammals would likely have a positive
42 but small impact on their population status, which would remain similar to their status under the No-action
43 Alternative.

44 **4.2.7 Alternative 7: Keep Clear of the Whales' Path**

45
46 Under this alternative, NMFS would promulgate a regulation requiring vessels to keep clear of the whales'
47 path. The current Be Whale Wise guidelines include a recommendation to keep vessels clear of the whales'
48 path. Monitoring groups such as Soundwatch have collected several years of data, including incidents of

1 parking in the path or crossing the path of whales. Parking in the path is often the top reported incident for
2 commercial and recreational whale watching vessels (Table 3-1 and Table 3-2). There is an increasing
3 number of parking in the path incidents (62 to 330) in recent years (2003 through 2006) primarily
4 associated with Canadian commercial whale watch vessels (43 percent) followed by recreational boaters
5 (37 percent) (Table 3-2 and Figure 3-10). While all reported incidents represent minimum numbers of
6 interactions of whales and vessels, reports of parking in the path may be the most under-reported incident
7 because observers must view a sequence of vessel and whale movements rather than an instantaneous event
8 like most other incidents.

9
10 A mandatory regulation under Alternative 7 that prohibits parking in the path of whales would probably not
11 change the average and maximum numbers of vessels within 1/2 mile of killer whales compared to the No-
12 action Alternative, because the vessels primarily parking in the path under the No-action Alternative are
13 commercial whale watch vessels. While these vessels may not park in the whales' path under Alternative 7,
14 they are unlikely to stop following whales and are, therefore, likely to still be in the vicinity of whales to
15 the same degree as under the No-action Alternative. For similar reasons, the structure of the commercial
16 whale watch industry (numbers of boats, length of season, viewing hours per day) would also likely
17 continue at current levels.

18
19 A regulation prohibiting parking in the path of killer whales would be clear to whale watch operators and is
20 consistent with the current guidelines. These operators would likely know about such a regulation and
21 would have some experience in judging the travel path of the whales. Under certain conditions, however,
22 whale movements can be unpredictable (i.e., foraging whale pod spread out over a large area) even for
23 experienced whale watchers. Recreational boaters would be less likely to know about such a regulation,
24 though over time it is reasonable to expect that familiarity with the regulation would increase, particularly
25 with education and if any prosecutions are well-publicized. Recreational boaters are less likely to know
26 when whales are present and are less likely to be able to judge the travel path of the whales. Similar to
27 monitoring, enforcement actions would require information on a sequence of vessel and whale movements
28 to establish a violation.

29
30 As described in Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary
31 Guidelines, fear of penalties would likely deter whale watch operators and recreational boaters from
32 violating the regulation. This incentive would be stronger for commercial operators as violations could also
33 result in loss of reputation and associated loss of business. For these reasons, implementation of Alternative
34 7 is likely to reduce total numbers of parking in the path incidents annually, compared to the No-action
35 Alternative. Because most parking in the path incidents are committed by commercial operators and
36 increased compliance is more likely among commercial operators, Alternative 7 may result in a greater
37 reduction in the number of vessel incidents than Alternatives 2 through 6, which address incidents that are
38 mostly committed by recreational vessel operators. Other vessel incidents (e.g., approach within 100 yards,
39 fast within 400 yards, in the no-go zone) would likely continue at levels similar to those described in the
40 No-action Alternative.

41
42 *Vessel Strikes.* In July of 2005 in the waters off San Juan Island, a commercial whale watch vessel
43 repeatedly parked in the path of whales resulting in a whale hitting the vessel and sustaining minor injuries.
44 The vessel owner and operators were charged with a violation of the MMPA and settled by paying a \$1,000
45 fine. A reduction in incidents of vessels parking in the whales' path would reduce the risk of vessel strikes,
46 compared to the No-action Alternative. This would in turn reduce the risk of a killer whale being injured or
47 killed by collision with a vessel. Any injury to a member of the Southern Resident killer whale population
48 is serious because of the small population size. As under the No-action Alternative, an injury or mortality to
49 a single individual could have population level impacts, particularly for reproductive females.

1 *Behavioral Disturbance.* The reduction in the numbers of vessels parking in the path would also reduce the
2 amount of behavioral disturbance compared to the No-action Alternative. The behavioral responses of
3 killer whales to vessels parked in the whales' path are described in Subsection 3.2.1.5, Vessel Interactions.
4 Vessels in the path of the whales can interfere with important social behaviors such as prey sharing (Ford
5 and Ellis 2006) or with behaviors that generally occur in a forward path as the whales are moving, such as
6 nursing (Kriete 2007). Because monitoring groups do not record which whales are currently exposed to
7 vessel incidents, it is not possible to quantify the total number of behavioral responses, either of individual
8 whales or the population as a whole, and therefore not possible to quantify the change from the No-action
9 Alternative.

10
11 Nevertheless, the data on whale behavior and energetic costs support a conclusion that a reduction in the
12 number of incidents of behavioral disturbance would decrease the energy expended by whales, compared to
13 the No-action Alternative. The behavior budgets of the whales (that is, time allocated to various activities)
14 would more closely resemble an undisturbed state, which would include more time spent foraging. Thus,
15 compared to the No-action Alternative, in which parking in the path would continue at current levels and
16 may increase, adoption of a mandatory prohibition of this activity would likely reduce the whales'
17 energetic costs and increase the time and energy available for foraging, resting, and other important
18 functions.

19
20 *Acoustic Masking.* While some vessels may park in the path and turn off their engine while quietly waiting
21 for the whales to closely approach, others engage in more traditional leapfrogging behavior as described in
22 Subsection 3.2.1.5, Vessel Interactions. Available information suggests that sound generated by fast
23 moving vessels leapfrogging the whales in order to park in their path masks the echolocation and
24 communication of the whales. The masking effects of vessel noise on killer whale echolocation and
25 communication is described in Subsection 3.2.1.5, Vessel Interactions. While distance and speed of the
26 vessels determine potential impacts to the whales, the direction of the vessels in relation to the whales can
27 also affect the impact. Sound from vessels has the greatest potential to mask echolocation directly in front
28 of the whales (Bain and Dahlheim 1994). The data on the whales' reliance on acoustic signals to
29 communicate and forage, particularly in front of the whales, and on the range in which their hearing
30 sensitivity is greatest, support a conclusion that a reduction in the number of parking in the path incidents
31 annually would decrease the level of acoustic masking compared to the No-action Alternative.

32
33 Similar to the No-Action alternative, vessel sound is not expected to damage the hearing of Southern
34 Resident killer whales.

35
36 Transient killer whales use passive listening when foraging and sounds from their marine mammal prey
37 may be masked by vessel sounds. The reduction of vessel sound under Alternative 7 would also reduce any
38 short-term or intermittent interference from vessels with transient killer whale foraging compared to the
39 No-Action Alternative.

40
41 *Habitat Use.* A prohibition on parking in the path would apply wherever the whales are found, thus the
42 protection would occur throughout the entire inland waters area and at all times of year. In addition, these
43 effects would apply to all killer whales, including transient and off-shore killer whales, because the
44 regulation would not distinguish among the different types.

45
46 As under the No-action Alternative, no changes to habitat use would be expected for killer whales in the
47 action area under Alternative 7 because the overall number of vessels would not be expected to change
48 from implementing a regulation prohibiting parking in the path. As described under the No-action
49 Alternative, there is insufficient information to estimate the effect of the current level of vessel traffic on

1 use of particular feeding habitats. Although under Alternative 7 there would be fewer parking in the path
2 incidents, there would be no changes in total vessel traffic expected under Alternative 7 as compared to the
3 No-action Alternative, or changes to use of important foraging areas.

4
5 *Overall Physiological Effects on Individuals and Effects on the Status of the Population.* As described
6 above, a mandatory prohibition on parking in the path under Alternative 7 is likely to reduce behavioral
7 responses associated with vessel disturbance and acoustic masking, compared to the No-action Alternative.
8 Also as described under the No-action Alternative and in Subsection 3.2.1.5, Vessel Interactions, vessel
9 disturbance and acoustic masking can have physiological effects on individual whales and the population as
10 a whole. It is not possible to quantify the physiological effects of the current level of disturbance and
11 acoustic masking, for the reasons described under the No-action Alternative. For the same reasons, it is not
12 possible to quantify the reduction in physiological effects, and associated improvement in individual and
13 population fitness, that would result from a reduction in the number of parking in the path incidents.
14 Nevertheless, the reduction in behavioral disturbance and acoustic masking is likely to have physiological
15 effects that increase the fitness of individual whales and the population as a whole, compared to the No-
16 action Alternative. Some level of behavioral disturbance and acoustic masking from other vessel incidents
17 (e.g., approach within 100 yards, fast within 400 yards, in the no-go zone) would likely continue at levels
18 similar to those described in the No-action Alternative.

19
20 Because the Southern Residents are such a small population, improvements to the fitness of even a small
21 number of individual whales could lead to population level effects, improving their status. The Southern
22 Residents have had a variable growth trend in recent years and reduced vessel effects under Alternative 7 as
23 compared to the No-action Alternative would likely have a positive impact on the status of Southern
24 Resident killer whales.

25
26 *Other Marine Mammals.* Soundwatch does not record incidents of vessels parking in the path of marine
27 mammals other than Southern Resident killer whales, thus it is not possible to quantify the extent to which
28 vessels currently engage in this behavior with other marine mammals. A parking in the path prohibition for
29 killer whales would apply to all killer whales, including transient and off-shore killer whales, because the
30 regulation would not distinguish among the different types. Thus, to the extent vessels engage in this
31 behavior around other killer whales, they would experience some reduction in parking in the path incidents.
32 It is unclear whether Alternative 7 would have any effect on other marine mammals, since it is a vessel
33 behavior that may be particular to killer whales and to commercial whale watch operators. Such operators
34 are likely to know if a regulation applies to a particular species, and if they are inclined to engage in this
35 behavior, it is likely that a regulation regarding killer whales would not cause them to avoid this behavior
36 around other marine mammals. Therefore impacts would continue to occur at some unknown level, similar
37 to the No-action Alternative. Most other marine mammals that are opportunistically viewed from vessels
38 have increasing or stable population levels, including the threatened population of Steller sea lions and
39 endangered humpback whales. Reduced vessel impacts to other killer whales and marine mammals would
40 likely have a positive but small impact on their population status, which would remain similar to their
41 status under the No-action Alternative. The Be Whale Wise campaign, which includes information on
42 responsible viewing of all marine mammals, would continue as under the No-action Alternative.

43 **4.2.8 Alternative 8: Proposed Action**

44
45 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
46 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would
47 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
48 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point

1 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
2 package on marine mammals would be a combination of the impacts described under Subsections 4.2.3,
3 4.2.5, and 4.2.7, and they are summarized in Table 4-2.

4 **4.3 Listed and Non-listed Salmonids**

5 **4.3.1 Alternative 1 (No Action)**

6
7 Under the No-action Alternative, current specific voluntary guidelines would remain in place to educate
8 boaters on how to view marine wildlife without causing disturbance or harassment. Current general
9 mandatory regulations would also remain in place under the MMPA and ESA, with enforcement levels
10 likely continuing as in the past.

11
12 Without additional specific regulations, boaters would likely continue to closely approach, approach at high
13 speeds, and park in the path of the whales, interfering with the whales' ability to echolocate and efficiently
14 locate prey (Subsection 4.2.1, Alternative 1 (No Action)). With vessels impairing foraging behavior,
15 whales would continue to consume salmon at current levels, and would consume the same species that
16 currently make up their diets (Subsection 3.3, Listed and Non-listed Salmonids). Southern Resident killer
17 whales might continue to persist at their current small population level or could decline as described in
18 Subsection 4.2, Marine Mammals, under the No-action Alternative.

19
20 The ESA-listed Puget Sound Chinook ESU is approximately 64 percent of all Puget Sound Chinook stocks
21 combined, and this ESU is composed of a combination of natural-origin and hatchery-origin fish. Under the
22 No-action Alternative, harvest and hatchery production as well as recovery efforts are expected to continue
23 under current management plans. With the final recovery plan for Puget Sound in place, many actions are
24 managed to increase population abundance and productivity of listed salmon ESUs and achieve a trend to
25 recovery and this would continue under the No-action Alternative. Federal harvest, hatchery, habitat, and
26 hydropower actions are subject to section 7 consultation under the ESA to analyze effects and to ensure that
27 actions will not jeopardize the continued existence of both listed salmon ESUs and Southern Resident killer
28 whales. Under the No-action Alternative, there would be no change to these processes.

29
30 Thus under the No-action Alternative, killer whale predation would likely continue to have the same level
31 of impact, or possibly a reduced impact, on listed and non-listed salmonid populations, including listed
32 Puget Sound Chinook and Hood Canal summer-run chum, two primary prey species for Southern Resident
33 killer whales (Subsection 3.3, Listed and Non-listed Salmonids).

34 **4.3.2 Action Alternatives 2 through 8**

35
36 Each of the action alternatives may have the potential for effects on listed and non-listed salmonids that are
37 the primary prey for killer whales. A reduction in vessel effects would be expected to reduce interference
38 with foraging activity. The action alternatives would increase the amount of time the Southern Resident
39 killer whales spend foraging and improve their foraging effectiveness, which would allow them to locate
40 and catch fish more easily. This could result in an increase in the number of listed and non-listed salmon
41 eaten by the whales, particularly Chinook, which is their primary diet (Subsection 3.3, Listed and Non-
42 listed Salmonids).

43
44 Over the long-term, better foraging conditions could contribute to an increase in the Southern Resident
45 killer whale population compared to the No-action Alternative. An increase in the number of killer whales
46 could result in increased consumption of salmonids as compared to the No-action Alternative. The 2008

1 summer census of Southern Residents counted 85 whales and any significant population increases would
2 occur gradually over many years.

3
4 Because of data limitations it is not possible at this time to quantify potential impacts of increased killer
5 whale foraging efficiency or population growth on the numbers of Chinook present in inland waters
6 (Subsection 3.3, Listed and Non-listed Salmonids) or of other listed and non-listed salmonids.

7
8 The ESA-listed Puget Sound Chinook ESU is approximately 64 percent of all Puget Sound Chinook stocks
9 combined, and this ESU is composed of a combination of natural-origin and hatchery-origin fish. Under
10 Alternatives 2 through 8, harvest and hatchery production as well as recovery efforts are expected to
11 continue under current management plans, similar to the No-action Alternative. With the final recovery
12 plan for Puget Sound in place, many actions are managed to increase population abundance and
13 productivity of listed salmon ESUs and to achieve a trend to recovery, and this would continue under each
14 alternative similar to the No-action Alternative. Federal harvest, hatchery, habitat, and hydropower actions
15 are subject to section 7 consultation under the ESA to analyze effects and to ensure that actions will not
16 jeopardize the continued existence of both listed salmon ESUs and Southern Resident killer whales. Under
17 Alternatives 2 through 8, there would be no change to these processes.

18
19 As information on potential increases in the Southern Resident killer whale population becomes available
20 over the long term, this information can be included in ESA section 7 consultations. With more specific
21 data in the future, it may be possible to quantify predation on specific listed salmon ESUs and to evaluate
22 whether predation is a limiting factor.

23 **4.4 Socioeconomics**

24
25 As described in Subsection 3.4, Socioeconomics, commercial whale watching is the only industry targeting
26 Southern Resident killer whales. While other commercial vessels including fishing, ferries, tug boats,
27 cargo, and tanker vessels do not target or follow the Southern Residents, they do operate in the same waters
28 used by the whales. As described in Subsection 1.6.4, Exceptions, vessels in shipping lanes and treaty
29 fishing vessels engaged in fishing would be exempt from any of the regulations under the action
30 alternatives. With these exceptions in place there would be only negligible economic impacts to these
31 sectors under each of the alternatives. This section therefore focuses on impacts to the commercial whale
32 watch industry and includes information on commercial fishing, shipping, and ferries as appropriate.
33 Commercial shipping impacts, other than socioeconomic, are addressed under transportation analyses
34 (Subsection 4.9). Private whale watching vessels and recreational fishing impacts are addressed under
35 Subsection 4.5, Recreation.

36
37 For the analysis of socioeconomic effects, Industrial Economics, Incorporated (IEC) (2008) relied on recent
38 data regarding violations that occur under the existing voluntary guidelines (Table 3-1 and Table 3-2) to
39 estimate, on average, the number of potential violations of the various regulations that would occur under
40 the No-action Alternative. For each of the action alternatives, IEC assumed that the effect would be that
41 those vessel operators would have to either change their behavior and adhere to the mandatory regulation,
42 or face penalties. For those choosing to violate the regulations and face penalties, it is possible that
43 passengers on those trips will be exposed to law enforcement actions, including possibly having a trip
44 suspended. The economic effect of that exposure is discussed in this subsection, while the recreational
45 effect is discussed below under Subsection 4.5, Recreation.

46
47 Data were only available to estimate a total number of commercial whale watching trips for U.S.-based
48 commercial whale watch companies for comparison between the No-action and action Alternatives. This is

1 an underestimate of total number of whale watch trips, which also includes Canadian commercial whale
2 watch trips. As discussed under Subsection 4.2, Marine Mammals, it is not possible to estimate what
3 proportion of those expected to violate voluntary guidelines under the No-action Alternative would adhere
4 to mandatory regulations under the action alternatives, but it is reasonable to expect that mandatory
5 regulations would result in greater compliance, particularly from commercial whale watch operators, for
6 the reasons described in Subsection 4.1.2, General Effects of Enforceable Regulations Compared to
7 Voluntary Guidelines.

8 **4.4.1 Alternative 1 (No Action)**

9
10 Under the No-action Alternative, current specific voluntary guidelines would remain in place to educate
11 boaters on how to view marine wildlife without causing disturbance or harassment. Current general
12 mandatory regulations would also remain in place under the MMPA and ESA, with enforcement levels
13 likely continuing as in the past. Subsection 4.2.1, Alternative 1 (No Action), describes the patterns of
14 expected future compliance by different types of vessels if the current specific guidelines are continued into
15 the future. Specific estimates of future non-compliance under the No-action Alternative are based on an
16 average of this pattern by vessel type, and contained in IEC (2008).

17
18 The commercial whale watching industry grew rapidly in the 1970s to 1990s and has leveled off in recent
19 years (Subsection 3.4.2, Whale Watch Industry in Puget Sound). The stability of the industry observed in
20 recent years is consistent with market saturation, so increased demand for whale watching and further
21 growth would not be expected. Under the No-action Alternative the number of companies and vessels
22 would likely continue at the current stable level with the same number of jobs (205) and same economic
23 contribution to the Puget Sound economy (\$18.4 million dollars) (Subsection 3.4.2, Whale Watch Industry
24 in Puget Sound). Based on data from 2006 (Russell and Schneidler, In Preparation), in the U.S. the 19
25 companies operating 22 vessels were estimated to offer approximately 6,264 trips per year.

26
27 Southern Resident killer whales might continue to persist at their current small population level or, with
28 continued vessel disturbance, they could decline as described in Subsection 4.2, Marine Mammals, under
29 the No -action Alternative. In the long term, opportunities for commercial whale watching could be reduced
30 if there were fewer whales. This would likely occur over a long period of time and adjustments by the
31 industry would be gradual. Commercial tours could continue with less of a focus on the Southern Resident
32 whales and more focus on other more abundant marine species and the scenic aspects of the inland waters
33 of Washington. There is no information available to quantify what proportion of the commercial whale
34 watching industry would be affected by a long-term decline in the number of Southern Resident killer
35 whales.

36
37 Commercial fishing occurs throughout the inland waters of Washington (Subsection 3.4.4, Commercial
38 Fisheries in Inland Waters of Washington), including along the west side of San Juan Island and
39 occasionally within the current voluntary no-go zone. Under the No-action Alternative, commercial fishing
40 would continue at current levels, in the same locations and with the same economic value (\$646 million in
41 inland waters) (Subsection 3.4.1, Overview of Puget Sound Economy).

42
43 Under the No-action Alternative recreational boating and fishing would continue at current levels
44 (Subsection 3.4.1, Overview of Puget Sound Economy) and no reductions in the overall number of boats on
45 the water would be expected. The economic value to the local economy from recreational boating and
46 fishing would not be expected to change under the No-action Alternative (Subsection 3.4.1, Overview of
47 Puget Sound Economy). Effects on non-economic recreational opportunities and experience are discussed
48 further below under Subsection 4.5, Recreation.

1 **4.4.2 Alternative 2: 100 Yard Approach Regulation**

2
3 Under Alternative 2, NMFS would adopt a mandatory regulation prohibiting all vessels from approaching
4 within 100 yards of killer whales, except vessels in shipping lanes and commercial and treaty fishing
5 vessels actively engaged in fishing. Those operating non-exempt vessels would need to stay 100 yards
6 away from killer whales or be subject to fines and other penalties. IEC (2008) relied on recent incidents to
7 estimate that there would be about 15 commercial whale watch trips each year, out of a total of 6,264 U.S.
8 trips per year, where the operator would face this choice, compared to the No-action Alternative.
9

10 For those operators who choose to adhere to the mandatory regulation, the impact would be negligible. The
11 vast majority of whale watch trips under the No-action Alternative would comply with a voluntary 100
12 yard approach guideline. Given that the whale watch industry has continued to grow and presumably reach
13 a saturation point with voluntary guidelines in place (including a 100 yard approach guideline) and largely
14 observed, it is reasonable to expect that adopting a mandatory approach regulation would not affect demand
15 for whale watch trips or revenues of the whale watch industry.
16

17 Based on an expected 15 violations under the No-action Alternative, and 55 passengers per trip,
18 approximately 825 passengers (out of a total of 500,000 passengers per year) could be exposed to an
19 enforcement action. For those operators who choose to violate the mandatory regulations, the economic
20 impacts could include fines associated with violating mandatory regulations, and loss of business, if the
21 violations are publicized. Although the individual companies committing the violations could have reduced
22 revenue from fewer customers, these customers would probably choose an alternate operator, so no impacts
23 to the industry as a whole would be expected. Even if exposure to an enforcement action deterred some
24 customers entirely, with only 0.17 percent of all passengers potentially being exposed to an enforcement
25 action, that exposure is likely to have minimal effects on commercial whale watch operator revenues.
26 Moreover, since respect for wildlife is a likely motivator for customers to seek whale watching experiences
27 (Subsection 3.4.2, Whale Watch Industry in Puget Sound), publicity about a small number of enforcement
28 actions is not a likely deterrent to customers.
29

30 These impacts to trips and passengers would be extremely small and would not be expected to impact the
31 demand for whale watching, the number of companies or vessels, the jobs associated with the industry, or
32 the overall value on the local economy of the commercial whale watch industry or local tourism in the
33 Puget Sound area as described under the No-action Alternative. As described in Subsection 4.2.2,
34 Alternative 2: 100 Yard Approach Regulation, Alternative 2 could reduce vessel impacts and increase the
35 fitness of Southern Resident killer whales. An increase in the Southern Resident killer whale population
36 would support the commercial whale watch industry in the long term and allow for continued stability in
37 the industry.
38

39 Commercial cargo ships in shipping lanes and commercial and treaty fishing vessels actively engaged in
40 setting, tending or retrieving fishing gear would be exempt from an approach regulation, however, fishing
41 vessels transiting to and from fishing areas would be subject to the 100 yard approach regulation. Bain
42 (2007) found that of the vessels he observed within 100 yards, none of them were commercial, tribal
43 fishing, or freight vessels. His study areas were not located within ferry routes.
44

45 Based on the small numbers of approach incidents by other commercial vessels reported by Soundwatch,
46 IEC (2008) estimated that in only four trips per year would commercial shipping operators (if outside of the
47 shipping lane) or fishing vessel operators (if not tending gear) be required to alter course or face penalties
48 as a result of a 100 yard approach regulation under Alternative 2, as compared to the No-action Alternative.
49 Average annual transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over

1 165,000 each year (Table 3-9 and Table 3-10). Slight course changes to remain at least 100 yards from
2 whales for approximately four vessel trips per year would be negligible and would not impact shipping or
3 commercial fishing fleets for these multi-million dollar industries as compared to the No-action
4 Alternative. Alternatively, if vessel operators instead choose to violate a mandatory 100 yard approach
5 regulation, associated fines and penalties for four incidents would be a negligible fraction of the current
6 economic value of these industries.

7
8 Under Alternative 2 a small number of recreational boaters and fishers could be inconvenienced as
9 described under Subsection 4.5, Recreation. The overall number of boats on the water (as described in
10 Subsection 4.1.4, Effects on Southern Resident Killer Whale Critical Habitat) and the economic value to
11 the local economy from recreational boating and fishing would not be expected to change in comparison to
12 the No-action Alternative.

13 **4.4.3 Alternative 3: 200 Yard Approach Regulation**

14
15 Under Alternative 3, NMFS would promulgate a mandatory 200 yard approach regulation, with the same
16 exceptions as under Alternative 2. There are little data available to evaluate how many vessels currently
17 approach within 200 yards, because it is acceptable under current guidelines and incidents are not reported.
18 Thus it was not possible to estimate under the No-action Alternative how many commercial whale watch
19 operators would likely operate within 200 yards of whales. For this reason, and because the current
20 guideline is only 100 yards, NMFS assumed that all commercial whale watch operators would need to
21 change their procedures to accommodate a new 200 yard approach rule. The 19 U.S. companies and 22
22 Canadian companies that make up the whale watching fleet of 76 vessels (Subsection 3.4.2, Whale Watch
23 Industry in Puget Sound) would have to train their personnel to remain 200 yards from the whales. Some
24 slight costs may be associated with such training.

25
26 It is likely that whale watch operators would adhere to a 200 yard approach regulation in a similar fashion
27 to the 100 yard guideline, while a small number may get closer by design or by accident, as they would
28 with a voluntary guideline under the No-action Alternative. It is possible that a viewing distance greater
29 than 100 yards would hurt the economic viability of the commercial whale watch industry. Viewing whales
30 from a distance of 200 yards may be less attractive to some individuals interested in participating in
31 commercial whale watch trips. However, there is no evidence to support this possibility. There is evidence,
32 however, that the economic viability of the industry would not be affected by an increased viewing
33 distance.

34
35 Several studies have assessed the value that whale watching participants have for wildlife viewing and
36 provide data on the factors that lead to an enjoyable or memorable whale watching trip, and how satisfied
37 participants are with various aspects of their trip (Subsection 3.5, Whale Watch Industry in Puget Sound).
38 Survey results of whale watch participants indicate that proximity to the whales is not the most important
39 part of the whale watchers' experience and that seeing whales and whale behavior was much more
40 important (Subsection 3.5, Whale Watch Industry in Puget Sound). In addition one study found participants
41 were most satisfied with the respect their vessel operators gave the whales; the number of whales, whale
42 behavior, and learning also received higher satisfaction than the distance from which whales were
43 observed; and the participants strongly agreed with statements related to protection of the whales
44 (Subsection 3.5, Whale Watch Industry in Puget Sound).

45
46 Thus, while it is possible that a mandatory 200 yard regulation could reduce whale watch revenues
47 compared to the No-action Alternative, these reductions may be minimized by educating whale watch
48 participants regarding the protective nature of a 200 yard viewing distance. In addition, whale watch

1 companies have a number of options to increase satisfaction from viewing whales at 200 yards rather than
2 100 yards, such as providing binoculars, encouraging the use of telephoto lenses for photography, and
3 using platforms that provide a better vantage point higher from the surface of the water.
4

5 Any impacts to the whale watch industry would be small, and based on the information above would not be
6 expected to impact the demand for whale watching, the number of companies or vessels, the jobs
7 associated with the industry, or the overall value on the local economy of the commercial whale watch
8 industry or local tourism in the Puget Sound area, compared to the No-action Alternative. As described in
9 Subsection 4.2.3, Alternative 3: 200 Yard Approach Regulation, Alternative 3 could reduce vessel impacts
10 and increase the fitness of Southern Resident killer whales. An increase in the Southern Resident killer
11 whale population would support the commercial whale watch industry in the long term and allow for
12 continued stability in the industry.
13

14 Commercial cargo ships in the shipping lanes and commercial and treaty fishing vessels actively engaged
15 in setting, tending, or retrieving fishing gear would be exempt from an approach regulation; however,
16 fishing vessels transiting to and from fishing areas would be subject to the 200 yard approach regulation.
17 While IEC (2008) was not able to estimate specific numbers of commercial fishing, tug boat, ferry or
18 shipping trips that would be affected each year because Soundwatch does not record approaches at 200
19 yards, Bain (2007) found that of the vessels he observed within 200 yards, none of them were commercial,
20 tribal fishing, or freight vessels. His study areas were not located within ferry routes.
21

22 IEC estimated that only four trips per year of commercial shipping or fishing vessels would be affected by
23 a 100 yard approach regulation compared to the No-action Alternative and it is likely that similarly low
24 numbers of commercial trips would be affected by a 200 yard rule based on the information above.
25 Average annual transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over
26 165,000 each year (Table 3-9 and Table 3-10). The four slight course changes IEC estimated would be
27 necessary compared to the No-action Alternative would not impact economic conditions related to
28 shipping, ferries, or commercial fishing fleets for these multi-million dollar industries and transportation
29 services. Alternatively, if vessel operators instead choose to violate a mandatory 200 yard approach
30 regulation, associated fines and penalties for four incidents would be a negligible fraction of the current
31 economic value of these industries.
32

33 Under Alternative 3, a small number of recreational boaters and fishers could be inconvenienced as
34 described under Subsection 4.5, Recreation. The overall number of boats on the water (as described in
35 Subsection 4.1.4, Effects on Southern Resident Killer Whale Critical Habitat) and the economic value to
36 the local economy from recreational boating and fishing would not be expected to change in comparison to
37 the No-action Alternative.

38 **4.4.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

39
40 Under Alternative 4, NMFS would promulgate a mandatory regulation prohibiting vessels from entering
41 the current voluntary no-go zone from May through September, except treaty fishing vessels actively
42 engaged in fishing. Those operating non-exempt vessels would need to stay outside the no-go zone or be
43 subject to fines and other penalties. IEC (2008) relied on recent incidents (Table 3-1 and Table 3-2) to
44 estimate that there would be about 61 commercial whale watch trips each year, out of a total of 6,264 U.S.
45 trips per year, where the operator would face this choice, compared to the No-action Alternative (Table 3-1
46 and Table 3-2).
47

1 For those operators who choose to adhere to the mandatory regulation, the impact would be negligible. The
2 vast majority of whale watch trips under the No-action Alternative would comply with a voluntary no-go
3 zone, and there is no evidence that such compliance affects revenue. Given that the whale watch industry
4 has continued to grow and presumably reach a saturation point with voluntary guidelines in place
5 (including a voluntary no-go zone) and largely observed, it is reasonable to expect that adopting a
6 mandatory approach regulation would not affect demand for whale watch trips or revenues of the whale
7 watch industry.

8
9 Based on an expected 61 violations under the No-action Alternative, and 55 passengers per trip,
10 approximately 3,355 passengers (out of a total of 500,000 passengers per year) could be exposed to an
11 enforcement action. For those operators who choose to violate the mandatory regulations, the economic
12 impacts could include fines associated with violating mandatory regulations, and loss of business, if the
13 violations are publicized. Although the individual companies committing the violations could have reduced
14 revenue from fewer customers, these customers would probably choose an alternate operator, so no impacts
15 to the industry as a whole would be expected. Even if exposure to an enforcement action deterred some
16 customers entirely, with only 0.7 percent of all passengers potentially being exposed to an enforcement
17 action, that exposure is likely to have minimal effects on commercial whale watch operator revenues.
18 Moreover, since respect for wildlife is a likely motivator for customers to seek whale watching experiences
19 (Subsection 3.4.2, Whale Watch Industry in Puget Sound), publicity about a small number of enforcement
20 actions is not a likely deterrent to customers.

21
22 Any impacts to the whale watch industry would be small and would not be expected to impact the demand
23 for whale watching, the number of companies or vessels, the jobs associated with the industry or the overall
24 value to the local economy of the commercial whale watch industry or local tourism in the Puget Sound
25 area as described under the No-action Alternative. As described in Subsection 4.2.4, Alternative 4:
26 Protected Area – Current Voluntary No-go Zone, Alternative 4 could reduce vessel impacts and increase
27 the fitness of Southern Resident killer whales. An increase in the Southern Resident killer whale population
28 would support the commercial whale watch industry in the long-term and allow for continued stability in
29 the industry.

30
31 The current no-go zone overlaps with a boat launch in Small Pox Bay located within the San Juan County
32 Park. The launch is a free public launch for motorized vessels and kayaks. Several commercial kayak
33 companies launch at the San Juan County Park and in 2007 the park tracked approximately 5,000
34 individual kayak company guests using the launch (San Juan County Economic Development Council
35 2008). Many of the kayak companies advertise whale watching as part of their kayak tours. Commercial
36 kayak trips would have to relocate to other launches, some of which may charge fees. If whale watching is
37 the primary objective for commercial kayakers, they would likely be launching from sites that are greater
38 distances from core whale areas and their opportunities for seeing whales would likely be reduced. The
39 companies pay fees to the park for use of the launch area. In 2007 the park collected \$38,500 from the
40 commercial kayak companies and this revenue could be affected under Alternative 4.

41
42 The current no-go zone overlaps with commercial fishing areas, particularly in summer months (July
43 through August) when sockeye and pink salmon fisheries are open. Commercial fishing vessels (non-
44 treaty) would not be exempt from the protected area. This commercial fishing fleet has been greatly
45 reduced in recent years due to factors such as decreased number of fishing days allowed and high costs of
46 fuel and has about 150 vessels participating. During aerial surveys of vessels in all San Juan County waters,
47 observers counted 50 to 60 commercial fishing vessels per day (Table 3-12). The no-go zone under
48 Alternative 4 would be a relatively small part of fishing area 7 (3.8 square miles out of over 1,000 square
49 miles).

1 While some fishing vessels fish within the current voluntary no-go zone, there are numerous other areas
2 available to fishing vessels just outside the protected area or in other locations. Most of the commercial
3 fishing fleet already utilizes other areas congregating near Point Roberts and in Rosario Strait (Figure 3-
4 13). A small number of commercial fishing vessels would be inconvenienced by having to relocate to areas
5 outside the protected area and could incur small economic costs for fuel and time to reach an alternate
6 destination depending on their home port, compared to the No-action Alternative. In addition, it might be
7 inconvenient for some vessels to travel around the no-go zone to reach certain fishing areas, although the
8 diversion would be minimal. Thus, while a small number of commercial fishing vessels could be displaced
9 from the protected area when compared to the No-action Alternative, fishing quotas and the economic
10 value of the fishery in Puget Sound would not be impacted. Alternatively, if vessel operators instead choose
11 to violate a mandatory no-go zone, associated fines and penalties would be a negligible fraction of the
12 current economic value of commercial fishing.

13
14 The no-go zone under Alternative 4 would not overlap with shipping lanes or any ferry routes (IEC 2008)
15 and would therefore have no impact on these economic sectors. The no-go zone would be in U.S. waters
16 and would not be immediately adjacent to Canadian waters and would not affect vessels in Canadian waters
17 or crossing the border into U.S. waters.

18
19 Under Alternative 4 a small number of recreational boaters and fishers could be inconvenienced as
20 described under Subsection 4.5, Recreation. The overall number of boats on the water (as described in
21 Subsection 4.1.4, Effects on Southern Resident Killer Whale Critical Habitat) and the economic value to
22 the local economy from recreational boating and fishing would not be expected to change in comparison to
23 the No-action Alternative.

24 **4.4.5 Alternative 5: Protected Area – Expanded No-go Zone**

25
26 Under Alternative 5 NMFS would promulgate a regulation requiring vessels to remain outside of a no-go
27 zone 1/2 mile wide from Mitchell Bay to Eagle point, from May through September, except treaty fishing
28 vessels actively engaged in fishing. The voluntary no-go zone under the No-action Alternative extends 1/4
29 mile from shore, from Mitchell Bay to Eagle Point, with a 1/2 mile zone around Lime Kiln Point, and
30 encompasses 3.8 square miles. In comparison, the expanded mandatory no-go zone would extend 1/2 mile
31 from shore, from Mitchell Bay to Eagle Point and encompass 6.2 square miles. There are little data
32 available to evaluate how many vessels currently operate between 1/4 mile and 1/2 mile in this area. Thus it
33 was not possible to estimate under the No-action Alternative how many commercial whale watch operators
34 would likely operate within an expanded no-go zone. IEC (2008) relied on recent incidents of vessels
35 inshore of whales to estimate that there would be about 58 commercial whale watch trips each year, out of
36 a total of 6,264 U.S. trips per year, where the operator would need to change their operations to remain
37 outside of the expanded no-go zone or be subject to fines and other penalties. If these trips are added to the
38 number of trips affected under Alternative 4, 119 trips would face this choice. Based on an expected 119
39 violations under the No-action Alternative, and 55 passengers per trip, approximately 6,545 passengers (out
40 of a total of 500,000 passengers per year) could be exposed to an enforcement action.

41
42 Because the current guideline is for a smaller no-go zone, all commercial whale watch operators may need
43 to change their procedures to accommodate the expanded no-go zone. The 19 U.S. companies and 22
44 Canadian companies that make up the whale watching fleet of about 76 vessels (Subsection 3.4.2, Whale
45 Watch Industry in Puget Sound) would have to train their personnel to remain outside the new zone. Some
46 slight costs may be associated with such training.

47

1 It is likely that whale watch operators would adhere to a 1/2 mile no-go zone in a similar fashion to the 1/4
2 mile no-go zone, while a small number may enter the zone by design or by accident, as they would with a
3 voluntary zone under the No-action Alternative. It is possible that potential customers may be less
4 interested in participating in commercial whale watch trips if vessels must remain outside the expanded no-
5 go zone, compared to the interest in viewing whales outside the voluntary no-go zone under the No-action
6 Alternative. There is evidence, however, that the economic viability of the industry would not be affected
7 by an increased viewing distance, for the same reasons as described above under Subsection 4.4.3.,
8 Alternative 3: 200 Yard Approach Regulation. Potential impacts on customer satisfaction could be
9 minimized in the same fashion as described under Alternative 3.

10
11 Any impacts to the whale watch industry would be small and, based on the information above, impacts
12 would not be expected on the demand for whale watching, the number of companies or vessels, the jobs
13 associated with the industry, or the overall value to the local economy of the commercial whale watch
14 industry or local tourism in the Puget Sound area, compared to the No-action Alternative. As described in
15 Subsection 4.2.5, Alternative 5: Expanded No-Go Zone, Alternative 5 could reduce vessel impacts and
16 increase the fitness of Southern Resident killer whales. An increase in the Southern Resident killer whale
17 population would support the commercial whale watch industry in the long term and allow for continued
18 stability in the industry.

19
20 Commercial fishing vessels (non-treaty) would not be exempt from the protected area. Expected impacts
21 would be the same or slightly greater than those described under Alternative 4, compared to the No-action
22 Alternative. This is because the 40 percent larger protected area under Alternative 5 compared to the no-go
23 zone area under Alternative 4 would result in a slightly greater number of fishing vessels displaced. While
24 a small number of commercial fishing vessels could be displaced from the protected area when compared
25 to the No-action Alternative, fishing quotas and the economic value of the fishery in Puget Sound would
26 not be impacted. As described under Alternative 4, socioeconomic impacts to commercial fishing vessels
27 would be greater than under the No-Action Alternative because a small number of commercial fishing
28 vessels would be inconvenienced by having to relocate to areas outside the protected area and could incur
29 small economic costs for fuel and time to reach an alternate destination depending on their home port,
30 compared to the No-action Alternative. In addition, it might be inconvenient for some vessels to travel
31 around the no-go zone to reach certain fishing areas, although the diversion would be minimal.
32 Alternatively, if vessel operators instead choose to violate a mandatory no-go zone, associated fines and
33 penalties would be a negligible fraction of the current economic value of the fishing industry.

34
35 As under Alternative 4, the 1/2 mile no-go zone under Alternative 5 would not overlap with shipping lanes
36 or any ferry routes (IEC 2008) and would therefore have no impact on these economic sectors, or vessels in
37 Canadian waters.

38
39 Under Alternative 5 a small number of recreational boaters and fishers could be inconvenienced as
40 described under Subsection 4.5, Recreation. The overall number of boats on the water (as described in
41 Subsection 4.1.4, Effects on Southern Resident Killer Whale Critical Habitat), and the economic value to
42 the local economy from recreational boating and fishing would not be expected to change in comparison to
43 the No-action Alternative.

44 **4.4.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

45
46 Under Alternative 6, NMFS would adopt a mandatory regulation requiring all vessels to reduce their speed
47 to 7 knots within 400 yards of killer whales, except vessels in shipping lanes and commercial and treaty
48 fishing vessels actively engaged in fishing. Those operating non-exempt vessels would need to reduce

1 speed to below 7 knots within 400 yards of killer whales or be subject to fines and other penalties. IEC
2 (2008) relied on recent incidents to estimate that there would be about 13 commercial whale watch trips
3 each year, out of a total of 6,264 U.S. trips per year, where the operator would face this choice, compared
4 to the No-action Alternative.

5
6 For those operators who choose to adhere to the mandatory regulation, the impact would be negligible. The
7 vast majority of whale watch trips under the No-action Alternative would comply with a voluntary speed
8 guideline, and there is no evidence that such compliance affects revenue. Given that the whale watch
9 industry has continued to grow and presumably reach a saturation point with voluntary guidelines in place
10 (including a speed guideline) and largely observed, it is reasonable to expect that adopting a mandatory
11 approach regulation would not affect demand for whale watch trips or revenues of the whale watch
12 industry.

13
14 Based on an expected 13 violations under the No-action Alternative, and 55 passengers per trip,
15 approximately 715 passengers (out of a total of 500,000 passengers per year) could be exposed to an
16 enforcement action annually. For those operators who choose to violate the mandatory regulations, the
17 economic impacts could include fines associated with violating mandatory regulations, and loss of
18 business, if the violations are well-publicized. Although the individual companies committing the
19 violations could have reduced revenue from fewer customers, these customers would probably choose an
20 alternate operator, so no impacts to the industry as a whole would be expected. Even if exposure to an
21 enforcement action deterred some customers entirely, with only 0.1 percent of all passengers potentially
22 being exposed to an enforcement action, that exposure is likely to have minimal effects on commercial
23 whale watch operator revenues. Moreover, since respect for wildlife is a likely motivator for customers to
24 seek whale watching experiences (Subsection 3.4.2, Whale Watch Industry in Puget Sound), publicity
25 about a small number of enforcement actions is not a likely deterrent to customers.

26
27 Any impacts to the whale watch industry would be small and would not be expected to impact the demand
28 for whale watching, the number of companies or vessels, the jobs associated with the industry or the overall
29 value to the local economy of the commercial whale watch industry or local tourism in the Puget Sound
30 area as described under the No-action Alternative. As described in Subsection 4.2.6, Alternative 6: Speed
31 Limit of 7 Knots Within 400 Yards of Killer Whales, Alternative 6 could reduce vessel impacts and
32 increase the fitness of Southern Resident killer whales. An increase in the Southern Resident killer whale
33 population would support the commercial whale watch industry in the long-term and allow for continued
34 stability in the industry.

35
36 Commercial and treaty fishing vessels actively engaged in setting, tending, or retrieving fishing gear would
37 be exempt from a speed regulation and would likely be moving slowly during these operations. Fishing
38 vessels transiting to and from fishing areas would, however, be subject to the speed regulation.

39
40 Bain (2007) found that of the vessels he observed within 400 yards of the whales, none of them were
41 freight vessels and only two were commercial fishing vessels. Counts of vessels in San Juan County from
42 aerial surveys (Dismukes/MRC 2007) were low for ferry and cargo ships (three to four), but higher for
43 commercial fishing vessels (50 to 60) (Table 3-12). Based on the small numbers of incidents of exceeding 7
44 knots within 400 yards of whales by these types of commercial vessels under the No-action Alternative,
45 IEC (2008) estimated that only four trips per year of commercial shipping or fishing vessels would be
46 affected by a speed regulation compared to the No-action Alternative. Average annual transits through
47 Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over 165,000 each year (Table 3-9 and
48 Table 3-10). If safe to do so, slight speed reductions to remain under 7 knots when within 400 yards of the
49 whales for approximately four vessel trips per year would be minimal and would not impact economic

1 conditions related to shipping or commercial fishing fleets for these multi-million dollar industries.
2 Alternatively, if vessel operators instead choose to violate a mandatory speed regulation, associated fines
3 and penalties for four incidents would be a negligible fraction of the current economic value of these
4 industries.

5
6 Under Alternative 6 a small number of recreational boaters and fishers could be inconvenienced as
7 described under Subsection 4.5, Recreation. The overall number of boats on the water (as described in
8 Subsection 4.1.4, Effects on Southern Resident Killer Whale Critical Habitat) and the economic value to
9 the local economy from recreational boating and fishing would not be expected to change in comparison to
10 the No-action Alternative.

11 **4.4.7 Alternative 7: Keep Clear of the Whales' Path**

12
13 Under Alternative 7, NMFS would adopt a mandatory regulation requiring all vessels to avoid parking in
14 the path of killer whales, except vessels in shipping lanes and commercial and treaty fishing vessels
15 actively engaged in fishing. Those operating non-exempt vessels would need to avoid parking in the
16 whales' path or be subject to fines and other penalties. IEC (2008) relied on recent incidents to estimate that
17 there would be about 137 commercial whale watch trips each year, out of a total of 6,264 U.S. trips per
18 year, where the operator would face this choice, compared to the No-action Alternative.

19
20 For those operators who choose to adhere to the mandatory regulation, the impact would be negligible. The
21 vast majority of whale watch trips under the No-action Alternative would comply with a voluntary
22 guideline to stay clear of the whales' path, and there is no evidence that such compliance affects revenue.
23 Given that the whale watch industry has continued to grow and presumably reach a saturation point with
24 voluntary guidelines in place (including a keep clear of the whales' path guideline) and largely observed, it
25 is reasonable to expect that adopting a mandatory approach regulation would not affect demand for whale
26 watch trips or revenues of the whale watch industry.

27
28 Based on an expected 137 violations under the No-action Alternative, and 55 passengers per trip,
29 approximately 7,535 passengers (out of a total of 500,000 passengers per year) could be exposed to an
30 enforcement action. For those operators who choose to violate the mandatory regulations, the economic
31 impacts could include fines associated with violating mandatory regulations, and loss of business, if the
32 violations are publicized. Although the individual companies committing the violations could have reduced
33 revenue from fewer customers, these customers would probably choose an alternate operator, so no impacts
34 to the industry as a whole would be expected. Even if exposure to an enforcement action deterred some
35 customers entirely, with only 1.5 percent of all passengers potentially being exposed to an enforcement
36 action, that exposure is likely to have minimal effects on commercial whale watch operator revenues.
37 Moreover, since respect for wildlife is a likely motivator for customers to seek whale watching experiences
38 (Subsection 3.4.2, Whale Watch Industry in Puget Sound), publicity about enforcement actions is not a
39 likely deterrent to customers.

40
41 Any impacts to the whale watch industry would be small and would not be expected to impact the demand
42 for whale watching, the number of companies or vessels, the jobs associated with the industry or the overall
43 value to the local economy of the commercial whale watch industry or local tourism in the Puget Sound
44 area as described under the No-action Alternative. As described in Subsection 4.2.7, Alternative 7: Keep
45 Clear of the Whales' Path, Alternative 7 could reduce vessel impacts and increase the fitness of Southern
46 Resident killer whales. An increase in the Southern Resident killer whale population would support the
47 commercial whale watch industry in the long term and allow for continued stability in the industry.

1 Other commercial vessels, such as large cargo ships and tankers, and fishing vessels, move in predictable
2 paths themselves, do not engage in stopping to watch whales and do not reposition or park in the path of the
3 whales, therefore, this regulation would have very little impact on these commercial sectors compared to
4 the No-action Alternative. Bain (2007) found that of the vessels he observed within 400 yards of the
5 whales, none of them were freight vessels and only two were commercial fishing vessels. Based on the
6 small numbers of parking in the path incidents by other commercial vessels reported by Soundwatch, IEC
7 (2008) estimated that only two trips per year of commercial shipping or fishing vessels would be affected
8 by a parking in the path regulation compared to the No-action Alternative. Average annual transits through
9 Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over 165,000 each year (Table 3-9 and
10 Table 3-10). Slight course adjustments to remain out of the whales' path for approximately two vessel trips
11 per year would be minimal and would not impact economic conditions related to shipping or commercial
12 fishing fleets for these multi-million dollar industries. Alternatively, if vessel operators instead choose to
13 violate a mandatory regulation to keep clear of the whales' path, associated fines and penalties for two
14 incidents would be a negligible fraction of the current economic value of these industries.

15
16 Under Alternative 7 a small number of recreational boaters and fishers could be inconvenienced as
17 described under Subsection 4.5, Recreation. The overall number of boats on the water (Subsection 4.1.4,
18 Effects on Southern Resident Killer Whale Critical Habitat) and the economic value to the local economy
19 from recreational boating and fishing would not be expected to change in comparison to the No-action
20 Alternative.

21 **4.4.8 Alternative 8: Proposed Action**

22
23 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
24 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would
25 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
26 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point
27 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
28 package on socioeconomics would be a combination of the impacts described under Subsections 4.4.3,
29 4.4.5, and 4.4.7, and they are summarized in Table 4-2. The number of commercial whale watch
30 participants affected would be between 14,905 (on 271 trips) and the total number of whale watch
31 participants, which is approximately 500,000 per year.

32 **4.5 Recreation**

33
34 As described in Subsection 3.5, Recreation, about 390,000 people participate in recreation activities in the
35 waters or on the beaches of Puget Sound at least once a year. Many of these people enjoy watching killer
36 whales as part of the recreational experience. Recreational whale watching occurs from land-based viewing
37 locations, private recreational vessels, and commercial whale watching vessels. Others who do not
38 specifically engage in whale watching share the waters of Puget Sound with killer whales and their
39 recreational experience could be affected by the action alternatives. Some of these recreational boaters are
40 engaged in recreational fishing.

41
42 There are 38 state parks and eight national parks that border Puget Sound, all of which could offer the
43 opportunity for land-based whale watching (Subsection 3.5, Recreation). The most popular site is Lime
44 Kiln Point State Park/Whale Watch State Park on San Juan Island, which has approximately 200,000
45 visitors annually and has an interpretive center with information about killer whales. The Whale Museum
46 also provides information on the whales and conducts shore-based wildlife tours that include whale
47 watching and stops at Lime Kiln Point State Park. There would likely be no impact on land-based viewing

1 opportunities from any of the vessel regulations or on any of these parks because they are land-based,
2 however there may be impacts on the recreational experience because of noise or aesthetics. These impacts
3 are discussed under Subsections 4.7, Noise and 4.8, Aesthetics, respectively. No impacts to land-based
4 facilities are expected under any alternative (e.g., museum or park visitor numbers). Thus there is no further
5 discussion to recreational impacts on land-based whale watching in this subsection.
6

7 Between 350,000 and 400,000 Washington residents of all ages boat for recreation, either owning a boat
8 directly, renting or chartering a boat, or accompanying friends and family on a boat (Subsection 3.5,
9 Recreation), with about 80 percent (up to 320,000) of these boaters operating on Puget Sound annually. An
10 estimated 34 percent of boaters also participate in wildlife viewing (Subsection 3.5, Recreation). If all
11 wildlife viewers were assumed to participate in whale watching then up to 108,800 recreational boaters
12 may be watching whales each year. For the analysis of effects on recreational boaters, IEC assumed that
13 under the No-action Alternative, the number of violations of the voluntary guidelines by recreational
14 vessels would be the same as the recent averages that have occurred under existing voluntary guidelines
15 (Table 3-1 and Table 3-2). For each of the action alternatives, IEC assumed that the effect would be that
16 those vessel operators would have to either change their behavior and adhere to the mandatory regulation,
17 or face penalties.
18

19 As described in Subsection 3.4.2, Whale Watch Industry in Puget Sound, approximately 500,000
20 passengers participate in commercial whale watch trips in Puget Sound. For the analysis of effects on
21 recreational whale watch participants who view whales from commercial whale watching vessels, IEC
22 assumed that under the No-action Alternative, the number of violations of the voluntary guidelines by
23 commercial whale watch operators would be the same as the recent averages that have occurred under
24 existing voluntary guidelines (IEC 2008) (Table 3-1 and Table 3-2). For each of the action alternatives, IEC
25 assumed that the effect would be that those passengers could have a changed recreational experience from
26 their experience under the No-action Alternative either because the vessel operators would change their
27 behavior and adhere to the mandatory regulations, or the vessel operators would violate the regulations and
28 passengers could be exposed to law enforcement actions, including possibly having a trip suspended. The
29 economic effect of that exposure was discussed in Subsection 4.4, Socioeconomics, while the recreational
30 effects are discussed in this subsection. As discussed under Subsection 4.2, Marine Mammals, it is not
31 possible to estimate what proportion of those expected to violate voluntary guidelines under the No-action
32 Alternative would adhere to mandatory regulations under the action alternatives, but it is reasonable to
33 expect that mandatory regulations would result in greater compliance, particularly from commercial whale
34 watch operators, for the reasons described in Subsection 4.1.2, General Effects of Enforceable Regulations
35 Compared to Voluntary Guidelines.
36

37 Finally, an estimated 53 percent of all boaters in Puget Sound also participate in recreational fishing,
38 (Subsection 3.5, Recreation). For the analysis of effects on recreational fishers, NMFS relied on
39 information from Soundwatch regarding the number of violations of the current voluntary guidelines to
40 estimate the numbers of recreational fishers who might have to either change their vessel operations to
41 comply with mandatory regulations or face fines or other penalties.

42 **4.5.1 Alternative 1 (No Action)**

43
44 Under the No-action Alternative, current specific voluntary guidelines would remain in place to educate
45 boaters on how to view marine wildlife without causing disturbance or harassment. Current general
46 mandatory regulations would also remain in place under the MMPA and ESA, with enforcement levels
47 likely continuing as in the past. Because the No-action Alternative would continue the current condition,

1 there would be no impact to the recreational opportunities or experience described above under Subsection
2 4.5, Recreation.

3 **4.5.2 Alternative 2: 100 Yard Approach Regulation**

4
5 Under Alternative 2, NMFS would adopt a mandatory regulation prohibiting all vessels from approaching
6 within 100 yards of killer whales, except vessels in shipping lanes and commercial and treaty fishing
7 vessels actively engaged in fishing. Recreational vessel operators and commercial whale watch operators
8 would need to stay 100 yards away from killer whales or be subject to fines and other penalties. Adoption
9 of a mandatory 100 yard approach regulation would not affect the opportunity for any type of recreational
10 vessel activity in Puget Sound, compared to the No-action Alternative, because the limited nature of the
11 prohibition would not discourage boating generally. It also would not change the recreational experience
12 for the vast majority of whale watchers on recreational or commercial vessels that would stay outside 100
13 yards of whales under a voluntary 100 yard approach guideline in the No-action Alternative. It could,
14 however, affect the recreational experience for those whale watchers on vessels whose operators either 1)
15 would change their behavior under Alternative 2 from what it would have been under the No-action
16 Alternative (to comply with a mandatory 100 yards approach regulation) or 2) would violate the mandatory
17 100 yard approach regulation and potentially be subjected to law enforcement actions. Alternative 2 would
18 be unlikely to change the recreational experience of those who are not whale watching but are simply
19 boating or fishing.

20
21 For private whale watching vessels, there would be about 55 private whale watch trips and seven kayak
22 trips each year in which the vessel operator would be required to either choose adherence to the mandatory
23 regulation or face possible fines or other penalties (IEC 2008) (Table 3-1 and Table 3-2), as compared to
24 the No-action Alternative. Koski (2007) estimates the number of individuals participating in these private
25 vessel trips at 3.42 individuals and most kayaks carry up to two individuals. The 202 individuals (55 trips x
26 3.42 individuals per trip) on those private whale watch trips and seven kayak trips faced with the choice
27 constitute a very small percent (0.06) of the total maximum of 320,000 people engaged in recreational
28 boating in inland waters each year.

29
30 Those on private whale watching vessels whose operators choose to follow a mandatory 100 yard
31 regulation would still have a wildlife viewing experience comparable to that under the No-action
32 Alternative. Survey results of participants in commercial whale watch trips indicate that proximity to the
33 whales is not the most important part of the whale watchers' experience and that seeing whales and whale
34 behavior was much more important (Subsection 3.5, Recreation). This is likely true for recreational whale
35 watchers as well. In addition, boaters can use binoculars and telephoto lenses to increase the enjoyment
36 from viewing whales from distances of 100 yards or greater.

37
38 Those on private whale watching vessels whose operators choose not to comply with a mandatory
39 regulation, either knowingly or because they are unaware of the regulation or of the presence of whales,
40 could have a less satisfying recreational experience than under the No-action Alternative if the operator is
41 subjected to law enforcement activities. As described above, no more boaters would be expected to violate
42 a mandatory regulation than a voluntary regulation under the No-action Alternative (55 private whale
43 watch trips and seven kayak trips each year), and probably fewer boaters would violate a mandatory
44 regulation, so only a small percentage of the maximum 320,000 boaters in Puget Sound would be affected.

45
46 For commercial whale watch vessels, IEC estimated that 825 individuals would be affected by Alternative
47 2 as compared to the No-action Alternative (IEC 2008), out of a total of approximately 500,000 whale
48 watch passengers annually. For these passengers, there would be no change in whale watching

1 opportunities compared to the No-action Alternative because there would likely be no change in the
2 number of commercial whale watch vessels or the number of trips as a result of implementing Alternative 2
3 (Subsection 4.4, Socioeconomics, under Alternative 2: 100 Yard Approach Regulation). For the vast
4 majority of passengers on commercial whale watch vessels, there would also be no change in the
5 recreational experience because almost all commercial whale watch operators would comply with the
6 voluntary 100 yard approach guideline under the No-action Alternative.

7
8 For those 825 individuals who could be affected annually, effects could include either viewing whales from
9 a greater distance, if the operators change their behavior to avoid approaching within 100 yards, or being
10 exposed to law enforcement actions, if the operators choose to violate the regulation. Those on vessels
11 whose operators choose to adhere to the mandatory regulation would likely have a wildlife viewing
12 experience comparable to that under the No-action Alternative, for the reasons described above for whale
13 watchers on private recreational vessels. Regardless of the proportion of passengers on vessels in
14 compliance or not, the 825 passengers potentially affected is a negligible percent (0.17) of the total 500,000
15 whale watchers each year.

16
17 Private vessels not engaged in whale watching, either simply boating or fishing, would experience minimal
18 effects as a result of repositioning to adhere to Alternative 2, compared to the No-action Alternative, with
19 only 20 fishing trips estimated to be affected each year (IEC 2008).

20 **4.5.3 Alternative 3: 200 Yard Approach Regulation**

21
22 Under Alternative 3, NMFS would promulgate a mandatory 200 yard approach regulation, with the same
23 exceptions as under Alternative 2. There are little data available to evaluate how many vessels currently
24 approach within 200 yards, because it is acceptable under current guidelines so incidents are not reported.
25 Thus it is not possible to estimate under the No-action Alternative the number of private recreational vessel
26 trips or commercial whale watching trips for which the operator would need to choose either to adhere to
27 the mandatory regulation or face fines or penalties. For this reason, and because the current guideline is
28 only 100 yards, NMFS assumes that all recreational and commercial whale watch operators would need to
29 change their procedures compared to the No-action alternative to accommodate a new 200 yard approach
30 rule.

31
32 The change to a 200 yard mandatory regulation under Alternative 3 from a 100 yard voluntary guideline
33 under the No-action Alternative would not affect the opportunity for any type of recreational vessel activity
34 in Puget Sound, compared to the No-action Alternative, because the limited nature of the prohibition would
35 not discourage boating generally. It also would not discourage whale watching, because viewing still could
36 occur outside 200 yards. There could be effects on the recreational experience for all recreational boaters
37 involved in whale watching and all passengers on whale watching vessels because all of these individuals
38 (except the few who would violate the 200 yard approach regulation) would have to view killer whales at a
39 distance of 200 yards compared with the ability to view whales from 100 yards or even closer under the
40 No-action Alternative. There may also be minor effects of repositioning to remain 200 yards from whales
41 to other recreational boaters and recreational fishers if they encounter whales during their other activities.

42
43 As described above under Subsection 3.5, Recreation, a maximum of 320,000 individuals enjoy
44 recreational boating in Puget Sound and approximately 34 percent of these engage in wildlife viewing. It is
45 unknown what proportion of this 34 percent engages in viewing killer whales. Conservatively assuming all
46 do, then the recreational experience of 108,800 individuals in private vessels could be affected by having to
47 view killer whales from 200 yards rather than 100 yards. In addition, all 500,000 passengers on commercial
48 whale watch trips could be similarly affected. This effect would likely be small. Survey results of

1 participants in commercial whale watch trips indicate that proximity to the whales is not the most important
2 part of the whale watchers' experience and that seeing whales and whale behavior was much more
3 important (Subsection 3.5, Recreation). This may be true for recreational whale watchers as well. Whale
4 watchers can also use binoculars and telephoto lenses to increase the enjoyment from viewing whales from
5 distances greater than 100 yards. By following a 200 yard approach regulation the recreational boaters
6 would have to change their behavior (i.e., view from greater distance) in order to comply, but would still
7 have a valuable wildlife viewing experience.

8
9 As described above, it is unknown how many private or commercial whale watch operators would violate a
10 mandatory 200 yard approach regulation, but those who do would be subject to law enforcement actions,
11 including fines and other penalties. Assuming that violations of a 200 yard approach regulation would be
12 similar to the expected violations of a voluntary 100 yard approach regulation under Alternative 2, the
13 effects of law enforcement actions on the recreational experiences of private vessel operators and
14 passengers on commercial whale watch vessels would thus be similar to those described under Alternative
15 2, when compared to the No-action Alternative.

16
17 For vessels simply engaged in recreational boating, or recreational boating and fishing, repositioning to
18 avoid 200 yard approaches to killer whales would have a very minor effect on the recreational experience,
19 as compared to the No-action Alternative.

20 **4.5.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

21
22 Under Alternative 4, NMFS would promulgate a mandatory regulation prohibiting all vessels from entering
23 the current voluntary no-go zone from May through September, except treaty fishing vessels. Those
24 operating recreational vessels would need to stay outside the no-go zone or be subject to fines and other
25 penalties. Adoption of a mandatory no-go zone would not affect the opportunity for any type of recreational
26 vessel activity in Puget Sound, compared to the No-action Alternative, because the limited nature of the
27 prohibition would not discourage boating generally. It also would not change the recreational experience
28 for the vast majority of whale watchers who would be on vessels staying outside the voluntary no-go zone
29 under the No-action Alternative. It could, however, affect the recreational experience for those whale
30 watchers on vessels whose operators either 1) would change their behavior under Alternative 4 from what it
31 would have been under the No-action Alternative (to comply with the mandatory no-go zone) or 2) would
32 violate the mandatory no-go zone and potentially be subjected to law enforcement actions. It would be
33 unlikely to change the recreational experience of those who are simply boating and can easily avoid the no-
34 go zone. Alternative 4 may affect recreational fishers who would have fished inside a voluntary no-go zone
35 under the No-action Alternative.

36
37 IEC (2008) relied on recent incidents to estimate that approximately 18 private whale watch trips, private
38 fishing trips, and kayak trips combined each year would be affected as described above compared to the
39 No-action Alternative. Koski (2007) estimates the number of individuals participating in these private
40 vessel trips at 3.42 individuals and most kayaks carry up to two individuals. The 62 individuals (18 trips x
41 3.42 individuals per trip) affected constitute a very small percent (0.02) of the maximum 320,000 people
42 engaged in recreational boating or the 108,800 recreational boaters engaged in viewing whales each year.

43
44 Those on private whale watching vessels whose operators choose to follow a mandatory no-go zone would
45 still have a wildlife viewing experience comparable to that under the No-action Alternative. Survey results
46 of participants in commercial whale watch trips indicate that proximity to the whales is not the most
47 important part of the whale watchers' experience and that seeing whales and whale behavior was much
48 more important (Subsection 3.5, Recreation). This is likely true for recreational whale watchers as well. In

1 addition, boaters can use binoculars and telephoto lenses to increase the enjoyment from viewing whales at
2 greater distances when the whales are inside the no-go zone.

3
4 Those on private whale watching vessels whose operators choose not to comply with a mandatory
5 regulation, either knowingly or because they are unaware of the regulation or of the presence of whales,
6 could have a less satisfying recreational experience than under the No-action Alternative if the operator is
7 subjected to law enforcement activities. As described above, no more boaters would be expected to violate
8 a mandatory regulation than a voluntary regulation under the No-action Alternative (19 private whale
9 watch trips, fishing and kayak trips combined each year), and probably fewer boaters would violate a
10 mandatory regulation, so only a small percentage of the maximum 320,000 boaters or 108,800 recreational
11 whale watchers in inland waters would be affected.

12
13 For passengers on commercial whale watch vessels whose operators choose to comply with the mandatory
14 regulation, the impact would be negligible, compared to the No-action Alternative, because the vast
15 majority of whale watch trips under the No-action Alternative comply with a voluntary no-go zone. IEC
16 estimated that 3,050 passengers would be affected by Alternative 4 as compared to the No-action
17 Alternative (IEC 2008). Effects could include either viewing whales from a greater distance (that is, from
18 outside the no-go zone), if the operators change their behavior to avoid the no-go zone, or being exposed to
19 law enforcement actions, if the operators choose to violate the regulation. Regardless of the proportion of
20 passengers on vessels in compliance or not, this would be a negligible percent (0.6) of the total 500,000
21 whale watchers each year.

22
23 IEC (2008) did not separately estimate the number of recreational fishing vessels that would enter the no-
24 go zone under the No-action Alternative, but it would be fewer than 18 (the total of private whale watching,
25 fishing, and kayaking combined). Under Alternative 4, with a mandatory no-go zone, the vessel operators
26 on these fishing trips would need to choose to follow the mandatory regulation or face fines or other
27 penalties. For the former group, there are many alternative fishing areas in Puget Sound (Subsection 3.5,
28 Recreation). If 53 percent of the maximum 320,000 recreational boaters in Puget Sound are engaged in
29 recreational fishing, that would be 169,600 recreational fishers in Puget Sound annually. Having to change
30 fishing locations, or face law enforcement actions, under Alternative 4 would affect a small fraction of
31 these fishers (less than 0.01 percent). Impacts to recreational fishing in Puget Sound would thus be
32 negligible.

33
34 The current no-go zone overlaps with a boat launch in Small Pox Bay located within the San Juan County
35 Park. The launch is a free public launch for motorized vessels and kayaks, however the park does not
36 currently track use by recreational boaters. There is an estimate of 5,000 recreational kayakers launching
37 from the park (San Juan County Economic Development Council 2008). The park does track the use of the
38 campground and in 2007 they collected fees for approximately 26,000 camper nights. Both campers and
39 local residents likely use the boat launch. Recreational kayakers would have to relocate to other launches
40 from May 1 through September 30, some of which may charge small fees. If whale watching is the primary
41 objective for recreational kayakers, they would likely be launching from sites that are greater distances
42 from core whale areas, and their opportunities for seeing whales would likely be reduced.

43 **4.5.5 Alternative 5: Protected Area – Expanded No-go Zone**

44
45 Under Alternative 5 NMFS would promulgate a regulation requiring vessels to remain outside of a no-go
46 zone 1/2 mile wide from Mitchell Bay to Eagle point, from May through September, except treaty fishing
47 vessels. The voluntary no-go zone under the No-action Alternative extends 1/4 mile from shore, from
48 Mitchell Bay to Eagle Point, with a 1/2 mile zone around Lime Kiln Point, and encompasses 3.8 square

1 miles. In comparison, the expanded mandatory no-go zone would extend 1/2 mile from shore, from
2 Mitchell Bay to Eagle Point and encompass 6.2 square miles. There are few data available to evaluate how
3 many vessels currently operate between 1/4 mile and 1/2 mile in this area. Thus it was not possible to
4 estimate under the No-action Alternative how many recreational or commercial whale watch operators,
5 fishing vessels, and kayaks would likely operate within an expanded no-go zone. For this reason, and
6 because the No-action Alternative includes a smaller no-go zone, NMFS assumes that all commercial
7 whale watch operators would need to change their procedures to accommodate the expanded no-go zone,
8 thus changing the recreational experience of all passengers on commercial whale watch vessels. An
9 expanded no-go zone under Alternative 5 would also have minor effects on other recreational vessels and
10 recreational fishing vessels. However, adoption of a mandatory expanded zone would not affect the
11 opportunity for any type of recreational vessel activity in Puget Sound, compared to the No-action
12 Alternative, because the prohibition would not discourage boating generally.

13
14 As described above under Subsection 4.5, Recreation, a maximum of 320,000 individuals enjoy
15 recreational boating in Puget Sound and approximately 34 percent of these engage in wildlife viewing. It is
16 unknown what proportion of this 34 percent engages in viewing killer whales. Conservatively assuming all
17 do, then the recreational experience of 108,800 individuals in private vessels could be affected by having to
18 view killer whales outside an expanded no-go zone under Alternative 5 compared to the voluntary no-go
19 zone under the No-action Alternative. In addition, all 500,000 passengers on commercial whale watch trips
20 could be similarly affected. Effects would include either having to view whales from a greater distance,
21 compared to the No-action Alternative, or being exposed to law enforcement actions.

22
23 Effects of an increased viewing distance would likely be small. It is likely that the preceding numbers
24 overestimate the number of whale watchers affected, since they are based on the percentage of boaters
25 engaged in all types of wildlife viewing. In addition, survey results of participants in commercial whale
26 watch trips indicate that proximity to the whales is not the most important part of the whale watchers'
27 experience and that seeing whales and whale behavior was much more important (Subsection 3.5,
28 Recreation). This may be true for recreational whale watchers as well. Whale watchers can also use
29 binoculars and telephoto lenses to increase the enjoyment from viewing whales from greater distances. By
30 staying outside the expanded no-go zone the recreational boaters may have to view whales from a greater
31 distance than under the No-action Alternative when the whales are inside the no-go zone, but would still
32 have a valuable wildlife viewing experience.

33
34 As described above, it is unknown how many private or commercial whale watch operators would violate a
35 mandatory no-go zone, but those who do would be subject to law enforcement actions, including fines and
36 other penalties. Assuming that violations of a mandatory no-go zone under Alternative 5 would be similar
37 to the expected violations of a voluntary no-go zone under the No-action Alternative, the effects of law
38 enforcement actions on the recreational experiences of private vessel operators and passengers on
39 commercial whale watch vessels would be similar to those described under Alternative 4, when compared
40 to the No-action Alternative.

41
42 The adoption of an expanded mandatory no-go zone under Alternative 5 would have similar effects to a
43 mandatory no-go zone under Alternative 4 with respect to recreational boaters and fishers not engaged in
44 wildlife viewing. In addition it is possible that inexperienced kayakers may avoid the expanded zone
45 because of potential safety issues with remaining 1/2 mile from shore.

46
47 Similar to the current no-go zone, the expanded no-go zone overlaps with a boat launch in Small Pox Bay
48 located within the San Juan County Park. The launch is a free public launch for motorized vessels and
49 kayaks, however the park does not currently track use by recreational boaters. There is an estimate of 5,000

1 recreational kayakers launching from the park (San Juan County Economic Development Council 2008).
2 The park does track the use of the campground and in 2007 they collected fees for approximately 26,000
3 camper nights. Both campers and local residents likely use the boat launch. Recreational kayakers would
4 have to relocate to other launches from May 1 through September 30, some of which may charge small
5 fees. If whale watching is the primary objective for recreational kayakers, they would likely be launching
6 from sites that are greater distances from core whale areas and their opportunities for seeing whales would
7 likely be reduced.

8 **4.5.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

9
10 Under Alternative 6, NMFS would adopt a mandatory regulation requiring all vessels to reduce their speed
11 to 7 knots within 400 yards of killer whales, except vessels in shipping lanes and commercial and treaty
12 fishing vessels actively engaged in fishing. Those operating non-exempt vessels would need to maintain a
13 speed of 7 knots within 400 yards of killer whales or be subject to fines and other penalties. Adoption of a
14 mandatory speed limit would not affect the opportunity for any type of recreational vessel activity in Puget
15 Sound, compared to the No-action Alternative, because the limited nature of the prohibition would not
16 discourage boating generally. It also would not change the recreational experience for the vast majority of
17 whale watchers on recreational or commercial vessels that would not exceed 7 knots near the whales under
18 the No-action Alternative. It could, however, affect the recreational experience for those whale watchers on
19 vessels whose operators either 1) would change their behavior under Alternative 6 from what it would have
20 been under the No-action Alternative (to comply with a mandatory speed limit) or 2) would violate the
21 mandatory speed limit and potentially be subjected to law enforcement actions. It may also affect those
22 non-whale-watching recreational boaters and fishers who would not observe a voluntary speed limit under
23 the No-action Alternative.

24
25 There would be approximately 46 private whale watch trips in which the vessel operator would be required
26 to either choose adherence to the mandatory regulation or face possible fines or other penalties (IEC 2008)
27 compared to the No-action Alternative. Slow moving human powered kayaks would not be affected by a
28 speed restriction. Koski (2007) estimates the number of individuals participating in these private vessel
29 trips at 3.42 individuals. The 157 individuals faced with the choice constitute a very small percent (0.05) of
30 the total maximum of 320,000 people engaged in recreational boating in inland waters each year.

31
32 Those on private whale watching vessels whose operators choose to follow a mandatory speed limit would
33 likely still have a wildlife viewing experience comparable to that under the No-action Alternative, as there
34 is no information to suggest that speeding near the whales enhances the recreational experience. Assuming
35 the purpose of speeding might be to get closer to the whales, survey results of participants in commercial
36 whale watch trips indicate that proximity to the whales is not the most important part of the whale
37 watchers' experience and that seeing whales and whale behavior was much more important (Subsection
38 3.5, Recreation). This is likely true for recreational whale watchers as well.

39
40 Those on private whale watching vessels whose operators choose not to comply with a mandatory
41 regulation, either knowingly or because they are unaware of the regulation or of the presence of whales,
42 could have a less satisfying recreational experience than under the No-action Alternative if the operator is
43 subjected to law enforcement activities. As described above, no more boaters would be expected to violate
44 a mandatory regulation than a voluntary regulation under the No-action Alternative (46 private vessel
45 trips), and probably fewer boaters would violate a mandatory regulation, so only a small percentage of the
46 maximum 320,000 boaters in Puget Sound would be affected.

1 For commercial whale watch vessels, IEC estimated that 715 individuals would be affected by Alternative
2 6 as compared to the No-action Alternative (IEC 2008), out of a total of approximately 500,000 whale
3 watch passengers annually. For these passengers, there would be no change in whale watching
4 opportunities compared to the No-action Alternative because there would likely be no change in the
5 number of commercial whale watch vessels or the number of trips as a result of implementing Alternative 6
6 (Subsection 4.4, Socioeconomics, under Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer
7 Whales). For the vast majority of passengers on commercial whale watch vessels, there would also be no
8 change in the recreational experience because almost all commercial whale watch operators would comply
9 with the voluntary speed guideline under the No-action Alternative.

10
11 For those 715 individuals whose recreational experience could be affected annually, effects could include
12 either viewing whales from a greater distance, if the operators change their behavior to avoid speeding near
13 the whales, or being exposed to law enforcement actions if the operators choose to violate the regulation.
14 Those on vessels whose operators choose to adhere to the mandatory regulation would likely have a
15 wildlife viewing experience comparable to that under the No-action Alternative, for the reasons described
16 above for whale watchers on private recreational vessels. Regardless of the proportion of passengers on
17 vessels in compliance or not, the 715 passengers potentially affected is a negligible percent (0.1) of the total
18 500,000 whale watchers each year.

19
20 Private vessels not engaged in whale watching, either simply boating or fishing, would experience minimal
21 effects of adjusting their speed as a result of implementing Alternative 6, compared to the No-action
22 Alternative, with only 16 fishing trips affected each year (IEC 2008).

23 **4.5.7 Alternative 7: Keep Clear of the Whales' Path**

24
25 Under Alternative 7, NMFS would adopt a mandatory regulation requiring all vessels to avoid parking in
26 the path of killer whales, except vessels in shipping lanes and commercial and treaty fishing vessels
27 actively engaged in fishing. Those operating non-exempt vessels would need to avoid parking in the
28 whales' path or be subject to fines and other penalties. Adoption of a mandatory requirement to keep clear
29 of the whales' path would not affect the opportunity for any type of recreational vessel activity in Puget
30 Sound, compared to the No-action Alternative, because the limited nature of the prohibition would not
31 discourage boating generally. It would also not change the recreational experience for the vast majority of
32 whale watchers on recreational or commercial vessels that would keep clear of the whales' path under a
33 voluntary guideline in the No-action Alternative. It could, however, affect the recreational experience for
34 those whale watchers on vessels whose operators either 1) would change their behavior under Alternative 7
35 from what it would have been under the No-action Alternative (to comply with a mandatory keep clear of
36 the whales' path regulation), or 2) would violate the mandatory keep clear of the whales' path regulation
37 and potentially be subjected to law enforcement actions. It would be unlikely to change the recreational
38 experience of those who are not whale watching but are simply boating or fishing.

39
40 For private whale watching vessels, there would be about 38 private whale watch trips, and five kayak trips
41 each year in which the vessel operator would be required to either choose adherence to the mandatory
42 regulation or face possible fines or other penalties (IEC 2008), as compared to the No-action Alternative.
43 Koski (2007) estimates the number of individuals participating in these private vessel trips at 3.42
44 individuals and most kayaks carry up to 2 individuals. The 181 individuals (38 trips x 3.42 individuals per
45 trip) faced with the choice constitute a very small percent (0.06) of the total maximum of 320,000 people
46 engaged in recreational boating in inland waters each year.

1 Those on private whale watching vessels whose operators choose to follow a mandatory keep clear
2 regulation would still have a wildlife viewing experience comparable to that under the No-action
3 Alternative. Assuming the purpose of being in the whales' path might be to get closer to the whales, survey
4 results of participants in commercial whale watch trips indicate that proximity to the whales is not the most
5 important part of the whale watchers' experience and that seeing whales and whale behavior was much
6 more important (Subsection 3.5, Recreation). This is likely true for recreational whale watchers as well. In
7 addition, boaters can use binoculars and telephoto lenses to increase the enjoyment from viewing whales
8 from greater distances.

9
10 Those on private whale watching vessels whose operators choose not to comply with a mandatory
11 regulation, either knowingly or because they are unaware of the regulation or of the presence of whales,
12 could have a less satisfying recreational experience than under the No-action Alternative if the operator is
13 subjected to law enforcement activities. As described above, no more boaters would be expected to violate
14 a mandatory regulation than a voluntary regulation under the No-action Alternative (38 private whale
15 watch trips and seven kayak trips each year), and probably fewer boaters would violate a mandatory
16 regulation, so only a small percentage of the maximum 320,000 boaters in Puget Sound would be affected.

17
18 For commercial whale watch vessels, IEC estimated that 7,535 individuals would be affected by
19 Alternative 7 as compared to the No-action Alternative (IEC 2008), out of a total of approximately 500,000
20 whale watch passengers annually. For these passengers, there would be no change in whale watching
21 opportunities compared to the No-action Alternative because there would likely be no change in the
22 number of commercial whale watch vessels or the number of trips as a result of implementing Alternative 7
23 (Subsection 4.4, Socioeconomics, under Alternative 7: Keep Clear of the Whales' Path). For the vast
24 majority of passengers on commercial whale watch vessels, there would also be no change in the
25 recreational experience because many commercial whale watch operators would comply with the voluntary
26 keep clear guideline under the No-action Alternative.

27
28 For those 7,535 individuals who could be affected annually, effects could include either viewing whales
29 from a greater distance, if the operators change their behavior to keep clear of the whales' path, or being
30 exposed to law enforcement actions, if the operators choose to violate the regulation. Those on vessels
31 whose operators choose to adhere to the mandatory regulation would likely have a wildlife viewing
32 experience comparable to that under the No-action Alternative, for the reasons described above for whale
33 watchers on private recreational vessels. Regardless of the proportion of passengers on vessels in
34 compliance or not, the 7,535 passengers potentially affected is a small percent (1.5) of the total 500,000
35 whale watchers each year.

36
37 Private vessels not engaged in whale watching, either simply boating or fishing, would experience minimal
38 effects from avoiding the whales' path as a result of implementing Alternative 7, compared to the No-
39 action Alternative, with only 12 fishing trips estimated to be affected each year (IEC 2008).

40 **4.5.8 Alternative 8: Proposed Action**

41
42 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
43 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would
44 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
45 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point
46 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
47 package on recreation would be a combination of the impacts described under Subsections 4.5.3, 4.5.5, and

1 4.5.7, and they are summarized in Table 4-2. The number of recreational whale watchers affected would be
2 between 472 (on 138 trips) and up to all 108,800 potential recreational wildlife viewers.

3 **4.6 Environmental Justice**

4 **4.6.1 All Alternatives**

5
6 Of the overall total population within the 12 counties that border the inland waters of Washington (Table 3-
7 7) and that would be affected by vessel regulations, a county average of 13.63 percent are minority, a
8 county average of 4.79 percent are of Hispanic origin, and a county average of 10.6 percent are low
9 income. These values were used to determine if these populations in the affected counties are meaningfully
10 greater than those in the general populations. Using the CEQ guidelines, the percentage of minority,
11 Hispanic, and low income populations in the affected counties is not meaningfully greater than the
12 proportion of these populations in several surrounding counties or in the State. Consequently, any
13 economic or social impacts realized by those who benefit from whale watching activities would not be
14 disproportionate to minority, Hispanic, or low income populations under any alternative since the affected
15 counties do not support a larger portion of these population groups than the state-wide average. In addition,
16 the exemption for treaty fishing vessels described in Subsection 3.6, Environmental Justice, would
17 eliminate any potential disproportionate impacts to tribes.

18 **4.7 Noise**

19 **4.7.1 Alternative 1 (No Action)**

20
21 Under the No-action Alternative, current specific voluntary guidelines would remain in place to educate
22 boaters on how to view marine wildlife without causing disturbance or harassment. Current general
23 mandatory regulations would also remain in place under the MMPA and ESA, with enforcement levels
24 likely continuing as in the past. There would be no change in the overall number of boats, types of boats,
25 seasonal use of boats, or boat speed generating underwater or atmospheric sound under the No-action
26 Alternative. Therefore, there would be no change in the overall ambient levels of noise in the action area.

27
28 Vessel use in the action area would continue to interact with weather and other atmospheric noise
29 conditions to create underwater and atmospheric background noise levels, but this would not differ from
30 current conditions. Additionally, continued compliance with state atmospheric noise regulations for vessels
31 would be required under the No-action Alternative.

32
33 The peak hearing sensitivity range for killer whales is 18 to 42 kHz and the most relevant frequency range
34 for communication and echolocation is 1 to 100 kHz. In Haro Strait the greatest increases in these high
35 frequencies occur in July and in the middle of the day, which coincide with larger numbers of small
36 recreational and commercial whale watching vessels. Continued sound levels from vessels within the
37 hearing sensitivity of whales would continue to cause auditory masking and interfere with communication
38 and echolocation as described in Subsection 4.2, Marine Mammals, under the No-action Alternative.

39 **4.7.2 Alternative 2: 100 Yard Approach Regulation**

40
41 A 100 yard approach regulation would not change the overall number of boats, types of boats, seasonal use
42 of boats, or boat speed generating underwater or atmospheric sound, compared to the No-action
43 Alternative, which currently has a similar 100 yard approach guideline that many boaters follow. Thus

1 there would be no change in the overall ambient sound. Vessels might be distributed differently spatially,
2 according to the approach restriction, but this would not change the frequency ranges of vessels or the level
3 of noise in the environment compared to the No-action Alternative.

4
5 Vessel use in the action area would continue to interact with weather and other atmospheric noise
6 conditions to create underwater and atmospheric background noise levels, but this would not differ from
7 conditions under the No-action Alternative. Additionally, continued compliance with state atmospheric
8 noise regulations for vessels would be required under Alternative 2.

9
10 Sound levels within the hearing sensitivity range of the whales, which cause auditory masking, would
11 likely be reduced as described under Subsection 4.2.2 Alternative 2: 100 Yard Approach Regulation, and
12 the effects of changes in sound levels on the whales are presented in Subsection 4.2.2, Alternative 2: 100
13 Yard Approach Regulation (*Acoustic Masking*).

14 **4.7.3 Alternative 3: 200 Yard Approach Regulation**

15
16 A 200 yard approach regulation would not change the overall number of boats, types of boats, seasonal use
17 of boats, or boat speed generating underwater or atmospheric sound, compared to the No-action Alternative
18 for the reasons described in Subsection 4.2, Marine Mammals, under Alternative 3: 200 Yard Approach
19 Regulation. Thus there would be no change in the overall ambient sound conditions. Vessels might be
20 distributed differently spatially, according to the approach restriction, but this would not change the
21 frequency ranges of vessels or the level of noise in the environment compared to the No-action Alternative.

22
23 Vessel use in the action area would continue to interact with weather and other atmospheric noise
24 conditions to create underwater and atmospheric background noise levels, but this would not differ from
25 conditions under the No-action Alternative. Additionally, continued compliance with state atmospheric
26 noise regulations for vessels would be required under Alternative 3.

27
28 Sound levels within the hearing sensitivity range of the whales would likely be reduced as described under
29 Subsection 4.2, Marine Mammals, under Alternative 3: 200 Yard Approach Regulation, and the effects of
30 changes in sound levels on the whales are presented in Subsection 4.2.3, Alternative 3: 200 Yard Approach
31 Regulation (*Acoustic Masking*).

32 **4.7.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

33
34 A protected area would not change the number of boats, types of boats, seasonal use of boats, or boat speed
35 generating underwater or atmospheric sound in the environment, compared to the No-action Alternative,
36 which currently has a voluntary no-go zone that many boaters follow. The distribution of vessels would be
37 affected by a protected area, with more boats remaining outside of the no-go zone than under the No-action
38 Alternative. The majority of vessels affected by a protected area would be commercial whale watch,
39 recreational whale watching, and fishing vessels. Both underwater and atmospheric sound levels within the
40 protected area would be reduced in the absence of these vessels during summer months and would likely be
41 similar to the winter ambient sound levels, which are dominated by lower frequency noise from shipping.
42 The effects of such a noise reduction on killer whales and other marine mammals are described in
43 Subsection 4.2, Marine Mammals, under Alternative 4: Protected Area – Current Voluntary No-go Zone.
44 People visiting Lime Kiln Point to view killer whales could also experience a reduction in atmospheric
45 noise under Alternative 4, compared to the No-action Alternative.

1 Vessel use in the action area would continue to interact with weather and other atmospheric noise
2 conditions to create underwater and atmospheric background noise levels, but this would not differ from
3 conditions under the No-action Alternative. Additionally, continued compliance with state atmospheric
4 noise regulations for vessels would be required under Alternative 4.

5 **4.7.5 Alternative 5: Protected Area – Expanded No-go Zone**

6
7 Noise effects from the expanded no-go zone would be the same as Alternative 4, and thus would compare
8 similarly to the No-action Alternative, except there would be a larger area with reduced sound levels.

9 **4.7.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

10
11 A 7-knot speed regulation would not change the overall number of boats, types of boats, or seasonal use of
12 boats generating underwater or atmospheric sound, compared to the No-action Alternative, for the reasons
13 described in Subsection 4.2, Marine Mammals, under Alternative 6: Speed Limit of 7 Knots Within 400
14 Yards of Killer Whales. Thus there would be no change in the overall ambient sound conditions. Some
15 vessels might generate less noise if they slowed down within 400 yards of the whales, however, vessels
16 could also remain at the same speed and adjust their path to remain further than 400 yards from the whales,
17 resulting in sound levels similar to those under the No-action Alternative.

18
19 Vessel use in the action area would continue to interact with weather and other atmospheric noise
20 conditions to create underwater and atmospheric background noise levels, but this would not differ from
21 conditions under the No-action Alternative. Additionally, continued compliance with state atmospheric
22 noise regulations for vessels would be required under Alternative 6.

23
24 Sound levels within the hearing sensitivity range of the whales would likely be reduced as described under
25 Subsection 4.2, Marine Mammals, under Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer
26 Whales. The effects of changes in sound levels on the whales are presented in Subsection 4.2.6, Alternative
27 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales (*Acoustic Masking*).

28 **4.7.7 Alternative 7: Keep Clear of the Whales' Path**

29
30 A regulation to keep the whales' path clear would not change the overall number of boats, types of boats,
31 seasonal use of boats, or boat speed generating underwater or atmospheric sound, compared to the No-
32 action Alternative, for the reasons described in Subsection 4.2.7, Alternative 7: Keep Clear of the Whales'
33 Path. Thus there would be no change in the overall ambient sound conditions. Vessels might be distributed
34 differently to stay out of the whales' path, but this would not change the frequency ranges or level of noise
35 in the environment, which would be similar to sound levels under the No-action Alternative.

36
37 Sound levels within the hearing sensitivity range of the whales would likely be reduced as described under,
38 4.2, Marine Mammals, under Alternative 7: Keep Clear of the Whales' Path. The effects of changes in
39 sound levels on the whales are presented in Subsection 4.2.7, Alternative 7: Keep Clear of the Whales' Path
40 (*Acoustic Masking*).

41 **4.7.8 Alternative 8: Proposed Action**

42
43 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
44 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would

1 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
2 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point
3 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
4 package on noise would be a combination of the impacts described under Subsections 4.7.3, 4.7.5, and
5 4.7.7, and they are summarized in Table 4-2.

6 **4.8 Aesthetics**

7 **4.8.1 Alternative 1 (No Action)**

8
9 Under the No-action Alternative, current voluntary guidelines would remain in place to educate boaters on
10 how to view marine wildlife without causing disturbance or harassment. In addition to those who view
11 whales from vessels, there are land-based viewing locations in the action area, with Lime Kiln Point State
12 Park/Whale Watch State Park being the primary viewing area. Visitors to Lime Kiln Point State
13 Park/Whale Watch State Park observe whales, primarily in summer months, with most commercial and
14 recreational vessels remaining 1/2 mile from the park to comply with the voluntary no-go zone. A goal of
15 the park is to preserve and interpret the natural and cultural resources of the area and the current voluntary
16 no-go zone was established in part to preserve the land-based viewing. A small number of vessels do
17 however, enter the no-go zone (Table 3-2) and these vessels may interfere with the viewing experience
18 from the park. Other aspects of the current voluntary guidelines, such as maintaining a 100 yard distance
19 from the whales, are intended to protect whales rather than to enhance viewing, but they may have ancillary
20 benefits to viewing. For example, it may be easier for viewers to see the whales if vessels are further from
21 them.

22
23 Under the No-action Alternative, the same number of commercial and recreational boats would likely be
24 visible from Lime Kiln Point State Park/Whale Watch State Park and from other vessels on the water as
25 under current conditions, with the same aesthetic impact on the 200,000 annual park visitors. Other land-
26 based viewing sites where there is no adjacent voluntary no-go zone are not visited by the whales as often
27 and also have less aesthetic viewing experiences because of the lack of a voluntary no-go zone.

28 **4.8.2 Alternative 2: 100 Yard Approach Regulation**

29
30 A 100 yard approach regulation would not change the overall number of commercial or recreational boats
31 visible to land-based or boat-based whale watchers, which would result in similar aesthetic conditions
32 regarding boats in the viewshed as under the No-action Alternative. Compared to the No-action
33 Alternative, a 100 yard approach regulation would likely result in more boaters staying at least 100 yards
34 from the whales, which would reduce the number of vessels in close proximity to the whales. This
35 increased distance of vessels from the whales would increase the aesthetic enjoyment of the 200,000 annual
36 visitors to Lime Kiln Point State Park/Whale Watch State Park, visitors to other land-based viewing sites
37 and over 500,000 individuals on commercial whale watching vessels annually, compared to the No-action
38 Alternative, because the experience viewing whales would be increased by removing boats from a portion
39 of the viewshed (i.e., the 100 yards between boats and whales).

40 **4.8.3 Alternative 3: 200 Yard Approach Regulation**

41
42 A 200 yard approach regulation would not change the overall number of commercial and recreational boats
43 visible to land-based or boat-based whale watchers, which would result in similar aesthetic conditions
44 regarding boats in the viewshed as under the No-action Alternative. Under current voluntary guidelines

1 (represented by the No-action Alternative), most commercial whale watching vessels remain at least 100
2 yards away from the whales most of the time (Table 3.2), and it is likely that most of these vessels would
3 observe a 200 yard approach regulation most of the time. Commercial whale watch vessels represent
4 slightly more than half of the boats in proximity to the whales (Figure 3.8). The remaining vessels are
5 recreational vessels. It is also likely that many of these recreational vessels would observe a 200 yard
6 regulation some of the time. Thus adoption of a 200 yard regulation, would double the distance between the
7 whales and most vessels, compared to the No-action Alternative. This increased distance of vessels from
8 the whales would benefit the aesthetic value to individuals engaged in land-based and boat-based whale
9 watching because the experience of viewing whales would be increased by removing boats from a portion
10 of the viewshed (i.e., the 200 yards between boats and whales).

11
12 Malcolm (2004) surveyed commercial whale watch participants and they ranked “see marine wildlife in an
13 uncrowded setting” as having high importance in their expectations. After their whale watch trip,
14 participants were dissatisfied with the lack of respect some boaters gave the whales (Subsection 3.8,
15 Aesthetics). A 200 yard approach regulation could, therefore, increase the aesthetic enjoyment of the
16 200,000 annual visitors to Lime Kiln Point State Park/Whale Watch State Park, visitors to other land-based
17 viewing sites, and over 500,000 individuals on commercial whale watching vessels annually, compared to
18 the No-Action Alternative and compared to Alternative 2 (100 yard approach regulation) because the
19 experience of viewing whales would be improved by removing boats from a portion of the viewshed (i.e.,
20 the 200 yards between boats and whales).

21 **4.8.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

22
23 Prohibiting vessels from entering the current voluntary no-go zone would not change the overall number of
24 commercial and recreational boats visible to land-based or boat-based whale watchers, which would result
25 in similar aesthetic conditions regarding boats in the viewshed as under the No-action Alternative. As a
26 regulation, more boaters would be inclined to stay out of the no-go zone, which would reduce the number
27 of vessels in the zone and their proximity to whales. This increased distance of vessels from the whales
28 would increase the aesthetic value to individuals engaged in vessel and land-based whale watching
29 compared to the No-Action Alternative because fewer vessels would be present in a portion of the
30 viewshed (i.e., within the mandatory no-go zone). As under the No-action Alternative, this would be a
31 particular benefit to the 200,000 visitors to Lime Kiln Point State Park/Whale Watch State Park, which is
32 adjacent to the protected area and one of the most popular land-based whale watching sites which was
33 established to preserve and interpret the natural and cultural resources of the area.

34 **4.8.5 Alternative 5: Protected Area – Expanded No-go Zone**

35
36 Prohibiting vessels from entering the expanded no-go zone would not change the overall number of
37 commercial and recreational boats visible on the water, which would result in similar aesthetic conditions
38 regarding boats in the viewshed as under the No-action Alternative. Protecting a larger zone would reduce
39 the number of boaters in the no-go zone and the proximity of vessels to the whales when in the protected
40 area. This increased distance of vessels from the whales would increase the aesthetic value to individuals
41 engaged in vessel and land-based whale watching, compared to the No-action Alternative. It would also
42 likely increase the aesthetic value more than under Alternative 4 because it would expand a portion of the
43 viewshed where vessels could not enter (i.e., expanding the distance between boats and whales beyond the
44 distance under Alternative 4). An expanded no-go zone would be a particular benefit to the 200,000 visitors
45 to Lime Kiln Point State Park/Whale Watch State Park, as described under Alternative 4.

1 **4.8.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

2
3 A speed regulation would not change the overall number of commercial and recreational boats visible on
4 the water or their proximity to whales, which would result in similar aesthetic conditions regarding boats in
5 the viewshed as under the No-action Alternative. The aesthetic experience of vessel and land-based whale
6 watchers might be improved by seeing vessels near the whales moving more slowly because viewers could
7 more easily see whales without the distraction of fast-moving boats. However, this viewshed change would
8 likely be a minor benefit compared to the No-action Alternative where a small number of boats violate the
9 current speed guideline.

10 **4.8.7 Alternative 7: Keep Clear of the Whales' Path**

11
12 A regulation to keep the whales' path clear would not change the overall number of boats visible on the
13 water, which would result in similar aesthetic conditions regarding boats in the viewshed as under the No-
14 action Alternative. As a regulation, more boaters would be inclined to stay out of the whales' path, which
15 would reduce the number of vessels in close proximity to the whales. This increased distance of vessels
16 from the whales would benefit the aesthetic value to individuals engaged in vessel and land-based whale
17 watching in the same manner as described under both Alternatives 3 and 4.
18

19 **4.8.8 Alternative 8: Proposed Action**

20
21 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
22 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would
23 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
24 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point
25 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
26 package on aesthetics would be a combination of the impacts described under Subsections 4.8.3, 4.8.5, and
27 4.8.7, and they are summarized in Table 4-2.

28 **4.9 Transportation**

29
30 Cargo ships, ferries, and recreational vessels can all be considered types of transportation. Ships using the
31 shipping lane (Subsection 3.9, Transportation) would be exempt from all of the alternatives and therefore,
32 there would be no impacts to vessels using the shipping lane. Large vessels traveling outside of the
33 shipping lanes and smaller vessels that are not part of the vessel tracking system, including recreational
34 vessels, would be subject to each of the alternatives. Recreational vessels were addressed under Subsection
35 4.5, Recreation, and commercial fishing vessels were addressed under Subsection 4.4, Socioeconomics.
36 This analysis of transportation focuses on large vessels such as tankers, cargo/freighters, government,
37 vessels, tug boats, and ferries.
38

39 All Coast Guard regulations governing transportation would remain in place under the No-action
40 Alternative as well as Alternatives 2 through 8.

41 **4.9.1 Alternative 1 (No Action)**

42
43 Under the No-action Alternative, current voluntary guidelines would remain in place to educate boaters on
44 how to view marine wildlife without causing disturbance or harassment. There is no information available

1 on the number of times that vessels involved in transportation adjust course or speed to comply with current
2 guidelines, but it is likely that very few make such adjustments (Subsection 3.9, Transportation). These
3 current small numbers of adjustments would likely continue under the No-action Alternative and would not
4 affect their ability to fulfill their transportation missions. The overall number of transits (165,000 per year)
5 and seasonal patterns would continue at current levels or, if growing trends in shipping continue, transit
6 numbers could increase in the future.

7 **4.9.2 Alternative 2: 100 Yard Approach Regulation**

8
9 As described in Subsections 4.4, Socioeconomics and 4.5, Recreation, under Alternative 2: 100 Yard
10 Approach Regulation, commercial shipping or ferry transportation vessels are rarely in close proximity to
11 the whales based on the small numbers of approach incidents by these vessels reported by Soundwatch.
12 IEC (2008) estimated that only four trips per year of commercial shipping or fishing vessels would be
13 affected by a 100 yard approach regulation compared to the No-Action Alternative. Average annual transits
14 through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over 165,000 each year (Table
15 3-9 and Table 3-10) and number of transits and seasonal patterns would continue as described under the
16 No-action Alternative. Slight course changes to remain at least 100 yards from whales for approximately
17 four vessel trips per year would be minimal and would be a very small impact on transportation. This small
18 number of vessel operators may be inconvenienced by deviating from their path, but, as under the No-
19 action Alternative, this would not affect their ability to fulfill their transportation missions.

20 **4.9.3 Alternative 3: 200 Yard Approach Regulation**

21
22 As described in Subsections 4.4, Socioeconomics and 4.5, Recreation, under Alternative 3: 200 Yard
23 Approach Regulation, commercial shipping or ferry transportation vessels are rarely in close proximity to
24 the whales and the total number of large transportation vessels would be a very small percentage of the
25 over 165,000 annual transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways
26 (Table 3-9 and Table 3-10) and number of transits and seasonal patterns would continue as described under
27 the No-action Alternative. Slight course changes to remain at least 200 yards from whales for a small
28 number of vessel trips per year would be minimal and would be a very small impact on transportation. This
29 small number of vessel operators may be inconvenienced by deviating from their path, but, as under the
30 No-action Alternative, this would not affect their ability to fulfill their transportation missions.

31 **4.9.4 Alternative 4: Protected Area – Current Voluntary No-go Zone**

32
33 As described in Subsections 4.4, Socioeconomics and 4.5, Recreation, under Alternative 4: Protected Area
34 – Current Voluntary No-go Zone, the current no-go zone does not overlap with shipping lanes or any ferry
35 routes and prohibiting vessels from entering the area would have no impacts on vessels that do not pass
36 through the area. The no-go zone would be in U.S. waters and would not be immediately adjacent to
37 Canadian waters and would not affect vessels in Canadian waters or crossing the border into U.S. waters.
38 Transportation under Alternative 4 would be the same as under the No-action Alternative.

39 **4.9.5 Alternative 5: Protected Area – Expanded No-go Zone**

40
41 The effects described under Alternative 4, would also be expected to occur under Alternative 5 because the
42 expanded no-go zone does not overlap with shipping lanes or any ferry routes and prohibiting vessels from
43 entering the area would have no impacts on vessels that do not pass through the area. Transportation under
44 Alternative 5 would be the same as under the No-action Alternative.

1 **4.9.6 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales**

2
3 As described in Subsections 4.4, Socioeconomics and 4.5, Recreation, under Alternative 6: Speed Limit of
4 7 Knots Within 400 Yards of Killer Whales, commercial shipping or ferry transportation vessels are rarely
5 in close proximity to the whales. Based on the number of approach incidents by these vessels reported by
6 Soundwatch, and assuming that in response to mandatory regulations all these types of vessels would adjust
7 behavior to avoid such incidents, IEC (2008) estimated that only four trips per year of commercial shipping
8 or fishing vessels would be affected by a speed regulation within 400 yards of the whales. Average annual
9 transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over 165,000 each
10 year (Table 3-9 and Table 3-10) and annual transits and seasonal patterns would continue as described
11 under the No-action Alternative. When safe to do so, slight reductions in speed within 400 yards from
12 whales for approximately four vessel trips per year would be minimal and would be a very small impact on
13 transportation. This small number of vessel operators may be inconvenienced by slowing down for short
14 periods of time in the rare instances they are within 400 yards of the whales, but, as under the No-action
15 Alternative, this would not affect their ability to fulfill their transportation missions.

16 **4.9.7 Alternative 7: Keep Clear of the Whales' Path**

17
18 As described in Subsections 4.4, Socioeconomics and 4.5, Recreation, under Alternative 7: Keep Clear of
19 the Whales' Path, vessels such as the Washington State ferries, large cargo ships, and tankers move in
20 predictable paths, are not engaged in stopping to watch whales, and do not reposition or park in the path of
21 the whales. Based on the small numbers of parking in the path incidents by commercial (non-whale
22 watching) vessels reported by Soundwatch, IEC (2008) estimated that only two trips per year of
23 commercial shipping or fishing vessels would be affected by a parking in the path regulation. Average
24 annual transits through Haro Strait, Boundary Pass, and the Strait of Georgia waterways are over 165,000
25 each year (Table 3-9 and Table 3-10). Slight course adjustments to remain out of the whales' path for
26 approximately two vessel trips per year would be minimal and would have a very small impact on
27 transportation compared to the current 165,000 annual transits. This small number of vessel operators may
28 be inconvenienced by adjusting their course in the rare instances they are in the path of the whales, but, as
29 under the No-action Alternative, this would not affect their ability to fulfill their transportation missions.

30 **4.9.8 Alternative 8: Proposed Action**

31
32 Under this alternative, NMFS would promulgate a package of regulations incorporating Alternatives 3, 5,
33 and 7 as described in Subsection 2.2.8, Alternative 8: Proposed Action. The regulation package would
34 prohibit vessels from approaching any killer whale closer than 200 yards, formalize a no-go zone along the
35 west side of San Juan Island extending 1/2 mile (800 meters) offshore from Eagle Point to Mitchell Point
36 (Figure 2-2), and require vessels to keep clear of the whales' path. The effects of the proposed action
37 package on transportation would be a combination of the impacts described under Subsections 4.9.3, 4.9.5,
38 and 4.9.7, and they are summarized in Table 4-2.

1 **Table 4-1. Summary of Effects of the Individual Alternatives.** Alternative 8 is the combination of effects described under Alternatives 3, 5,
 2 and 7 and is summarized in Table 4-2.

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
Marine Mammals	Current level of vessel incidents and disturbance continues or increases, negative effect on status of Southern Residents.	•Reduction in vessel incidents and decreased risk of strikes, behavioral disturbance, and auditory masking throughout Puget Sound. •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.	•Similar to Alternative 2, but greater reduction in risk of strikes, behavioral disturbance, and auditory masking throughout Puget Sound. •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.	•Decreased risk of strikes, reduced behavioral disturbance, and reduced auditory masking in protected area (3.8 sq miles). •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.	•Similar to Alternative 4, but with decreased risk of strikes, reduced behavioral disturbance, and reduced auditory masking in larger area (6.2 sq miles). •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.	•Reduction in vessel incidents and decreased risk of strikes and auditory masking throughout Puget Sound. •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.	•Reduction in vessel incidents and decreased risk of strikes, behavioral disturbance and auditory masking throughout Puget Sound. •Greater reductions than Alternatives 2, 4, and 6 based on higher numbers of commercial operator incidents and increased compliance expected for commercial operators. •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.

4.0 Environmental Consequences

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
Listed/ Non-listed Salmonids	No effect	Long-term increase in whale population and increase in number of salmonids consumed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
Socio-economics* 1. Commercial Whale Watching, 2. Shipping, Ferries, and Commercial Fishing	No effect	1. 15 commercial whale watch trips affected per year (only those not currently following guidelines). 2. Negligible impact on four commercial shipping, ferries or commercial fishing vessel trips per year.	1. More than 15 commercial whale watch trips affected per year (large portion of fleet currently views from greater distance) and up to all whale watch participants (500,000 per year). 2. Slightly larger number of commercial shipping and commercial fishing vessels affected per year than Alternative 2.	1. 61 commercial whale watch trips affected per year (only those not currently following guidelines). Up to 5,000 commercial kayak participants displaced from San Juan County boat launch. 2. No overlap with shipping or ferry routes, small number of commercial fishing vessels displaced.	1. Between 119 commercial whale watch trips with 825 participants and total number of whale watchers (500,000 per year) affected per year. Up to 5,000 commercial kayak participants displaced from San Juan County boat launch. 2. No overlap with shipping or ferry routes, slightly larger number of fishing vessels displaced than Alternative 4.	1. 13 commercial whale watch trips affected per year (only those not currently following guidelines). 2. Negligible impact on commercial shipping, ferries or commercial fishing vessels.	1. 137 commercial whale watch trips affected per year (only those not currently following guidelines). 2. Negligible impact on commercial shipping, ferries or commercial fishing vessels.

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
<p>Recreation* 1. Recreational boating/private whale watch, 2. Participants in commercial whale watch 3. Recreational fishing</p> <p>Affects to all types of boaters consist of either changing behavior to comply with a mandatory regulation or facing enforcement action</p>	<p>No effect</p>	<p>1. 62 private whale watch trips affected per year (those not currently following guidelines would have to change behavior to comply or face enforcement actions). 2. 825 individuals participating in commercial whale watch trips affected per year. 3. Negligible impact on 20 recreational fishing vessel trips per year.</p>	<p>1. More than 62 private whale watch trips and up to all recreational whale watchers (108,800) affected per year by greater distance 2. More than 825 individuals participating in commercial whale watch trips affected per year. 3. Slightly larger number of recreational fishing vessel trips affected per year than Alternative 2.</p>	<p>1. 18 private whale watch trips affected per year (those not currently following guidelines would have to change behavior to comply or face enforcement actions). Up to 5,000 private kayakers displaced from San Juan County boat launch. 2. 3,355 individuals participating in commercial whale watch trips affected per year. 3. Small number of recreational fishing vessels displaced.</p>	<p>1. Between 45 private whale watch trips with 154 passengers and all recreational whale watchers (108,800) affected per year. Up to 5,000 private kayakers displaced from San Juan County boat launch. 2. More than 3,355 individuals participating in commercial whale watch trips affected per year. 3. Slightly larger number of recreational fishing vessels displaced than Alternative 4</p>	<p>1. 46 private whale watch trips affected per year (those not currently following guidelines would have to change behavior to comply or face enforcement actions). 2. 715 individuals participating in commercial whale watch trips affected per year. 3. Negligible impact on 16 recreational fishing vessel trips per year.</p>	<p>1. 43 private whale watch trips affected per year (those not currently following guidelines would have to change behavior to comply or face enforcement actions). 2. 7,535 individuals participating in commercial whale watch trips affected per year 3. Negligible impact on 12 recreational fishing vessel trips per year.</p>

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
Environmental Justice	No effect	No effect	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Noise	No effect	No effect	Same as Alternative 2	Small decrease in ambient sound levels inside protected area.	Small decrease in sound levels inside expanded area (larger area than Alternative 4).	Same as Alternative 2	Same as Alternative 2
Aesthetics	No effect	No effect	Same as Alternative 2	Increase in quality of viewing experience from land-based areas.	Increase in quality of viewing experience from land-based areas (greater increase than Alternative 4, vessels further away from land-based viewing area).	Same as Alternative 2	Same as Alternative 2

Resources Impacted	Alternative 1: No Action	Alternative 2: Approach distance 100 yards	Alternative 3: Approach distance 200 yards	Alternative 4: Current no-go zone	Alternative 5: Expanded no-go zone	Alternative 6: 7 knots within 400m	Alternative 7: Prohibit park in path
Transportation* 1. Shipping, ferries 2. Commercial fishing and recreational boats	No effect	1. Negligible impact on commercial shipping and ferries. 2. Negligible impact on commercial fishing and recreational vessels.	1. Slightly larger number of commercial shipping and ferries affected than Alternative 2. 2. Slightly larger number of commercial fishing and recreational vessels than Alternative 2.	1. No overlap with shipping or ferry routes. 2. Small number of commercial fishing and recreational vessels displaced.	1. No overlap with shipping or ferry routes. 2. Larger number of commercial fishing and recreational vessels displaced than for Alternative 4.	1. Negligible impact on commercial shipping and ferries. 2. Negligible impact on commercial fishing and recreational vessels.	1. Negligible impact on commercial shipping and ferries. 2. Negligible impact on commercial fishing and recreational vessels.

1
2 *Affects to all types of boaters consist of either changing behavior (slight course changes) to comply with a mandatory regulation or facing enforcement
3 action. Affects to whale watch participants consist of increased viewing distances.

1 **Table 4-2. Summary of Effects of the Proposed Alternative (Alternative 8).**

Resources Impacted	Alternative 8: Proposed Action: Approach distance 200m (Alternative 3), expanded no-go zone (Alternative 5), and prohibit park in path (Alternative 7)
Marine Mammals	<ul style="list-style-type: none"> •Reduction in vessel incidents and decreased risk of strikes, behavioral disturbance and auditory masking throughout Puget Sound and in 6.2 square mile no-go zone (greater reduction than Alternatives 2 and 4 (see Table 4-1)). •Greater reductions in park in path incidents than reduction in other incidents under Alternatives 2, 4, and 6 (see Table 4-1) based on higher numbers of commercial operator incidents and increased compliance expected for commercial operators. •Compared to No-action Alternative, increased fitness of individuals and Southern Resident population improving status.
Listed/ Non-listed Salmonids	Long-term increase in whale population and increase in number of salmonids consumed.
Socioeconomics* 1. Commercial Whale Watching, 2. Shipping, Ferries, and Commercial Fishing	<ol style="list-style-type: none"> 1. Between 14,905 individuals (271 commercial trips) and total number of whale watch participants, which is approximately 500,000 each year. Up to 5,000 commercial kayak participants displaced from San Juan County boat launch. 2. Slightly larger number of commercial shipping and commercial fishing vessels affected per year than Alternative 2 (see Table 4-1). No overlap with shipping or ferry routes, slightly larger number of fishing vessels displaced than Alternative 4 (see Table 4-1).
Recreation* 1. Recreational boating/private whale watch, 2. Participants in commercial whale watch 3. Recreational fishing	<ol style="list-style-type: none"> 1. Between 472 individuals (on 138 trips) and up to all 108,800 potential recreational wildlife viewers. Small # recreational boaters displaced from San Juan County boat launch and up to 5,000 private kayakers displaced from San Juan County boat launch. 2. Between 14,905 individuals (271 commercial trips) and total number of whale watch participants, which is approximately 500,000 each year. 3. 107 private fishing trips with 366 passengers.
Environmental Justice	No effect
Noise	Small decrease in sound levels inside expanded area (larger area than under Alternative 4).
Aesthetics	Increase in quality of viewing experience from land-based areas (greater increase than under Alternative 4, vessels further away from land-based viewing area).
Transportation* 1. Shipping, ferries 2. Commercial fishing and recreational boats	<ol style="list-style-type: none"> 1. Negligible impact on commercial shipping and ferries. 2. Small number of commercial fishing and recreational vessels displaced.

2 *Affects to all types of boaters consist of either changing behavior (slight course changes) to comply with a mandatory regulation or facing enforcement
3 action. Affects to whale watch participants consist of increased viewing distances.

1 **5.0 CUMULATIVE EFFECTS**

2 **5.1 Context for Analysis**

3

4 NEPA defines cumulative effects as “the impact on the environment which results from the incremental
5 impact of the action when added to other past, present, and reasonably foreseeable future actions,
6 regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR
7 1508.7). Section 3.0, Affected Environment, described the current status of each resource, which reflects
8 the effects of past and current actions. The preceding subsections in Section 4.0, Environmental
9 Consequences, evaluated the effects of no action and eight action alternatives on the current status of each
10 resource. This section now considers the cumulative effects of the alternatives on two resources – Southern
11 Resident killer whales and socioeconomics – where such effects might occur, in the context of the effects
12 of past actions, current conditions, and reasonably foreseeable future actions and conditions. Cumulative
13 effects to other resources would likely be minor and are not discussed further.

14 **5.2 Southern Resident Killer Whales**

15

16 An important past action that could have cumulative effects on killer whales is the introduction of
17 persistent organic pollutants into the whales’ food web. Southern Resident killer whales are among the
18 most contaminated mammals tested. Contaminants can affect fitness and reproductive success. The
19 contamination levels and effects of contaminant accumulation are discussed generally in Subsection 3.2.1,
20 Killer Whales. Even though some of these contaminants are no longer produced, they remain in the whales’
21 fat stores and can be mobilized when food is scarce. The continued or increased introduction of current or
22 emerging contaminants into the whales’ food web would have cumulative effects when added to the effects
23 of the contaminants already stored in the whales’ blubber.

24

25 Several reasonably foreseeable future actions or conditions also have the potential to result in cumulative
26 effects to killer whales. One is the expected human population growth in the Puget Sound region, which
27 was around 3.5 million people in 2000, and is expected to grow to nearly 5 million people by 2030
28 (Washington Office of Financial Management 2007).

29

30 Human population growth in the Puget Sound area is likely to increase the amount of existing and newly
31 emerging contaminants into Puget Sound, as increased population leads to increased effluent, impervious
32 surface, and stormwater runoff, all of which are sources of contamination (Subsection 3.2.1, Killer
33 Whales). In particular, NMFS has identified flame retardants as a persistent organic pollutant that could
34 have effects on killer whale fitness and reproduction. This pollutant has increased dramatically in the recent
35 past (Subsection 3.2.1, Killer Whales) (NMFS 2007) and it is reasonably foreseeable that it will increase
36 further with additional population growth. In 2007 the State of Washington established the Puget Sound
37 Partnership, a new agency consisting of an executive director, an ecosystem coordination board, and a
38 Puget Sound science panel (RCW 90.21.210). The Partnership was created to oversee the restoration of the
39 environmental health of Puget Sound by 2020, and has created a long-term plan called the 2020 Action
40 Agenda (Puget Sound Partnership, 2008). The Partnership does not presently have a sufficient track record
41 to support a conclusion that the control or reduction of pollutants into Puget Sound is reasonably
42 foreseeable, and therefore, it is not possible to draw conclusions about Partnership efforts and how they
43 may affect pollution and contamination or whale populations.

44

45 Population growth is also likely to result in increased commercial and recreational vessel traffic in the
46 action area. The recreational boating registration figures for Washington state show that the number of

1 boats on the water is gradually increasing over time and this trend is expected to continue (Washington
2 Commission 2004). More recreational vessels in the area could lead to increased interactions between
3 vessels and killer whales, increasing the amount of energy whales spend avoiding vessels, decreasing the
4 time spent foraging because they are reacting to vessels, and decreasing their foraging efficiency because of
5 physical disruption and auditory masking (Subsection 3.2.1, Killer Whales, *Status*.) Increased energy
6 expenditure and decreased foraging efficiency are likely to require whales to draw on fat stores, mobilizing
7 the existing contaminants that are a legacy of past pollution.

8
9 In addition to recreational boating, The Washington Ports Association projects a 4 percent annual growth
10 rate of container shipping into Puget Sound through 2025 (Washington Public Ports Association and
11 Washington Department of Transportation 2004). Increased vessel traffic increases the risk of oil spills in
12 Puget Sound. In its recovery plan for killer whales, NMFS identifies a large oil spill occurring in an area
13 where all pods are present as the greatest single threat to their persistence (NMFS 2008a).

14
15 The growth of human populations in Puget Sound is also likely to have negative effects on the abundance
16 of salmon, the whales' preferred prey. Population growth and urbanization with the accompanying
17 conversion of land from farm or forest to residential results in the direct loss of habitat areas, a loss of
18 vegetation, and an increase in impervious surface and traffic, with accompanying increase of pollutants in
19 streams and changes in the natural watersheds. These conditions in turn degrade stream channel conditions,
20 by increasing peak flows that wash out gravels and reduce bank stability, increasing stream temperatures,
21 increasing sediment, and loss of stream complexity and riparian vegetation (NMFS 2007). These habitat
22 alterations may continue to degrade the conservation value for recovering salmon. Salmon recovery plans
23 call for a combination of habitat protection and restoration actions as well as integrated harvest, hatchery
24 and habitat management approaches.

25
26 Another future trend that may indirectly affect Southern Residents is continued global climate change,
27 which will affect Puget Sound freshwater and marine habitats. As reviewed in ISAB (2007), the current
28 status of salmon and steelhead species and their critical habitat in the Pacific Northwest has been
29 influenced by climate change over the past 50 to 100 years and this change is expected to continue into the
30 future. Average annual Northwest air temperatures have increased by approximately 1°C since 1900, which
31 is nearly twice that for the last 100 years, indicating an increasing rate of change. The latest climate models
32 project a warming of 0.1 to 0.6°C per decade over the next century. This change in surface temperature has
33 already modified, and is likely to continue to modify, freshwater, estuarine, and marine habitats of salmon
34 and steelhead, including designated critical habitat. Consequently, abundance, productivity, spatial
35 distribution, and diversity of salmonid life stages occupying each type of affected habitat is likely to be
36 further modified, generally in a detrimental manner. There is still a great deal of uncertainty associated with
37 predicting specific changes in timing, location, and magnitude of future climate change. It is also likely that
38 the intensity of climate change effects on salmon and steelhead will vary by geographic area. It is uncertain
39 how these changes may directly affect killer whales, but it is reasonably foreseeable that they will decrease
40 the abundance of salmon, the whales' preferred prey (Battin et al. 2007). Any future reduction in prey
41 availability for killer whales would work in concert with increased contaminants and increased vessel
42 disturbance to further diminish the fitness of the killer whale population.

43
44 In Puget Sound and elsewhere along the west coast, governments and non-governmental organizations are
45 working to restore depressed salmon stocks. Efforts to protect and restore habitat, reduce harvest impacts,
46 and improve hatchery management practices can all be expected to improve the status of salmon and
47 steelhead coast-wide. At this point it is not clear whether the magnitude of these efforts is sufficient to
48 support an inference that improved abundance of salmon stocks is reasonably foreseeable, particularly
49 given the trends mentioned above of population growth and global climate change. Consequently, since it is

1 difficult to predict salmon abundance within the Puget Sound, it is also difficult to estimate the effect of
2 such an unknown abundance on marine mammal populations dependent on this prey species.

3
4 There are also local efforts underway to identify and protect important habitats. In 2004, the San Juan
5 County Board of Commissioners designated the entire marine waters of the county as a Marine
6 Stewardship Area. Under the Marine Stewardship Area designation, the County is working with other
7 government agencies and using public input from Indian Tribes, county residents, non-resident landowners,
8 visitors, and others with an interest in the county's marine ecosystems to closely look at adopted goals,
9 develop specific objectives, and determine what additional protections are necessary to achieve those
10 objectives. The results of this work will be the designation of specific areas within the marine stewardship
11 area where different levels of voluntary or regulatory protection could be established in a coordinated effort
12 by marine site managers of the County waters to meet the goals. A new mandatory no-go zone could be
13 recognized and promoted as part of the Marine Stewardship Area, which could increase compliance by
14 vessel operators and thereby provide a benefit to Southern Resident killer whales by decreasing potential
15 vessel disturbances in the zone location.

16
17 Under the No-action Alternative, NMFS would continue to promote the Be Whale Wise guidelines and
18 enforce mandatory ESA and MMPA prohibitions, but would not adopt mandatory regulations regarding
19 vessel activities around killer whales. As a result, the current levels of disturbance, described in Subsection
20 3.2, Marine Mammals, would continue and could increase. These levels of disturbance may interact with
21 the factors described above (contaminant levels, increased vessel use, and prey availability) to harm the
22 fitness of individual killer whales and the population as a whole. Continuation of these risks, in
23 combination with negative effects of population growth and climate change, could have negative
24 cumulative effects on killer whales.

25
26 Under the action alternatives, NMFS would regulate vessel activity in an effort to reduce vessel incidents
27 that can harm killer whales. Benefits to killer whales may help offset the potential cumulative negative
28 effects described above.

29 **5.3 Socioeconomics**

30 Under all of the action alternatives, NMFS would impose mandatory restrictions on vessels, including
31 commercial whale watch vessels. Alternatives 2, 4, 6, and 7 would not impose mandatory regulations
32 beyond the voluntary guidelines that the whale watch industry largely already observes. Under Alternatives
33 3 and 5, NMFS would promulgate regulations that are more restrictive than the current voluntary
34 guidelines. While the analysis presented in Section 4.0, Environmental Consequences, suggests that any
35 economic impacts of these regulations would be minor, they could have cumulative effects when
36 considered with other current and potential future events affecting the whale watch industry. In particular,
37 Washington gasoline prices almost tripled between 2002 and 2007 (Leffler 2007). Some whale watch
38 companies have begun charging fuel surcharges to their customers. Any long-term projection of world oil
39 prices and effects on fuel costs is highly uncertain, but for a number of scenarios forecasters have projected
40 oil prices may remain at high levels or could continue to rise (Energy Information Administration 2008). If
41 whale watch operators either have to raise prices to cover fuel costs or operate with smaller profit margins,
42 it is possible that small decreases in the number of passengers could have cumulative effects on whale
43 watch profits.
44

1 **6.0 REGULATORY IMPACT REVIEW**

2 **6.1 Introduction**

3 This Regulatory Impact Review/Regulatory Impact Assessment (RIR/RIA) describes the costs and
4 benefits of the proposed action and other alternatives in accordance with Executive Order (EO) 12866
5 and its guidelines established in OMB Circular A-4 and the Regulatory Flexibility Act, and EO 13422.
6 This assessment is separate from the NEPA analysis but is included here for convenient reference. EO
7 12866 states:

8
9 Federal agencies should promulgate only such regulations as are required by law, are
10 necessary to interpret the law, or are made necessary by compelling public need, such
11 as material failures of private markets to protect or improve the health and safety of the
12 public, the environment, or the well-being of the American people. In deciding whether
13 and how to regulate, agencies should assess all costs and benefits of available
14 regulatory alternatives, including the alternative of not regulating. Costs and benefits
15 shall be understood to include both quantifiable measures (to the fullest extent that
16 these can be usefully estimated) and qualitative measures of costs and benefits that are
17 difficult to quantify, but nevertheless essential to consider. Further, in choosing among
18 alternative regulatory approaches, agencies should select those approaches that
19 maximize net benefits (including potential economic, environmental, public health and
20 safety, and other advantages; distributive impacts; and equity), unless a statute requires
21 another regulatory approach.

22
23 EO 12866 was amended by EO 13422 (September 7, 2007), which requires Federal agencies to
24 describe in writing the market failure that gives rise to the need for regulations. Executive branch
25 guidance from the Office of Management and Budget describes one type of market failure as follows:

26
27 1. Externality, common property resource and public good
28 An externality occurs when one party's actions impose uncompensated benefits or costs
29 on another party. Environmental problems are a classic case of externality. For
30 example, the smoke from a factory may adversely affect the health of local residents
31 while soiling the property in nearby neighborhoods. If bargaining were costless and all
32 property rights were well defined, people would eliminate externalities through
33 bargaining without the need for government regulation. From this perspective,
34 externalities arise from high transaction costs and/or poorly defined property rights that
35 prevent people from reaching efficient outcomes through market transactions (OMB
36 2003).

37
38 As described in Subsection 1.4, Purpose and Need for Action, the statement of purpose and need for the
39 proposed action is as follows:

40 The purpose of the proposed action is to protect killer whales from vessel impacts, which will
41 support recovery of Southern Resident killer whales.

42
43 Both the ESA and MMPA prohibit the take of Southern Resident killer whales, and give NMFS
44 authority to adopt such other regulations as are appropriate to carry out the purposes of the respective
45 statutes (ESA section 11(f), MMPA section 112(a)). Specific voluntary guidelines (described in
46 Subsection 1.3, Current MMPA and ESA Prohibitions, Regulations, and NMFS Guidelines) currently
47 assist vessel operators by describing vessel operations that protect the whales. In spite of the current

1 general take prohibitions and specific voluntary guidelines, there continue to be many incidents where
2 vessel activities disturb the whales and create the risk of collisions. Without specific mandatory
3 regulations (that is, under the No-action Alternative) continued and possibly increasing levels of vessel
4 incidents are likely (Subsection 4.2.1, Alternative 1 (No Action)). Vessel effects were identified as a
5 risk factor in the listing of Southern Resident killer whales and the recovery plan identifies actions such
6 as minimizing disturbance from vessels (NMFS 2008a). In other words, a continuation of the status quo
7 is likely to inhibit the recovery of this endangered population. Existing market forces have proven
8 incapable of limiting the number of vessel incidents to the point that they are not a threat to the whales'
9 continued existence. Available information supports a conclusion that the number of vessel incidents
10 will decrease with specific mandatory regulations in place. Accordingly, NMFS is proposing to reduce
11 the threat vessels pose to the whales, and increase their chances of recovery, by promulgating specific
12 mandatory regulations.

13
14 The proposed action – a combination of a 200 yard approach regulation, an expanded no-go zone, and
15 prohibition on parking in the path – would likely reduce the number and severity of vessel incidents
16 and promote population growth and recovery. The approach regulation and parking in the path
17 prohibition would protect the whales throughout inland waters of Washington. A no-go zone would
18 provide additional protection in a specific habitat used often by the whales and important for foraging.
19 This regulatory approach would meet the purpose and need identified in this EA and implement an
20 action called for in the recovery plan, providing protection for the whales. The rationale for the
21 individual elements chosen as part of the proposed action is described in Subsection 6.2, Alternatives.
22 The benefits of the proposed action are evaluated in detail in Section 4.0, Environmental
23 Consequences, and summarized below in Subsection 6.3.1, Description of Benefits. The costs of the
24 proposed action are also evaluated in detail in Section 4.0, Environmental Consequences, and
25 summarized below in Subsection 6.3.2, Description of Affected Parties and Types of Costs.

26
27 The discussion that follows summarizes the costs and benefits of alternative regulations, including the
28 No-action Alternative of not promulgating regulations. The No-action Alternative represents the status
29 quo and is the baseline used to estimate costs and benefits of the alternative regulations (Alternatives 2
30 through 8). This draft EA, including RIR/RIA analysis, and separate economic analysis (IEC 2008)
31 contain all the elements of the RIR/RIA. The RIR/RIA also serves as a basis for NMFS' determination
32 on whether the proposed action is a "significant regulatory action" under the criteria provided in EO
33 12866. This determination is discussed in Subsection 6.4, Determination of Significant Regulatory
34 Action. Moreover, NMFS concludes that the proposed action would not impose undue economic
35 burdens on industries or individuals.

36 **6.2 Alternatives Considered**

37
38 Subsection 2.1, Introduction, lists the criteria by which alternatives were selected for full analysis.
39 Subsection 2.2, Alternatives, describes each alternative in detail. The list of alternatives analyzed is as
40 follows:

- 41 Alternative 1: No-action
- 42 Alternative 2: 100 Yard Approach Regulation
- 43 Alternative 3: 200 Yard Approach Regulation
- 44 Alternative 4: Protected Area – Current Voluntary No-go Zone
- 45 Alternative 5: Protected Area – Expanded No-go Zone
- 46 Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer Whales
- 47 Alternative 7: Keep Clear of the Whales' Path
- 48 Alternative 8: Proposed Action (Package of Alternatives 3, 5, and 7)

1 **Approach Regulation (Alternative 2: 100 Yard Approach Regulation, Alternative 3: 200 Yard**
2 **Approach Regulation)**

3 Recent research suggests that the current 100 yard guideline, which was also adopted as a state
4 regulation in 2008, is not sufficient to protect the whales from vessel interactions that can cause
5 behavioral disturbance, mask echolocation and communication, and result in risk of vessel strikes.
6 Because boaters are more likely to observe a mandatory regulation than a voluntary guideline
7 (Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines),
8 adopting a 100 yard approach regulation would reduce the number of incidents compared to the
9 baseline. Adopting a 200 yard approach regulation would not only reduce the number of incidents but
10 would increase the distance between the whales and vessels compared to the baseline and to
11 Alternative 2.

12
13 Several studies have demonstrated changes in whale behavior when vessels approach (Subsection 4.2,
14 Marine Mammals). These changes can increase energy expenditure and reduce time spent foraging,
15 both of which can result in harmful physiological impacts (Subsection 4.2, Marine Mammals). For
16 example, the presence of some fast moving vessels within 100 yards of the whales can decrease the
17 distance at which whales can detect salmon by 88 to 100 percent and within 200 yards the distance is
18 decreased by 75 to 95 percent. Both behavioral disturbance and masking decrease as vessel distance
19 increases.

20
21 Reducing behavioral disturbance and acoustic masking is likely to have physiological effects that
22 increase the fitness of individual whales. While a small increase in fitness from a 100 yard approach
23 regulation would provide some moderate benefit to the whales, impacts from vessels at 100 yards
24 would still occur. A 200 yard regulation would provide high benefit to the whales' fitness by limiting
25 the effects from vessels at 100 yards. In addition to reducing behavioral disturbance and acoustic
26 masking, reducing the number of incidents in which vessels closely approach whales would reduce the
27 risk of vessel strike. Because the Southern Residents are such a small population, injury or mortality
28 from a vessel strike could have population level impacts, particularly for reproductive females.
29 Reducing risk of vessel strikes and improving the fitness of even a small number of individual whales
30 could substantially reduce the entire population's risk of extinction. There is currently a decreasing
31 population trend and an increase in fitness could slow or reverse this trend by reducing the number of
32 mortalities and/or increasing the number of births.

33
34 A 200 yard approach regulation in U.S. waters would also provide an opportunity for continued
35 coordination regarding protections of killer whales in Canadian waters. Considerable efforts have been
36 made to coordinate the guidelines on both sides of the border for clarity to boaters operating in the
37 waters of both countries. We will continue coordination and provide support for any efforts in Canada
38 to also consider increased approach guidelines or regulations to maintain consistency and provide a
39 benefit to the whales.

40
41 **No-go Zone (Alternative 4: Current No-go Zone and Alternative 5: Expanded No-go Zone)**

42 Eliminating vessels from an area reduces the risk of vessel strikes, behavioral disturbance and auditory
43 masking. The no-go zones along the west side of San Juan Island are important foraging areas for the
44 whales (Subsection 3.2.1.3, Foraging) and reducing behavioral disturbance and auditory masking in the
45 area increases the opportunities for the whales to forage and to locate prey without interference with
46 echolocation. Some effects may still occur from vessels just outside the no-go zone or watching whales
47 from the border of the no-go zone. As discussed above under Approach Regulations above, behavioral
48 disturbance and acoustic masking are both reduced the further the vessels are from the whales. While
49 the current no-go zone would provide a moderate benefit to the whales, the larger expanded no-go zone

1 would provide a bigger buffer from vessels and result in greater reductions of vessel effects and high
2 benefits to the whales.

3
4 Reducing behavioral disturbance and acoustic masking is likely to have physiological effects that
5 increase the fitness of individual whales. In addition to reducing behavioral disturbance and acoustic
6 masking, prohibiting vessels from an area used regularly by the whales would greatly reduce the risk of
7 vessel strike in that area. Because the Southern Residents are such a small population, injury or
8 mortality from a vessel strike could have population level impacts, particularly for reproductive
9 females. Reducing risk of vessel strikes and improving the fitness of even a small number of individual
10 whales could substantially reduce the entire population's risk of extinction. There is currently a
11 decreasing population trend and an increase in fitness could slow or reverse this trend by reducing the
12 number of mortalities and/or increasing the number of births.

13
14 In addition to the benefits to the whales, the no-go zones would benefit individuals participating in
15 land-based viewing at locations adjacent to the no-go zones, including Lime Kiln Point State Park. The
16 benefits to land-based viewing would be greater for the expanded no-go zone because fewer vessels
17 would be in the viewshed compared to the current no-go zone.

18
19 **Speed Limit of 7 Knots Within 400 Yards of Killer Whales Regulation (Alternative 6)**

20 Because boaters are more likely to observe a mandatory regulation than a voluntary guideline
21 (Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines),
22 adopting a speed regulation would reduce the number of incidents compared to the baseline. As
23 described in Subsection 4.2.6, Alternative 6: Speed Limit of 7 Knots Within 400 Yards of Killer
24 Whales, fast moving vessels near the whales can interfere with echolocation and put the whales at risk
25 for vessel strikes. There is currently only a small number of speed incidents observed and the reduction
26 in incidents would be difficult to achieve through enforcement. A speed limit within 400 yards of the
27 whales would be difficult to enforce because it would require measuring both speed and distance from
28 whales. Enforcement techniques for estimating speed are limited (i.e., pacing vessels) and speed over
29 ground vs. over water would also need to be specified, making interpretation of the speed limit
30 challenging for boaters. The challenges of enforcing a speed regulation would result in only small
31 reductions in incidents that result in risk of vessel strikes or auditory masking. The speed regulation
32 would therefore, likely provide low biological benefits to the whales over the baseline. In addition, the
33 proposed regulation, which includes a 200 yard approach regulation (Alternative 3) in combination
34 with a keep clear of the whales' path regulation (Alternative 7), would address some of the same sound
35 impacts as a speed limit.

36
37 **Keep Clear of the Whales' Path Regulation (Alternative 7)**

38 Because boaters are more likely to observe a mandatory regulation than a voluntary guideline
39 (Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines),
40 adopting a parking in the path regulation would reduce the number of incidents compared to the
41 baseline. Parking in the path is the most common incident for commercial operators and as discussed in
42 Subsection 4.1.2, General Effects of Enforceable Regulations Compared to Voluntary Guidelines, a
43 large increase in compliance with a mandatory regulation would be expected for commercial operators.
44 As described in Subsection 4.2.7, Alternative 7: Keep Clear of the Whales' Path, parking in the path
45 can interfere with important social behaviors and sound from vessels has the greatest potential to mask
46 echolocation directly in front of the whales.

47
48 Reducing behavioral disturbance and acoustic masking is likely to have physiological effects that
49 increase the fitness of individual whales. A parking in the path regulation would provide high benefit to

1 the whales' fitness by limiting these effects particularly when whales are engaging in important social
2 activities and foraging. In addition to reducing behavioral disturbance and acoustic masking, reducing
3 the number of incidents in which vessels are in the path of whales would reduce the risk of a vessel
4 strike. Because the Southern Residents are such a small population, injury or mortality from a vessel
5 strike could have population level impacts, particularly for reproductive females. Reducing the risk of
6 vessel strikes and improving the fitness of even a small number of individual whales could
7 substantially reduce the entire population's risk of extinction. There is currently a decreasing
8 population trend and an increase in fitness could slow or reverse this trend by reducing the number of
9 mortalities and/or increasing the number of births.

10
11 **Regulation Package (Alternative 8)**

12 The proposed regulation, a combination of regulations contained in Alternatives 3, 5, and 7, would
13 provide all of the benefits described above under each of those Alternatives. This combination provides
14 higher biological benefits to the whales than any single alternative. The proposed regulation provides
15 biological benefits throughout inland waters and even greater benefits in specific habitat important to
16 the whales. Having both an approach regulation and a keep clear of the whales' path regulation would
17 address some of the same impacts that a speed limit would address, and an approach regulation and
18 keep clear of the whales' path regulation would be easier to enforce than a speed limit within 400 yards
19 of whales. The combination of regulations would reduce behavioral disturbance and acoustic masking
20 from closely approaching vessels and vessels in the path of the whales, and reduce the risk of vessel
21 strikes and impacts. These effects would be reduced even more within the no-go zone.

22
23 Reducing the risk of vessel strikes, behavioral disturbance and acoustic masking and, therefore,
24 improving the fitness of even a small number of individual whales could substantially reduce the entire
25 population's risk of extinction. There is currently a decreasing population trend and an increase in
26 fitness could slow or reverse this trend by reducing the number of mortalities and/or increasing the
27 number of births. Such benefits to the status of Southern Resident whales would begin to address
28 concerns that led NMFS to list this DPS as endangered under the ESA (Subsection 3.2.1.2, Status).

29
30 **Summary**

31 The No-action Alternative, Alternative 1 would not provide any benefits to the Southern Resident killer
32 whale population over the baseline because no additional measures would be taken to reduce vessel
33 incidents or disturbance from vessels and current levels of disturbance would continue to inhibit
34 recovery. Alternatives 2 through 8 would have positive effects on the Southern Resident population
35 since they would reduce the number of vessel incidents and decrease the risk of strikes, behavioral
36 disturbance, and auditory masking. These reductions are expected to increase the fitness of individual
37 whales and the population. Alternative 3 is expected to have a greater reduction than Alternative 2
38 because risk of strikes, behavioral disturbance, and auditory masking would all be lower for vessels
39 viewing whales at 200 yards than for vessels at 100 yards. Alternative 5 is expected to have a greater
40 reduction to impacts than Alternative 4 because risk of strikes, behavioral disturbance, and auditory
41 masking would all be lower throughout a larger no-go zone. Alternative 7 is expected to have greater
42 reductions in vessel incidents compared to Alternatives 2, 4, and 6 based on higher numbers of parking
43 in the path incidents for commercial operators and the greater level of compliance expected for
44 commercial operators as compared to recreational boaters. The combination of Alternatives 3, 5, and 7
45 in Alternative 8 is expected to have the greatest contribution to the likelihood of survival of endangered
46 Southern Resident killer whales.

1 Section 4.2, Marine Mammals, also describes benefits to other protected marine mammals under each
2 alternative. These benefits are indirect and we are not able to quantify reductions in impacts to or
3 improvements for other marine mammals at this time.

4
5 In addition to benefits to the whales and other marine mammals, Alternatives 4 and 5 also benefit
6 tourism and recreation by increasing the quality of land-based viewing opportunities along the west
7 side of San Juan Island including Lime Kiln Point State Park, one of the most popular land-based
8 viewing sites. Approximately 200,000 visitors go to Lime Kiln Point State Park each year and they
9 would experience enhanced viewing opportunities under Alternatives 4 and 5.

10 **6.3.2 Description of Costs**

11
12 There is a cost of the No-action Alternative to society. As described above, the No-action Alternative
13 would not benefit the whales. A failure to reduce the threat from vessel effects could lead to increased
14 probability of extinction for Southern Resident killer whales. This would affect all of the values
15 discussed in Subsection 6.3.1, Description of Benefits.

16
17 Subsections 4.4, Socioeconomics and 4.5, Recreation report the results of the economic analysis which
18 estimated effects of the alternatives on specific parties (IEC 2008). The economic analysis provides
19 greater detail on the methodology used to produce the estimates. The analysis uses the most recently
20 available data on vessel activities to predict impacts to various parties under each alternative. Vessel
21 operations that focus on the whales including both commercial whale watching tours and recreational
22 boating are expected to be affected the most by each of the action alternatives. Commercial shipping
23 vessels, ferries, and commercial fishing vessels that are not on the water to view the whales would be
24 affected to a lesser extent. When possible, the impacts were quantified by identifying the numbers of
25 individuals or vessel trips potentially affected by each alternative (Table 6-1). The number of
26 individuals or trips affected provides information on relative size of impacts, however, dollar estimates
27 or costs associated with those impacts are not available. The primary effect is an increased viewing
28 distance from the whales and these effects are described in both Subsections 4.4 Socioeconomics and
29 4.5 Recreation, but are not monetized.

30
31 Alternatives 2, 4, 6, and 7 are consistent with what is recommended under the current voluntary Be
32 Whale Wise guidelines. The parties affected by making these guidelines mandatory are the individuals
33 who are currently not following the recommended guidelines. Recreational boaters are currently less
34 likely to comply with the guidelines that would be codified in Alternatives 2, 4, and 6, while
35 commercial whale watchers are less likely to comply with the guideline that would be codified in
36 Alternative 7.

37
38 More individuals participating in commercial whale watch tours may be affected than the number of
39 private boaters for each of the alternatives. Based on different occupancy throughout the year there are
40 approximately 6,264 commercial whale watch trips per year, with most trips concentrated in May
41 through September (Russell and Schneider In Preparation). Commercial whale watch trips are
42 estimated to have an average of 55 individuals (NWFSC data), while recreational vessels including
43 kayaks have an average of 3.42 individuals participating (Koski 2007). Even though more private
44 vessels may not follow some guidelines, the number of people on each whale watch tour
45 (approximately 55) increases the impacts in terms of individuals for commercial whale watching.

1 **Table 6-1. Benefits and costs of alternatives.**

Alternative		Benefits to whales	Costs	
			Socioeconomics	Recreation
1	No Action	None	<ul style="list-style-type: none"> Increased risk of extinction of whales and potential loss of whale watch industry 	<ul style="list-style-type: none"> Increased risk of extinction of whales and potential loss of recreational whale watch opportunities
2	100 Yard Approach Regulation	Moderate, throughout inland waters of Washington	<ul style="list-style-type: none"> 15 commercial trips and 825 individuals on commercial whale watch trips 4 commercial shipping/fishing trips 	<ul style="list-style-type: none"> 55 private whale watching trips with 188 passengers 20 private fishing trips with approximately 68 passengers 7 kayak trips with 14 passengers
3	200 Yard Approach Regulation	High, throughout inland waters and potentially in Canadian waters with continued coordination	<ul style="list-style-type: none"> Between 15 commercial trips and 825 individuals on commercial whale watch trips and total number of whale watch participants (500,000) Greater than 4 commercial shipping/fishing trips 	<ul style="list-style-type: none"> Potentially all recreational whale watchers (up to 108,800) Minor effects on private fishing trips
4	Protected Area-Current No-go Zone	Moderate, within zone (also some benefits to land-based viewing)	<ul style="list-style-type: none"> 61 commercial trips and 3,355 individuals on commercial whale watch trips Small number of fishing vessels displaced Up to 5,000 commercial kayakers displaced from San Juan County boat launch 	<ul style="list-style-type: none"> 18 private vessel trips with approximately 62 passengers Small number of recreational boaters displaced from San Juan County boat launch and up to 5,000 private kayakers displaced from San Juan County boat launch
5	Protected Area-Expanded No-go Zone	High, within zone (also some benefits to land-based viewing)	<ul style="list-style-type: none"> Between 119 commercial trips and 6,545 individuals on commercial whale watch trips and total number of whale watch participants (500,000) Small number of fishing vessels displaced (larger number than Alternative 4) Up to 5,000 commercial kayakers displaced from San Juan County boat launch 	<ul style="list-style-type: none"> Potentially all recreational whale watchers (up to 108,800) Small number of recreational boaters displaced from San Juan County boat launch and up to 5,000 private kayakers displaced from San Juan County boat launch

6	7 knots Within 400m	Low, throughout inland waters of Washington	<ul style="list-style-type: none"> 13 commercial trips with approximately 715 individuals on commercial whale watch trips 	<ul style="list-style-type: none"> 46 private whale watching trips with approximately 157 passengers 16 private fishing trips with approximately 55 passengers
7	Keep Clear of the Whales' Path	High, throughout inland waters of Washington	<ul style="list-style-type: none"> 137 commercial trips with 7,535 individuals on commercial whale watch trips 	<ul style="list-style-type: none"> 38 private whale watching trips with 130 passengers 12 private fishing trips with 41 passengers 5 kayak trips with 10 passengers
8	200 Yard Approach Regulation, Expanded No-go Zone, and Keep Clear of the Whales' Path	High, throughout inland waters of Washington, in expanded zone and potentially in Canadian waters with continued coordination	<ul style="list-style-type: none"> Between 271 trips with 14,905 individuals and total number of whale watch participants (500,000) Small number of fishing vessels displaced Up to 5,000 commercial kayakers displaced from San Juan County boat launch 	<ul style="list-style-type: none"> Between 138 private vessel trips with 472 passengers and all recreational whale watchers (up to 108,800) Small number of recreational boaters displaced from San Juan County boat launch and up to 5,000 private kayakers displaced from San Juan County boat launch 107 private fishing trips with 366 passengers

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Commercial Whale Watching

Alternatives 2, 4, 6, and 7 are consistent with current Be Whale Wise guidelines, so only operators who are not following the guidelines would be affected by making the guidelines mandatory. For the most part, commercial whale watch operators comply with the 100 yard viewing guideline, current voluntary no-go zone, and the speed guideline. The small number of operators not complying with these guidelines would have to adjust their behavior to comply with mandatory regulations or face enforcement actions and potential fines. There are a larger number of commercial operators that currently do not follow the guideline asking to keep clear of the whales' path that would face a similar choice between adjusting their operations or facing enforcement actions. For Alternatives 2, 4, 6, and 7, it is likely that commercial operators would adjust their behavior to comply with new regulations rather than face enforcement actions that could result not only in fines, but also in loss of reputation and, potentially, future customers.

Alternatives 3 (200 Yard Approach Regulation) and 5 (Expanded No-go Zone) have the largest uncertainty regarding potential economic impacts. Both of these alternatives could result in a large portion of the commercial whale watch industry viewing whales from a greater distance than they currently do when operating by the current Be Whale Wise Guidelines. The entire fleet would need to adjust their approach to viewing the whales to comply with these new regulations. While members of the commercial whale watching industry have suggested that viewing from a greater distance could reduce interest in whale watching and result in fewer customers, there is evidence that proximity to

1 whales is not the most important feature of a whale watch experience. An increased viewing distance
2 may not have any economic impact on commercial whale watch trips particularly if the reasons for the
3 increased viewing distance are explained to customers. This is consistent with the importance of
4 responsible viewing and respect to the whales valued by whale watch participants. In addition, other
5 methods can be employed to increase the viewing experience from a greater distance including use of
6 larger viewing platforms, binoculars, and telephoto lenses. If an increased viewing distance did affect
7 the willingness to pay of individuals participating in commercial whale watch trips or value, this would
8 have an effect on the consumer surplus rather than the net expenditures for these types of leisure
9 activities (IEC 2008).

10
11 Alternatives 4 and 5 (no-go zones) also have the potential to affect a number of commercial kayak
12 operations that launch from the San Juan County Park boat ramp. These operations would need to find
13 alternate launch locations which could increase the current cost of their operations.

14
15 Alternative 8 (which combines Alternatives 3, 5, and 7) has the largest estimated impact to the
16 commercial whale watch industry in terms of the number of trips and individuals that would be
17 affected. The combination of trips and individuals affected by Alternative 8 is still a small percentage
18 of the total direct, indirect, and induced expenditures related to the industry, which is estimated at \$18.4
19 million annually. While not the most likely scenario, if all of the individuals affected by Alternative 8
20 decided not to participate in commercial whale watching the impacts could be up to 1 million dollars
21 (approximately 3 to 6 percent of \$18.4 million). The higher end of this estimate includes the 5,000
22 commercial kayak participants affected by not being able use the San Juan County Park boat ramp for
23 several months of the year.

24 25 **Recreation**

26 Alternatives 2, 4, 6, and 7 are consistent with current Be Whale Wise guidelines, so only recreational
27 boaters who are not following the guidelines would be affected by making the guidelines mandatory.
28 Recreational boaters may not be aware of the guidelines and some fail to comply with the 100 yard
29 viewing guideline, current voluntary no-go zone, and speed guideline. The recreational boaters not
30 complying with these guidelines would have to adjust their behavior to comply with mandatory
31 regulations or face enforcement actions and potential fines. There are also a number of recreational
32 boaters who do not comply with the guideline asking to keep clear of the whales' path, however, non-
33 compliance with this guideline is a bigger issue for commercial operators. All recreational boaters not
34 following current guidelines would face the choice between adjusting their operations or risking
35 enforcement actions. It is likely that recreational boaters who are aware of new regulations would
36 adjust their behavior to comply with new regulations rather than face enforcement actions and
37 associated fines. Complying with new regulations, particularly Alternatives 3 and 5 would increase the
38 viewing distance for most recreational boaters. Proximity to the whales is not the most important aspect
39 of whale watching for participants in commercial trips and this is likely the case for recreational boaters
40 as well. No economic impacts have been identified for increasing the viewing distance for recreational
41 boaters.

42
43 Alternatives 4 and 5 (no-go zones) also have the potential to affect a number of recreational kayak and
44 motorized vessel operations that launch from the free public San Juan County Park boat ramp. These
45 kayakers and other boaters would need to find alternate launch locations, some of which charge small
46 launch fees.

47
48 While some recreational boaters are targeting the killer whales and participating in whale watching
49 activities, this is not the primary activity for most recreational boaters. Even if recreational boaters

1 adjusted their behavior to follow new regulations and viewed the whales at greater distances, this is not
2 likely to discourage people from participating in boating. None of the alternatives would be expected to
3 reduce the number of recreational boaters on the water or affect the economic value of recreational
4 boating.

6 Other Commercial Operations

7 A small number of commercial ships, ferries, and commercial fishing vessels would need to alter their
8 course to follow new regulations or face enforcement action and fines. Commercial vessel operators
9 aware of the new regulations and presence of whales would likely alter their course if safe to do so.
10 Small course changes would be inconvenient but would not have a monetary impact. Although
11 diverting around whales and no-go zones could potentially result in delays, increased distance traveled
12 and fuel consumed, these impacts would be very short-term in nature and affect such a small number of
13 trips that it would be negligible in the context of the value of commercial shipping, fishing, or ferry
14 operation.

15 6.3.3 Cost/Benefit Conclusions

16
17 Vessel regulations would address one of the three main threats identified in the listing of Southern
18 Resident killer whales as endangered under the ESA, and implement an action identified in the
19 recovery plan. Alternatives 2 through 7 each provide some benefit to the whales, some more than
20 others (Table 6-1). Alternative 8 is made up of three alternatives, each with high benefits to the whales,
21 and therefore provides the greatest benefit to the whales in terms of reducing risk of vessel strikes,
22 behavioral disturbance, and acoustic masking that can all affect the fitness of individual whales and the
23 population of endangered Southern Resident killer whales. These benefits cannot be quantified in terms
24 of the number of whales saved or increased chance of recovery. Thus it is not possible to translate the
25 biological benefits to whales into a dollar value. Nevertheless, NMFS concludes that the benefit of the
26 proposed regulation is considerable in terms of reducing threats to the population, increasing fitness of
27 individuals, and increasing the probability of achieving recovery. The ESA provides a basis for the
28 conclusion that recovery of endangered species has value.

29
30 Any economic burden resulting from the proposed regulation will likely be greatest for the commercial
31 whale watch industry as a result of increased viewing distance, however, as described, there is
32 information that commercial whale watching will continue and regulations could even provide benefits
33 for land-based whale watching activities. Studies have found that it is more important to whale
34 watching participants that they view whales in a respectful, protective manner than that they get within
35 a specific distance. This suggests any negative effects caused by regulations that increase the viewing
36 distance may be minimized if the participants are educated on the reasons for the regulations. The
37 result is likely a small impact born by the participants and not necessarily and economic impact borne
38 by the commercial whale watching companies.

39
40 If the quality of a whale watching trip is compromised by an increased viewing distance, lack of access
41 to a particular area, or changes in methods (i.e., no parking in the path) the amount participants are
42 willing to pay may decrease. In this case they may travel to another area or choose different ways to
43 spend their leisure time which would reduce the consumer surplus (IEC 2008). The overall level of
44 expenditures on leisure activities in the project area, however, is likely to remain constant for a
45 particular individual. The local area or set of businesses that benefit from those expenditures may vary.

46
47 The benefits of three alternatives (Alternatives 3, 5, and 7) are high and Alternative 8 combines these
48 individual regulations into a proposed action with the highest benefit. The expected costs are minimal

1 for each alternative. For Alternatives 2 through 8 costs, as estimated by the number of commercial and
2 recreational trips and passengers affected, vary and in some cases the overall number of trips and
3 passengers affected are small (Alternatives 2, 4, 6, and 7). For other alternatives (Alternatives 3, 5, and
4 8) there is some uncertainty as to the number of trips and passengers affected. Even if all participants in
5 recreational and commercial whale watching are affected, the impact itself (based on an increased
6 viewing distance) is small. Therefore, Alternative 8 with the highest benefit and small costs provides
7 the highest net benefit. While there may be some economic cost to various industry groups, particularly
8 commercial whale watching, overall this cost is likely to be minimal and outweighed by the
9 conservation benefits of regulations.

10 **6.4 Determination of Significant Regulatory Action**

11
12 EO 12866 defines a “significant regulatory action” as one that is likely to result in a rule that could:

- 13 1. Have an annual effect on the economy of \$100 million or more or adversely affect in a
14 material way the economy, a sector of the economy, productivity, competition, jobs, the
15 environment, public health or safety, or state, local, or tribal governments or communities.
- 16 2. Create a serious inconsistency or otherwise interfere with an action taken or planned by
17 another agency.
- 18 3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or
19 the rights and obligations of recipients thereof.
- 20 4. Raise novel legal or policy issues arising out of legal mandates, the President’s priorities,
21 or the principles set forth in the EO.

22
23 None of the alternatives are expected to have a substantial economic impact on the commercial whale
24 watch industry or other parties. Under Alternative 8 if individuals discontinued participation in trips
25 because of new regulations and increased viewing distance, a portion of the whale watch industry
26 would be affected. Alternative 8 includes both Alternatives 3 and 5, which have uncertain economic
27 impacts. Although not anticipated, even if a large portion of the commercial fleet suffered negative
28 economic impacts, the entire estimated value of the industry is \$18.4 million, which is below the \$100
29 million level considered significant under EO 12866. While this proposed rule does not meet the
30 economic criteria, the Advance Notice of Proposed Rulemaking and this proposed rule are considered
31 significant regulatory action for the purposes of EO 12866.

32 **6.5 Regulatory Flexibility Analysis**

33
34 When a Federal agency proposes regulations, the Regulatory Flexibility Act requires the agency to
35 prepare an analysis that describes the effect of the rule on small entities (i.e., small businesses, small
36 organizations, and small government jurisdictions). As described by IEC (2008) most of the businesses
37 operating in the commercial whale watch industry are small entities for purposes of the Regulatory
38 Flexibility Act. Commercial fishing industries that could be affected to a lesser degree are also
39 considered small entities. It is therefore likely that the potentially affected entities are small businesses.
40 While operations of the whale watch industry may be affected by the proposed regulation, it is the
41 customers and not necessarily the whale watching operators who may bear impacts. The economic
42 analysis (IEC 2008) projects no change in revenue for whale watching operations, but rather the
43 potential diminished value of the customers’ experience as a result of greater viewing distances. Such
44 losses to individuals engaged in whale watching are not borne by small entities. NMFS does not expect
45 any small entity to cease operation as a result of any of the alternatives.

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authorized to operate under the program and possesses the appropriate State or Tribal permits, when required. Moreover, this section does not authorize the killing of any migratory bird species or destruction of their nest or eggs other than resident Canada geese.

(8) Registrants may not undertake any actions under this section if the activities adversely affect species designated as endangered or threatened under the authority of the Endangered Species Act. Persons operating under this order must immediately report the take of any species protected under the Endangered Species Act to the Service. Further, to protect certain species from being adversely affected by management actions, registrants must:

* * * * *

(e) *Can the depredation order be suspended?* We reserve the right to suspend or revoke this authorization for a particular landowner, homeowners' association, or local government if we find that the registrant has not adhered to the terms and conditions specified in the depredation order. Final decisions to revoke authority will be made by the appropriate Regional Director. The criteria and procedures for suspension, revocation, reconsideration, and appeal are outlined in §§ 13.27 through 13.29 of this subchapter. For the purposes of this section, "issuing officer" means the Regional Director and "permit" means the authority to act under this depredation order. For purposes of § 13.29(e), appeals must be made to the Director. Additionally, at such time that we determine that resident Canada goose populations no longer need to be reduced in order to resolve or prevent injury to people, property, agricultural crops, or other interests, we may choose to terminate part or all of the depredation order by subsequent regulation. In all cases, we will annually review the necessity and effectiveness of the depredation order.

* * * * *

8. In subpart E, amend § 21.61 by revising paragraph (d)(2) to read as follows:

§ 21.61 Population control of resident Canada geese.

* * * * *

(d) * * *

(2) Control activities may be conducted under this section only between August 1 and August 31.

* * * * *

Dated: March 6, 2007.

David M. Verhey,

Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. E7-5199 Filed 3-21-07; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 216

[Docket No. 070125020-7020-01; I.D. 010907A]

RIN 0648-AV15

Protective Regulations for Killer Whales in the Northwest Region under the Endangered Species Act and Marine Mammal Protection Act

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Advance notice of proposed rulemaking.

SUMMARY: We, the National Marine Fisheries Service (NMFS), listed the Southern Resident killer whale distinct population segment (DPS) as endangered under the Endangered Species Act (ESA) on November 18, 2005. In the final rule announcing the listing, we identified vessel effects, including direct interference and sound, as a potential contributing factor in the recent decline of this population. Both the Marine Mammal Protection Act (MMPA) and the ESA prohibit take, including harassment, of killer whales, but these statutes do not prohibit specified acts. We are considering whether to propose regulations that would prohibit certain acts, under our general authorities under the ESA and MMPA and their implementing regulations. The Proposed Recovery Plan for Southern Resident killer whales (published November 29, 2006) includes as a management action the evaluation of current guidelines and the need for regulations and/or protected areas. The scope of this advance notice of proposed rulemaking (ANPR) encompasses the activities of any person or conveyance that may result in the unauthorized taking of killer whales and/or that may cause detrimental individual-level and population-level impacts. NMFS requests comments on whether—and if so, what type of—conservation measures, regulations, or other measures would be appropriate to protect killer whales from the effects of these activities.

DATES: Comments must be received at the appropriate address (see **ADDRESSES**) no later than June 20, 2007. Public meetings have been scheduled for April 18, 2007, 2–4 p.m. in The Grange Hall, Friday Harbor, WA and April 19, 2007, 7–9 p.m. at the Seattle Aquarium, Seattle, WA. Requests for additional public meetings must be made in writing by April 23, 2007.

ADDRESSES: You may submit comments by any of the following methods:

- E-mail: orca.plan@noaa.gov.
- Federal e-rulemaking Portal: <http://www.regulations.gov>.

• Mail: Assistant Regional Administrator, Protected Resources Division, Northwest Regional Office, National Marine Fisheries Service, 7600 Sand Point Way NE, Seattle, WA 98115.

FOR FURTHER INFORMATION CONTACT: Lynne Barre, Northwest Regional Office, 206-526-4745; or Trevor Spradlin, Office of Protected Resources, 301-713-2322.

SUPPLEMENTARY INFORMATION:

Background

Viewing wild marine mammals is a popular recreational activity for both tourists and locals. In Washington, killer whales (*Orcinus orca*) are the principal target species for the commercial whale watch industry—easily surpassing other species, such as gray whales (*Eschrichtius robustus*), porpoises, and pinnipeds (Hoyt, 2001). NMFS is concerned that some whale watch activities may cause unauthorized taking of killer whales or cause detrimental individual-level and population-level impacts.

Killer whales in the eastern North Pacific have been classified into three forms, or ecotypes, termed residents, transients, and offshore whales. Resident killer whales in the North Pacific consist of the following groups: Southern, Northern, Southern Alaska (includes Southeast Alaska and Prince William Sound whales), Western Alaska, and Western North Pacific Residents. The Southern Resident killer whale population contains three pods—J pod, K pod, and L pod and was designated as a depleted stock under the MMPA and listed as endangered under the ESA.

During the spring, summer, and fall, the Southern Residents' range includes the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Strait of Georgia. Their occurrence in the coastal waters off Oregon, Washington, Vancouver Island, and more recently off the coast of central California in the south and off the Queen Charlotte Islands to the north has

been documented. Little is known about the winter movements and range of Southern Residents.

Scientific studies have documented human disturbance of Southern Resident killer whales by vessels engaged in whale watching in the inland waters of Washington. Short-term behavioral changes in Northern and Southern Residents have been observed and studied by several researchers (Kruse, 1991; Kriete, 2002; Williams *et al.*, 2002a, 2002b, 2006; Foote *et al.*, 2004; Bain *et al.*, 2006), although it is not well understood whether it is the presence and activity of the vessel, the sounds the vessel makes, or a combination of these factors that disturbs the animals. Individual animals can react in a variety of different ways to whale watching, including swimming faster, adopting less predictable travel paths, making shorter or longer dive times, moving into open water, and altering normal patterns of behavior at the surface (Kruse, 1991; Williams *et al.*, 2002a; Bain *et al.*, 2006). High frequency sound generated from recreational and commercial vessels moving at high speed in the vicinity of whales may mask echolocation and other signals the species rely on for foraging, communication (Foote *et al.*, 2004) and navigation.

In rare instances, killer whales are injured or killed by collisions with passing ships and powerboats, primarily from being struck by the turning propeller blades (Visser, 1999c; Ford *et al.*, 2000; Visser and Fertl, 2000; Baird, 2001; Carretta *et al.*, 2001, 2004). Some animals with severe injuries eventually make full recoveries, such as a female described by Ford *et al.* (2000) that showed healed wounds extending almost to her backbone. One resident whale mortality from a vessel collision was previously reported for Washington and British Columbia from the 1960s to 1990s (Baird, 2002). However, two additional mortalities have recently been reported. In March of 2006 the lone Southern Resident killer whale, L98, residing in Nootka Sound for several years was killed by a tug boat. While L98 exhibited unusual behavior and often interacted with vessels, his death demonstrates the risk of vessel accidents. In July 2006, the death of a stranded Northern Resident female was attributed to blunt trauma, probably from a vessel strike (M. Joyce, pers. comm.) Five additional accidents between vessels and killer whales have been documented in the region since the 1990s (Baird, 2001; DFO, unpubl. data, NMFS, unpubl. data). One took place on the Washington side of Haro Strait in

1998 and involved a slow moving boat that apparently did not injure the whale. In 1995, a Northern Resident was struck by a speedboat, causing a wound to the dorsal fin that quickly healed. Another Northern Resident was injured by a high-speed boat in 2003, but also recovered. A 2005 collision of a Southern Resident with a commercial whale watch vessel resulted in a minor injury to the whale, which subsequently healed. An additional Northern Resident calf was struck by a vessel in July 2006.

We are concerned about the potential for individual-level and population-level effects because of vessel activities. Vessel effects were identified as a factor in the ESA listing of the Southern Residents and are addressed in the recovery plan which is available on our web page at <http://www.nwr.noaa.gov/>. NMFS has received an increasing number of complaints from the public alleging that killer whales in the core summer area along the west side of San Juan Island are routinely being disturbed by people attempting to closely approach and interact with the whales by vessel (motor powered or kayak). Concerns have been expressed by the U.S. Marine Mammal Commission, as well as members of the scientific community, researchers, wildlife conservation organizations, and some commercial tour operators.

Current MMPA and ESA Prohibitions and NMFS Guidelines and Regulations

The Marine Mammal Protection Act, 16 U.S.C. 1361 *et seq.*, contains a general prohibition on take of marine mammals. Section 3(13) of the MMPA defines the term take as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” Except with respect to military readiness activities and certain scientific research activities, the MMPA defines the term 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].”

In addition, NMFS regulations implementing the MMPA further describe the term take to include: “the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or

attempting to feed a marine mammal in the wild” (50 CFR 216.3).

The MMPA provides limited exceptions to the prohibition on take for activities such as scientific research, public display, and incidental take in commercial fisheries. Such activities require a permit or authorization, which may be issued only after a thorough agency review.

The ESA generally prohibits the taking of endangered species. The ESA defines take to mean “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Both the ESA and MMPA require wildlife viewing to be conducted in a manner that does not cause take.

NMFS has regulated close vessel approaches to large whales in Hawaii, Alaska, and the North Atlantic. In 1995, NMFS published a final rule to establish a 100-yard (91.4-m) approach limit for humpback whales in Hawaii (60 FR 3775, January 19, 1995). In 2001, NMFS published a final rule (66 FR 29502, May 31, 2001) to establish a 100-yard (91.4-m) approach limit for humpback whales in Alaska that included a speed limit for when a vessel is near a whale. In 1997, an interim final rule was published to prohibit approaching critically endangered North Atlantic right whales closer than 500 yards (457.2 m) (62 FR 6729, February 13, 1997).

In addition to these specific regulations, NMFS has provided general guidance for wildlife viewing that does not cause take. This is consistent with the philosophy of responsible wildlife viewing advocated by many federal and state agencies to unobtrusively observe the natural behavior of wild animals in their habitats without causing disturbance (see <http://www.watchablewildlife.org/>).

Each of the six NMFS Regions has developed recommended viewing guidelines to educate the general public on how to responsibly view marine mammals in the wild and avoid causing a take. These guidelines are available on line at: http://www.nmfs.noaa.gov/prot_res/MMWatch/MMViewing.html

The “Be Whale Wise” guidelines developed for marine mammals by the NMFS Northwest Regional Office and partners are also available at: <http://www.nwr.noaa.gov/Marine-Mammals/upload/BeWhaleWise.pdf>

Be Whale Wise is a transboundary effort to develop and revise guidelines for viewing marine wildlife. NMFS has partnered with commercial operators, whale advocacy groups, U.S. and Canadian government agencies and enforcement divisions over the past

several years to promote safe and responsible wildlife viewing practices through the development of outreach materials, training workshops, on-water education and public service announcements. The 2006 version of the Be Whale Wise guidelines recommends that boaters parallel whales no closer than 100 yards (91.4 m), approach animals slowly from the side rather than from the front or rear, and avoid putting the vessel within 400 yards (365 m) in front of or behind the whales. Vessels are also recommended to reduce their speed to less than 7 knots (13 km/h) within 400 meters of the whales, and to remain on the outer side of the whales near shore. Two voluntary no-boat areas off San Juan Island are recognized by San Juan County although this is separate from the Be Whale Wise guidelines. The first is a 1/2-mile (800 m)-wide zone along a 3-km stretch of shore centered on the Lime Kiln lighthouse. The second is a 1/4-mile (400 m)-wide zone along much of the west coast of San Juan Island from Eagle Point to Mitchell Point. These areas were established to facilitate shore-based viewing and to reduce vessel presence in an area used by the whales for feeding, traveling, and resting.

NMFS supports the Soundwatch program, an on-water stewardship and monitoring group, to promote the Be Whale Wise guidelines and monitor vessel activities in the vicinity of whales. Soundwatch reports (Koski, 2004, 2006) characterize trends in incidents when the guidelines are not followed and there is the potential for disturbance of the whales. Incidents are frequently observed involving both recreational and commercial whale watching vessels. Soundwatch also serves as a crucial education component, providing information on the viewing guidelines to boaters that are approaching areas with whales.

Despite the regulations, guidelines and outreach efforts, interactions between vessels and killer whales continue to occur in the waters of Puget Sound and the Georgia Basin. Advertisements on the Internet and in local media in the Pacific Northwest promote activities that appear inconsistent with what is recommended in the NMFS guidelines. NMFS has received letters from the Marine Mammal Commission, members of the scientific research community, environmental groups, and members of the general public expressing the view that some types of interactions with wild marine mammals have the potential to harass and/or disturb the animals by causing injury or disruption of normal behavior patterns. NMFS has

also received inquiries from members of the public and commercial tour operators requesting clarification of NMFS' policy on these matters.

In 2002, NMFS published an ANPR requesting comments from the public on what types of regulations and other measures would be appropriate to prevent harassment of marine mammals in the wild caused by human activities directed at the animals (67 FR 4379, January 30, 2002). The 2002 ANPR was national in scope and covered all species of marine mammals under NMFS' jurisdiction (whales, dolphins, porpoises, seals and sea lions), and requested comments on ways to address concerns about the public and commercial operators closely approaching, swimming with, touching or otherwise interacting with marine mammals in the wild. Several potential options were proposed for consideration and comment, including: (1) codifying the current NMFS Regional marine mammal viewing guidelines into regulations; (2) codifying the guidelines into regulations with additional improvements; (3) establishing minimum approach regulations similar to the ones for humpback whales in Hawaii and Alaska and North Atlantic right whales; and (4) restricting activities of concern similar to the MMPA regulation prohibiting the public from feeding or attempting to feed wild marine mammals. The 2002 ANPR specifically mentioned the complaints received from researchers and members of the public concerning close vessel approaches to killer whales in the Northwest. Over 500 comments were received on the 2002 ANPR regarding human interactions with wild marine mammals in United States waters and along the nation's coastlines.

Request for Information and Comments

NMFS is requesting information and comments on whether — and if so, what type of — conservation measures, regulations, or other measures would be appropriate to protect killer whales in inland waters of Washington from human activities that result in the unauthorized taking of killer whales and/or that may cause detrimental individual-level and population-level impacts.

NMFS has received input on potential measures to address vessel impacts during the ESA listing and recovery planning process. Suggestions included regulations governing all vessels (including aircraft) or only commercial whale watch vessels. Suggestions included a moratorium on all whale watching, prohibiting whale watching for one or more days per week,

developing a permit program for commercial operators, and requiring whale watch vessels to purchase and install Vessel Monitoring System (VMS) equipment to allow for monitoring their activities. Based on the comments received, and the regulations implemented for other marine mammals, NMFS has developed a preliminary list of options for consideration and comment:

Codify the current Be Whale Wise marine mammal viewing guidelines — Codifying the guidelines, in whole or in part, as regulations would make them requirements rather than recommendations, and would allow enforcement of these provisions and penalties for violations.

Establish minimum approach rule — Similar to the minimum approach rules for humpback whales in Hawaii and Alaska, and right whales in the North Atlantic (50 CFR 224.103; 66 FR 29502, May 31, 2001), a limit could be established by regulation to accommodate killer whale viewing opportunities while minimizing the potential detrimental impacts from humans. If establishing a minimum approach rule is appropriate, then we would have to consider whether the current guideline of 100 yards (approximately 100 m) is appropriate for this regulation. We would consider exceptions for situations in which marine mammals approach vessels as well as other situations in which approach is not reasonably avoidable.

Prohibit vessel activities of concern — The current guidelines address specific activities of concern. A regulation could prohibit vessel operators from engaging in these activities or others of concern. Activities of concern include using vessels to herd whales, surrounding whales or otherwise preventing a reasonable means of escape, leapfrogging whales or positioning a vessel in their predictable path, separating calves from attending adults, approaching whales at or above specified speeds, or running a vessel through a group of whales.

Establish time-area closures — Similar to the prohibitions used to protect fish stocks or habitat, we could establish a regulation restricting human access to specific areas. These restrictions could restrict all human entry to the area or restrict only specified acts within an area; they could be full-time or limited to certain seasons when killer whales are likely to be present; or a closure could be any combination of the above.

Operator permit or certification program — We could adopt approach rules or establish closed areas that applied to all vessels except those

operated under a whale watching permit or certification. Issuance of a permit or certification could be based on the operator's knowledge of whale behavior and proper procedures for operating vessels around whales. A permit or certification could allow the whale watch operator to get closer to the whales than those who do not have one. For example, a general approach limit of 200 m could be implemented for all non-permitted or uncertified operators, and only operators who are permitted or certified would be allowed to approach to 100 m of the whales. Sanctions, up to and including loss of permit or certification for noncompliance with applicable regulations, would be possible. The issuance of permits or certifications could be directly related to an assessment of the appropriate level of whale watching in Puget Sound. This would require us to evaluate the current level of whale watching effort and limit the maximum number of vessels that can be engaged in whale watching activity. The limit could be adjusted based on monitoring and ongoing evaluation of what is appropriate to protect the whales.

We recognize that the most appropriate regulations may be some combination of the above measures, or that additional possibilities may exist.

Regulations adopted under the MMPA could apply to all three killer whale ecotypes - residents, transients, and offshores. To the average wildlife viewer, these whales are difficult to differentiate between visually, and all three could potentially be found in the inland waters of Washington State where whale watching occurs.

The geographic scope of regulations, if proposed, would likely be the inland waters of the State of Washington, since this is where vessel interactions are concentrated. The coastal waters off Washington and Oregon do not currently have a significant level of documented vessel interactions, and the small number of killer whale sightings in these areas makes it unlikely that they will develop whale watching operations at significant levels in the future.

NMFS invites information and comment from the public on the advisability of regulations, on the above options, and on other possible measures that will help the agency decide what type of regulations, if any, would be most appropriate to consider for protecting killer whales in the Pacific Northwest. In particular, we are seeking information and comments concerning:

- (1) The advisability of and need for regulations;
- (2) The geographic scope of regulations;
- (3) Management options for regulating vessel interactions with killer whales, including but not limited to the options listed in this notice;
- (4) Scientific and commercial information regarding the effects of vessels on killer whales and their habitat;
- (5) Information regarding potential economic effects of regulating vessel interactions; and
- (6) Any additional relevant information that NMFS should consider should it undertake rulemaking.

You may submit information and comments concerning this ANPR by any

one of several methods (see **ADDRESSES**). Materials related to this notice can be found on the NMFS Northwest Region Web site at <http://www.nwr.noaa.gov/>. We will consider all comments and information received during the comment period in preparing a proposed rule.

References Cited

A complete list of all references cited in this advanced notice of proposed rulemaking can be found on our Web site at <http://www.nwr.noaa.gov/> and is available upon request from the NMFS office in Seattle, Washington (see **ADDRESSES**).

Public Hearings

Based on the level of interest in killer whales and whale watching, public meetings have been scheduled for April 18, 2007, 2–4 p.m. in The Grange Hall, Friday Harbor, WA and April 19, 2007, 7–9 p.m. at the Seattle Aquarium, Seattle, WA. Requests for additional public hearings or special accommodations must be made in writing (see **ADDRESSES**) by April 23, 2007.

Classification

This ANPR was determined to be significant for purposes of E.O. 12866.

Dated: March 15, 2007.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. E7-5262 Filed 3-21-07; 8:45 am]

BILLING CODE 3510-22-S



Memorandum

To: Interested parties

From: NMFS Northwest Fisheries Science Center - Conservation Biology
Division and Northwest Regional Office - Protected Resources Division

Subject: Guidance Document: Data Collection Methods to Characterize
Background and Ambient Sound within Inland Waters of Washington
State

Date: November 30, 2009

Objectives:

To characterize background sound levels (levels absent of proposed activity) and ambient sound levels (sound absent of human influence) in areas of proposed activities that have the potential to injure or disturb marine mammals. These measurements should be relevant in terms of frequency bands of sensitivity and spatial scales (location and depth) with respect to the species considered and work activities in question. These measurements should be characterized across a range of temporal (hourly, weekly, seasonally) and oceanographic conditions that occur during the in-water work window.

Methods for characterizing background sound levels:

Frequency relevance, bandwidth analysis and reported measurements

The list below defines frequency bands for the species considered which is based on known or estimated hearing ranges (see Southall et al. 2007). For each species or taxa, unweighted measurements need to be reported in dBrms re: 1 microPa in one-third octave levels (TOLs) *and* overall sound pressure levels across the entire frequency band (referred to as “overall dB rms levels” which can be calculated by integrated TOLs across the entire frequency band). Overall dB rms levels will be consistent with the way that NMFS applies generic sound exposure thresholds for broadband sounds that cause behavioral disturbance in marine mammals. See temporal scale considerations for how these measurements should be time averaged.

Frequency bands relevant to specific taxa:

- Killer whales (resident and transient), 1-100 kHz (based on Szymanski et al. 1999)
- All pinnipeds (Steller and California sea lions, harbor seals, northern elephant seals) 0.75-75 kHz (based on Southall et al. 2007)



- All baleen whales (humpback, gray and minke whales), 0.07-22 kHz (based on Southall et al. 2007)
- Harbor and Dall's porpoise, 0.2-180 kHz (based on Southall et al. 2007)

Spatial scale considerations

Locations of measurements need to be consistent with where construction and monitoring will take place and need to be at depths consistent with the behavior of the species considered. An initial assessment of where the edge of monitoring will take place is needed to define boundaries of monitoring. Until more comprehensive guidelines are available, NMFS uses conservative thresholds including 120 dBrms re: 1 microPa for continuous sound¹. Thus, one should assume that the 120 dB rule (measured within the appropriate frequency bands listed above) would be applied as a first step. For (a hypothetical) example, let's assume that vibratory pile driving plus other construction activity has a source level equal to 175 dB rms re 1 microPa and that spreading loss equals 15 log R in the location (the actual sound propagation features should be assessed empirically), with R being distances in meters, then the construction activity would equal 120 dB at 4.6 km (2.86 mi) from the source. Background sound levels need to be made somewhere along this 4.6 km radius from the source that is away from features that would bias the data such as main shipping and ferry lanes and near shore where wave action dominates.

In terms of depth, little information is available about how marine mammals use the water column in a specific location. There are some published data that provide a general understanding of some species dive behavior. For example, studies that include dive data collected in inland waters of Washington State suggest that Southern Resident killer whales use most of the water column, except for extreme deep depths that may be beyond their physical dive capabilities (i.e., Review in pgs. II-15 – II-16 of NMFS 2008 and Baird and Hanson 2004). Ideally, data would be collected at multiple depths to represent the range in background sound levels the whales are exposed to (i.e., 10 m, 30 m, 50 m, >150 m or bottom depth). Note that the deepest dives reported for killer whales are 264 m by a Southern Resident (Baird et al. 2005). If data collection at multiple depths is not possible, at least two depths should be represented: (1) at relatively shallow depth (i.e., within 10 m to 20 m of the surface, which represents a depth range frequently used by marine mammals; see Baird and Hanson 2004 [Southern Resident killer whales]; Westgate et al. 1995, and Otani et al. 1998 [harbor porpoises]) and (2) at relatively deep depth potentially close to the bottom, the specific depth range of which would be dependent on site characteristics and known species use.

Temporal scale considerations

A variety of factors are predicted to affect sound levels. For example, close approaches by vessels and inclement weather will likely result in the highest levels. Thus, it is necessary to capture the temporal variation in sound levels that occur at the location in question.

¹ NMFS is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption in the context of the Marine Mammal Protection Act. Until formal guidance is available, NMFS uses conservative thresholds of sound pressure levels from broad band sounds that cause behavioral disturbance (160dBrms re: 1μPa for impulse sound and 120 dBrms re: 1μPa for continuous sound) and injury (180dBrms re: 1μPa for whales and 190dBrms re: 1μPa for pinnipeds) (70 FR 1871). Impact pile driving is an impulsive sound source, and vibratory pile driving is a continuous sound source.

- TOLs and overall dB rms levels need to be based on short enough time windows to capture temporal variation in sound levels. Those based on 10-30 sec averages will likely capture this variation. These need to be collected systematically and then they can be compared over hourly, daily and monthly time periods. For example, these individual background levels should be plotted for every hour during daylight hours over 1 full work week, for each month of the work window. This information together with information on sea state, wind speed, tidal cycle, and precipitation (obtained through close weather stations, for example) will capture the seasonal/temporal and oceanographic variations that likely affect background sound levels occurring during the work window.

Averaging measurements

- Measured overall dB rms levels will need to be characterized in terms of average conditions. A cumulative distribution function (cumulative % vs. overall dB rms levels) of all dB rms sound levels would allow NMFS to determine what dBrms levels $\geq X$ occur at least 50% (or some other %) of time during the work window.

Equipment considerations

- The recording system need to be appropriate for the frequency range of measurements. It needs to be calibrated having a known and preferably flat (receiving sensitivity) frequency response curve across the bandwidth of measurements. If the same recording system will be used for all species listed above, then this would range from 7 Hz to 180 kHz.
- Especially for ambient sound levels, the recording system will need to be capable of accurately measuring low ambient sound levels across the entire frequency range; at the very least, the self noise floor of the recording system should be compared with lowest spectral levels measured in the field to illustrate that the reported levels are not limited by equipment performance.

Methods for characterizing ambient sound levels (absent of human influence):

Characterizing ambient sound levels absent of human influence will be challenging in Puget Sound given the number of anthropogenic sources of sound present. It is assumed that ambient sound levels are those absent of *obvious* human influence. For example, close approaches by vessels will likely result in higher sound levels and these are considered obvious human influences. Other variables such as sea state or precipitation will also influence sound levels and teasing apart anthropogenic variables from natural ones will be difficult without some way of monitoring human activity in the vicinity of where measurements are taken. Visual monitoring is the best way to characterize sound levels absent of human influence. A visual observer should note when no vessels and other obvious human activity that generate underwater sounds are present within a given distance of the recorder (such as 2 km). Only recordings identified as absent of obvious human influence should be reported as ambient sound levels which could then be compared over hourly, daily and monthly time periods and plotted as a cumulative distribution function.

References:

- Baird and Hanson 2004. Diving behavior of “Southern Resident” killer whales. Final report to NMFS Contract, No. AB133F-03-SE-1070, 55 pp.
- Baird et al. 2005. Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and inter-annual variation in diving rates. *Canadian Journal of Zoology* 83, 257-267.
- NMFS. 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington.
- Otani et al. 1998. Diving behavior and performance of harbor porpoises, *Phocoena phocoena*, in Funka Bay, Hokkaido, Japan. *Marine Mammal Science* 14, 209-220.
- Southall et al. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals*, 33, 411-521
- Szymanski et al 1999. Killer whale (*Orcinus orca*) hearing: Auditory brainstem response and behavioral audiograms *Journal of the Acoustical Society of America*, 106, 1134-1141
- Westgate et al. 1995. Diving behaviour of harbor porpoises, *Phocoena phocoena*. *Canadian Journal of Fisheries and Aquatic Sciences*, 52, 1064-1073.

Species	Element of Proposed Action	Pathway/Type or Extent of Effect	Species/PCEs	Likelihood of Occurrence	Severity
Southern Resident Killer Whale (SRKW)	Site Selection - Depth, location, size (footprint), biological monitoring and evaluation	Pathway- Within the diving range, within a use area, along or across a migratory pathway. Type of effect - methodology dependent.	Species Effect may include direct behavior and foraging effects on whales (Species), and habitat effects passage (PCE) dependent on methodology. For example: No affect - Literature search, shorebased observation. Minimal affect - Passive Acoustic Monitoring, aerial observation. Disturbance, stress or injury affects - Vessel based observation, prey sampling, tagging.	Site methodology dependent	Moderate severity if limited to small passage effects, i.e., route changes within Admiralty inlet with no loss of foraging. Severe if migratory route blocked or negative foraging effects.
SRKW*	Construction- Site preparation for anchor and turbine placement	Pathway- Vessels, Noise (drilling, dredging), Turbidity, Contaminants (sediments, spills). Type or Extent - Direct behavior effects on whales from vessels such as avoidance, changes to dive time and directionality (Species). Direct behavior effects on whales from noise such as masking, disturbance from foraging or area avoidance, temporary or permanent hearing loss (species). Direct effects on prey (indirect on whales) from noise such as changes to migratory route or avoidance of area, juvenile fish mortality (PCE). Direct effects on prey (indirect on whales) from habitat disturbance/modification, turbidity. Indirect effects on whales from reduced amount of habitat available for foraging and passage (PCE). Direct effects on prey quality indirect on whales from increased potential for contamination from spills or disturbance of substrate (PCE).	PCE- Water quality to support growth and development PCE- Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth PCE- Passage conditions to allow for migration, resting, and foraging	Vessels - low (work window?). Noise - lower than operation because of duration. Habitat disturbance/modification - high. Contaminants - likelihood unknown.	Vessels - Direct behavior effects severity low. Passage effects severity low. Noise - Direct effects severity dependent on sound levels and mitigation. Habitat disturbance/modification - severity dependent on location and baseline use. Contaminants - severity unknown
SRKW	Construction- Anchor and Turbine placement	Pathway- Vessels (tow boats, barges), Noise (towing, positioning, hoisting/lowering), Modification of habitat, and Turbidity. Type or Extent - Similar effects to site preparation above but with the added habitat modification of hard structures to the underwater habitat. Direct effect on whale behavior from vessels and noise, altered use patterns-additional vessel traffic may be an obstacle to whale passage, causing the whales to swim further and change direction more often, which potentially increases energy expenditure for whales and impacts foraging behavior. May reduce amount of habitat available for foraging (PCE). Direct effects on prey (indirect on whales) some increased turbidity	PCE- Water quality to support growth and development PCE - Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth PCE - Passage conditions to allow for migration, resting, and foraging	See effects of site prep above.	Similar to Site preparation but with added habitat modification of hard structures to habitat. Short term novel effects from new structures.
SRKW	Construction- Anchor and Turbine placement	Pathway- Local habitat alteration and altered use patterns. Type or Extent- may increase quantity and quality of habitat for structure-oriented fish such as rockfish; may enhance local fisheries and/or increase piscivorous predation on salmonids (PCE)	PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth		unclear to what degree the project structures will serve as an artificial reef.
SRKW	Construction- Anchor and Turbine placement	Pathway- Marine debris entanglement. Type or Extent- derelict fishing gear could snag on turbine structures, and in turn pose an entanglement risk to marine mammals, fish, and potentially marine birds	PCE- passage conditions to allow for migration, resting, and foraging PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth		
SRKW	Construction- Anchor and Turbine placement	Pathway- Contamination. Type or Extent- Anchor and turbine placement may re-suspend contaminated sediments within the water column and once in the environment these substances proceed up the food chain, accumulating in long-lived top predators like SRKWs. Chemical contamination of prey is a potential threat to Southern Resident killer whale critical habitat.	PCE- Water quality to support growth and development PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth		

SRKW	Construction- Subsea cabling	<p>Pathway- Vessels (towing, trenching, cable laying), Noise (towing, trenching), Turbidity, Habitat modification (displacement of benthic infauna). Type or Extent - Direct behavior effects on whales from vessels as described above. Direct behavior effects on whales from noise as described above. Direct effects on prey (PCE) (indirect on whales) from noise as described above. Direct effects on prey (PCE) from habitat disturbance/modification, turbidity (indirect on whales). Contaminant effects on prey quality (PCE). Habitat alteration- may have temporary or permanent reduction in available foraging habitat and displacement of proximal habitat usage post installation; increased turbidity; increased potential for contamination from disturbance of substrate</p>	<p>PCE-Water quality to support growth and development</p>	<p>Vessels - low (work window?). Noise - lower than operation because of duration. Habitat disturbance/modification - high. Contaminants - likelihood unknown.</p>	<p>Vessels - Direct behavior effects severity low. Passage effects severity low. Noise - Direct effects severity dependent on sound levels and mitigation. Habitat disturbance/modification - severity dependent on location and baseline use. Contaminants - severity unknown</p>	
		<p>Pathway- Contamination. Type or Extent-Subsea cabling methods may re-suspend contaminated sediments within the water column and once in the environment these substances proceed up the food chain, accumulating in long-lived top predators like SRKWs. Chemical contamination of prey is a potential threat to Southern Resident killer whale critical habitat.</p>	<p>PCE - prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>	<p>Vessels - low (work window?). Noise - lower than operation because of duration. Habitat disturbance/modification - high. Contaminants - likelihood unknown.</p>	<p>Vessels - Direct behavior effects severity low. Passage effects severity low. Noise - Direct effects severity dependent on sound levels and mitigation. Habitat disturbance/modification - severity dependent on location and baseline use. Contaminants - severity unknown</p>	
		<p>Pathway- Turbine motion, Noise (mechanical, turbulence, electronic), Electromagnetic fields, Long term habitat modification, Contaminants, Debris fouling. Type or Extent - Direct injury to whales from collision. Potential for collision with turbine blades or turbine structure. Turbine placement is well within the diving capabilities of the SRKW, as described in site selection above, and may impair ability to forage; Direct effects on prey (indirect on whales) because prey may aggregate to the turbine array potentially attracting cetaceans to feed and increasing the risk of marine mammal collisions with turbines; potential for direct take, direct injury, and impacts from prey reduction</p>	<p>prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>	<p>Unknown</p>	<p>High for direct injury or mortality to whales if struck by moving parts. Unknown for indirect loss of prey. Unknown for disorientation or other EMF effects on whales or prey. Unknown for contaminant effects (monitoring, detection, maintenance) High for direct injury or loss (whales) to entanglement or unknown for prey species.</p>	
	SRKW	Turbine operation and Power Transmission	<p>Pathway-Habitat alteration. Type or Extent- may have temporary or permanent reduction in available habitat and displacement of proximal habitat usage post installation; Turbine anchoring, composition and pattern of sediment, and the proximal landscape of the habitat near the anchor system.</p>	<p>PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>		
			<p>PCE- Water quality to support growth and development</p>			
			<p>Pathway- Changes in tidal flow and tidal flushing. Type or Extent- operation of TISEC devices will extract energy from the water, which will reduce the velocity of currents in the local area. This loss of current energy could, in turn, alter sediment transport; reduce tidal flow velocities; alter water exchange rates and water quality</p>	<p>PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>		
<p>PCE- passage conditions to allow for migration, resting, and foraging</p>						
		<p>PCE- passage conditions to allow for migration, resting, and foraging</p>				
		<p>Pathway- Altered use patterns. Type or Extent- devices themselves may affect migratory movements to and from Puget Sound and could impair foraging capability</p>	<p>PCE- prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>			
		<p>PCE- Direct injury/mortality of whales (Species) prey (PCE)</p>				

		<p>Pathway-Contamination. Type or Extent-the use of antifouling paints are on the turbine structures may contribute to considerable pollution effects on the marine community within and beyond the location of the turbine array</p>	<p>PCE - Water quality to support growth and development</p>		
			<p>PCE - Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p>		
		<p>Pathway-EMF Emissions. Type or Extent- may alter use patterns of the area causing SRKW to swim further and change direction more often, which potentially increases energy expenditure for whales and impacts foraging behavior</p>	<p>PCE - Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p> <p>PCE - Passage conditions to allow for migration, resting, and foraging</p>		
		<p>Pathway- Marine debris entanglement. Type or Extent- derelict fishing gear could snag on turbine structures, and in turn pose an entanglement risk to marine mammals, fish, and potentially marine birds</p>	<p>PCE-prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth</p> <p>PCE-passage conditions to allow for migration, resting, and foraging</p> <p>PCE- Water quality to support growth and development</p>		
<p>Steller Sea Lion (SSL)*</p>	<p>Site Selection - Depth, location, size (footprint). Biological monitoring and evaluation.</p>	<p>Pathway - Proximity to known haulouts, within the diving range, within a use area, along or across a migratory route. Type or Extent - Sea lions are vulnerable to disturbance at haulout and rookery sites. Animals are concentrated around haulouts and may be encountered more frequently in the water near such sites. Potential effects from biological monitoring and evaluation are methodology dependent. Some examples of potential effects from monitoring include No affect - Literature search, shorebased observation. Minimal affect - Passive Acoustic Monitoring, on water or aerial observation of animals in the water away from haulouts. Disturbance, stress or injury effects - (less) based or low altitude aerial observation of haulouts, scat sampling at haulouts, captures and tagging.</p>	<p>Potential for direct behavior and/or foraging effects and disturbance on sea lions. There are no breeding sites (critical habitat) for this species in proximity to Admiralty Inlet.</p>	<p>Low - numbers of animals present are small compared to stock population size.)</p>	<p>Minor severity if limited to small disturbance effects, i.e., short term haulout attendance changes or minor route deflections within Admiralty Inlet with no loss of foraging. Moderate if long term shifts in haulout use or migratory route blocked or negative foraging effects.</p>
<p>SSL</p>	<p>Construction - Site preparation for anchor and turbine placement</p>	<p>Pathway - Vessels, Noise (drilling, dredging), Turbidity, Contaminants (sediments, spills). Type or Extent - Direct behavior effects on sea lions in the water or hauled out from vessels such as avoidance, changes to dive time and directionality. Direct behavior effects on sea lions from noise include disturbance, changes in foraging or transiting behavior, temporary or permanent hearing loss. Direct effects on prey (indirect on sea lions) from noise. Direct effects on prey from habitat disturbance/modification, turbidity (indirect on sea lions). Contaminant effects on prey quality.</p>	<p>Direct and indirect effects on sea lions, no modification or effects on critical habitat.</p>	<p>Vessels - low (work window?). Noise - lower than operation because of duration. Habitat disturbance/modification - unknown. Contaminants - likelihood unknown.</p>	<p>Vessels - Direct behavior effects severity low for sea lions in the water, moderate for short term disturbance of haulout. Noise - Direct effects severity dependent on sound levels and mitigation (low for levels below disturbance threshold, short term or away from haulout). Habitat disturbance/modification - severity dependent on location and baseline use. Contaminants - severity unknown</p>
<p>SSL</p>	<p>Construction - Anchor and Turbine placement</p>	<p>Pathway-Vessels (tow boats, barges), Noise (towing, positioning, hoisting/lowering), Modification of habitat, Turbidity, Contaminants (sediments, spills). Type or Extent- Similar effects to site preparation above but with the added habitat modification of hard structures to the underwater habitat.</p>	<p>Direct and indirect effects on sea lions, no modification or effects on critical habitat.</p>	<p>See effects of site prep above. Habitat modification likelihood - high.</p>	<p>Similar to Site preparation but with added habitat modification of hard structures to habitat. Short term novel effects from new structures.</p>
<p>SSL</p>	<p>Construction - Sub-sea Cabling</p>	<p>Pathway - Vessels (towing, trenching, cable laying), Noise (towing, trenching), Turbidity, Habitat modification (displacement of benthic infauna). Type or Extent - Direct behavior effects on sea lions in the water or hauled out from vessels. Direct behavior effects on sea lions in the water or hauled out from noise. Direct effects on prey (indirect on sea lions) from noise. Direct effects on prey from habitat disturbance/modification, turbidity (indirect on sea lions). Contaminant effects on prey quality.</p>	<p>Direct and indirect effects on sea lions, no modification or effects on critical habitat.</p>	<p>Vessels - low (work window?). Noise - lower than operation because of duration. Habitat disturbance/modification - high. Contaminants - likelihood unknown.</p>	<p>Vessels - Severity low for direct behavior effects on sea lions in the water, moderate for short term minor haulout disturbances. Noise - Direct effects severity dependent on sound levels and mitigation. Habitat disturbance/modification - severity dependent on location and baseline use. Contaminants - severity unknown</p>
<p>SSL</p>	<p>Operation - Turbines & Power Transmission</p>	<p>Pathway - Turbine motion, Noise (mechanical, turbulence, electronic), Electromagnetic fields, Long term habitat modification, Contaminants, Debris fouling. Type or Extent - Motion, Noise - Direct injury to sea lions (species), Behavioral disturbance (avoidance, attraction). Direct effects on prey (attract/repel) indirect of sea lions, kill prey. Contamination/pollution (antifouling coatings, lubricants, coolants) may affect prey quantity or quality. Spills could contaminate sea lions directly. Debris entanglement - Direct injury/mortality of sea lions and/or prey.</p>	<p>Direct and indirect effects on sea lions, no modification or effects on critical habitat.</p>	<p>Unknown</p>	<p>High for direct injury or mortality to sea lions if struck by moving parts. Unknown for indirect loss of prey. Unknown for disorientation or other EMF effects on sea lions or prey. Unknown for contaminant effects (monitoring, detection, maintenance) High for direct injury or loss of sea lions to entanglement or unknown for prey species.</p>

Species	Element of Proposed Action	Type of Effect/ VSP Parameter Affected (affect abundance, productivity, spatial structure and/or diversity?) (life stage affected?)	PCEs Affected	Probability of Effect Occuring	Extent of Effect (Time and Space)
Chinook*	Biological monitoring and evaluation	Sublethal stress for "x" number of individuals	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation	e.g., Likely, Not likely	e.g., Short-term, pulsed, long-term, or chronic for sublethal stress for time; Entire or part of action area for space
Chinook	Site preparation for anchor placement	Local habitat alteration- may reduce amount of habitat available for foraging and migration (productivity, abundance)	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination from construction equipment and materials and increased turbidity- juvenile salmon leaving their natal streams typically stay in nearshore areas where they depend on a photic-based food web of plankton and other invertebrates. Site preparation may suspend existing contaminated sediments. This increased turbidity and/or contamination could impact water quality and forage capability	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
Chinook		Altered use patterns- construction and turbine placement may present an obstacle to salmon migration, causing the salmon to swim further and change direction more often, which potentially increases energy expenditure for salmon and impacts foraging behavior; may reduce amount of habitat available for foraging.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Local habitat alteration and altered use patterns- may increase quantity and quality of habitat for forage species providing additional foraging opportunities. Could also alter predator-prey interactions (abundance, productivity, and spatial structure).	Nearshore marine areas providing adequate natural cover and forage sufficient to support growth and maturation		
		Marine debris entanglement- derelict fishing gear may snag on turbine structures, and in turn pose an entanglement risk to salmon or forage species (abundance)	Nearshore marine areas free of obstruction with forage sufficient to support growth and maturation		
		Contamination from construction equipment and materials and increased turbidity- juvenile salmon leaving their natal streams typically stay in nearshore areas where they depend on a photic-based food web of plankton and other invertebrates. Anchor and turbine placement may suspend existing contaminated sediments. This increased turbidity and/or contamination could impact water quality and	Nearshore marine areas free of obstruction with forage sufficient to support growth and maturation		
		Biofouling- the anchor and turbine structure will provide habitat for marine life including biofouling (barnacles, mussels, sponges, etc.). As these structures need to be cleaned of accreted biofouling, the accumulated organic material could impact water quality conditions.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
Chinook	Subsea cabling	Habitat alteration- may have temporary or permanent reduction in available foraging habitat and displacement of proximal habitat usage post installation; increased turbidity; increased potential for contamination from disturbance of substrate (abundance)	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination from construction equipment and materials and increased turbidity- Subsea cabling methods may suspend existing contaminated sediments within the water column and once in the environment these substances proceed up the food chain. Chemical contamination of prey is a potential threat to salmon critical habitat (abundance).	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		

Chinook	Turbine operation	Collision- Potential for collision with turbine blades or turbine structure. The 30-60m depth of turbine placement is well within the swimming capabilities of salmon and may impair ability to forage; prey may aggregate to the turbine array potentially attracting predators to feed and increasing the risk of collisions with turbines; potential for direct take, direct injury, and impacts from prey reduction (abundance)	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Habitat alteration- May have temporary or permanent reduction in available foraging habitat and displacement of proximal habitat usage post installation; Turbine anchoring systems could alter the composition and pattern of sediment, and potentially alter the proximal landscape of the habitat near the anchor system.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Changes in tidal flow and tidal flushing- Operation of TISEC devices will extract energy from the water, which will reduce the velocity of currents in the local area. This loss of current energy could, in turn, alter sediment transport; reduce tidal flow velocities; alter water exchange rates and water quality.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination- the use of antifouling paints on the turbine structures may contribute to pollution effects of the marine community within and some distances beyond the location of the turbine array	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		EMF Emissions- may alter use patterns of the area causing Chinook to swim further and change direction more often, which potentially increases energy expenditure for Chinook and impacts foraging behavior	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Noise Emission- sounds the turbines generate may affect foraging efficiency and/or energy expenditure through their physical presence, increased underwater sound levels, and vibration	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Interference with fishing- could reduce fishing mortality and also displace fishing effort	Nearshore marine areas free of obstruction with water quality and forage sufficient to support growth and maturation		
Chum**	Biological monitoring and evaluation	Sublethal stress for "x" number of individuals	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation	e.g., Likely, Not likely	e.g., Short-term, pulsed, long-term, or chronic for sublethal stress for time; Entire or part of action area for space
Chum	Site preparation for anchor placement	Local habitat alteration- may reduce amount of habitat available for foraging and migration (productivity, abundance)	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination from construction equipment and materials and increased turbidity- juvenile salmon leaving their natal streams typically stay in nearshore areas where they depend on a photic-based food web of plankton and other invertebrates. Site preparation may suspend existing contaminated sediments. This increased turbidity and/or contamination could impact water quality and forage capability	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
Chum	Turbine placement	Altered use patterns- construction and turbine placement may present an obstacle to salmon migration, causing the salmon to swim further and change direction more often, which potentially increases energy expenditure for salmon and impacts foraging behavior; may reduce amount of habitat available for foraging.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Local habitat alteration and altered use patterns- may increase quantity and quality of habitat for forage species providing additional foraging opportunities. Could also alter predator-prey interactions (abundance, productivity, and spatial structure).	Nearshore marine areas providing adequate natural cover and forage sufficient to support growth and maturation		
		Marine debris entanglement- derelict fishing gear may snag on turbine structures, and in turn pose an entanglement risk to salmon or forage species (abundance).	Nearshore marine areas free of obstruction with forage sufficient to support growth and maturation		

	Anchor and	Contamination from construction equipment and materials and increased turbidity- juvenile salmon leaving their natal streams typically stay in nearshore areas where they depend on a photic-based food web of plankton and other invertebrates. Anchor and turbine placement may suspend existing contaminated sediments. This increased turbidity and/or contamination could impact water quality and forage capability (abundance).	Nearshore marine areas free of obstruction with forage sufficient to support growth and maturation		
		Biofouling- the anchor and turbine structure will provide habitat for marine life including biofouling (barnacles, mussels, sponges, etc.). As these structures need to be cleaned of accreted biofouling, the accumulated organic material could impact water quality conditions.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
Chum	Subsea cabling	Habitat alteration- may have temporary or permanent reduction in available foraging habitat and displacement of proximal habitat usage post installation; increased turbidity; increased potential for contamination from disturbance of substrate (abundance)	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination from construction equipment and materials and increased turbidity- Subsea cabling methods may suspend existing contaminated sediments within the water column and once in the environment these substances proceed up the food chain. Chemical contamination of prey is a potential threat to salmon critical habitat (abundance).	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
Chum	Turbine operation	Collision- Potential for collision with turbine blades or turbine structure. The 30-60m depth of turbine placement is well within the swimming capabilities of salmon and may impair ability to forage; prey may aggregate to the turbine array potentially attracting predators to feed and increasing the risk of collisions with turbines; potential for direct take, direct injury, and impacts from prey reduction (abundance).	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Habitat alteration- May have temporary or permanent reduction in available foraging habitat; displacement of proximal habitat usage post installation; increased turbidity; and sediment transport from mooring and anchoring systems could alter the composition and pattern of sediment, and potentially alter the proximal landscape of the habitat near the anchor system.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Changes in tidal flow and tidal flushing- Operation of TISEC devices will extract energy from the water, which will reduce the velocity of currents in the local area. This loss of current energy could, in turn, alter sediment transport; reduce tidal flow velocities; alter water exchange rates and water quality.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Contamination- the use of antifouling paints on the turbine structures may contribute to pollution effects of the marine community within and some distances beyond the location of the turbine array	Nearshore marine areas with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		EMF Emissions- may alter use patterns of the area causing Chinook to swim further and change direction more often, which potentially increases energy expenditure for Chinook and impacts foraging behavior	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Noise Emission- sounds the turbines generate may affect foraging efficiency and/or energy expenditure through their physical presence, increased underwater sound level, or both.	Nearshore marine areas free of obstruction with water quality and quantity conditions; adequate natural cover; and forage sufficient to support growth and maturation		
		Interference with fishing- could have a beneficial effect because it reduces fishing mortality but could also displace fishing effort	Nearshore marine areas free of obstruction with water quality and forage sufficient to support growth and maturation		

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*We have included some species as examples but have not included all the species that potentially could need ESA consultation. In the matrix we have included potential effects for listed marine mammals of 2 major taxonomic groups (cetaceans, pinnipeds) that have substantially different vulnerabilities.

**We have included potential effects for listed Chinook and chum salmon (but have not included Steelhead). The matrix is likely to change in the future.