

Supplemental Draft Environmental Impact Statement on the Makah Tribe Request to Hunt Gray Whales



JUNE 2022



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

TITLE OF ENVIRONMENTAL REVIEW	Supplemental Draft Environmental Impact Statement on the Makah Tribe Request to Hunt Gray Whales
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LOCATION OF PROPOSED ACTIVITIES	The coastal portion of the Tribe's usual and accustomed fishing grounds (U&A), off the northwest coast of WA.
PROPOSED ACTION	NMFS proposes to act on the Makah Tribe's request for a waiver of the Marine Mammal Protection Act (MMPA) to resume treaty-based hunting of eastern North Pacific gray whales (<i>Eschrichtius robustus</i>) for ceremonial and subsistence purposes.
ABSTRACT	In March 2015, NMFS published a Draft Environmental Impact Statement (DEIS) on the Makah Tribe Request to Hunt Gray Whales. Since the publication of the 2015 DEIS, NMFS identified a seventh alternative that was not separately analyzed in the 2015 DEIS. Based on this 'composite alternative,' NMFS published a proposed rule (84 FR 13604, April 5, 2019) to issue a waiver under the MMPA and propose regulations governing the hunting of ENP gray whales by the Makah Tribe for a 10-year period. This Supplement to the 2015 DEIS considers the Composite Alternative and its principal components, including: hunt timing and location; the number of whales harvested, struck, and struck and lost; cessation of whale hunting if pre-established population abundance thresholds were met; and the duration of regulations and permits.

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) is considering a request by the Makah Indian Tribe to resume limited hunting of eastern North Pacific (ENP) gray whales (*Eschrichtius robustus*) for ceremonial and subsistence purposes. This request stems from the 1855 Treaty of Neah Bay, which expressly secures the Tribe's right to hunt whales. To authorize Makah gray whale hunting, NMFS must waive the Marine Mammal Protection Act (MMPA) take moratorium, issue requisite MMPA regulations and permits, and comply with provisions governing aboriginal subsistence whaling under the Whaling Convention Act (WCA).

NMFS prepared and published a Draft Environmental Impact Statement (DEIS) pursuant to the National Environmental Policy Act (NEPA)(42 U.S.C.321 et seq.) in March 2015 (80 FR 13373). The DEIS considered the Tribe's proposed action to conduct treaty-based hunting of ENP gray whales, as well as five additional alternatives. The DEIS can be found at: <https://www.fisheries.noaa.gov/west-coast/makah-tribal-whale-hunt>.

Since the publication of the 2015 DEIS, NMFS identified a seventh alternative that was not separately analyzed in the 2015 DEIS. After reviewing public comments on the 2015 DEIS and additional information relevant to the Tribe's request, NMFS developed this additional action alternative, which is composed of elements from other alternatives that were analyzed in the DEIS. Based on this 'composite alternative,' NMFS published a proposed rule (84 FR 13604, April 5, 2019) to issue a waiver under the MMPA and to promulgate regulations governing the hunting of ENP gray whales by the Makah Tribe for a 10-year period. That proposal is still under consideration and a final determination is contingent on additional steps in the waiver review process.

In November of 2019, the proposed waiver and regulations, in addition to written and oral testimony, were reviewed by an Administrative Law Judge (ALJ) during a week-long, trial-type hearing. Six parties—the Makah Tribe, NMFS, the Marine Mammal Commission, Sea Shepherd Legal, the Peninsula Citizens for the Protection of Whales, and the Animal Welfare Institute—presented evidence and expert testimony for the ALJ's consideration. The full hearing record and transcript were made available for public inspection at <https://www.uscg.mil/Resources/Administrative-Law-Judges/Decisions/ALJ-Decisions-2016/NOAA-Formal-Rulemaking-Makah-Tribe/>. On September 23, 2021, the ALJ issued a recommended decision that included modifications to the proposed regulations based on the hearing record. The recommended decision was published and made available for public comment on September 29, 2021 (86 FR 53949).

Also, in May of 2019, NMFS declared an Unusual Mortality Event (UME) for ENP gray whales after a larger than normal number of whales were reported stranded during their migration between Arctic feeding grounds and Mexican breeding grounds (see information posted at <https://www.fisheries.noaa.gov/national/marine-life-distress/2019-gray-whale-unusual-mortality-event-along-west-coast>). While the 2015 DEIS discussed UMEs in general and a previous ENP gray whale UME, which was declared in 1999-2000, it pre-dated the ongoing 2019 UME. NMFS has determined that it would now benefit both the public and agency decision making to prepare a Supplemental Draft Environmental Impact Statement (SDEIS) to reflect the composite alternative that comprised the proposed regulations and to address the ALJ's recommended decision and corresponding public comments, and the ongoing UME. This SDEIS will inform

next steps in the waiver process and provide an opportunity for greater transparency by bringing together the components of the previously analyzed alternatives that comprise Alternative 7 to be reviewed in aggregate.

This SDEIS is being prepared using the 1978 CEQ NEPA Regulations. NEPA reviews initiated prior to the effective date of the 2020 CEQ regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020. This review began on February 27, 2020 with the publication of the Notice of Intent, and the agency has decided to proceed under the 1978 regulations.

ACRONYMS AND ABBREVIATIONS

ALJ	Administrative law judge
ASW	Aboriginal subsistence whaling
AWMP	Aboriginal whaling management procedure
ENP	Eastern North Pacific
CEQ	Council on Environmental Quality
DEIS	Draft environmental impact statement
EPA	Environmental Protection Agency
ITA	Incidental take authorization
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
K	Carrying capacity
MHW	Marine heatwave
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial DNA
MNPL	Maximum net productivity level
MUA	Makah U&A
nDNA	Nuclear DNA
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCNMS	Olympic Coast National Marine Sanctuary
OR-SVI	Oregon—Southern Vancouver Island
OSP	Optimum sustainable population
PBR	Potential biological removal
PCFG	Pacific Coast Feeding Group
SAR	Stock assessment report
SC	Scientific Committee
SDEIS	Supplemental draft environmental impact statement
SLA	Strike limit algorithm
SST	Sea surface temperature
SURTASS	Surveillance Towed Array Sensor System
U&A	Usual and accustomed
UME	Unusual mortality event
WNP	Western North Pacific

GLOSSARY

Aboriginal subsistence whaling = As defined in regulations implementing the Whaling Convention Act, aboriginal subsistence whaling refers to whaling authorized by paragraph 13 of the Schedule annexed to and constituting a part of the Convention (i.e., International Convention for the Regulation of Whaling). The Schedule does not otherwise define aboriginal subsistence whaling, but the International Whaling Commission adopted the following definition of subsistence use by consensus at its 2004 annual meeting: (1) the personal consumption of whale products for food, fuel, shelter, clothing, tools, or transportation by participants in the whale harvest; (2) The barter, trade, or sharing of whale products in their harvested form with relatives of the participants in the harvest, with others in the local community or with persons in locations other than the local community with whom local residents share familial, social, cultural, or economic ties. A generalized currency is involved in this barter and trade, but the predominant portion of the products from each whale are ordinarily directly consumed or utilized in their harvested form within the local community; (3) The making and selling of handicraft articles from whale products, when the whale is harvested for the purposes defined in (1) and (2) above. General principles governing aboriginal subsistence whaling are contained in the Schedule.

Aboriginal subsistence whaling quota = Number of whales that may be taken by a Native American whaling organization for subsistence uses.

Benthic = Of or on the bottom of the ocean.

Bilateral agreement = An agreement between two countries detailing their mutual understanding, policies, and obligations on a particular matter.

Calf (whale) = As defined by regulations implementing the Whaling Convention Act, a calf is any whale less than 1-year old or having milk in its stomach.

Cetacean = Refers to an animal belonging to the order Cetacea, which includes sea mammals such as whales and dolphins.

Chukotka natives = Aboriginal people located in the far northeast of the Russian Federation.

Contracting Government = A country/government party to the International Convention for the Regulation of Whaling.

Council on Environmental Quality (CEQ) = A division of the White House established as part of the National Environmental Policy Act of 1969. The CEQ issues an annual report to the President of the United States on the state of the environment; coordinates United States environmental efforts and works closely with agencies and other White House offices in the development of environmental and energy policies and initiatives; oversees federal agency implementation of the environmental impact assessment process; and acts as a referee when agencies disagree over the adequacy of such assessments.

Darting gun = A hand thrown device consisting of a barrel (to hold an explosive projectile) that is attached to a wooden shaft equipped with a toggle-point harpoon. The barrel contains a trigger rod that ignites a propellant or ‘pusher’ charge which fires the explosive projectile into the whale’s body.

Eastern North Pacific (ENP) gray whales = Gray whales that feed during the summer and fall primarily in the Chukchi, Beaufort, and northwestern Bering Seas, but also as far south as California.

Environmental Impact Statement (EIS) = A detailed written statement required by the National Environmental Policy Act and prepared by a federal agency. The EIS is used by decision makers to take environmental consequences into account. It describes a proposed action, the need for the action, alternatives considered, the affected environment, the environmental impacts of the proposed action, and other reasonable alternatives to the proposed action. An EIS is prepared in two stages: a draft and a final.

Environmental Protection Agency (EPA) = A United States agency responsible for protecting human health and the environment.

Harassment = As defined in regulations implementing the Marine Mammal Protection Act, harassment means any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild; or (2) 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. In the case of a military readiness activity or a scientific research activity conducted by or on behalf of the Federal Government, the term harassment means (1) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild; or (2) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered.

Harmful Algal bloom = A rapid and often visible increase in the population of (usually) phytoplankton algae in an aquatic system.

Harvest = To kill and land a whale.

Identified whale = An individual gray whale that has been identified from photographs and cataloged using a code unique to that animal.

International Convention for the Regulation of Whaling (ICRW) = An international treaty (also referred to as the “Convention”) signed in 1946 designed to “provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry.” A focus of the treaty was the establishment of the International Whaling Commission. There are presently 79 member nations to the ICRW, including the United States.

International Whaling Commission (IWC) = A body of commissioners charged with carrying

out the provisions of the ICRW.

IWC Scientific Committee = A part of the International Whaling Commission (IWC), this group consists of approximately 200 of the world's leading whale biologists who provide advice on the status of whale stocks. The IWC Scientific Committee meets annually in the two weeks immediately preceding the main International Whaling Commission meeting. It may also call special meetings as needed to address particular subjects during the year.

Land/Landing = As defined by regulations implementing the Whaling Convention Act, landing means bringing a whale or any parts thereof onto the ice or land in the course of whaling operations.

Landfill = A place where solid waste (garbage) is disposed between layers of dirt.

Low Abundance Threshold = A threshold for the abundance estimate for a given population, below which hunting must cease.

Makah Tribal Council = The governing body of the Makah Tribe. In three cooperative agreements with the Makah Tribe (in 1996, 1997, and 2001) the National Oceanic and Atmospheric Administration recognized the Makah Tribal Council as a Native American whaling organization and allowed the Council to issue permits to whaling captains in compliance with the cooperative agreements and Whaling Convention Act regulations.

Makah Whaling Commission = Members of the Makah Tribe that serve to review whaling crew qualifications, identify whaling crew and vessel participation, and provide other hunt restrictions and recommendations. The Makah Tribal Council would issue the permit to a whaling captain before any hunt, based on recommendations from the Makah Whaling Commission.

Marine Mammal Protection Act (MMPA) = A United States law that prohibits, with certain exceptions, the take of marine mammals in United States waters and by United States citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States.

Maximum Net Productivity Level (MNPL) = A population level related to maximum net productivity, a rate of change defined in the National Marine Fisheries Service's Marine Mammal Protection Act regulations as the greatest net annual increment in population numbers or biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality.

Mitochondrial deoxyribonucleic acid (mtDNA) = DNA that is found in the mitochondria of cells. Unlike nuclear DNA, mtDNA is only inherited through the mother.

National Environmental Policy Act (NEPA) = A United States law declaring that it is the continuing policy of the Federal government to use all practicable means to create and maintain conditions under which people and nature can exist in productive harmony and fulfill the social,

economic, and other needs of present and future generations of Americans. NEPA provides a mandate and a framework for Federal agencies to consider all reasonably foreseeable environmental effects of their proposed actions and to involve and inform the public in the decision making process.

National Marine Fisheries Service (NMFS) = A United States agency within the National Oceanic and Atmospheric Administration and under the Department of Commerce charged with the stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems.

National Oceanic and Atmospheric Administration (NOAA) = A scientific agency of the United States Department of Commerce focused on the conditions of the oceans and the atmosphere. NOAA warns of dangerous weather, charts seas and skies, guides the use and protection of ocean and coastal resources, and conducts research to improve understanding and stewardship of the environment. NOAA manages 13 National Marine Sanctuaries, including the Olympic Coast National Marine Sanctuary.

Observer = According to the Makah waiver application, a member of the Makah Department of Fisheries Management whose duties include observing the hunt and photographing any whale landed.

Olympic Coast National Marine Sanctuary (OCNMS) = One of 13 marine sanctuaries in the United States administered by NOAA. It was designated as the first National Marine Sanctuary in the Pacific Northwest in 1994 and encompasses 3,310 square miles off of Washington State's Olympic Peninsula, extending 135 miles along the Washington Coast from about Cape Flattery to the mouth of the Copalis River.

Olympic National Park = A large national park located on Washington's Olympic Peninsula and managed by the United States National Park Service. Originally designated as the Olympic National Monument in 1909, it was re-designated a National Park in 1938 and became a World Heritage Site in 1981.

Optimum sustainable population (OSP) = As defined by regulations implementing the Marine Mammal Protection Act, the term optimum sustainable population means, with respect to any population stock, the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element.

Oregon to Southern Vancouver Island (OR-SVI) = An area surveyed for whales within the Pacific Coast Feeding Group range and encompassing coastal marine waters from Oregon to southern Vancouver Island, B.C.

Oregon to Southern Vancouver Island (OR-SVI) whales = PCFG whales observed in any survey area from southern Oregon to southern Vancouver Island (excluding areas in Puget Sound).

Pacific Coast Feeding Group (PCFG) range = A coastal marine area from northern California to northern Vancouver Island, B.C, used by PCFG gray whales.

Pacific Coast Feeding Group (PCFG) whales = Gray whales observed in at least 2 years between June 1 and November 30 in the PCFG area (along the U.S. and Canada coasts between 41°N and 52°N, excluding areas in Puget Sound) and entered into the Cascadia Research Collective's photo-identification catalog. For purposes of determining whether a harvested whale is a PCFG whale (i.e., counts against a bycatch or mortality limit), the Tribe's proposal under Alternative 2 would include cataloged whales seen in at least 1 year, while the other action alternatives would include cataloged whales seen in 2 or more years or at least once in the past 4 years.

Pacific Coast Feeding Group (PCFG) Mortality Limit = Term used in this SDEIS to refer to calculated limits on all hunt-related mortality (i.e., whales that are struck and lost as well as whales that are landed) of Pacific Coast Feeding Group (PCFG) whales.

Pelagic = Of or in the upper layers of the open ocean.

Petroglyph = An ancient picture or inscription drawn or carved into a rock.

Potential Biological Removal Level (PBR) = As defined by regulations implementing the Marine Mammal Protection Act, the term PBR level means the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population level. The PBR level is the product of the following factors: (1) the minimum population estimate of the stock; (2) one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; (3) a recovery factor of between 0.1 and 1.0.

Precedential effects = The effects of an action that would set a precedent for similar actions in the future.

Recruitment = The process of adding individual whales to a population, group or area (usually by reproduction but also by migration).

Russian Federation = A federation of independent states in northeastern Europe and northern Asia; formerly the Soviet Union.

Schedule = A document maintained by the International Whaling Convention that governs the conduct of whaling throughout the world. The measures described in the Schedule, among other things, provide for the protection of certain species; designate specified areas as whale sanctuaries in which commercial whaling may not occur if it were to resume; set limits on the numbers and size of whales which may be taken; prescribe open and closed seasons and areas for whaling; and prohibit the capture of suckling calves and female whales accompanied by calves. The compilation of catch reports and other statistical and biological records is also required. The most recent Schedule was amended by the Commission at the 64th Annual Meeting in Panama City, Panama, July 2012.

Summer/fall Hunt = A four-month hunting season that would begin on July 1 and end on the following October 31. Summer/fall hunts are followed by one month (November) of no hunting or training harpoon throws before a winter/spring hunt could begin on December 1.

Summer/Fall Hunt Year = The calendar year in which a summer/fall hunt takes place.

Stock = As defined by regulations implementing the Marine Mammal Protection Act, the term stock (or population stock) means a group of marine mammals of the same species or smaller taxa in a common spatial arrangement, that interbreed when mature.

Strike/Struck = As defined by the July 2012 Schedule to the International Convention for the Regulation of Whaling, strike means to penetrate with a weapon used for whaling.

Transfer station = A site used to temporarily store refuse prior to transporting it to the end point of disposal or treatment (e.g., a landfill).

Treaty of Neah Bay = The United States government and the Makah Tribe entered into the Treaty of Neah Bay on January 31, 1855. In addition to reserving the right of taking fish at all usual and accustomed grounds and stations, Article IV of the treaty secured the rights of whaling or sealing. The Treaty of Neah Bay is the only treaty between the United States and an Indian tribe that expressly provides for the right to hunt whales.

United States Coast Guard (USCG) = A branch of the United States Department of Homeland Security involved in maritime law, mariner assistance, and search and rescue in America's coasts, ports, and inland waterways as well as international waters with security and economic interests to the United States.

Usual and accustomed fishing grounds (U&A) = Areas in Washington where tribes have secured treaty rights to fish. The 1855 Treaty of Neah Bay secured these rights (including whaling and sealing rights) for the Makah tribe, and the tribe's U&A fishing grounds were adjudicated in *United States v. Washington*, 626 F.Supp. 1405, 1467 (W.D. Wash. 1985). The boundaries of this U&A include United States waters in the western Strait of Juan de Fuca as well as open ocean areas of the Washington coast north of 48° 02'15" latitude and east of 125°44'00" longitude.

Western North Pacific (WNP) gray whales = Gray whales that feed during the summer and fall in the Okhotsk Sea (primarily off northeast Sakhalin Island, Russia), some of which also feed off southeastern Kamchatka in the Bering Sea.

Whaling Convention Act (WCA) = A United States law that provides the framework for meeting United States obligations arising from the 1946 International Convention for the Regulation of Whaling. It provides for a United States Commissioner to the International Whaling Commission and authorizes the Secretary of State to present objections to that Commission's regulations. It establishes as unlawful whaling, transporting whales or selling

whales, in violation of the Convention regulations. It sets up a whaling licensing framework, with fines and imprisonment for violations. Enforcement is primarily the responsibility of the Secretary of Commerce.

Winter/Spring Hunt = A six-month hunting season that would begin on December 1 and end the following May 31. Winter/spring hunts would be followed by 13 months of no hunting before the next summer/fall hunt would begin on July 1 of the calendar year following the end of the winter/spring hunt.

Winter/Spring Hunt Year = The calendar year in which a winter/spring hunt ends.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	iii
ACRONYMS AND ABBREVIATIONS	i
GLOSSARY	i
TABLE OF CONTENTS.....	1
1.0 PURPOSE AND NEED.....	4
1.1 Introduction	4
1.2 Legal Framework – Whaling Convention Act.....	4
1.2.1 International Whaling Governance under the International Convention for the Regulation of Whaling.....	4
2.0 ALTERNATIVES.....	6
2.1 Alternative 7 (Composite Alternative – Preferred).....	6
2.1.1 Location of Hunt (Area Restrictions)	9
2.1.2 Timing of Hunt (Seasonal Restrictions)	9
2.1.3 Numbers of Whales Struck or Lost.....	9
2.1.4 Number of Whales Harvested.....	10
2.1.5 ENP Population Abundance Threshold Sub-alternatives	10
2.1.6 Limits on Harvesting PCFG Whales.....	10
2.1.7 Whales Approached and Subjected to Unsuccessful Strike Attempts.....	10
2.1.8 Age, Sex, and Reproductive Status.....	11
2.1.9 Proposed Hunting Method	11
2.1.10 Whale Product Use and Distribution	11
2.1.11 Other Environmental Protection Measures	12
2.2 Alternatives Considered but Eliminated from Detailed Analysis.....	12
3.0 AFFECTED ENVIRONMENT	13
3.1 Marine Habitat and Dependent Species	13
3.1.1 Introduction.....	13
3.1.2 The Salish Sea.....	14
3.1.3 Marine Heatwaves	15
3.2 Gray Whales.....	17

3.2.1 Population Abundance and Structure.....	17
3.2.2 Strandings	38
3.3 National and International Regulatory Environment.....	40
4.0 ENVIRONMENTAL CONSEQUENCES	42
4.1 Introduction.....	42
4.1.1 Alternative 2, Tribe’s Proposed Action	47
4.1.2 Alternative 3, Offshore Hunt	49
4.1.3 Alternative 4, Summer/Fall Hunt.....	53
4.1.4 Alternative 5, Split-Season Hunt	54
4.1.5 Alternative 6, Different Limits on Strikes and PCFG, and Limited Duration of Regulations and Permits	58
4.1.6 Alternative 7, Composite Alternative – Preferred	60
4.2 Water Quality.....	67
4.3 Marine Habitat and Species	69
4.4 Gray Whales.....	71
4.4.1 Change in Abundance and Viability of the ENP Gray Whale Stock.....	71
4.4.2 Change in Abundance and Viability of the WNP Gray Whale Stock	74
4.4.3 Change in Abundance and Viability of PCFG Whales.....	74
4.4.4 Change in Numbers of Gray Whales in Repeatedly Sighted in the Makah U&A and OR-SVI Areas.....	75
4.5 Other Wildlife	77
4.6 Economics.....	79
4.7 Environmental Justice.....	81
4.7.2 Ceremonial and Subsistence Resources.....	82
4.7.3 Social Environment.....	83
4.8 Social Environment.....	83
4.9 Cultural Resources	84
4.10 Ceremonial and Subsistence Resources.....	85
4.11 Noise	86
4.12 Aesthetics.....	87
4.13 Transportation	89

4.14 Public Services.....	90
4.15 Public Safety	91
4.16 Human Health	92
4.17 Regulatory Environment Governing Harvest of Marine Mammals	92
5.0 CUMULATIVE EFFECTS	94
5.1 Background	94
5.1.1 Geographical Area and Temporal Scope for Analysis	94
5.1.2 Past, Present, and Reasonably Foreseeable Future Actions.....	94
5.2 Gray Whales.....	96
REFERENCES	98
LIST OF PREPARERS.....	107

1.0 PURPOSE AND NEED

1.1 Introduction

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) is considering a request by the Makah Indian Tribe to resume limited hunting of eastern North Pacific (ENP) gray whales (*Eschrichtius robustus*) for ceremonial and subsistence purposes. This Supplemental Draft Environmental Impact Statement (SDEIS) builds on NMFS' previous consideration of the request in its 2015 Draft Environmental Impact Statement (DEIS).

The 2015 DEIS considered the Makah Tribe's proposed action to conduct treaty-based hunting of the whales, as well as five additional alternatives. It included a description of the purpose and need for the proposed action in Chapter 1 and is incorporated by reference. This SDEIS describes an additional action alternative that was derived from other action alternatives analyzed in the DEIS and the Administrative Law Judge (ALJ)'s recommended decision. It also provides recent updates on the affected environment and the environmental impacts associated with NMFS' proposed hunt plan as set forth in the composite alternative. Where methodologies, the affected environment, and environmental consequences under the new alternative are the same as those discussed previously, this SDEIS will refer to the DEIS for further information. Where circumstances differ from the DEIS, this SDEIS provides further information and analysis.

Issuing this SDEIS provides the public with the opportunity to comment on the composite alternative and updated information. Public comments and responses on the SDEIS and responses to previous comments on the DEIS will be provided in the final environmental impact statement.

1.2 Legal Framework – Whaling Convention Act

1.2.1 International Whaling Governance under the International Convention for the Regulation of Whaling

The aboriginal subsistence whaling (ASW) management scheme used by the International Whaling Commission (IWC) described in the 2015 DEIS has since been updated. The IWC governs ASW by setting catch limits for certain whale stocks in the Schedule—the legally binding document that sets out the measures adopted by the IWC to regulate whaling and conserve whale stocks—after considering requests from contracting governments and/or after consulting with the IWC's Scientific Committee. Previously, the IWC required contracting governments requesting catch limits to demonstrate the cultural and nutritional needs of their subsistence harvesters in order for them to receive catch limits. An expert workshop convened by the IWC in 2015 concluded that the cultural and nutritional needs of these communities had been well-documented and that it was no longer appropriate for the Commission to continue to require these “need statements” as a condition for receiving a quota (IWC 2015). The IWC has now posted to its website descriptions of the aboriginal subsistence whaling hunts carried out by contracting governments that outline information on recent catches, hunting methods, relevant international and national regulations, and the cultural and nutritional significance of the hunt, as well as the most recent advice of the Scientific Committee on the status of the relevant stocks and the catch or strike limit requested (IWC 2015).

The current catch limits were set in a 2018 Amendment to the Schedule and cover 2019 through 2025 (IWC 2018c). Paragraph 13(b)(2) of the current Schedule (IWC 2018b) sets a landing limit of 980 ENP gray whales and a strike limit of 140 in any year of the quota period. The 2018

Amendment also allows for unused strikes to be carried forward and added to the strike limit of subsequent years, provided that no more than 50% of the annual strike limit is added to any one year. Beginning in 2026, the catch limits set in 2018 will automatically carry forward for six more years provided that the Scientific Committee advises that these catch limits will not harm the stocks, the ASW country relying on the stocks does not request a change in its respective catch limits, and the IWC determines that the ASW countries have complied with the approved timeline of reporting requirements set for them and that the information provided represents a status quo continuation of the hunt.

The IWC set the ENP gray whale catch limit in response to a joint request from the United States, the Russian Federation, Denmark on behalf of Greenland, and St. Vincent and the Grenadines. The 7-year (2019-2025) ENP gray whale catch limit is allocated through a bilateral agreement between the United States and the Russian Federation as five strikes per year for the Makah Tribe and 135 strikes per year for the Chukotka Natives (Fominykh and Wulff 2021).

In 2018, the IWC Scientific Committee finalized an Aboriginal Whaling Management Procedure (AWMP), which applies stock-specific strike limit algorithms (SLAs) to provide advice on ASW strike and catch limits (IWC/67/Rep01(2018) Annex E). The AWMP relies on four main components, several of which have scientific subcomponents: (1) SLAs used to provide advice on the strike and catch limits; (2) operational rules, including carryover provisions, block quotas, and interim relief allocations; (3) guidelines for implementation reviews; and (4) guidelines for data and analysis (IWC/67/Rep01(2018) Annex E). At its 2018 meeting, the Scientific Committee reviewed the hunt management plan proposed by the United States for the Makah Tribe and found that it met the Commission's conservation objectives for western North Pacific (WNP) and ENP (including Pacific Coast Feeding Group [PCFG]) gray whales. The Committee also reviewed the proposed strike and landing limits as well as the strike carryover provision using the SLA developed for ENP gray whales and found that the proposed Amendment to the Schedule for gray whales met the Commission's conservation objectives (IWC/67/Rep01(2018) Annex E). In 2021, the Scientific Committee reviewed the circumstances of the current unusual mortality event (UME) and concluded that it fell within the testing parameters for the SLA (Givens and Weller 2021).

2.0 ALTERNATIVES

Chapter 2 of the 2015 DEIS describes the No Action Alternative and five action alternatives. This SDEIS incorporates these alternatives by reference and analyzes a “composite” Alternative 7 (hereafter referred to as “Alternative 7”).

2.1 Alternative 7 (Composite Alternative – Preferred)

Alternative 7 combines various elements from alternatives previously analyzed in the DEIS and the ALJ’s recommended decision. Under this alternative, the waiver of the MMPA take moratorium would be valid for 10 years and subject to numerous provisions contained in NMFS’ proposed regulations to govern a Makah Tribe gray whale hunt (84 FR 13604). Two management goals shaped many of the provisions in the proposed regulations and Alternative 7: (1) limiting the likelihood that tribal hunters would strike or otherwise harm a WNP gray whale and (2) ensuring that the hunting does not reduce PCFG abundance below recent stable levels. Key provisions are described in the following subsections, and Table 2-1 compares Alternative 7 to the six alternatives assessed in the 2015 DEIS.

Table 2-1. Primary differences among alternatives.

		Alternatives						
Whale Hunting Components		1 No- action	2 Tribe's Proposed Action	3 Offshore Hunt	4 Summer/Fall Hunt	5 Split Season Hunt	6 Different Limits on Strikes and PCFG, and Limited Duration of Regulations and Permits	7 Composite – Preferred
Hunt timing		None	December 1 through May 31	Same as Alternative 2	June 1 through November 30	December 1 through December 21; May 10 through May 31	Same as Alternatives 2 and 3	Summer/fall hunts and hunting approaches will be authorized from July 1 through October 31, and winter/spring hunts and hunting approaches will be authorized from December 1 through May 31. Only one hunt season may be authorized in a calendar year, however the first month (December) of a winter/spring hunt would fall in the same calendar year as a summer/fall hunt.
Hunt area		None	U&A west of Bonilla-Tatoosh line; no whale may be struck within 200 yards (183 m) of Tatoosh Island or White Rock during the month of May	Same as Alternative 2, except at least 5 miles (8 km) from shore	Same as Alternative 2, except no whale may be struck within 200 yards (183 m) of Tatoosh Island or White Rock during any month	Same as Alternative 2	Same as Alternatives 2 and 5	Same as Alternative 2, with other site and time restrictions possible to protect Olympic Coast National Marine Sanctuary resources
Maximum limit for harvested, struck, and struck and lost whales	Annual	0	Up to 5 harvested, 7 struck, and 3 struck and lost	Up to 5 harvested, 6 struck, and 2 struck and lost	Up to 5 harvested, 7 struck, and 3 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 5 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 4 harvested (7 over 2 years); up to 4 struck (7 over 2 years); struck and lost limited by strike limit or PCFG limit (see below)	In winter/spring hunts, up to 3 harvested, struck, or struck and lost. In summer/fall hunts, only 1 harvested and 2 struck or struck and lost
	6-year	0	Up to 24 harvested, 42 struck, and 18 struck and lost	Up to 24 harvested, 36 struck, and 12 struck and lost	Up to 24 harvested, 42 struck, and 18 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 24 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 21 harvested, 21 struck; struck and lost limit dictated by PCFG limit (see below)	Up to 12 harvested, and 15 struck or struck and lost

	10-year	0	Up to 40 harvested, 70 struck, and 30 struck and lost	Up to 40 harvested, 60 struck, and 20 struck and lost	Up to 40 harvested, 70 struck, and 30 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 40 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 35 harvested, 35 struck; struck and lost limited by PCFG limit (see below)	Up to 20 harvested, and 25 struck, or struck and lost
ENP Population Abundance Threshold		N/A	N/A	N/A	N/A	N/A	N/A	The impacts of the Preferred Alternative are analyzed without an ENP population abundance threshold. However, three thresholds are considered as Sub-alternatives. Under the Sub-alternatives, hunting would cease if the abundance estimate (N) of the ENP gray whale stock dropped below: a) N=11,000, b) N=16,000, or c) N=18,000
Additional limits on harvest or mortality of PCFG whales. Estimated limits are based on current conditions and could change based on updated information. The descriptions in the table are summaries. Please refer to the narrative for full details, and Subsection 3.4.2.1.3, for background on the potential biological removal (PBR) approach.		N/A	Tribe's bycatch proposal (apply PBR-based formula, with Rmax of 4% and Recovery Factor same as for ENP (1.0) and Nmin of OR-SVI) results in about 3.0 whales/year; struck but not landed do not count as PCFG; no carry-over of unused limit	Total mortality limit set at PBR (as reported in NMFS' stock assessment report); additional female mortality limit set based on proportion of females in PCFG (results in about 2.7 males and 1.6 females); all struck but not landed count as PCFG whales in proportion to presence of PCFG whales; no carry-over of unused limit	Mortality limit set to achieve or maintain 80% of carrying capacity (PBR-based formula with recovery factor of 0.35), minus other human-caused mortality (results in 1 whale); approach only known ENP males; all strikes count as PCFG; no carry-over of unused limit unless it's between 0.5 and 1.0	Mortality limit set at 10% of PBR (results in about 1 whale/4 years); struck but not landed count as PCFG in proportion to presence of PCFG whales; carry-over of unused limit used to calculate hunt hiatus	Mortality limit set at PBR minus other human-caused mortality (results in about 2 whales/year); all struck but not landed count as PCFG in proportion to presence of PCFG whales; no carry-over of unused limit	Mortality limit set at 16 PCFG whales over 10 years, no more than 8 of which may be females. Hunting would be prohibited if the forecasted abundance of the PCFG falls below 192 whales, or the minimum abundance falls below 171 whales
Waiver and permit duration and additional regulations		N/A	Unlimited waiver period; permits for maximum of 5 years; no additional regulations	Same as Alternative 2	Same as Alternatives 2 and 3	Same as Alternatives 2, 3, and 4	Waiver period ends after 10 years; permits for maximum of 3 years	Waiver period ends after 10 years; initial permit for maximum of 3 years followed by permits up to 5 years

2.1.1 Location of Hunt (Area Restrictions)

Consistent with Alternative 2, the Tribe's proposed action, the hunt area would be limited to that portion of the Makah Indian Tribe's usual and accustomed fishing grounds (U&A) west of the Bonilla-Tatoosh Line (i.e., excluding the Strait of Juan de Fuca). Within this area, the Tribe proposed to protect nesting seabirds by not allowing strikes to occur within 200 yards (183 meters) of Tatoosh Island or White Rock during the month of May. Under Alternative 7, these and other sites could be subject to hunt restrictions via the hunt permitting process to protect Olympic Coast National Marine Sanctuary resources pursuant to consultation under the National Marine Sanctuary Act.

2.1.2 Timing of Hunt (Seasonal Restrictions)

To achieve the two management goals described in Subsection 2.1 above, Alternative 7 includes alternating hunt seasons where winter/spring hunts would occur during the migration season (December 1 through May 31) to reduce the risk to PCFG whales, and summer/fall hunts would occur during the feeding season (July 1 through October 31) to reduce the risk to WNP whales. The 2019 Proposed Rule limited winter/spring hunts to even-numbered years and summer/fall hunts to odd-numbered years. The even-year/odd-year hunt language is not a conservation measure. NMFS could remove this language to provide more flexibility in determining when the first hunt season of the 10-year waiver period should take place. Still, only one hunt season would be authorized each year; however, the winter/spring hunts may start in the same calendar year as a summer/fall hunt. This results in a 1-month gap (November) between the end of a summer/fall hunt and the start of a winter/spring hunt, and a 13-month gap between the end of a winter/spring hunt and the start of the next summer/fall hunt, and so on.

2.1.3 Numbers of Whales Struck or Lost

Alternative 7 imposes strike limits and landing limits for each hunt season. During winter/spring hunts, a maximum of three whales may be struck regardless of whether or not they are landed. During summer/fall hunts, a maximum of two whales may be struck but only if the first whale is lost (i.e., struck but not landed). "Strike" or "struck" is defined in NMFS' proposed regulations as to cause a harpoon, darting gun, or other device, or a projectile from a rifle or other weapon, to penetrate a gray whale's skin or an instance in which a gray whale's skin is penetrated by such a weapon or projectile during hunting. Once a whale has been struck, any subsequent strikes on that same whale will not count against the limit. In other words, multiple strikes on the same whale count as a single struck whale.

WNP whales are not expected to be encountered during a summer/fall hunt because current evidence indicates they would have returned to summer feeding grounds in the WNP (Mate et al. 2015). In contrast, during a winter/spring hunt there is a very small risk of striking a WNP whale that has migrated to the ENP wintering grounds (Moore and Weller 2019). Therefore, under Alternative 7, in order to receive a permit for a winter/spring hunt, the Tribe must also obtain an Incidental Take Authorization (ITA) for WNP whales. Furthermore, under Alternative 7, the Tribe could only strike one whale in a 24-hour period during a winter/spring hunt as a precaution against striking multiple WNP gray whales that might be traveling together in a group (Weller et al. 2012). In the unlikely event the Tribe struck a WNP whale, all hunting would cease unless and until NMFS determined that measures were taken to ensure that no additional WNP gray whales would be struck during the remainder of the waiver period.

2.1.4 Number of Whales Harvested

Under Alternative 7, no more than 25 ENP gray whales may be harvested over the 10-year waiver period, with no more than two or three whales killed in a given hunt season (see Subsection 2.1.3). As noted in the DEIS, the term “harvest” is defined as landing a whale.

2.1.5 ENP Population Abundance Threshold Sub-alternatives

Although NMFS’ proposed regulations did not include an ENP population low abundance threshold, the ALJ recommended, in light of the current UME, that the hunt regulations include an abundance threshold for the ENP gray whale stock below which the hunt would not be permitted. NMFS received three suggestions for thresholds in the 45-day public comment period following the publication of the recommended decision. If NMFS includes a low abundance threshold for the ENP stock in the final rule and the abundance estimate for the ENP stock were to drop below the selected threshold, hunting could resume once the abundance estimate increased above the threshold again.

In this SDEIS, the impacts of the hunt under Alternative 7 are analyzed both without a low abundance threshold and with the addition of the three thresholds proposed in the public comment period, which are analyzed as Sub-alternatives:

7(a) 11,000 whales

7(b) 16,000 whales

7(c) 18,000 whales.

2.1.6 Limits on Harvesting PCFG Whales

The 2015 DEIS’s action alternatives (including the Tribe’s proposal—Alternative 2) were designed to manage impacts on PCFG whales using various calculations reliant on the “potential biological removal level” (PBR) for PCFG whales. (A full description of PBR and its usage in the action alternatives can be found in Subsections 2.3.2.2.3 and 3.4.2.1.4 of the 2015 DEIS). In contrast to that PBR-based approach, Alternative 7 relies on static strike limits and low-abundance thresholds to manage impacts on PCFG whales. Specifically, no more than 16 PCFG whales may be struck over the 10-year waiver period, and no more than eight of these whales can be females. To determine if a landed whale belonged to the PCFG, observers would photograph the whale and provide those photographs to NMFS and the Cascadia Research Collective to compare with the PCFG photo catalog. During summer/fall hunts, all struck whales that cannot be identified as a WNP gray whale—whether struck and landed or struck and lost—will count as a member of the PCFG. During winter/spring hunts, struck whales that cannot be identified will be counted in proportion to the estimated percentage of PCFG whales in the hunt area during the month of the strike. Also, hunting would be prohibited if the current or forecasted abundance of the PCFG falls below 192 whales, or if its minimum abundance falls below 171 whales. Hunting could resume once the most recent or forecasted abundance, and minimum abundance, increase above their respective thresholds.

2.1.7 Whales Approached and Subjected to Unsuccessful Strike Attempts

Recognizing that actions by tribal hunters, short of killing a gray whale, may affect whales and may constitute a take under the MMPA, the proposed regulations would limit the number of approaches and unsuccessful strike attempts, including those associated with hunt training.

Under Alternative 7, the Tribe would be required to obtain an ITA for WNP gray whales in order to make training approaches from November 1 through June 30 due to the likelihood that a WNP whale may be encountered during these months over the 10-year waiver period (Mate et al. 2015; Moore and Weller 2019). Alternative 7 would authorize no more than 353 ENP gray whales to be approached (including both hunting and training approaches) each calendar year, of which no more than 142 could be PCFG whales. Any hunting approach on a gray whale that has already been struck will not count against these limits. As with strikes (Subsection 2.1.3 above), approaches in winter/spring hunts would take into account the proportion of PCFG whales expected to be encountered, while in summer/fall hunts, all whales approached would count as PCFG whales. Training approaches during June through November in any year would count as PCFG whales. Consistent with permit conditions imposed by NMFS for research vessels pursuing large cetaceans, an “approach” is defined as causing a hunting or training vessel to be within 100 yards of a gray whale.

Alternative 7 would also limit the number of whales subjected to unsuccessful strike attempts to 18 during winter/spring hunt years, and 12 during summer/fall hunt years. Each training harpoon throw will count against the unsuccessful strike attempt limit in effect during the calendar year that the throw is made. Training harpoon throws could occur in any month in winter/spring hunt years. In contrast, training harpoon throws would be restricted to the hunting season in summer/fall hunt years (July through October, when WNP whales are not expected in the hunt area) to reduce the risk of encountering WNP whales over the waiver period. Similar to the limit on approaches, the purpose of these provisions is to limit the risk of nonlethal impacts, particularly to WNP and PCFG whales.

2.1.8 Age, Sex, and Reproductive Status

Consistent with the proposal by the Makah Tribe, Alternative 7 would prohibit striking or approaching a calf or any whale accompanied by a calf. As noted in Subsection 2.1.6 above, Alternative 7 also states that no more than eight PCFG females may be struck over the 10-year waiver period. The accounting associated with this limit would mirror the assumptions regarding PCFG proportion estimates described in Subsection 2.1.6 above, as well as the best available information regarding the sex ratio within the PCFG. For more information, see Subsection 3.4.3.4.1 of the 2015 DEIS.

2.1.9 Proposed Hunting Method

The proposed hunting method under Alternative 7 mirrors that proposed by the Tribe and analyzed as Alternative 2. For more information, see Subsection 2.3.2.2.10 of the 2015 DEIS.

2.1.10 Whale Product Use and Distribution

Under Alternative 7, special provisions are made for the use and distribution of both edible and nonedible products. Enrolled members of the Makah Indian Tribe would be permitted to possess, consume, and transport edible whale products such as meat and blubber within and outside the Tribe’s reservation borders. They would also be permitted to share and barter these products with other tribal members. Tribal members would be permitted to share these products with non-members within the reservation boundaries or at the tribal member’s residence, should they reside outside the reservation. Tribal members could also share edible products with non-members at tribal or intertribal gatherings sanctioned by the Makah Tribal Council in quantities under two pounds per person attending the gathering.

Members of the Makah Tribe would also be permitted to possess, transport, share, and barter nonedible whale products, such as bone and baleen, with other tribal members both within and outside the reservation borders. Handicrafts made from these nonedible products could also be shared, offered for sale, and bartered with both members and non-members, with a permanent, distinct marking approved by the Makah Tribal Council and a certificate of authenticity if such products are to be taken outside the reservation boundaries.

2.1.11 Other Environmental Protection Measures

Alternative 7 utilizes the same environmental protection measures proposed by the Tribe in Alternative 2. These are discussed in subsection 2.3.2.2.12 of the 2015 DEIS, which emphasizes that tribal whalers would be subject to training and certification processes overseen by the Makah Whaling Commission or Makah Fisheries Management Department. The proposed regulations underlying Alternative 7 also recognize training as an important component of the management of a tribal hunt. They go on to clarify training-related elements (e.g., training vessels are defined as those not carrying hunting weapons; training approaches as those made by training vessels; and a training harpoon throw as the use of a blunted spear incapable of penetrating a whale's skin). In addition, Subsection 2.1.7 above describes how training-related approaches and training harpoon throws would be managed and accounted for under Alternative 7.

2.2 Alternatives Considered but Eliminated from Detailed Analysis

In Subsection 2.4.8 of the 2015 DEIS, we noted several alternatives and provisions that were not carried forward from an earlier 2008 DEIS that was subsequently terminated in 2012 (see 77 FR 29967, May 21, 2012). One alternative employing a fixed limit on PCFG whales was not carried forward because analyses completed for the 2012 IWC Scientific Committee meeting showed that establishing a set annual limit of one or two PCFG whales within the framework of the Tribe's proposed hunt management plan (Alternative 2) did not meet the IWC's conservation objectives (IWC 2012a). Since that time, the Scientific Committee has convened five range-wide workshops on the status of North Pacific gray whales (IWC 2018) and has analyzed a new proposed management plan that is now presented as the new alternative in this SDEIS. This more complex management plan (see Subsection 2.1, Alternative 7) includes provisions relying on fixed limits and low-abundance triggers for PCFG whales. After modeling the available data (i.e., biology, ecology, abundance and trends, removals including direct hunting, ship strikes, and bycatches), the Scientific Committee concluded that this proposed hunt management plan meets the IWC conservation objectives for ENP gray whales, as well as for PCFG and WNP gray whales (IWC, 2018; see Subsection 1.1, International Whaling Governance under the International Convention for the Regulation of Whaling).

3.0 AFFECTED ENVIRONMENT

We have supplemented this section of the DEIS to address issues raised during the waiver hearing process regarding the geographic areas relevant to our analysis and provide any updates to information on resources and conditions in these areas, including recent events affecting ENP gray whales and their habitat. This information augments that presented in the DEIS to evaluate the alternatives described in Section 2 (Alternatives) and the anticipated environmental effects addressed in Section 4 (Environmental Consequences) and Section 5 (Cumulative Impacts). NEPA regulations at §1502.15 describe the “affected environment” as follows:

The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The description shall be no longer than is necessary to understand the effects of the alternatives.

As described in the 2015 DEIS Subsection 3.1 (Geographically Based Management in the Project Area), we refer to the area affected by the alternatives as the “project area,” which is confined primarily to the marine waters, islands, and land areas near the Makah Tribe’s U&A in the Pacific Ocean and Strait of Juan de Fuca that may be directly or indirectly affected by the proposed whale hunt (see DEIS Figure 1-1).

Our selection of the project area is informed by the *Anderson v. Evans* court’s application of the NEPA regulation 40 C.F.R. 1508.27(a) regarding local impacts. Pursuant to the court’s direction, we examine the impact of the action alternatives on the relevant “local” area, which the court defined as “the Strait of Juan de Fuca and the northern Washington coast” (i.e., the Makah U&A). *Anderson v. Evans*, 350 F.3d 815, 832 (9th Cir. 2003), *opinion amended and superseded on denial of reh’g*, 371 F.3d 475 (9th Cir. 2004). Our assessment is also informed by the purposes and policies of the MMPA, which emphasize maintaining marine mammals as “a significant functioning element in the ecosystem of which they are a part,” “maintain[ing] the health and stability of the marine ecosystem,” and “obtain[ing] an optimum sustainable population keeping in mind the carrying capacity of the habitat” (16 U.S.C. § 1361). Thus, our assessment considers the effects of the various alternatives on the affected stock of marine mammals (ENP gray whales), as well as resources in the project area and affected ecosystems.

3.1 Marine Habitat and Dependent Species

3.1.1 Introduction

The entire range of the ENP gray whale stock is vast and crosses many large marine ecosystems, including the Pacific Central American Coast, California Current, Gulf of Alaska, and Bering and Chukchi Seas (Longhurst 2006; Sherman and Alexander 1989). The project area is located within a coastal transitional zone between the Gulf of Alaska and the California Current large marine ecosystems (Sherman and Alexander 1989; Longhurst 1998). These ecosystems are largely defined by the splitting of the North Pacific Current into two broad coastal currents as it encounters the U.S./Canada west coast: the north-flowing Alaska Current and the south-flowing California Current. Within the California Current Province, scientists regularly study and predict physical and biological features and processes in the northern California Current ecosystem, which is generally described as extending from northern California to Vancouver Island (e.g., Field et al. 2001; Field et al. 2006; Hickey and Banas 2008; Sydeman and Elliott 2008; Harvey et

al. 2017; Wells et al. 2017), though some studies extend only to the U.S.–Canada border in the north because of differing management regimes between the two countries (Field et al., 2001; Field et al., 2006).

Some whales from the ENP stock forage seasonally in the semi-enclosed inland waters of Washington State and British Columbia, an area collectively known as the “Salish Sea.” As described below in subsection 3.2.1.3, some PCFG whales forage during the summer/fall in the westernmost part of the Salish Sea (in the Strait of Juan de Fuca), and each spring a small number of whales from the ENP stock break off from the northward migration to feed for 2-3 months in isolated areas of North Puget Sound. Therefore, we have added information about the Salish Sea to the SDEIS to clarify its overlap with the project area and the potential for the action alternatives to have indirect effects on resources in these waters.

Thus, the project area is associated with the confluence of three marine ecosystems: the Gulf of Alaska, California Current, and Salish Sea. For purposes of our MMPA analysis, we took a precautionary approach of examining the impact of the proposed waiver and regulations at an ecosystem scale commensurate with the project area – specifically the northern California Current and Salish Sea ecosystems. These are the smallest recognized marine ecosystems of which ENP gray whales are a part, and, combined, they encompass the entire Makah U&A. The proposed hunt area on the outer Washington coast lies within the U&A. Figure 3-1 shows the location of the project area and associated ecosystems.

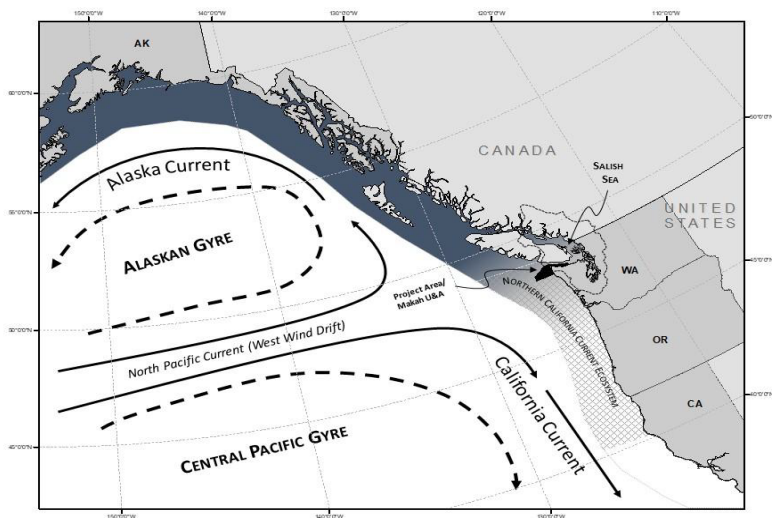


Figure 3-1. Project area/Makah U&A in relation to relevant ocean currents and ecosystems (Adapted from Field et al. 2006).

3.1.2 The Salish Sea

The semi-enclosed inland waters of Washington State and British Columbia are collectively known as the Salish Sea. This area encompasses the Strait of Juan de Fuca, the Strait of Georgia, and Puget Sound. These three areas were seen as distinct water bodies until 2010 when they were unified under the Salish Sea name to honor the region’s first inhabitants, the Coast Salish people (Gaydos et al. 2009; Tucker and Rose-Redwood 2015; Western Washington University 2020).

The Salish Sea is bordered by 7,470 km (4,642 mi) of coastline, has a sea surface area of 16,925 km² (6,535 mi²), and contains the largest estuary by water volume in the United States (Puget Sound Partnership 2019; SeaDoc Society 2020). Researchers estimate that 37 mammal species (including gray whales, see subsection 3.2.1.2), 172 bird species, 253 fish species, and over 3,000 invertebrate species utilize the Salish Sea habitat to some degree (Gaydos and Brown 2011; Gaydos and Pearson 2011).

The environment of the Salish Sea is characterized by strong seasonality in dissolved oxygen, temperature, and primary productivity (Masson and Cummins 2007; Grundle et al. 2009; Johannessen and Macdonald 2009). Snowmelt and rain in the Cascade and Olympic mountain ranges drain into the Salish Sea, delivering minerals and nutrients to the marine zone (USEPA 2019). In addition to the nutrients delivered from freshwater input, coastal upwelling also plays an important role in primary productivity in the Salish Sea, as ocean-derived nutrients entering the Strait of Juan de Fuca spur spring phytoplankton blooms and fuel biogeochemical cycles (Mackas and Harrison 1997; Khangaonkar et al. 2012; Allen and Wolfe 2013). On the sea floor, the primary driver of benthic productivity in the Salish Sea is temperature, followed by the quality of organic matter on the benthic substrate following phytoplankton blooms (Belley et al. 2016). Like the adjacent northern California Current Ecosystem, dynamic physical processes affect the ecosystem structure, ecological interactions, and species' recruitment mechanisms in the Salish Sea, especially in that portion overlapping with the project area.

3.1.3 Marine Heatwaves

Subsections 3.3.3.1 and 3.3.3.2 of the 2015 DEIS describe the physical and biological features and processes of the pelagic and benthic environments associated with the project area. Those subsections also discuss the anomalous ocean conditions associated with the El Niño Southern Oscillation Cycle and Pacific Decadal Oscillation. These events typically occur over relatively long periods spanning many months and decades, respectively. In addition to these events, short-term marine heatwaves (MHWs) have become more frequent in the 21st century (Frolicher et al. 2018; Hobday et al. 2018; Oliver et al. 2018) and warrant further description in this SDEIS.

MHWs are extreme warm sea surface temperature (SST) events that persist for days to months and can extend up to thousands of square kilometers (Scannell et al. 2016; Frölicher et al. 2018). Hobday et al. (2018) outlined three specific characteristics to define MHWs: (1) an area of anomalously warm water compared to a 30-year baseline for that area; (2) prolonged duration lasting for at least five days; and (3) discrete in that there is a defined start and end date that may include gaps of less or no warming. The SST generally exceeds the local 90th percentile for the duration of the five-day minimum period. MHWs are believed to be caused by unusual weather patterns that either cause the ocean to absorb more heat, which warms the surface layer, or prevent heat from escaping from the ocean (NOAA Research 2019). Anomalous barometric pressure at sea level is often linked to MHWs because it suppresses heat loss from the ocean to the atmosphere (Bond et al. 2015; Leising et al. 2015; Cavole et al. 2016).

The frequency of MHWs has increased globally since 1985 as the upper ocean temperatures have warmed around the world (Oliver et al. 2018). It is very likely that 84-90% of MHWs have occurred between 2006 and 2015, caused by increased temperatures due to anthropogenic climate change. Future MHWs are projected to increase in frequency, duration, spatial extent, and intensity (maximum temperature) (IPCC 2019). The largest changes in MHW occurrences

are projected for the tropical Pacific and the Arctic Ocean (Frölicher et al. 2018). There have been six notable MHWs in recent history: in the northern Mediterranean Sea in 2003; off the Western Australian coast in 2011; in the northwest Atlantic in 2012; in the northeast Pacific from 2013 to 2015; off of southeastern Australia in 2015 and 2016; and through northern Australia in 2016 (Oliver et al. 2018). The MHW in the northeastern Pacific from 2013 to 2015, referred to as the “Blob,” was the largest recorded MHW (Frölicher & Laufkötter 2018). During that event, the West Coast of North America experienced increased marine layer stratification, decreased nutrient fluxes (due to decreases in upwelling), and the deepening of the nutricline (Cavole et al. 2016). Offshore ocean temperatures reached as high as 4 degrees Celsius above the climatological mean (Leising et al. 2015). A Blob-like event developed in the northeastern Pacific Ocean again in the summer and fall of 2019. It was the second largest MHW event in terms of area and was one of the top five largest MHWs recorded within the last 40 years in the region (Northwest Fisheries Science Center 2019).

The long-term impacts of MHWs remain uncertain. Short-term impacts have been severe in some regions. Recent MHWs have resulted in kelp forest loss, coral bleaching, decreases in surface chlorophyll, mass mortality of marine invertebrates, rapid shifts in species ranges, fisheries closures, increases in seabird and sea lion disability and mortality, and increases in whale entanglements (Cavole et al. 2016; Oliver et al. 2018; Santora et al. 2020). Marine species appear more susceptible to acute environmental extremes than to slower changes in ocean temperature (Oliver et al. 2018). Many species have shifted their distributions north during the warming events in the North Pacific Ocean (Cavole et al. 2016), similar to range shifts witnessed during El Niño events (Sanford et al. 2019). Some species’ ranges return to their normal extent once the warming has stopped; other species have developed relict populations that slowly disappear or sink populations that can persist indefinitely (Sanford et al. 2019).

The Blob resulted in lower primary productivity from weak upwelling and extremely low levels of ocean mixing and a shift in warm water copepod abundance in northern California (Leising et al. 2015; Di Lorenzo & Mantura 2016). The decrease in productivity led to a decrease in the amount of krill near the coast, which resulted in prey switching by large cetaceans such as humpback whales and large die-offs of some seabirds (Cavole et al. 2016; Harvey et al. 2020). Harmful algal blooms (HABs) in Washington, Oregon, and California resulted in increased levels of domoic acid that delayed and closed fisheries and led to the death of many seabirds (Cavole et al. 2016; Di Lorenzo & Mantura 2016). However, some of these impacts appear to be temporary. For example, northern copepod biomass has increased steadily since 2016, as has the mean body length of krill (Harvey et al. 2020). Although reported entanglements of humpbacks were higher in 2019 than pre-2014 levels, they were lower than the number of reports received each year from 2015-2018 (Harvey et al. 2020). In addition, while it is unclear what, if any, impact the Blob may have had on the ENP gray whale stock, that stock continued to grow steadily through that event, with a 22% increase in abundance estimates in 2014/2015 and 2015/2016 since the 2010/2011 estimates (Durban et al. 2017). Still, the California Current Ecosystem has experienced exceptional ocean warming due to El Niño events and MHWs since 2013, and the impacts of this warming will continue to warrant investigation (Harvey et al. 2020).

3.2 Gray Whales

This section provides updates to gray whale status, population structure, distribution, and habitat use since the DEIS was published in 2015. These parameters are relevant when analyzing the effects of any hunt on the population and on whales that migrate through or stop to feed in the waters off the Washington coast. More detailed information about ENP, WNP, and PCFG whales is contained in Subsection 3.4.3, Existing Conditions, of the DEIS.

3.2.1 Population Abundance and Structure

3.2.1.1 Western North Pacific (WNP) Gray Whales

Abundance and Recruitment

The current abundance of WNP gray whales (290 whales with a 90% confidence interval of 271—311, Cooke et al. 2018) is markedly smaller than that of ENP gray whales (20,580 whales, Stewart and Weller 2021). Before commercial whaling, at least 1,500 whales were thought to be part of the western population. While it is likely that the number of WNP gray whales before exploitation was smaller than the number of ENP gray whales, WNP gray whales did comprise a more significant portion of the species in the North Pacific in the past.

WNP gray whales are considered to be gray whales that spend all or part of their lives in the western North Pacific in the waters of Vietnam, China, Japan, Korea (Republic of Korea and/or Democratic People's Republic of Korea), or the Russian Far East, including southern and southeastern Kamchatka but not necessarily areas north of 55°N in eastern Kamchatka. This definition is consistent with that used in the IUCN/IWC Western Gray Whale Conservation Management Plan and with how the WNP gray whale subpopulation has been evaluated by the IUCN (Cooke et al. 2018). The animals that feed in the western North Pacific, including those whales found off Sakhalin and southeastern Kamchatka, represent the only large feeding concentration of gray whales in the western North Pacific, and their numbers remain small (171 to 214 age 1+ years; Cooke et al. 2019). While modern sightings of gray whales in Japanese waters are not common, they have increased slowly in recent years, especially off the Pacific coast (Nakamura et al. 2019). However, very few contemporary records of gray whales in other regions of the western North Pacific exist, with only two records from Chinese waters since 1996 (Zhao 1997; Zhu 2012). A Surveillance Towed Array Sensor System (SURTASS) vessel operated by the United States Navy in the East China Sea recorded a unique acoustic signature in 2011 that was identified as a probable WNP gray whale; however, the species identification has yet to be verified (Gagnon 2016; IWC 2017). From 2011 to 2016, the Integrated Undersea Surveillance System Marine Mammal Monitoring program regularly detected acoustic signatures from WNP gray whales in the East China Sea when a SURTASS vessel was present from September through March (Gagnon 2016). No verified records of gray whales in Korean waters have been detected since 1977 (Park 1995; Kim et al. 2013).

While the pre-exploitation abundance of WNP gray whales is unknown, some have estimated that the population contained between 1,500 and 10,000 (Yablokov and Bogoslovskaya 1984) and up to approximately 25,000 (Cooke et al. 2019) individuals before commercial whaling. Mark-recapture analysis of photo-identification data collected on the Sakhalin Island feeding ground provided the first post-exploitation estimates of the abundance of WNP gray whales. It indicated that fewer than 100 whales used the feeding ground between 1997 and 2003 (Bradford

et al. 2008). More recently, an assessment using a stage-structured individual-based population model estimated that the number of whales, excluding calves, using the combined Sakhalin-southeastern Kamchatka area in 2016 was 320-410 whales, with the abundance increasing at annual rates of 2-5% during recent years (Cooke 2018). Approximately 130-170 of those whales were estimated to feed predominantly off Sakhalin Island (Cooke 2017).

Recent satellite tagging data, genetic, and photo-identification matches between Sakhalin, Canada, the United States, and Mexico have identified 54 whales known to travel between the eastern and western North Pacific (Lang 2010; Weller et al. 2012; Mate et al. 2015; Urbán et al. 2019). This raises questions about the proportion of WNP gray whales that remain in the western North Pacific year-round. Based on population modeling that incorporated data on known movements of WNP gray whales into the eastern North Pacific, Cooke et al. (2019) concluded that 45-80% of Sakhalin whales migrate to the eastern North Pacific in the winter. This finding indicates that at least 20%, and perhaps more, of the whales migrate elsewhere, presumably to wintering areas off the Asian coast. Thus, the number of WNP gray whales remaining in the western North Pacific year-round is likely small (possibly fewer than 50 whales, WGWAP 2018), making these whales more vulnerable than previously thought (Weller and Brownell 2012).

Based on the positive growth rates and estimates that the number of mature WNP gray whales now is greater than 50, the IUCN downlisted the WNP gray whale from Critically Endangered to Endangered status in 2018 (Cooke et al. 2018).

Distribution

WNP gray whales have been found off both coasts of Japan, but sightings are uncommon. From 1955 to April 2018, only 31 records of gray whales were reported (Nakamura et al. 2019). Most of the records were from the Pacific coast of Japan, with only a few (n=6) reports from the Sea of Japan. The lack of frequent sightings off Japan may reflect true absence but may also reflect limited search effort (Weller et al. 2016). While still rare, the frequency with which gray whales are reported off Japan has increased in recent years, with ten records, some of which included the same individual, reported in 2015 or later (Nakamura et al. 2017, 2019). A female gray whale that died in a Japanese set net off the Pacific coast of Honshu, Japan in 2007 was identified as a whale observed off Sakhalin Island (Weller et al. 2008). This photographic match was the first to show that whales on the summer feeding grounds off Sakhalin are found 1,500 km (932 mi) south within a migratory corridor. In addition, Weller et al. (2016) determined the migratory movement of one gray whale that moved back and forth from Sakhalin Island and the Pacific coast of Honshu, Japan during 2014 to 2016. This individual was first observed as a calf with its mother off Sakhalin Island during the summer of 2014, then observed off Japan from March through May of 2015, back in Sakhalin during the summer of 2015, and then off Japan in January through February of 2016. The March to May sightings correspond with the timing of ENP gray whale northbound migrations in the spring from Mexico wintering grounds to Bering Sea feeding grounds, while the January and February sightings correspond with the timing of the ENP gray whales' southbound migrations in the winter to Mexico. These records support a migratory link between the summer Sakhalin feeding grounds and the suspected wintering area(s) somewhere off the coast of Asia (Weller et al. 2016). Data reported from the U.S. Navy SURTASS vessel would further support this migratory link, should the acoustic signatures

detected in the East China Sea from September through March be verified as WNP gray whale vocalizations. The 55 Hertz sweeps detected by the towed acoustic array have included up to eleven individuals in a two-hour period, moving south in the fall and north in the spring, consistent with a seasonal migration pattern (Gagnon 2016).

Tagging, photo-identification, and genetic studies show that some whales identified in the WNP off Russia have been observed in the ENP, including coastal waters of Canada, the United States, and Mexico (Lang 2010; Mate et al. 2011; Weller et al. 2012; Urbán et al. 2013; Mate et al. 2015; Urbán et al. 2019). In combination, these studies have documented 54 gray whales observed in both the WNP and ENP. Despite this geographic overlap, significant mtDNA and nDNA differences are found between whales in the WNP and those summering in the ENP (LeDuc et al. 2002; Lang et al. 2011a; Carretta et al. 2021).

Genetic Information

As described in the DEIS (Subsection 3.4.3.2 Western North Pacific (WNP) Gray Whales), genetic comparisons of ENP and WNP gray whales have consistently revealed statistically significant differences. Analysis of mtDNA control region sequences have shown differences between WNP gray whales feeding off Sakhalin and whales sampled on eastern migratory routes and/or feeding grounds ($F_{ST}=0.086-0.087$, $p<0.001$; LeDuc et al. 2002; Lang et al. 2011); these differences remained apparent when a much longer region of mtDNA was sequenced and compared ($F_{ST} = 0.124-0.202$, $p<0.0001$; Meschersky et al. 2015). The mtDNA results support strong matrilineally driven fidelity of WNP gray whales to the Sakhalin feeding ground, whereby the return of whales first brought to Sakhalin as calves by their mothers (and, if female, the subsequent return of their calves) causes the frequencies of mtDNA haplotypes carried by reproductive females to build over time. This evidence is consistent with the patterns identified in the photo-identification data, in which the return of whales first brought to Sakhalin as calves by their mothers has been documented.

Comparisons of nuclear loci, which are bi-parentally inherited and thus reflect patterns of gene flow, also revealed statistically significant differentiation in microsatellite allele frequencies ($n=8$ loci) when WNP gray whales were compared with ENP gray whales feeding north of the Aleutians ($F_{ST}=0.010$, $p=0.001$, Lang et al. 2011). A subsequent study that compared WNP gray whales with gray whales sampled on the Mexican wintering lagoons also identified significant levels of nuclear genetic differentiation ($F_{ST} = 0.039$, $p=0.001$) using the panel of 84 SNP loci (Brüniche-Olsen et al. 2018a).

While highly significant, the magnitude of nuclear genetic differentiation identified between WNP and ENP gray whales is relatively low (Lang et al. 2011; Brüniche-Olsen et al. 2018b). Currently, the best available information suggests that there could be interbreeding between ENP and WNP gray whales, which is not surprising given the observed spatial overlap between some WNP and ENP gray whales on eastern migratory routes and wintering grounds. However, paternity analysis based on 13 microsatellite loci showed that 46-53% of sampled whales that were first identified as calves off Sakhalin could be assigned a putative father from among Sakhalin whales (Lang et al. 2010a). When combined with the significant levels of genetic differentiation identified between ENP and WNP gray whales, these findings indicate that WNP gray whales do not mate randomly with the much larger number of whales that comprise the

eastern North Pacific population, but rather are largely, but not exclusively, interbreeding with each other.

3.2.1.2 Eastern North Pacific Gray (ENP) Whales

Abundance and Recruitment

The most recent estimate of abundance for the ENP population is from the 2019/2020 southbound survey and is 20,580 (CV=0.05) whales, down 23.7% from the previous estimate (26,960 whales) from the 2015/2016 survey (Stewart and Weller 2021). Table 3-1 lists the gray whale population estimates from southbound sightings from 1967/68 to 2019/2020.

The pattern of population growth and decline represented in the time series of population abundance data for ENP gray whales suggests that large-scale fluctuations are not rare for this stock. Over the last several decades, the overall population size of the ENP has grown despite a UME in 1999 and 2000, as well as the UME the stock is currently undergoing (see Subsection 3.2.2, Unusual Mortality Event). The current UME coincides with the recent decline in abundance observed in the 2019/2020 survey. As of June 3, 2022, a total of 578 stranded whales were recorded in Canada, Mexico, and the U.S. While the number of strandings in this event are slightly lower compared to the 1999/2000 UME, the almost 23% decline in abundance is consistent with that observed in the previous UME (Stewart and Weller 2021). In 2017, Durban et al. noted that a recent 22% increase in ENP gray whale abundance over 2010/2011 levels was consistent with high observed and estimated calf production. A new estimation of calf production resulted in slightly higher estimates (by about 10%) than previously thought, largely due to how the updated model addressed uncertainty in unobserved periods (Stewart and Weller 2020). Increases in abundance observed prior to the 2019 UME supported hypotheses that gray whales may have been experiencing more favorable feeding conditions in arctic waters due to a rise in ice-free habitat that might have resulted in increased primary productivity in the region (Perryman et al. 2002; Moore 2016).

Table 3-1. Gray whale population estimates from southbound sightings 1967/68 to 2015/16.

Year	Population Estimate	Statistical Interval ^a
1967/1968	13,426	10,952 - 15,900
1968/1969	14,548	12,267 - 16,829
1969/1970	14,553	12,186 - 16,920
1970/1971	12,771	10,743 - 14,799
1971/1972	11,079	9,060 - 13,098
1972/1973	17,365	14,642 - 20,088
1973/1974	17,375	14,582 - 20,168
1974/1975	15,290	12,773 - 17,807
1975/1976	17,564	14,603 - 20,525
1976/1977	18,377	15,495 - 21,259
1977/1978	19,538	16,168 - 22,908
1978/1979	15,384	12,972 - 17,796
1979/1980	19,763	16,548 - 22,978
1984/1985	23,499	19,400 - 27,598
1985/1986	22,921	19,237 - 26,605
1987/1988	26,916	23,856 - 29,976
1992/1993	15,762	13,661 - 17,863
1993/1994	20,103	17,936 - 22,270
1995/1996	20,944	18,440 - 23,448
1997/1998	21,135	18,318 - 23,952
2000/2001	16,369	14,412 - 18,326
2001/2002	16,033	13,865 - 18,201
2006/2007	19,126	16,464 - 21,788
<i>Data above from Laake et al. (2012); Data below from Durban et al. (2013)</i>		
2006/2007	20,750	18,860 - 23,320
2007/2008	17,820	16,150 - 19,920
2009/2010	21,210	19,420 - 23,250
2010/2011	20,990	19,230 - 22,900
<i>Data below from Durban et al. (2017)</i>		
2014/2015	28,790 ¹	23,620 – 39,210
2015/2016	26,960	24,420 – 20,990
<i>Data below from Stewart and Weller (2021)</i>		
2019/2020	20,580	18,700 – 22,870

^a Data reported in this column depict Confidence Intervals (1967/8-2006/7: Laake et al. 2012; 2019/2020: Stewart and Weller 2021) and Highest Posterior Density Intervals (HDPI) (2007/8-2010/11: Durban et al. 2013; 2014/2-15 and 2015/2016: Durban et al. 2017). Both are terms used commonly by researchers to describe the precision of a point estimate, depending on their method of statistical inference. For example, within a Bayesian statistical framework HDPIs indicate that there is a relatively high probability (signaled by 95th percentile as an interval of certainty)

¹ While this value is the highest ever reported, it is not typically cited as such due to considerable uncertainty (i.e., large error bars) in the estimate compared to the subsequent year's more precise estimate of 26,960 (Durban et al. 2017).

that the true abundance estimate in 2010/2011 falls between 19,230 and 22,900 gray whales. In general, narrower intervals indicate more precise point estimates.

NMFS Stock Assessment Report for ENP Gray Whales

Punt and Wade (2012) estimated the ENP population was at 85% of carrying capacity (K) and at 129% of the maximum net productivity level (MNPL), with a probability of 0.884 that the population is above MNPL and, therefore, within the range of its optimum sustainable population (OSP) (Carretta et al. 2021). Even though the stock is within OSP, abundance will fluctuate as the population adjusts to natural and human-caused factors affecting carrying capacity (Punt and Wade 2012). It is expected that a population close to or at carrying capacity will be more susceptible to environmental fluctuations (Moore et al. 2001). The correlation between gray whale calf production and environmental conditions in the Bering Sea may reflect this (Perryman et al. 2002; Perryman and Weller 2012). Overall, the population nearly doubled in size over the first 20 years of monitoring and has fluctuated for the last 30 years, with a recent increase to nearly 27,000 whales. Carrying capacity for this stock was estimated at 25,808 whales in 2009 (Punt and Wade 2012); however, the authors noted that carrying capacity was likely to vary with environmental conditions.

Based on 2014-2018 data, the estimated annual level of human-caused mortality and serious injury for ENP gray whales includes Russian harvest (119), mortality and serious injury from commercial fisheries (9.3), marine debris (0.4), and ship strikes (1.8), and totals 131 whales per year, which does not exceed the PBR (801). Therefore, the ENP stock of gray whales is not classified as a strategic stock (Carretta et al. 2021). The IWC completed an implementation review for ENP gray whales (including the PCFG) in 2012 (IWC 2013) and a review of the Makah Management Plan in 2018 (IWC 2018a). It concluded that levels of harvest and other human-caused mortality are sustainable, given the population abundance.

Genetics and Distribution

The IWC Scientific Committee has conducted a series of annual (2014-2018) range-wide workshops on the status of North Pacific gray whales. The primary objective was not to determine a single ‘best’ stock structure hypothesis (unless definitively supported by existing data), but rather to identify plausible hypotheses consistent with the suite of available data. The goal is to create a foundation for developing range-wide conservation advice. The primary hypotheses deemed as most plausible considered three separate ‘breeding stocks’ or biological populations. Currently, the IWC recognizes two ‘highly plausible’ hypotheses: (a) “Hypothesis 4a” which assumes that two breeding stocks exist and overwinter off Mexico, and (b) “Hypothesis 7a” which is characterized by maternal feeding ground fidelity, two migratory routes/wintering grounds used by Sakhalin whales, and non-random mating. Under Hypothesis 4a, one breeding stock includes Northern Feeding Group (NFG) and PCFG whales, and the second breeding stock includes Western Feeding Group (WFG) whales that mate largely with each other while migrating to Mexico. Whales show matrilineal fidelity to feeding grounds, one migratory route/wintering region used by Sakhalin whales, and non-random mating. Areas off Southern Kamchatka and the Northern Kuril Islands are used by some whales that belong to the breeding stock comprised of WFG whales and some whales that belong to the NFG. Although a third breeding stock (the western breeding) may once have existed, under this hypothesis it is

assumed to have been extirpated. In comparison, Hypothesis 7a assumes that three breeding stocks exist: Eastern Breeding Stock (EBS) and Western Breeding Stock (WBS) and an unnamed stock of WFG whales that largely breed with each other while on migration to Mexico. The EBS includes two feeding groups: PCFG and NFG. The WBS whales feed in the Northeastern Sakhalin Island sub-area, areas of the Okhotsk Sea, and the Southern Kamchatka and Northern Kuril Islands and then migrate to Vietnam-South China Sea sub-area to overwinter. Southern Kamchatka and the Northern Kuril Islands are used by the WFG (that are part of the unnamed breeding stock migrating to Mexico), the NFG, and the feeding whales that are part of the WBS (IWC 2021).

Table 3-2. ENP gray whale human-caused mortality estimates from NMFS Stock Assessment Reports (SARs) 1998 to 2021.

SAR Year	Publication Date – NMFS Citation	PBR	Estimated Annual Level of Human-caused Mortality and Serious Injury ¹
1998	December 1998 - NOAA Technical Memorandum NMFS-AFSC-97	432	Ship Strikes = 1 Commercial Fisheries = 4 <u>Subsistence Harvest = 43</u> <i>Total = 48</i>
1999	December 1999 - NOAA Technical Memorandum NMFS-AFSC-110	432	Ship Strikes = 1 Commercial Fisheries = 4 <u>Subsistence Harvest = 43</u> <i>Total = 48</i>
2000	December 2000 - NOAA Technical Memorandum NMFS-AFSC-119	649	Ship Strikes = 1 Commercial Fisheries = 6 <u>Subsistence Harvest = 76</u> <i>Total = 83</i>
2001	December 2001 - NOAA Technical Memorandum NMFS-AFSC-124	575	Ship Strikes = 1 Commercial Fisheries = 6 <u>Subsistence Harvest = 76</u> <i>Total = 83</i>
2002	December 2002 - NOAA Technical Memorandum NMFS-AFSC-133	575	Ship Strikes = 1 Commercial Fisheries = 9 <u>Subsistence Harvest = 97</u> <i>Total = 107</i>
2003	August 2004 - NOAA Technical Memorandum NMFS-AFSC-144	575	Ship Strikes = 1 Commercial Fisheries = 9 <u>Subsistence Harvest = 97</u> <i>Total = 107</i>
2005	December 2005 - NOAA Technical Memorandum NMFS-AFSC-161	442	Ship Strikes = 1 Commercial Fisheries = 7.4 <u>Subsistence Harvest = 122</u> <i>Total = 130.4</i>
2006	January 2007 - NOAA Technical Memorandum NMFS-AFSC-168	417	Ship Strikes = 1.2 Commercial Fisheries = 6.7 <u>Subsistence Harvest = 122</u> <i>Total = 129.9</i>
2007	February 2008 - NOAA Technical Memorandum NMFS-AFSC-180	417	Ship Strikes = 1.2 Commercial Fisheries = 6.7 <u>Subsistence Harvest = 122</u> <i>Total = 129.9</i>
2008	April 2009 - NOAA Technical Memorandum NMFS-AFSC-193	417	Ship Strikes = 1.2 Commercial Fisheries = 6.7 <u>Subsistence Harvest = 122</u> <i>Total = 129.9</i>
2009	February 2010 - NOAA Technical Memorandum NMFS-AFSC-206	417	Ship Strikes = 1.2 Commercial Fisheries = 6.7 <u>Subsistence Harvest = 122</u> <i>Total = 129.9</i>

2010	May 2011 - NOAA Technical Memorandum NMFS-AFSC-223	360	Ship Strikes = 1.2 Commercial Fisheries = 3.3 Unlawful Hunt = 1 ² <u>Subsistence Harvest = 121</u> <i>Total = 126.5</i>
2011	May 2011 - NOAA Technical Memorandum NMFS-AFSC-234	360	Ship Strikes = 1.2 Commercial Fisheries = 3.3 Unlawful Hunt = 1 <u>Subsistence Harvest = 121</u> <i>Total = 126.5</i>
2012	January 2013 - NOAA Technical Memorandum NMFS-SWFSC-504 ³	558	Ship Strikes = 2.2 Commercial Fisheries = 3 <u>Subsistence Harvest = 123</u> <i>Total = 128.2</i>
2013	August 2014 - NOAA Technical Memorandum NMFS-SWFSC-532	559	Ship Strikes = 2.2 Commercial Fisheries = 2.45 <u>Subsistence Harvest = 123</u> <i>Total = 127.7</i>
2014	August 2015 - NOAA Technical Memorandum NMFS-SWFSC-549	624	Ship Strikes = 2.0 Commercial Fisheries = 4.45 <u>Subsistence Harvest = 127</u> <i>Total = 133.5</i>
2015	May 2016 - NOAA Technical Memorandum NMFS-SWFSC-561	624	Ship Strikes = 2.0 Commercial Fisheries = 4.45 <u>Subsistence Harvest = 127</u> <i>Total = 133.5</i>
2016	June 2017 - NOAA Technical Memorandum NMFS-SWFSC-577	624	Ship Strikes = 2.0 Commercial Fisheries = 4.45 <u>Subsistence Harvest = 127</u> <i>Total = 133.5</i>
2017	June 2018 - NOAA Technical Memorandum NMFS-SWFSC-602	624	<i>ENP gray whale SAR not updated</i>
2018	June 2019 - NOAA Technical Memorandum NMFS-SWFSC-617	801	Ship Strikes = 0.8 Commercial Fisheries = 8.7 <u>Subsistence Harvest = 128</u> <i>Total = 137.5</i>
2019	August 2020 - NOAA Technical Memorandum NMFS-SWFSC-629	801	<i>ENP gray whale SAR not updated</i>
2020	July 2021 - NOAA Technical Memorandum NMFS-SWFSC-646	801	Ship Strikes = 1.8 Commercial Fisheries = 9.3 Subsistence Harvest = 119 <i>Total = 130.1</i>

1. These estimates are typically based on recent 5-year averages.

2. This is the first reporting in the SAR of the whale killed near Neah Bay in September 2008.

3. Beginning in 2012, responsibility for the gray whale SAR was transferred to the NMFS Southwest Fisheries Science Center.

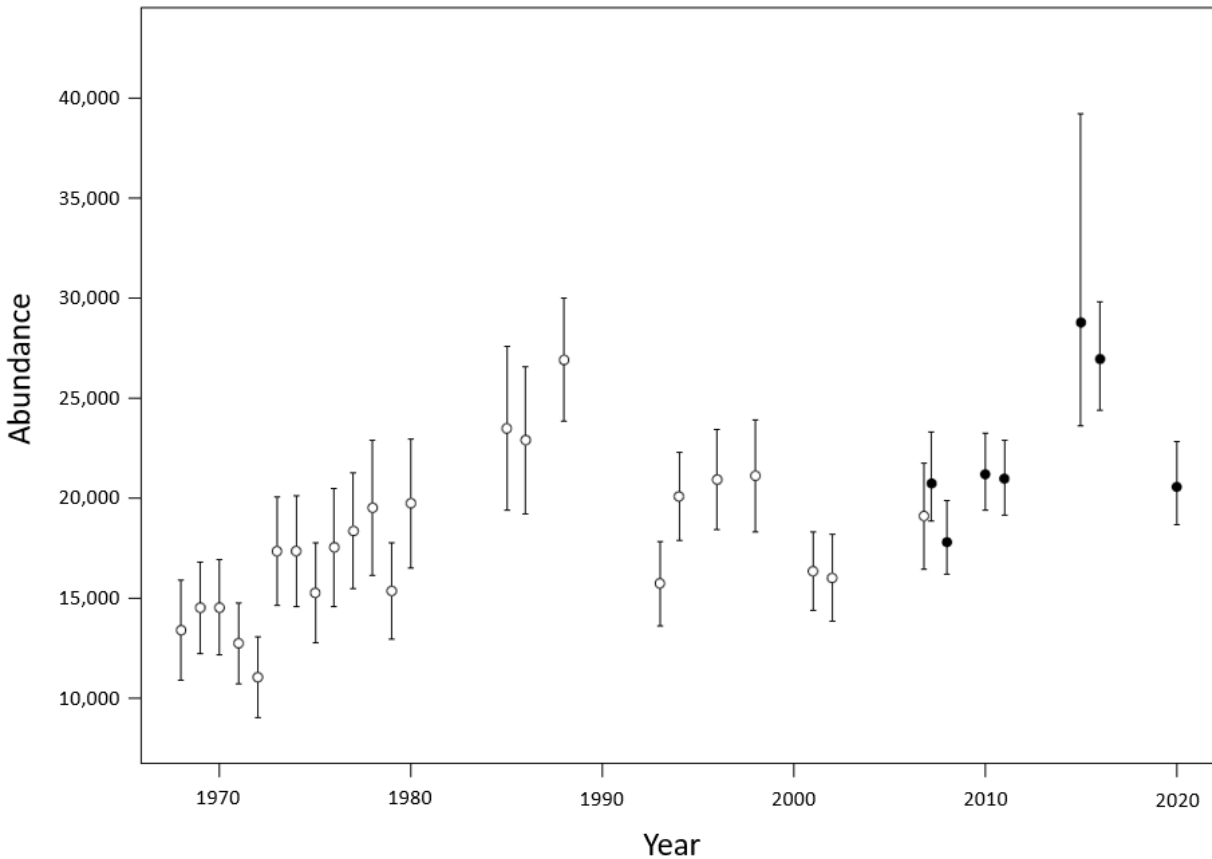


Figure 3-2. Estimated abundance of Eastern North Pacific gray whales from NMFS counts of migrating whales past Granite Canyon, California. Open circles represent abundance estimates and 95% confidence intervals reported by Laake et al. (2012) and Durban et al. (2015), as cited in Carretta et al. 2021. Closed circles represent estimates and 95% posterior highest density intervals reported by Durban et al. (2017), as cited in (Carretta et al. 2021) for the 2014/2015 and 2015/2016 migration seasons and Stewart and Weller for the 2019/2020 migration season.

3.2.1.3 Pacific Coast Feeding Group (PCFG) of Gray Whales

PCFG Recruitment

Photo-identification and genetic studies continue to evaluate recruitment patterns and determine the relatedness of members of the PCFG. Calambokidis and Perez (2017a) reviewed the most recent mother-calf data and concluded that a high percentage of surviving calves appear to become part of the PCFG². Between 1993 and 2015, they documented 102 calves accompanying 62 different, probable mothers identified as PCFG whales, with a high proportion of these mother/calf pairs seen from 2012 to 2015 (11 to 18 each year). The increase in sightings may be due to an increase in births in recent years, an increase in survey effort focused on identifying calf/mother pairs, or some combination thereof. Still, these calf data likely represent a minimum estimate because: (1) most surveys took place after the mean date of weaning (1 August), so some calves may not have been identified as such because they had already weaned from their

² Whales are identified as calves when they are accompanied by their mother; thus, once the calf is weaned, it may not be recognized as a calf and this may in turn affect calf estimates.

mothers, and (2) larger calves may not be identified as calves even when they are with mothers (human error). Calambokidis and Perez (2017a) went on to analyze the re-sighting history of calves and found that 65% were seen in a year subsequent to the year they were calves. The 35% not seen in a subsequent year could result from the calf dying, the calf not returning to the area or not re-sighted during its return, or the calf not being recognized by photo-identification because of changes in its markings.

Calambokidis and Perez (2017b) also studied photographs of migrating gray whales to determine if PCFG whales remain associated during migration, in addition to the time they spend together in their summer feeding grounds. Using photographs from marine naturalists in Southern California from 2013 through 2015, they were able to identify 26 PCFG whales—15 females and 11 males— on 21 occasions. In nine of those 21 sightings (42%), multiple PCFG animals were present in the group. Of the nine groups containing multiple PCFG whales, six groups contained multiple animals of known sex, 4 of which contained both males and females. These associations were present during both the northbound and southbound migrations. Calambokidis and Perez (2017b) concluded that these associations during migration increase the probability of PCFG association in the wintering grounds and, therefore, the likelihood of breeding occurring within the PCFG, even in the presence of non-PCFG animals.

The IWC Subcommittee on Gray Whales reviewed these data in the Fourth Rangewide Workshop on the Status of North Pacific Gray Whales in 2017 (IWC 2017). It determined that although the associations observed by Calambokidis and Perez (2017b) may provide an opportunity for breeding to occur within the PCFG, the co-occurrence of PCFG whales during migration does not necessarily mean that they breed together. Furthermore, genetic analyses of PCFG whales have not ruled out the hypothesis that PCFG whales breed randomly with non-PCFG animals (D’Intino et al. 2013; Lang et al. 2014; IWC 2017).

Sex Ratio of PCFG Whales

Recent genetic studies by Frasier et al. (2011) and Lang et al. (2010b) sampled dozens of whales (40 to 71 animals) in the PCFG range and found that females made up 59 to 60% of the samples. More recent analysis of 194 PCFG individuals biopsied between 1996 and 2015 revealed that 103 (53%) are female and 91 (47%) are male (Aimee Lang, pers. comm., Southwest Fisheries Science Center Biologist, February 26, 2020). While earlier studies (Steeves et al. 2001; Ramikrishnan et al. 2001) found a slight male bias, Lang et al. (2010b) noted that results from those earlier studies may have been influenced by small sample sizes (Steeves et al. 2001 analyzed just 16 samples from known PCFG animals) or the laboratory assays used by Ramikrishnan et al. (2001). Based on this information, we estimate a sex ratio within the PCFG of approximately 50:50 males to females.

PCFG Seasonal Distribution, Migration, and Movements

Section 3.4.3.4.2 of the 2015 DEIS describes ongoing research partnerships aimed at understanding the migratory patterns of the PCFG and includes data on the number of unique individuals identified and re-sighted in the PCFG range through 2012. Scientists have continued

to research the PCFG and have obtained photographic identifications of 2,125 unique³ whales from 1996-2020 that have been identified from southern California to Kodiak, Alaska (multiple photographs were taken of most whales in each year, and some whales were seen in more than one year, so the number of photos taken exceeds the number of whales uniquely photo-identified). From photographs taken during the 22-year period from 1999 (when photo-ID effort expanded to cover all survey regions) to 2020, scientists identified 168 unique whales per year on average (ranging from 120 to 232)(Table 3-4). Prior to 2020, a cumulative total of 888 unique whales⁴ were identified at least once in the PCFG seasonal range (i.e., June 1 to November 30 between northern California and northern British Columbia) (Figure 3-3a). Of those 888 whales, approximately 47% were identified at least twice in the PCFG seasonal range (Harris et al. in prep.) (Figure 3-3b). As noted in the DEIS, whales seen within the PCFG range have also been sighted elsewhere. While some individuals return to the same general feeding area in some years, photo-identification studies have captured the large-scale movements and variability in the distribution of gray whales within seasons and between years.

³ A 'unique whale' or 'identified whale' is an individual gray whale that has been identified from photographs and cataloged using a code unique to that animal (e.g., whale #1045 in the Cascadia Research Collective catalog would be coded "CRC 1045").

⁴ The Cascadia Research Collective's database includes gray whale sightings from as far back as 1977. However, the data analyzed here focuses on the 888 identified whales sighted during the 1996 to 2019 time period during which there were more consistent and collaborative surveys, and some analyses focus on a subset of those years (1999 to 2019) to account for re-sightings and improved population modeling characteristics (see Harris et al. in prep.).

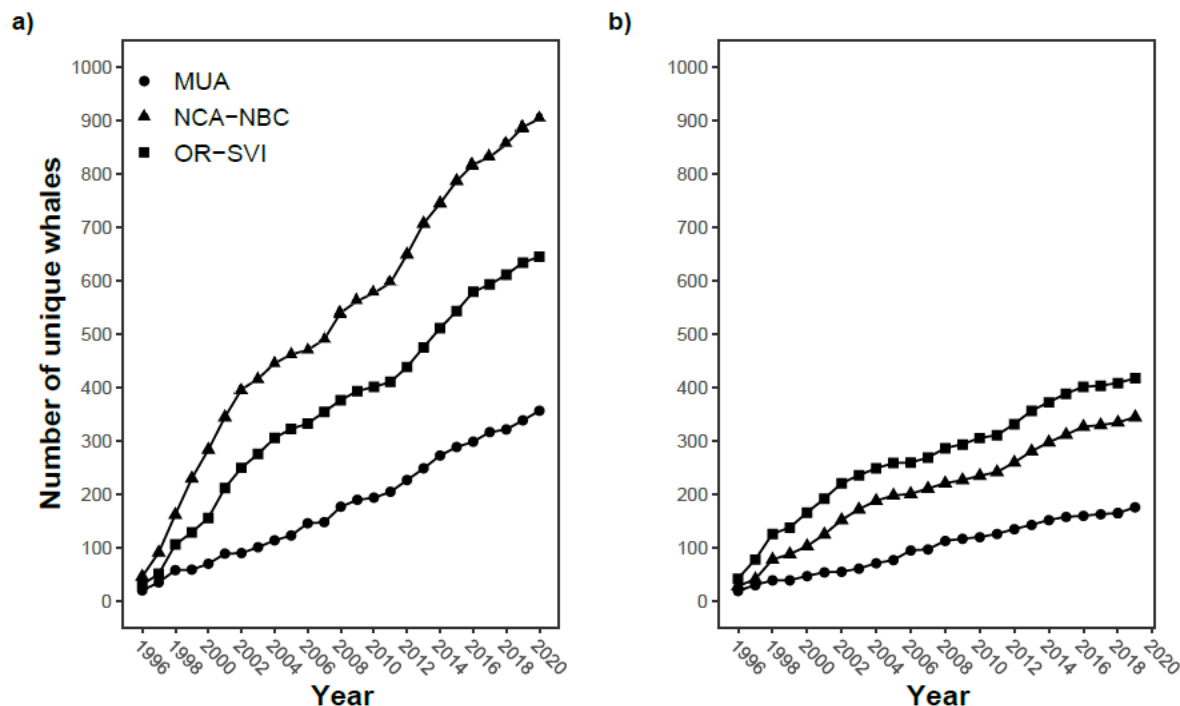


Figure 3-3. Cumulative number of unique gray whales photo-identified between 1 June and 30 November in at least one year (a) or more than one year (b) in the Makah U&A, PCFG (NCA-NBC), and OR-SVI survey regions from 1996 to 2020 (figure from Harris et al. in prep.).

PCFG Abundance and Trends

Section 3.4.3.4.3 of the 2015 DEIS describes the methods used for estimating PCFG abundance and trends based on mark-recapture estimator models using photo-identification data collected annually in the PCFG range from June 1 to November 30. Table 3-3 and Figure 3-4 display the estimates from the most recent analysis by the Cascadia Research Collective and NMFS' Alaska Fisheries Science Center (Harris et al. in prep.). The data indicate that the PCFG has grown significantly from 39 animals identified in 1996 to 212 animals in 2020. The overall PCFG population has been stable over the last 20 years, declining slightly in recent years from a peak in 2015 (Harris et al. in prep.) (Figure 3-4).

Although the PCFG is not considered a stock under the MMPA, the most recent ENP stock assessment reports (SARs) include estimates of PCFG abundance, human-caused mortality, and potential biological removal (PBR) for informational purposes. A NMFS gray whale stock identification workshop held in 2012 concluded that while the PCFG appears to be a distinct feeding aggregation, "there remains a substantial level of uncertainty in the strength of the lines of evidence supporting the demographic independence of the PCFG," and that the group might warrant consideration as a distinct stock in the future (Weller et al. 2013). PBR is calculated for marine mammal stocks to identify the maximum number of animals that may be removed from a stock, not including natural mortalities, while allowing that stock to reach or maintain its OSP level. The 2020 SAR calculated a PBR of 3.5 animals per year for the PCFG (Carretta et al. 2021). More recently, Harris et al. (in prep.) calculated a PBR of 3.1 animals per year for the PCFG in 2020. PBR can be a useful tool in managing marine mammal stocks for which little

information exists, however the PCFG is regularly monitored through photo identification studies that have provided reliable data on the group's abundance and population dynamics. Furthermore, the PCFG is not a closed population, meaning that the PBR formula may not represent actual population dynamics of the group and may, therefore, not be an appropriate tool for management decisions regarding the PCFG.

Table. 3-3. Model-averaged abundance estimates for gray whales repeatedly sighted in the PCFG, OR-SVI, and Makah U&A survey regions (Harris et al. in prep.).

Year	PCFG (NCA-NBC)		OR-SVI		Makah U&A (NWA-SJF)	
	N	Nmin	N	Nmin	N	Nmin
1996	39	37	25	23	17.7	16.6
1997	81	73	46	41	32.4	28.6
1998	133	122	94	87	43.5	35.5
1999	145	133	82	76	42.8	31.0
2000	147	136	86	79	36.0	21.9
2001	182	171	156	147	54.4	43.7
2002	210	191	128	120	46.1	30.9
2003	209	196	169	159	55.1	42.0
2004	224	208	159	150	58.2	44.9
2005	208	184	170	160	64.2	54.0
2006	195	178	152	143	74.0	66.2
2007	185	163	173	162	79.7	62.4
2008	217	202	199	188	90.8	83.2
2009	208	191	165	156	94.6	83.6
2010	201	186	144	135	98.7	79.1
2011	213	200	140	131	94.5	79.5
2012	229	215	181	171	105.7	94.2
2013	249	235	194	185	108.8	96.4
2014	245	230	210	199	115.8	101.0
2015	257	242	225	215	131.5	109.9
2016	244	224	240	229	131.5	105.8
2017	224	206	197	187	121.4	103.4
2018	211	191	201	190	104.4	76.4
2019	228	209	231	219	116.6	100.3
2020	212	198	199	190	119.4	104.4

Source: Table 11 in Harris et al. (in prep.)

N = Population size estimate; Nmin = Minimum population size estimate

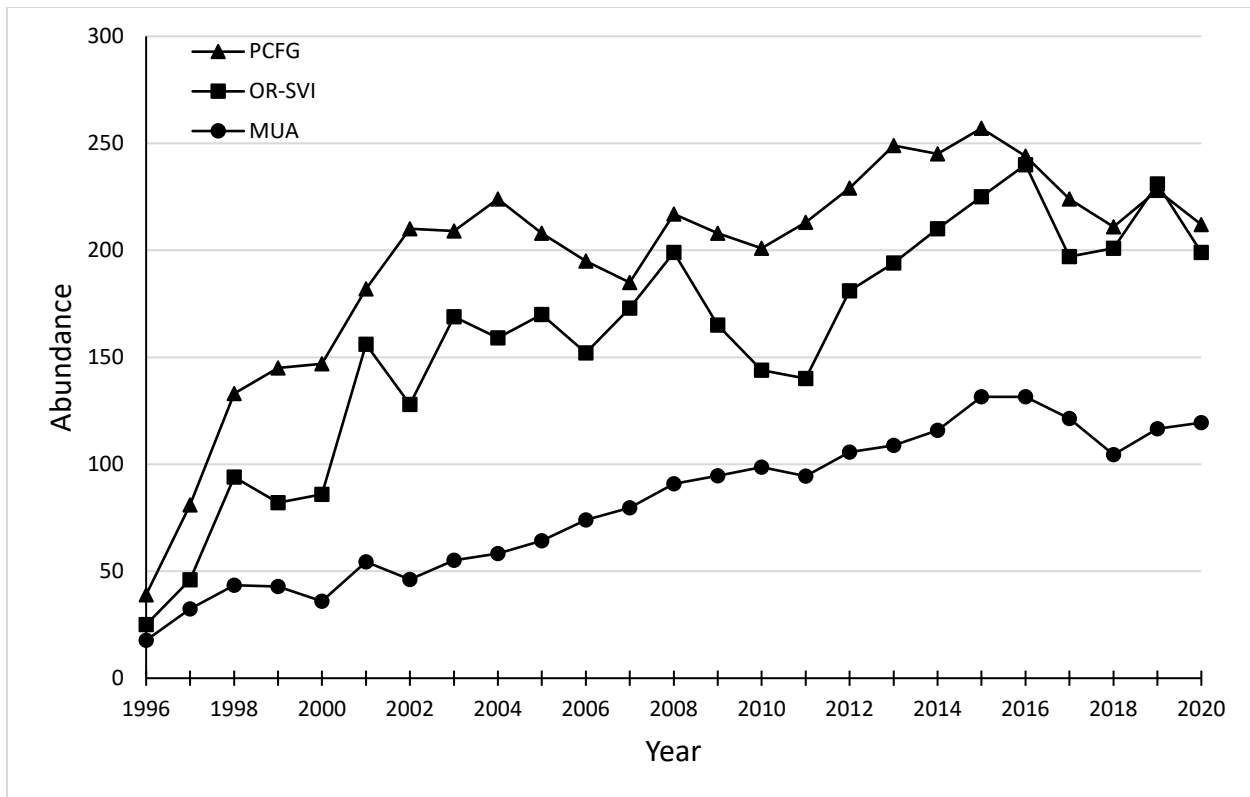


Figure 3-4. Model-averaged abundance estimates for whales repeatedly sighted in the PCFG, OR-SVI, and Makah U&A survey regions from 1996 to 2020 (data from Harris et al. in prep.).

The granularity of the data analyzed by Harris et al. (in prep.) provides insight into the abundance of gray whales utilizing the whole PCFG range and smaller areas within it. Tables 3-4 through 3-6 summarize the trends throughout the range and within the Oregon to Southern Vancouver Island (OR-SVI) region and the Makah U&A (NWA-SJF). Subsection 3.4.3.4.3, PCFG Abundance and Trends, of the DEIS outlines the rationale behind analyzing the local impacts of the hunt on members of the PCFG that are sighted in two or more years in the OR-SVI and Makah U&A survey regions between June 1 and November 30. These whales are referred to as “OR-SVI whales” and “Makah U&A (MUA) whales,” respectively (Harris et al. in prep.). The Makah U&A survey area is a subset of the OR-SVI survey area, located within the broader geographic area that delineates the PCFG. Therefore, MUA and OR-SVI whales are subsets of the PCFG, and MUA whales are a subset of OR-SVI whales.

From June 1 to November 30 for the primary sampling period of 1996 to 2020, 904 unique ENP gray whales were seen in the PCFG range; their related sighting data is shown in Table 3-4. Approximately 71% (645 of the 904 whales seen) were seen within the smaller OR-SVI region (Table 3-5), and about 39% (356 of the 904 whales seen) were seen within the smaller Makah U&A region (Table 3-6). These tables also show the annual average number of whales identified, which was 158, 112, and 39 in the PCFG, OR-SVI, and Makah U&A survey regions respectively. However, those numbers do not represent the total numbers of whales that use each of these survey regions because not all whales present in a survey region in a year are seen, not all whales return to the same survey region each year, and not all of the whales return to the

PCFG region each year. The annual average number of newly seen whales (excluding years prior to 1999 when the photo-identification effort expanded to cover all survey areas) was 34, 25, and 14 for the PCFG, OR-SVI, and Makah U&A survey regions, respectively. The annual average number of newly seen whales that were seen again in a subsequent year, excluding 1996 to 1998 and 2020, was 14, 13, and 7 for PCFG, OR-SVI, and Makah U&A survey regions, respectively. Thus, a substantial number of new whales were seen each year, and 40, 51, and 49% of those were seen again in a subsequent year in the PCFG, OR-SVI, and Makah U&A survey regions, respectively.

The plots shown in Figure 3-4 display the cumulative number of unique whales identified by Harris et al. (in prep.) for the PCFG, OR-SVI, and Makah U&A survey regions, respectively. The plots (typically called “discovery curves”) demonstrate that the PCFG is not a completely closed population, because all of these curves continue to climb due to new individuals seen each year (31 non-calf whales per year on average from 1999-2020 in the PCFG range) and at a rate that exceeds the number of new calves seen each year (approximately 5 per year from 1999-2020 in the PCFG range)⁵. The same pattern is true for whales that are sighted in more than one year (Figure 3-3b).

Estimating Numbers of Whales for Subregions Within the PCFG Range

As described in the DEIS, our evaluation of the PCFG includes assessing impacts on PCFG whales repeatedly sighted in the MUA survey region to address the "local area" impacts referenced in the *Anderson v. Evans* decision. In addition, we have assessed the impacts on whales repeatedly sighted in the OR-SVI survey region because the Tribe's proposal uses the abundance estimate for that group of whales as the basis for estimating the allowable annual harvest of PCFG.

OR-SVI. Section 3.2.3.4.3, Estimating Numbers of Whales for Subregions Within the PCFG Range, of the 2015 DEIS discusses the rationale behind analyzing the OR-SVI region for abundance estimation and assessing hunt-related impacts on PCFG whales. Harris et al. (in prep.) calculated estimates for PCFG whales sighted in the OR-SVI survey region between June 1 and November 30 in two or more years— referred to by the authors as “OR-SVI whales”— using the estimators described in Subsection 3.4.3.4.3, PCFG Abundance Trends. The JS1 estimator produced estimates for OR-SVI survey region that were expectedly lower than PCFG values but followed a trajectory very similar to that of the PCFG estimates. The OR-SVI estimates increased from approximately 25 animals in 1996 to 231 in 2019, with the most recent 2020 estimate somewhat lower at approximately 199 whales. Minimum abundance estimates are typically slightly lower than the average estimates, with the most recent (2020) Nmin estimated at 190 animals. For comparison, the most recent photo-identification data on gray whales (Harris et al. in prep.) in the OR-SVI from June 1 to November 30 show that the number of uniquely identified whales sighted in a given year has averaged 112 and ranged from 30 (in 1996) to 176 (in 2016); the most recent number seen was 141 whales in 2020 (Table 3-5).

⁵ As noted in DEIS Subsection 3.4.3.4.1 (PCFG Population Structure), calf estimates could possibly be higher because some of the new whales may have entered the PCFG earlier as a calf and were not seen or identified as such, or used other feeding areas during their first several years. Regardless, the large disparity between calf and non-calf sightings makes it most plausible that the majority of non-calf animals sighted in a given year are immigrants to the PCFG (and subregions within).

Makah U&A. The JS1 estimator produced estimates for the number of PCFG whales sighted in the Makah U&A survey region between June 1 and November 30 in two or more years—referred to by the authors as “Makah U&A (MUA) whales”. These estimates were expectedly lower than PCFG and OR-SVI values and followed an increasing trajectory that was similar to, but flatter than, the trends for PCFG and OR-SVI estimates. The Makah U&A abundance estimates increased from approximately 18 animals in 1996 to 119 animals in 2020. Minimum estimates are typically lower than the average estimates, with the most recent (2017) Nmin estimated at 104 animals. For comparison, the most recent photo-identification data on gray whales (Harris et al. in prep.) sighted within the Makah U&A from June 1 to November 30 show that the number of uniquely identified whales sighted in a given year has averaged 39 and ranged from eight (in 2002) to 75 (in 2008); the most recent number seen was 64 whales in 2020 (Table 3-6).

Table 3-4. Classification of whales seen within the PCFG (Northern California to Northern British Columbia) from June 1 to November 30 from 1996 to 2020.

Year	Total Seen^a	Newly Seen^b	Newly Seen and Seen Again^c
1996	45	45	41
1997	69	45	36
1998	132	71	48
1999	151	68	12
2000	140	54	28
2001	172	61	26
2002	203	52	29
2003	157	20	15
2004	178	29	13
2005	134	17	10
2006	126	8	1
2007	120	20	9
2008	174	50	18
2009	152	22	7
2010	144	15	12
2011	163	19	5
2012	208	53	21
2013	232	58	25
2014	201	38	16
2015	211	42	16
2016	186	31	13
2017	152	14	2
2018	146	24	5
2019	185	32	9
2020	163	16	n/a
Total	3,944	904	417
Average^d	157.8	33.8	13.9

Source: Table 9 in Harris et al. (in prep.).

^a“Total Seen” is the number of unique whales seen/identified in each year.

^b“Newly Seen” is the number of whales seen that year that had not been seen prior to that year (but within the 1996 to 2020 period).

^c“Newly Seen and Seen Again” is the number of whales that were seen in at least one more year within the PCFG range during June 1 to November 30 subsequent to the first year they were seen.

^dAverages for Newly Seen exclude 1996 to 1998 because photo-identification effort expanded to cover all survey areas in 1999. Averages for Newly Seen and Seen Again exclude 1996 to 1998 and 2020 for the same reason as above (as well as it not being possible to determine if whales seen in 2020 were seen in a subsequent year).

Table 3-5. Classification of whales seen within the OR-SVI (Oregon to Southern Vancouver Island) survey region from June 1 to November 30 from 1996 to 2020.

Year	Total Seen^a	Newly Seen^b	Newly Seen and Seen Again^c
1996	30	30	27
1997	36	20	13
1998	86	55	37
1999	71	23	10
2000	70	27	15
2001	128	56	22
2002	103	38	27
2003	110	26	20
2004	117	30	16
2005	107	17	10
2006	96	10	3
2007	114	22	10
2008	123	22	10
2009	118	17	6
2010	93	8	8
2011	89	9	7
2012	127	28	18
2013	147	37	21
2014	152	36	17
2015	161	32	14
2016	176	36	15
2017	130	14	3
2018	128	18	5
2019	150	23	10
2020	141	11	n/a
Total	2,803	645	344
Average^d	112.1	24.5	12.7

Source: Table 9 in Harris et al. in prep..

^a“Total Seen” is the number of unique whales seen/identified in each year.

^b“Newly Seen” is the number of whales seen that year that had not been seen prior to that year (but within the 1996 to 2020 period).

^c“Newly Seen and Seen Again” is the number of whales that were seen in at least one more year within the PCFG range during June 1 to November 30 subsequent to the first year they were seen.

^d Averages for Newly Seen exclude 1996 to 1998 because photo-identification effort expanded to cover all survey areas in 1999. Averages for Newly Seen and Seen Again exclude 1996 to 1998 and 2020 for the same reason as above (as well as it not being possible to determine if whales seen in 2020 were seen in a subsequent year).

Table 3-6. Classification of whales seen within the Makah U&A (NWA-SJF) survey region from June 1 to November 30 from 1996 to 2020.

Year	Total Seen^a	Newly Seen^b	Newly Seen and Seen Again^c
1996	19	19	18
1997	27	15	11
1998	37	23	9
1999	11	1	0
2000	14	11	8
2001	32	19	7
2002	8	1	1
2003	22	11	6
2004	25	13	10
2005	33	9	6
2006	58	23	18
2007	20	2	2
2008	75	29	16
2009	57	13	4
2010	26	4	3
2011	39	11	6
2012	67	22	9
2013	66	22	8
2014	63	24	9
2015	47	16	6
2016	34	10	2
2017	53	18	3
2018	17	5	2
2019	55	17	11
2020	64	18	n/a
Total	969	356	175
Average^d	38.8	13.6	6.5

Source: Table 9 in Harris et al. in prep.

^a “Total Seen” is the number of unique whales seen/identified in each year.

^b “Newly Seen” is the number of whales seen that year that had not been seen prior to that year (but within the 1996 to 2020 period).

^c “Newly Seen and Seen Again” is the number of whales that were seen in at least one more year within the PCFG range during June 1 to November 30 subsequent to the first year they were seen.

^d Averages for Newly Seen exclude 1996 to 1998 because photo-identification effort expanded to cover all survey areas in 1999. Averages for Newly Seen and Seen Again exclude 1996 to 1998 and 2020 for the same reason as above (as well as it not being possible to determine if whales seen in 2020 were seen in a subsequent year).

Table 3-7. Population estimates and limits for Western North Pacific, Eastern North Pacific, and Pacific Coast Feeding Group gray whales.

Parameter	WNP Stock	ENP Stock	PCFG
Recent Abundance	290 whales (271-311) (Cooke 2017; Cooke et al. 2018)	20,580 whales (Stewart and Weller 2021)	212 whales (Harris et al. in prep.)
Minimum Population Estimate (N _{min})	271 whales (Cooke 2017)	19,725 whales (Stewart and Weller 2021)	198 whales (Harris et al. in prep.)
Recent Trend	Increasing at 2-5% per year (Carretta et al. 2021)	Increasing (Carretta et al. 2021)	Increasing (Carretta et al. 2021)
Recruitment	Average of 7 calves/year for 1995-2092; calf production index for 2019 = 6.9 % (Burdin et al. 2019)	Calf production indices for 1994-2019 range between 1.3-10.2% (Stewart and Weller 2020)	Average of 10.4 non-calf whales previously-seen-and-seen-again/year [range 0-28] plus 3.5 calves seen/year that were seen again [range 0-11] (Harris et al. in prep.)
Within OSP?	Not assessed (stock is listed as depleted under the MMPA)	Yes, at 91% of K and an 88.4% chance of being above MNPL (Punt and Wade 2012)	Unknown (Punt and Moore 2013)
Recovery Factor (Fr)	0.1 (Carretta et al. 2021)	1.0 (Carretta et al. 2021)	0.5 (Carretta et al. 2021)
Maximum Net Productivity Rate (R _{MAX})	0.062 (Carretta et al. 2021)	0.062 (Carretta et al. 2021)	0.062 (Carretta et al. 2021)
Potential Biological Removal Level (PBR)	0.12 whales/year (Carretta et al. 2021)	801 whales/year (Carretta et al. 2021)	3.5 whales/year (Carretta et al. 2021)
IWC Catch Limits (2019-2025)	n/a	Up to 140 whales/year (980 max over 7 years) (IWC 2018b; Fominykh & Wulff 2021)	n/a
Human-caused Mortality and Serious Injury – Minimum Estimates			
Recent Subsistence/ Native Harvest	Unknown; not targeted by native hunters	122 whales/year by Chukotkan hunters [range 107-137 whales/year from 2015-2019] (IWC Annual Reports)	n/a (Carretta et al. 2021)
Commercial Fisheries	Unknown; 28 of 150 photo-identified whales had entanglement-related scars (Bradford et al. 2009)	9.3 whales/year (Carretta et al. 2021)	1.1 whales/year (Carretta et al. 2021)
Ship Strikes	Unknown; 3 of 150 photo-identified whales had collision-related scars (Bradford et al. 2009)	1.8 whales/year (Carretta et al. 2021)	0.6 whales/year (Carretta et al. 2021)
Total	Unknown	138 whales/year	1.25 whales/year

3.2.2 Strandings

DEIS subsection 3.4.3.1.7 (Strandings) describes the relevant MMPA provisions pertaining to stranded marine mammals (including the Marine Mammal Health and stranding Network) and

summarizes gray whale stranding data from Alaska to Mexico. As noted in Table 3-7, the SARs address strandings during the most recent 5-year period and articulate various sources of human-caused mortality and serious injury, including subsistence harvest, commercial fisheries, and ship strikes. While subsistence harvest levels have remained steady since the time of the DEIS, strandings associated with commercial fisheries have increased approximately four-fold while ship strikes have declined approximately three-fold. However, these numbers can vary considerably depending on the 5-year period assessed in the SAR, so trends can be difficult to detect. For example, a recent qualitative assessment of the co-occurrence of North Pacific gray whales and vessel traffic found that ship strikes and related underwater noise may pose a significant risk to gray whales (Silber et al. 2021). Areas modeled to be high risk were in the Russian Far East (Kamchatka peninsula and Okhotsk Sea), Bering Sea, Gulf of Alaska, and along the entire west coast of North America. The study estimated that the number of gray whales killed annually rangewide may be in the tens or perhaps low hundreds, and the risk was greatest during gray whale migration periods when animals are near shore and overlap with coastal shipping routes and fisheries.

Since publishing the DEIS, elevated strandings of ENP gray whales beginning in January 2019 prompted NMFS to declare an Unusual Mortality Event (UME) for the stock on May 29, 2019. The 1992 amendment of the MMPA defines a UME as a stranding event that “is unexpected; involves significant die-off of any marine mammal population; and demands immediate response,” (16 U.S.C. 1361 *et seq.*). A previous UME was declared for ENP gray whales in 1999 and is discussed in subsection 3.4.3.1.7 of the DEIS. While there has only been one UME declared for the ENP gray whale stock in the past, it is possible that the population had undergone these kinds of large-scale mortality events prior to the 1992 amendment to the MMPA that established the UME declaration as a management tool.

As of June 3, 2022, the UME declared in 2019 is ongoing with 678 gray whales stranded along the coast of Mexico, the United States, and Canada, with the greatest number of strandings concentrated in the United States and Mexico (Table 3-8). NMFS works in coordination with external partners through the Marine Mammal Health and Stranding Network in California, Oregon, Washington, and Alaska to document and respond to stranded gray whales. Under the MMPA, the declaration of a UME authorizes a federal investigation led by the Working Group on Marine Mammal Unusual Mortality Events (referred to here as the Working Group) into the cause of the event. NMFS has assembled an independent team of scientists to coordinate with the Working Group to collect samples from the stranded whales, review the data collected, and determine the next steps for the investigation.

Table 3-8. Number of gray whale strandings by country in 2019 through 2022, as of June 3, 2022.

Country	2019	2020	2021	2022	Total
Canada	11	5	5	0	21
U.S.	122	79	55	12	278
Mexico	83	88	54	53	279
Total	216	172	114	65	578

The full extent of the mortality from this event is unknown. Although some carcasses have been recovered, it is likely that many carcasses either sank or washed out to sea rather than stranding, or became stranded in remote locations unobserved by humans. However, it is possible to estimate mortality resulting from this UME through ongoing population surveys conducted by NMFS, and noted above in Subsection 3.2.1.2. The current UME coincides with a recent 23% decline in abundance observed in the 2019/2020 survey (Stewart and Weller 2021).

NMFS relies on the West Coast Marine Mammal Stranding Network for compiling reports of stranded animals, collecting data, conducting necropsies, and collecting samples from carcasses when possible in Washington, Oregon, and California. This network was established under the MMPA in the early 1980s. Members of the network include, among others, scientific institutions, volunteer groups, animal care institutions, veterinarians, wildlife agencies and state and federal law enforcement. So far, full or partial necropsies have been performed on just a few of the stranded animals. Samples can be difficult or impossible to collect if the whale has become too decomposed or has stranded in an inaccessible location. NMFS does not mandate what necropsy data to collect. However, stranding network partners often record as much basic data as possible (referred to as Level A data), such as the state of decomposition and condition of the animal, the location of the stranding, and a list of samples that were collected, if any. Some but not all of the stranded whales have shown evidence of emaciation, but more research is needed to determine the cause(s) of the UME.

It is not possible to predict how long the UME will continue. Although the population likely underwent similar events in the past, only one previous event has been designated since the 1992 amendment to the MMPA that established the UME declaration and investigation process. The 1999-2000 UME lasted for only two years, after which the population recovered to its highest abundance level since monitoring began in the 1950s (for more information about the 1999-2000 UME see subsection 3.4.3.1.7 of the DEIS). NMFS regularly posts updates regarding this UME on its website at <https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2020-gray-whale-unusual-mortality-event-along-west-coast-and>.

3.3 National and International Regulatory Environment

Section 3.17 of the 2015 DEIS discusses the national conditions relevant to the harvest of marine mammals and the international conditions related to the harvest of whales. The information provided in the DEIS with respect to the national regulatory environment is still current; however, the international regulatory environment has changed since 2015, as described below.

The United States provided the Scientific Committee (SC) of the IWC with a proposed management plan for a Makah subsistence hunt of ENP gray whales for review with respect to the conservation objectives of the IWC. The proposed plan reviewed by the SC matches the Preferred Alternative analyzed in this SDEIS. The SC tested the proposed plan using a modeling framework developed as part of a previous rangewide review of gray whales, which took place in 2012. The SC concluded that the Management Plan met the IWC's conservation objectives for ENP, WNP, and PCFG gray whales. The Aboriginal Subsistence Whaling Subcommittee of the IWC also reviewed the Makah Management Plan and endorsed the SC's report and recommendations (IWC 2018a).

In 2018, the IWC adopted several new provisions in the ASW quota allocation process through amendments to the IWC Schedule (IWC 2018b). These provisions aimed to ease the considerable burden placed on ASW countries in obtaining and renewing their quotas, and provide some stability and security for the indigenous subsistence hunters they represent. The first provision deals with the timing of the quota renewal process. The one-time 7-year quota block beginning in 2019 shifted the expiration of the quotas to one year after the Commission meeting, during which they would be considered for renewal. This allows for a buffer year after the Commission meeting so that an ASW country could revise or re-submit a quota request in the event that the original request was not endorsed at the regular Commission meeting. Therefore, the current catch limits will be reviewed in 2024, but they will not expire until 2025. Beginning in 2026, the quota period will return to a 6-year block to maintain this timeline (IWC 2018a).

The IWC also adopted a carryover provision for unused strikes in a quota block. This provision allows for greater flexibility for subsistence hunters to use their strikes when it is safe for them to do so. The carryover provision does not change the total number of strikes allowed within a quota period; however, it does affect when those strikes may be used (IWC 2018a). This change was prompted by reports of Arctic Inuit hunters facing greater uncertainty with respect to environmental conditions each year.

Finally, the IWC adopted a limited automatic quota renewal process with safeguards for whale stocks to de-politicize the quota adoption process and allow for greater food security for subsistence harvesters. The plan adopted by the IWC would allow the previous catch limits to be automatically renewed if: (1) the SC continues to advise that those catch limits will not harm the stock; (2) the ASW country receiving the quota has not proposed a change in their catch limits; and (3) the IWC determines that the ASW country has complied with the approved timeline of reporting requirements set for them and that the information provided represents a status quo continuation of the hunt (IWC 2018a).

These Schedule Amendments were adopted by a greater than 3/4 majority, with 58 countries in favor of adoption, seven against, and five abstentions. Opponents to the Amendments expressed support for the needs of indigenous subsistence harvesters, but remained concerned about the automatic renewal provision (IWC 2018b).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Chapter 4, Environmental Consequences, of the 2015 DEIS examines the potential direct and indirect effects of six alternatives on each of the resources considered in Chapter 3 of the DEIS, and is hereby incorporated by reference. This SDEIS includes a seventh alternative in our analysis, and examines the effects of the previously considered alternatives in light of the new information provided in Chapter 3 above.

Alternative 1, No Action, is the only alternative for which there are no updates or changes to impacts based on the new information provided in Chapter 3 of this SDEIS. For Alternatives 2 through 6 of the DEIS, the updates to the WNP, ENP, and PCFG abundance estimates since 2015 impact the mixing proportions of these three groups of whales. This, in turn, affects the potential ratio of non-PCFG to PCFG whales struck during a hunt as well as the likelihood of hunters striking a WNP whale. For each of these action alternatives, this section of the SDEIS will focus solely on the impacts informed by the updated PCFG and WNP estimates and the various hunt-related calculations that rely on them. Also, given the complexity of these hunt-related calculations, we have carried forward from the DEIS the computational rationale to more clearly describe the bases for the updated results, and to allow for a comparison of these results in the context of the 10-year waiver period specified in the new Alternative 7.

The current annual and 7-year catch limits set by the International Whaling Commission (IWC) for ENP gray whales are based on a joint request of the Russian Federation and the United States. The current catch limit set by the IWC is 980 ENP gray whales landed over the 7-year period (2019 through 2025), with no more than 140 struck in any one year. A bilateral agreement between the Russian Federation and the United States, renewed each year, allocates those 140 strikes between the two countries; 135 strikes for the Chutkoka Natives and five strikes for the Makah Tribe. If we do not authorize a Makah gray whale hunt, or if we authorize a hunt for fewer whales than provided in the 2021 bilateral agreement, the agreement provides that “either side may initiate discussions on the transfer of unused strikes from one Native group to the other.” If a transfer is agreed to, the Russian Federation could authorize the Chukotka Natives to take any of the Makah Tribe’s unused strikes. While Alternatives 2 through 5 allow for more than the five strikes specified in the current bilateral agreement, that agreement could change in the future and allow for a greater number of strikes. Therefore, we have analyzed the full number of potential strikes for each alternative. Table 4-1 summarizes the key hunting components and primary differences associated with each alternative, including the number of potential strikes.

Table 4-1. Primary differences among the seven alternatives and associated assumptions for analysis.

Whale Hunting Components		Alt. 1 No Action	Alternative 2 Tribe's Proposed Action	Alternative 3 Offshore Hunt	Alternative 4 Summer/Fall Hunt	Alternative 5 Split Season Hunt	Alternative 6 Different Limits on Strikes and PCFG, and Limited Duration of Regulations and Permits	Alternative 7 Composite – Preferred
Hunt timing		None	December 1 through May 31 ^a	Same as Alternative 2	June 1 through November 30	December 1 through December 21; May 10 through May 31	Same as Alternatives 2 and 3	Summer/fall hunts and hunting approaches will be authorized from July 1 through October 31, and winter/spring hunts and hunting approaches will be authorized from December 1 through May 31. Only one hunt season may be authorized in a calendar year, however the first month (December) of a winter/spring hunt would fall in the same calendar year as a summer/fall hunt.
Hunt area		None	U&A west of Bonilla-Tatoosh line; no whale may be struck within 200 yards (182.9 m) of Tatoosh Island or White Rock during the month of May	Same as Alternative 2 except at least 5 miles (8 km) from shore	Same as Alternative 2, except no whale may be struck within 200 yards of Tatoosh Island or White Rock during any month	Same as Alternative 2	Same as Alternatives 2 and 5	U&A west of Bonilla- Tatoosh line, with other site and time restrictions possible to protect Olympic Coast National Marine Sanctuary resources
Maximum limit for harvested, struck, and struck and lost whales	Annual	0	Up to 5 harvested, 7 struck, and 3 struck and lost	Up to 5 harvested, 6 struck, and 2 struck and lost	Up to 5 harvested, 7 struck, and 3 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 5 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 4 harvested (7 over 2 years); up to 4 struck (7 over 2 years); struck and lost limited by strike limit or PCFG limit (see below)	In winter/spring hunts, up to 3 harvested, struck, or struck and lost. In summer/fall hunts, only 1 harvested and 2 struck or struck and lost

	6-year	0	Up to 24 harvested, 42 struck, and 18 struck and lost	Up to 24 harvested, 36 struck, and 12 struck and lost	Up to 24 harvested, 42 struck, and 18 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 24 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 21 harvested, 21 struck; struck and lost limited by PCFG limit (see below)	Up to 12 harvested, and 15 struck or struck and lost
	10-year	0	Up to 40 harvested, 70 struck, and 30 struck and lost	Up to 40 harvested, 60 struck, and 20 struck and lost	Up to 40 harvested, 70 struck, and 30 struck and lost; harvest, struck, and struck and lost limited by PCFG limit (see below)	Up to 40 harvested; struck and struck and lost limited by PCFG limit (see below)	Up to 35 harvested, 35 struck; struck and lost limited by PCFG limit (see below)	Up to 20 harvested, and 25 struck or struck and lost
ENP Population Abundance Threshold		N/A	N/A	N/A	N/A	N/A	N/A	The impacts of the Preferred Alternative are analyzed without an ENP population abundance threshold. However, three thresholds are considered as Sub-alternatives. Under the Sub-alternatives, hunting would cease if the abundance estimate (N) of the ENP gray whale stock dropped below: a) N=11,000, b) N=16,000, or c) N=18,000
Additional limits on harvest or mortality of PCFG whales. Estimated limits are based on current conditions and could change based on updated information. The descriptions in the table are shorthand. Please refer to the narrative for full details, and Subsection 3.4.2.1.3, for background on the potential biological removal (PBR) approach.		N/A	Tribe's bycatch proposal (apply PBR-based formula, with Rmax of 4% and Recovery Factor same as for ENP (1.0) and Nmin of OR-SVI) (results in 3 whales/year); struck but not landed do not count as PCFG; no carry-over of unused limit	Total mortality limit set at PBR (as reported in NMFS' stock assessment report or calculated by NMFS); additional female mortality limit set based on proportion of females in PCFG (results in about 3.5 males and 1.75 females); all struck but not landed count as PCFG whales in proportion to presence of PCFG whales; no carry-over of unused limit	Mortality limit set to achieve or maintain 80% of carrying capacity (PBR-based formula with same values as Alt 3 but a recovery factor of 0.35), minus other human-caused mortality (results in 1 whale every 2 years); approach only known ENP males; all strikes count as PCFG; no carry-over of unused limit unless it's between 0.5 and 1.0	Mortality limit set at 10% of PBR as calculated in Alt 3 (results in about 1 whale/3 years); struck but not landed count as PCFG in proportion to presence of PCFG whales; carry-over of unused limit used to calculate hunt hiatus	Mortality limit set at PBR (as calculated in Alt 3) minus other human-caused mortality (results in about 1 whale/year); all struck but not landed count as PCFG in proportion to presence of PCFG whales; no carry-over of unused limit	Mortality limit set at 16 PCFG whales over 10 years, no more than 8 of which may be females. Hunting would be prohibited if the forecasted abundance of the PCFG falls below 192 whales, or the minimum abundance falls below 171 whales

Waiver and permit duration and additional regulations	N/A	Unlimited waiver period; up to 5-year permits; no additional regulations	Same as Alternative 2	Same as Alternatives 2 and 3	Same as Alternatives 2, 3, and 4	Waiver period ends after 10 years; 3-year permits	Waiver period ends after 10 years; initial 3-year permit followed by 5-year or shorter permits
ESTIMATES FOR ANALYSIS							
Whale Hunting Components	Alternative 1 No-action	Alternative 2 Tribe's Proposed Action	Alternative 3 Offshore Hunt	Alternative 4 Summer/Fall Hunt	Alternative 5 Split Season Hunt	Alternative 6 Different Limits on Strikes and PCFG, and Limited Duration of Regulations and Permits	Alternative 7
Likely timing of hunt	NA	March-May	March-May	June 1-September 30	May 10 through May 31	Same as Alternatives 2 and 3	March-May in winter/spring hunt years; July 1-October 31 in summer/fall hunt years
Likely number of hunting days per year	0	33	33 (with an additional 9 days possible during winter months)	7	11	Same as Alternative 2	33 in winter/spring hunt years; 7-14 in summer/fall hunt years
Likely number of days with hunt-related trips (including scouting) per year	0	60	Same as Alternative 2	7	22	Same as Alternatives 2 and 3	60 in winter/spring hunt years; 7-14 in summer/fall hunt years
Maximum number of ENP gray whales killed each year by Makah Tribe (based on current estimates of PCFG mortality limits)	0	7 based on strike limit	6 based on strike limits and current estimates of PCFG mortality limits	1 over 2 years based on current estimates of PCFG mortality limits	5 based on harvest limits and current estimates of PCFG mortality limits	7 over 2 years, no more than four in 1 year (based on strike limit)	3 based on strike limits in winter/spring hunts; 2 based on strike limits in summer/fall hunts (if the first whale struck is lost)
Maximum number of PCFG whales that might be killed in a year (based on current estimates of PCFG mortality limits) and likely number killed per year	0	Maximum: 5 Likely: 1.9	Maximum: 4 Likely: 1.1	Maximum: 1 Likely: 0.5 (1 every 2 years)	Maximum: 1 Likely: 0.25 (1 every 4 years)	Maximum: 3.5 Likely: 1	Winter/spring hunts Maximum: 3 Likely: 0.8
							Summer/fall hunts Maximum: 2 Likely: 2 (assumes the first struck whale is lost)

If maximum number of strikes occur, likelihood of killing a WNP whale per year expressed as the median probability	0	3.5% (assumes 7 strikes)	3.0% (assumes 6 strikes)	0	2.5% (assumes 5 strikes)	1.8% (assumes 3.5 strikes)	1.5% (assumes 3 strikes) in winter/spring hunts; 0% in summer/fall hunts
Potential maximum number of unsuccessful harpoon attempts per year ^b (based on estimated 6:1 ratio of unsuccessful harpoon attempts to successful strikes)	0	42	36	6	30	21	18 in winter/spring hunts; 12 in summer/fall hunts
Potential maximum number of approaches per year ^b (based on estimated 8.3 approaches per day of hunting)	0	353	Same as Alternative 2	58	122 ^c	Same as Alternatives 2 and 3	353 (based on Alternative 2's maximum value)
Likely number of whales successfully harvested on average per year (based on current population estimates and calculations, and other conditions specific to each alternative)	0	Up to 4	Same as Alternative 2	0 – 1	0 – 1	Up to 3.5	Up to 3 in winter/spring hunts; up to 1 in summer/fall hunts
Likely number of rifle shots or grenade explosions per year (based on estimated 16 rifle shots and 3 grenade explosions per struck whale)	0	Up to 64 rifle shots or 12 grenade explosions	Same as Alternative 2	0 – 16 rifle shots or 0 – 3 grenade explosions	0 – 16 rifle shots or 0 – 3 grenade explosions	Up to 56 rifle shots or 11 grenade explosions	Up to 48 shots and 9 explosions in winter/spring hunts; up to 32 shots and 6 explosions in summer/fall hunts
<p>a. With this and other alternatives, we rely on calendar year (“per year”) calculations and estimates to simplify comparisons.</p> <p>b. The analysis also considers the likely number of approaches and attempted strikes per year for PCFG, OR-SVI, Makah U&A, and WNP gray whales.</p> <p>c. Based on a maximum of 14.7 hunt days in May and December.</p>							

4.1.1 Alternative 2, Tribe's Proposed Action

Table 4-1 summarizes the key hunting components associated with Alternative 2. The following elements remain unchanged from what was reported in Subsection 4.1.2 of the 2015 DEIS: potential timing of a hunt; number of hunting days; potential number and types of vessels; potential number of unsuccessful harpoon attempts and approaches; and potential number of shots fired or grenade explosions. As noted above in the Introduction, there have been updates since the 2015 DEIS to some gray whale population estimates. Therefore, in the subsections below, we summarize and update (where appropriate) estimates of the potential number of ENP and PCFG whales killed, the likelihood of striking a WNP whale, and the likely number of whales harvested under this alternative.

Potential Number of ENP Whales Killed and Harvested

As described in DEIS Subsection 4.1.2.3, under Alternative 2, the maximum number of whales that could be killed each year by the Tribe would be seven, because of the limit of seven strikes per year. This estimated maximum assumes that struck and lost whales subsequently die. Harvest could average up to four whales per year, with a maximum of five whales in a single year. This equates to 0.0002% of the ENP gray whale population. This level of mortality, although higher than under the No-action Alternative, would have no discernable effect on the ENP stock's abundance or rate of growth, and no effect on the stock's abundance relative to OSP.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Using the method proposed by the Tribe to calculate a harvest limit for PCFG whales, the maximum allowable number of PCFG whales that may be killed in a given year under Alternative 2 would be three whales (Table 4-2).

Table 4-2. Alternative 2 method of calculating PCFG harvest limits (Tribe's Proposed Action).

Element	Current Value	Source for Establishing Value in Future Calculations	Notes
One-half maximum net productivity rate (Rmax)	$(\frac{1}{2}) 0.040 = 0.02$	IWC 2012b (Annex D)	See Subsection 3.4.3.4.4, PCFG Status, Carrying Capacity (K), and Related Estimates
Minimum abundance of OR-SVI (Nmin) ^a	190	Reports based on annual PCFG surveys (currently Harris et al. in prep.)	See Subsection 3.4.3.4.3, PCFG Abundance and Trends
Recovery factor for ENP stock as a whole	1.0	IWC 2012b (Annex D)	See Subsection 3.4.3.4.4, PCFG Status, Carrying Capacity (K), and Related Estimates
CURRENT RESULT	$(0.02) * (190) * 1.0 = 3.8$ (rounded down to 3)		

^aThe value for Nmin is derived from photo-identification analyses of PCFG whales reported periodically by Cascadia Research Collective and NMFS (Harris et al. in prep.) and may change as new information becomes available.

It is possible that up to five PCFG whales could be killed each year if two were landed (hunting would cease if three were landed) and three were struck and lost and subsequently died. However, given the updated information on the mixing proportion of PCFG whales in the hunt area, it is unlikely that three to five PCFG whales would actually be killed. The maximum number of seven strikes multiplied by the mixing proportion of PCFG whales in the hunt area yields the likely number of PCFG whales that might be killed in a given year if the full number of strikes were to occur during the spring. From 1996 to 2020, Harris et al. (in prep.) observed 417 whales in the northern Washington coast survey area between December 1 and May 31. Of these whales, 27.1% were observed in the PCFG range after June 1, while 25.9% were observed in the OR-SVI area and 22.54% were observed in the Makah U&A after June 1. Therefore, if seven whales were killed per year under Alternative 2, the likely number of PCFG whales killed would be 1.9 (7 whales killed times 27.1%), the likely number of OR-SVI whales killed would be 1.81 (7 whales killed times 25.9%), and the likely number of Makah U&A whales killed would be 1.58 (7 whales killed times 22.54%) (Harris et al. in prep.; Table 4-3). This level of mortality for the PCFG is below the informational PBR of 3.5 whales calculated by NMFS (Carretta et al. 2021). It is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Likelihood of Striking a WNP Whale

Under the Tribe's proposal, hunting would take place from December 1 through May 31. This period coincides with both the southward (December to mid-February) and northward (mid-February to late May) migration of ENP whales and overlaps with the time when WNP gray whales have been sighted in the ENP. Thus, there is a potential risk to WNP whales from the proposed hunt operations. The best estimate of the proportion of the WNP population that migrates along the North American coast was reported to the IWC's rangewide workshop in 2015 as at least 0.37 (Cooke 2015). Based on this estimate, Moore and Weller (2019) calculated the per-strike probability of striking a WNP whale in the hunt area during the hunt season at 0.5%. Therefore, if all seven strikes were used, it is likely that 0.035 WNP whales could be struck each year (seven whales killed times 0.5%) (Table 4-3).

Potential Number of Unsuccessful Harpoon Attempts and Approaches

Table 4-3 shows the calculated probability of subjecting ENP, PCFG, OR-SVI, Makah U&A, and WNP whales to unsuccessful harpoon attempts and approaches. These calculations are based on the methods described in Subsection 4.1.2.4 of the 2015 DEIS and incorporate the most recent estimates of the mixing proportions of each stock/group described in the subsection above.

It is likely that unsuccessful harpoon attempts and approaches will result in behavioral disturbance of the whale subjected to them. Therefore, Alternative 2 is likely to result in increased behavioral disturbance compared to the No-action Alternative. However, based on the best available science, it is also likely that any changes in behavior due to an approach or unsuccessful strike attempt would be temporary. Given these considerations, and the small number of approaches and unsuccessful harpoon attempts that are expected per year under Alternative 2, it is unlikely that these activities will have a discernable impact on the ENP gray whale stock's abundance, rate of growth, or distribution, or that these activities will affect their migration. Approaches and unsuccessful strike attempts are also likely to be limited to relatively small areas, resulting in negligible impacts on the overall feeding opportunities and nutritional state of the whales.

Table 4-3. Estimated number of strikes, unsuccessful harpoon attempts, and approaches of ENP, PCFG, OR-SVI, Makah U&A (MUA), and WNP whales under Alternative 2.

Whales		Number of Strikes ^a			Number of Unsuccessful Harpoon Attempts ^b			Number of Approaches ^c		
		Annual	6-year	10-year	Annual	6-Year	10-year	Annual	6-Year	10-year
ENP ^d		7	42	70	42	252	420	353	2118	3530
PCFG ^e	27.1%	1.9	11.4	19	11.4	68.3	113.8	95.7	574	956.6
OR-SVI ^e	25.9%	1.8	10.9	18.1	10.9	65.3	108.8	91.4	548.6	914.3
MUA ^e	22.54%	1.6	9.5	15.8	9.5	56.8	94.7	79.6	477.4	795.7
WNP ^f	0.50%	0.04	0.21	0.35	0.21	1.27	2.13	1.79	10.71	17.86

- a. Limited by regulation.
- b. Calculated using number of unsuccessful harpoon attempts per successful strike (6:1), based on experience during 1999 and 2000 hunts combined.
- c. Calculated using an estimate of 8.3 approaches per day of hunting and a total of 42.5 hunting days per year.
- d. ENP estimates are maximum values and do not take into account the currently calculated PCFG harvest limit.
- e. Percentage estimates are based on the springtime whale analysis by Harris et al. (in prep.) that compares whales seen in the spring to the entire catalog of whales identified in the PCFG range during the summer/fall feeding period (in contrast to the definition we use in this EIS for PCFG whales, which requires a whale to have been seen in at least 2 years). This results in estimates that are likely higher and therefore more conservative than estimates that would be derived from a comparison with whales observed in at least 2 years. We conclude that this conservative approach is appropriate as it allows for the possibility that a whale sighted in the spring might later be seen for the second time in the PCFG seasonal range. Note that OR-SVI and MUA are nested regions within the PCFG range. Also, the estimates based on these percentages are based on the maximum allowed ENP values and do not reflect the currently calculated PCFG harvest limit.
- f. Percentage estimate is based on modeling by Moore and Weller (2019).

4.1.2 Alternative 3, Offshore Hunt

Table 4-1 summarizes the key hunting components associated with Alternative 3. The following elements remain unchanged from those reported in Subsection 4.1.3 of the 2015 DEIS: potential timing of a hunt; number of hunting days; potential number and types of vessels; potential number of unsuccessful harpoon attempts and approaches; and potential number of shots fired or grenade explosions. As noted above in the Introduction, there have been updates since the 2015 DEIS to some gray whale population estimates. Therefore, in the subsections below, we summarize and update (where appropriate) estimates of the potential number of ENP and PCFG whales killed, the likelihood of striking a WNP whale, and the likely number of whales harvested under this alternative.

Potential Number of ENP Whales Killed and Harvested

As described in the DEIS subsection 4.1.3.3, under Alternative 3 the maximum number of whales that could be killed each year by the Tribe would be six (including the maximum of two allowable struck and lost whales that are assumed to subsequently die). Harvest could average up to four whales per year, with a maximum of five whales in a single year. This equates to 0.0002% of the ENP gray whale population. Therefore, the total level of mortality for ENP gray whales is lower under Alternative 3 than Alternative 2, although still higher than under the No-

action Alternative. This level of mortality would have no discernable effect on the ENP stock's abundance or rate of growth, and no effect on the stock's abundance relative to OSP.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Under Alternative 3, the maximum number of whales that could be killed in a year would be six, including the maximum of two allowable struck and lost whales. While Alternative 2 limits the *harvest* of PCFG whales, Alternative 3 limits the *total mortality* of PCFG whales. In this scenario, all struck and lost whales would be counted against the PCFG limit in proportion to their relative occurrence in the hunt area at the time of the strike. The annual mortality limit for PCFG whales under this alternative would be equal to NMFS' calculation of PBR for the PCFG in its most recent stock assessment report, or 3.5 whales (Table 4-4).

Table 4-4. Alternative 3 method of calculating PCFG mortality limits.

Element	Current Value	Source for Establishing Value in Future Calculations ^a	Notes
One-half maximum net productivity rate (Rmax)	$(\frac{1}{2}) 0.062 = 0.031$	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Minimum abundance estimate of PCFG (Nmin)	227	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.3, PCFG Abundance and Trends
Recovery factor for PCFG	0.5	NMFS' stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
CURRENT RESULT	Total Mortality: $(0.031) * (227) * 0.5 = \mathbf{3.5}$ PCFG Female Mortality = $3.5 * 0.50 = \mathbf{1.75}$		

^aValues for the elements used in this calculation are derived from NMFS Stock Assessment Reports, the most recent of which is Carretta et al. (2021). These values may change as new information becomes available. It is also possible that future reports could discontinue reporting values for PCFG whales. In that case, NMFS would base these calculations on an alternative source(s) for the best available scientific information regarding PCFG whales.

Alternative 3 would count whales that are struck and lost against the PCFG mortality limit in proportion to the occurrence of PCFG whales in the coastal portion of the Makah U&A from March through May (currently 27%). It would also count a proportion of those whales as female PCFG whales based on the proportion of female whales in the PCFG during the feeding season (June through November). That proportion is approximately 50% (A. Lang, pers. comm., Southwest Fisheries Science Center Biologist, February 26, 2020). Consequently, a struck and lost whale would count as 0.14 PCFG females (0.27 PCFG whales times 50%). In addition, under Alternative 3 the Tribe would be limited to a maximum of two struck and lost whales per year. This limit would help to ensure that striking and losing two whales would, on average, limit impacts on PCFG females to approximately one per year (0.5 PCFG females times two strikes).

Given these considerations and current estimates, the maximum number of PCFG whales that *could* be killed in a year under Alternative 3 would be four whales, at least one of which must be a struck and lost whale that is assumed to subsequently die. Also, the maximum of four whales can only occur (1) if a certain sequence of strikes occurs, and (2) a female PCFG whale is not

one of the first three whales harvested. Using these conditions and the current estimates shown in Table 4-5, the following six sequences could result in the maximum four PCFG whales killed under this alternative (H = harvested whale is a landed, known PCFG whale that counts as 1.0 against the total mortality limit; S = struck and lost whale is presumed to be a PCFG whale that counts as 0.27 against the total mortality limit):

- HSHS or HSHH or SHHH = 3.27 (hunt stops because striking or harvesting another PCFG whale would exceed the total mortality limit of 3.5 PCFG whales)
- SHHS or HSHS or HHSS = 2.54 (hunt stops because the annual struck and lost limit is met)

In these scenarios, any number of non-PCFG whales could be landed, up to the maximum of five in one year or an average of four per year over 6 years.

Currently, no data are available on the proportion of PCFG whales in the offshore hunt area under Alternative 3 because most surveys have been conducted closer than 5 miles (8 km) from shore (DEIS Subsections 3.4.3.3.2, ENP Seasonal Distribution, Migration, and Movements, Migratory Distribution Relative to Shore, and 3.4.3.4.2, PCFG Seasonal Distribution, Migration, and Movements). For this analysis, we assumed that PCFG whales would be present 5 miles (8 km) from shore in the same proportion they are present closer to shore. This may be a conservative assumption, as it is possible that migrating whales travel further from shore while PCFG whales travel closer to shore (DEIS Subsection 3.4.3.4.2, PCFG Seasonal Distribution, Migration, and Movements).

Under Alternative 3, if a maximum of six whales were struck or killed in a year during the spring, the expected number of PCFG whales that would be struck or killed would be 1.6 whales (six whales times 27%), the expected number of OR-SVI whales struck or killed would be 1.6 (six whales times 25.9%), and the expected number of Makah U&A whales struck or killed would be 1.4 (six whales times 22.54%). However, given the limits on PCFG mortality under current conditions and the limits on struck and lost whales, the likely number of whales struck or killed in a year during the spring would be four whales, of which 1.1 would likely be PCFG whales (four whales times 27%), 1.0 would likely be an OR-SVI whale (four whales times 25.9%), and 0.9 would likely be a Makah U&A whale (four whales times 22.54%). These numbers are subsets of one another (the OR-SVI is contained in the PCFG area and the Makah U&A is contained in the OR-SVI area) (Figure 3-10) so they are not additive. The maximum estimates are also displayed in Table 4-5. This level of mortality for the PCFG is higher than would be expected under the No-action Alternative, but lower than would be expected under Alternative 2. It is also lower than the informational PBR of 3.5 whales calculated by NMFS (Caretta et al. 2021), and). It is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Likelihood of Striking a WNP Whale

Although it is very unlikely that a WNP whale would be struck during the course of the hunt under Alternative 3, it is possible that a member of the WNP stock will be present in the hunt area in the winter and early spring months when the hunt would be taking place. Table 4-5 shows the calculated probability of striking a WNP whale based on the latest analysis by Moore and Weller (2019) and the updated mixing proportion described above. If all six strikes are utilized in

a given year, it is likely that 0.03 of them would be on a WNP whale (six strikes times 0.5%), with a total of 0.18 strikes over 6 years. Therefore, the risk posed to WNP gray whales under Alternative 3, although higher than would be expected under the No-action Alternative, is lower than under Alternative 2.

Potential Number of Unsuccessful Harpoon Attempts and Approaches

Table 4-5 shows the calculated probability of subjecting ENP, PCFG, OR-SVI, Makah U&A, and WNP whales to unsuccessful harpoon attempts and approaches. These calculations are based on the estimates of unsuccessful strike attempts and approaches derived in Subsection 4.1.2.4 of the 2015 DEIS and incorporate the most recent estimates of the mixing proportions of each stock/group described under Alternative 2 above. Under Alternative 3, we estimate the same number of hunting days under Alternative 2. Therefore, the potential number of approaches is the same under both alternatives. Due to the lower strike limit, however, Alternative 3 carries a lower potential number of unsuccessful strike attempts. Therefore, Alternative 3 would likely result in less behavioral disturbance due to unsuccessful strikes attempts than Alternative 2, but more than the No-action Alternative.

Table 4-5. Estimated number of strikes, unsuccessful harpoon attempts, and approaches of ENP, PCFG, OR-SVI, Makah U&A (MUA), and WNP whales under Alternative 3.

Whales		Number of Strikes ^a			Number of Unsuccessful Harpoon Attempts ^b			Number of Approaches ^c		
		Annual	6-Year	10-Year	Annual	6-Year	10-Year	Annual	6-Year	10-Year
ENP ^d		6	36	60	36	216	360	353	2118	3530
PCFG ^e	27.1%	1.6	9.8	16.3	9.8	58.5	97.6	95.7	574	956.6
OR-SVI ^e	25.9%	1.6	9.3	15.5	9.3	55.9	93.2	91.4	548.6	914.3
MUA ^e	22.54%	1.4	8.4	14.0	8.4	50.5	84.2	82.6	495.6	826.0
WNP ^f	0.50%	0.03	0.18	0.30	0.18	1.09	1.82	1.79	10.71	17.86

a. Limited by regulation.

b. Calculated using number of unsuccessful harpoon attempts per successful strike (6:1), based on experience during 1999 and 2000 hunts combined.

c. Calculated using an estimate of 8.3 approaches per day of hunting and a total of 42.5 hunting days per year.

d. ENP estimates are maximum values and do not take into account the currently calculated PCFG mortality limit.

e. Percentage estimates are based on the springtime whale analysis by Harris et al. (in prep.) that compares whales seen in the spring to the entire catalog of whales identified in the PCFG range during the summer/fall feeding period (in contrast to the definition we use in this EIS for PCFG whales, which requires a whale to have been seen in at least 2 years). This results in estimates that are likely higher and therefore more conservative than estimates that would be derived from a comparison with whales observed in at least 2 years. We conclude that this conservative approach is appropriate as it allows for the possibility that a whale sighted in the spring might later be seen for the second time in the PCFG seasonal range. Note that OR-SVI and MUA are nested regions within the PCFG range. Also, the estimates based on these percentages are based on the maximum allowed ENP values and do not reflect the currently calculated PCFG mortality limit.

f. Percentage estimate is based on modeling by Moore and Weller (2019).

4.1.3 Alternative 4, Summer/Fall Hunt

Table 4-1 summarizes the key hunting components associated with Alternative 4. The following elements remain unchanged from what was reported in Subsection 4.1.4 of the 2015 DEIS: potential timing of a hunt; number of hunting days; potential number and types of vessels; potential number of unsuccessful harpoon attempts and approaches; and potential number of shots fired or grenade explosions. As noted above in the Introduction, there have been updates since the 2015 DEIS to some gray whale population estimates. Therefore, in the subsections below, we summarize and update (where appropriate) estimates of the potential number of ENP and PCFG whales killed, the likelihood of striking a WNP whale, and the likely number of whales harvested under this alternative.

Potential Number of ENP Whales Killed and Harvested

As described in DEIS subsection 4.1.4.3, the potential number of ENP whales killed under Alternative 4 would be determined by the PCFG limit, which would be one under current conditions, and any whale struck would be counted as a PCFG whale. (This limit of one whale is unchanged from the DEIS estimate). Because Alternative 4 would allow up to seven strikes per year, the number of ENP whales potentially killed could be as high as seven, but this would require the PCFG abundance to more than triple, which is highly unlikely. Harvest could average up to four whales per year, with a maximum of five whales in a single year. However, under current conditions, the maximum number of whales the Tribe could harvest in any year under current conditions would be one because of the PCFG limit. This equates to 0.00005% of the ENP gray whale stock. This level of mortality, although higher than would be expected under the No-action Alternative, is lower than would be expected under Alternatives 2 and 3. It would have no discernable effect on the ENP stock's abundance or rate of growth or the stock's abundance relative to OSP.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Unlike the method used to calculate PCFG mortality limits under Alternative 2, other sources of human mortality reported in the most recent NMFS stock assessment report are subtracted from the calculated PBR to account for the total potential removal from the PCFG in a given year under Alternative 4. Table 4-6 shows this calculation (one whale per year) under current conditions. This PCFG limit of one whale is unchanged from the DEIS estimate and likewise assumes that any whale hunted in the coastal portion of the Makah U&A between June 1 and November 30 would be a PCFG whale and, therefore, would also be an OR-SVI and Makah U&A whale. This level of mortality for the PCFG is higher than would be expected under the No-action Alternative but lower than would be expected under Alternatives 2 and 3. It is also lower than the informational PBR of 3.5 whales calculated by NMFS (Caretta et al. 2021). It is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Table 4-6. Alternative 4 method of calculating PCFG mortality limits.

Element	Current Value	Source for Establishing Value in Future Calculations ^a	Notes
One-half maximum net productivity rate (Rmax)	(½) 0.062 = 0.031	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Minimum abundance estimate of PCFG (Nmin)	227	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.3, PCFG Abundance and Trends
Recovery factor for PCFG	0.35	Wade (1998)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Other sources of human-caused mortality	1.7	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.4 PCFG Status, Carrying Capacity (K), and Related Estimates
CURRENT RESULT	Total Mortality: $(0.031) * (227) * 0.35 = 2.46 - 1.7 = 0.76^b$		

^a Values for some of the elements used in this calculation are derived from NMFS Stock Assessment Reports, the most recent of which is Carretta et al. (2021). These values (e.g., for Rmax and Nmin) may change as new information becomes available. It is also possible that future reports could discontinue reporting values for PCFG whales. In that case, NMFS would base these calculations on an alternative source(s) for the best available scientific information regarding PCFG whales.

^b As described in DEIS subsection 4.1.4.3, hunting could not occur when the PCFG mortality limit is less than 1.0 whales. However, when the annual mortality limit is less than 1.0 but greater than 0.5 during 2 consecutive years, the values would be aggregated to allow for the mortality of one PCFG whale during the second year.

Likelihood of Striking a WNP Whale

The hunting season under Alternative 4 is designed to avoid the potential for striking a WNP whale because such whales would be feeding in the WNP during the summer feeding period. Therefore, the risk to WNP gray whales under Alternative 4 is the same as under the No-action and lower than under Alternatives 2 and 3.

Potential Number of Unsuccessful Harpoon Attempts and Approaches

The annual mortality limit calculated for PCFG whales under this alternative (0.76 whales) results in one PCFG whale killed every other year. Therefore, the estimated annual numbers of ENP, PCFG, OR-SVI, and Makah U&A whales subjected to unsuccessful harpoon attempts (3) and approaches (29) are half of the values reported in the 2015 DEIS (see DEIS Subsection 4.1.4.4). This would result in more behavioral disturbance than would be expected under the No-action Alternative, but less than would be expected under Alternatives 2 and 3.

4.1.4 Alternative 5, Split-Season Hunt

Table 4-1 summarizes the key hunting components associated with Alternative 5. The following elements remain unchanged from what was reported in Subsection 4.1.5 of the 2015 DEIS: potential timing of a hunt; number of hunting days; potential number and types of vessels; potential number of unsuccessful harpoon attempts and approaches; and potential number of shots fired or grenade explosions. As noted above in the Introduction, there have been updates since the 2015 DEIS to

some gray whale population estimates. Therefore, in the subsections below we summarize and update (where appropriate) estimates of the potential number of ENP and PCFG whales killed, the likelihood of striking a WNP whale, and the likely number of whales harvested under this alternative.

Potential Number of ENP Whales Killed and Harvested

As described in DEIS subsection 4.1.5.3, Alternative 5 does not include a strike limit, but the mortality limit for PCFG whales in concert with the IWC limit on total catches would effectively limit the number of strikes per year, and thus the number of whales killed, to four per year on average, with a maximum of five in a single year. For a variety of reasons, it is extremely unlikely the Tribe would harvest an average of four whales per year over six years under Alternative 5 due to the limit on PCFG whales, their proportional presence in the hunt area, and the limited number of likely hunting days. For these reasons, under Alternative 5 we assume that the maximum number of whales harvested in a year would be one. This equates to 0.00005% of the ENP gray whale stock. This level of mortality, although higher than would be expected under the No-action Alternative, would have no discernable effect on the ENP stock's abundance or rate of growth, and no effect on the stock's abundance relative to OSP. However, given the limits on harvesting PCFG whales described below, it is likely that there would be periods of no harvest that could last for several years. Therefore, the potential number of ENP gray whales killed under Alternative 5 would be the same or less than under Alternative 4, and less than under Alternatives 2 and 3.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Under Alternative 5, the mortality limit set on PCFG whales would be equivalent to 10% of the PBR, as reported in NMFS' recent stock assessment reports. Table 4-7 illustrates how the limit would be calculated. Under current conditions, the PCFG mortality limit would be 0.35 whales. Because this limit represents less than one whale, it would differ from the mortality limits in other alternatives in that it would be allowed to accumulate across years for the purposes of calculating how frequently a PCFG whale could be killed or struck and lost. Although this PCFG mortality limit would always be less than one whale,⁶ the Tribe could hunt in any year—including the first year—until they either (1) kill a PCFG whale or (2) strike and lose any whale. If either of those two outcomes occur, then the PCFG mortality limit would be applied to determine the number of years during which the Tribe would need to take a hiatus from hunting (i.e., until the accumulated mortality limits would add up to at least one whale).

For example, if the Tribe killed a PCFG whale in the first year of hunting, then the PCFG mortality limit would be reduced to zero and there would be a hiatus until mortality limit calculations had accumulated (over subsequent years) to yield a value greater than or equal to one whale. In this example, and using current calculated values, the Tribe could not hunt again until year 4 because it would take 3 years (i.e., a 2-year hiatus from hunting) for a PCFG mortality limit of 0.35 whales to add up to at least one whale (i.e., 0.35 whales/year times 3 years = 1.05 whales).

Alternatively, if the Tribe strikes and loses any whale in the first year of hunting, then the PCFG mortality limit would be reduced from one whale by a fraction equal to the proportional presence of PCFG whales in the coastal portion of the Makah U&A during the season in which it was

⁶ Even if the recovery factor used to calculate this estimate were doubled, the resultant PCFG mortality limit would still be less than 1.0 whale (unless the minimum population estimate were to exceed 320 animals, which is highly unlikely given that all estimates to date have been less than 250 animals).

struck (e.g., 0.27 whales in the spring when the Tribe is most likely to hunt). As a result, if a whale is struck and lost during the spring then the result would be a reduction in the PCFG mortality limit to 0.73 whales (1 whale minus 0.27 whales) and hunting would cease until the next year when the mortality limit calculations had accumulated to yield a value greater than or equal to one whale (i.e., 0.73 whales plus 0.35 whales in year 2 = 1.08 whales, which would be rounded down to 1.0 whale). And if the Tribe strikes and loses a whale in year 2, then hunting would cease until year 3, and so on (i.e., hunting could occur every year under this continued struck-and-lost scenario).

In the case of either a killed whale or a struck-and-lost whale, if new information (such as a change in the minimum population size estimate) during the hiatus period changes the PCFG mortality limit it could affect the length of that hiatus. For example, in the scenario above for a killed whale, if the PCFG mortality limit was 0.35 whales in the year of the kill but increased to 0.5 in subsequent years, then the Tribe would only need to take a 1-year hiatus from hunting (i.e., 0.5 whales/year times 2 years = 1 whale at start of year 3).

Table 4-7. Alternative 5 method of calculating PCFG harvest limits.

Element	Current Value	Source for Establishing Value in Future Calculations ^a	Notes
One-half maximum net productivity rate (Rmax)	(½) 0.062 = 0.031	NMFS Stock Assessment Report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Minimum abundance estimate of PCFG (Nmin) ^a	227	NMFS Stock Assessment Report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.3, PCFG Abundance and Trends
Recovery factor for PCFG	0.5	NMFS Stock Assessment Report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
CURRENT RESULT	(0.031) * (227) * 0.5 = 3.5 * 0.1 = 0.35		

^a Values for the elements used in this calculation are derived from NMFS Stock Assessment Reports, the most recent of which is Carretta et al. (2021). These values may change as new information becomes available. It is also possible that future reports could discontinue reporting values for PCFG whales. In that case, NMFS would base these calculations on an alternative source(s) for the best available scientific information regarding PCFG whales.

Using the struck and lost example above and assuming that every struck-and-lost whale was, in fact, a PCFG whale that died, then the *maximum* number of PCFG whales that might be killed under Alternative 5 would be approximately one per year. However, it is unlikely that would actually be the case given the proportion of PCFG whales present in the Makah U&A during the spring portion of the hunting season when the Tribe is most likely to hunt (Table 4-8). Taking into account that spring proportion yields a more *likely* estimate of one PCFG whale that is struck and lost (and dies) every 4 years (Table 4-8).⁷ If the Tribe also hunted in the winter, it is

⁷ This is estimated by dividing one “successful” strike on a PCFG whale by the 27.1% chance of that strike actually being on a PCFG whale, which yields 3.7 strike attempts (rounded to 4 strike attempts). Because hunting could

uncertain what the proportion of PCFG whales would be; thus, there could be more or fewer whales killed (Subsection 3.2.1.3, PCFG Seasonal Distribution, Migration, and Movements).

This level of mortality for the PCFG is higher than would be expected under the No-action Alternative but lower than would be expected under Alternatives 2 through 4. It is also lower than the informational PBR of 3.5 whales calculated by NMFS (Caretta et al. 2021) and is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Likelihood of Striking a WNP Whale

It is possible (but very unlikely due to hunt timing restrictions) that a WNP whale would be struck under Alternative 5. Table 4-8 shows the calculated probability of striking a WNP whale based on the analysis by Moore and Weller (2019) and the updated mixing proportion described above. If all five strikes are utilized in a given year, it is likely that 0.025 of them would be on a WNP whale (five strikes times 0.5%), with a total of 0.15 strikes over the 6 years (30 strikes times 0.5%). Thus, the risk to WNP gray whales is lower under Alternative 5 than under Alternatives 2 and 3, but higher than under Alternative 4 and the No-action Alternative.

Potential Number of Unsuccessful Harpoon Attempts and Approaches

Table 4-8 shows the calculated probability of subjecting ENP, PCFG, OR-SVI, Makah U&A, and WNP whales to unsuccessful harpoon attempts and approaches. These calculations are based on the methods described in Subsection 4.1.5.4 of the 2015 DEIS and incorporate the most recent estimates of the mixing proportions of each stock/group described under Alternative 2 above. With an estimated 30 unsuccessful strike attempts and 122 approaches annually, Alternative 5 would likely result in less behavioral disturbance due to these activities than Alternatives 2 and 3, but more than Alternative 4 and the No-action Alternative.

Table 4-8. Estimated number of strikes, unsuccessful harpoon attempts, and approaches of ENP, PCFG, OR-SVI, Makah U&A (MUA), and WNP whales under Alternative 5.

Whales		Number of Strikes			Number of Unsuccessful Harpoon Attempts ^b			Number of Approaches ^c		
		Annual	6-Year	10-Year	Annual	6-Year	10-Year	Annual	6-Year	10-Year
ENP ^a		5	24	40	30	144	240	122	732	1220
PCFG ^d	27.1%	0.25 ^e	1.5	2.5	8.1	39.0	81.3	33.1	198.4	330.6
OR-SVI ^d	25.9%	0.24 ^f	1.4	2.4	7.8	37.3	77.7	31.6	189.6	316
MUA ^d	22.54%	0.21 ^g	1.3	2.1	6.8	32.5	67.6	27.5	165	275
WNP ^h	0.50%	0.025	0.12	0.20	0.15	0.73	1.21	0.62	3.70	6.17

a. Limited by regulation and by the PCFG mortality limit and method of accounting for struck and lost whales as PCFG whales (five would be the maximum in any one year and no more than 24 could be struck over 6 years).

b. Calculated using number of unsuccessful harpoon attempts per successful strike (6:1), based on experience during 1999 and 2000 hunts combined.

c. Calculated using an estimate of 8.3 approaches per day of hunting and a high estimate of 14.7 hunting days (11.2 days in May plus 3.5 days in December).

d. Percentage estimates are based on the springtime whale analysis by Harris et al. (in prep.) which compares whales seen in the spring to the entire catalog of whales identified in the PCFG range during the summer/fall feeding period (in contrast to the definition we use in this EIS

occur every year under a struck-and-lost scenario, it would take 3.7 years (rounded to 4 years) to achieve the expected strike of one PCFG whale.

for PCFG whales, which requires a whale to have been seen in at least 2 years). This results in estimates that are likely higher and therefore more conservative than estimates that would be derived from a comparison with whales observed in at least 2 years. We conclude this conservative approach is appropriate as it allows for the possibility that a whale sighted in the spring might later be seen for the second time in the PCFG seasonal range. Note that OR-SVI and MUA are nested regions within the PCFG range.

- e. Hunting would be managed so that the average annual mortality of PCFG whales would not exceed 10% of PBR (currently 0.35 whales per year). The values shown are based on the proportion of PCFG whales in the MUA during the spring and the estimate that one PCFG whale is struck every 4 years.
- f. Based on the proportional presence, 96% of PCFG whales in the MUA during March through May are also OR-SVI whales (0.259 divided by 0.271 = 0.96, and 0.96 times 0.25 = 0.24).
- g. Based on the proportional presence, 83% of PCFG whales in the MUA during March through May are also MUA whales (0.2254 divided by 0.271 = 0.83, and 0.83 times 0.25 = 0.21).
- h. Median probability based on modeling by Moore and Weller (2018) using strike/attempt/approach estimates.

4.1.5 Alternative 6, Different Limits on Strikes and PCFG, and Limited Duration of Regulations and Permits

Table 4-1 summarizes the key hunting components associated with Alternative 6. The following elements remain unchanged from what was reported in Subsection 4.1.6 of the 2015 DEIS: potential timing of a hunt; number of hunting days; potential number and types of vessels; potential number of unsuccessful harpoon attempts and approaches; and potential number of shots fired or grenade explosions. As noted above in the Introduction, there have been updates since the 2015 DEIS to some gray whale population estimates. Therefore, in the subsections below, we summarize and update (where appropriate) estimates of the potential number of ENP and PCFG whales killed, the likelihood of striking a WNP whale, and the likely number of whales harvested under this alternative.

Potential Number of ENP Whales Killed and Harvested

As described in DEIS subsection 4.1.6.3, under Alternative 6 the maximum number of whales that could be killed or harvested per year by the Tribe would be determined by the total limit on strikes, which would be not more than four in a single year and seven over 2 years (or 3.5 per year on average). This equates to 0.002% of the ENP gray whale stock. This level of mortality is lower than under Alternatives 2 and 3, but higher than under the No-action Alternative and Alternatives 4 and 5 under current conditions. It would still, however, have no discernable effect on the ENP stock's abundance or rate of growth, and no effect on the stock's abundance relative to OSP.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Under Alternative 6, a limit would be set on PCFG mortality equal to NMFS' calculation of PBR in its most recent stock assessment report (Subsection 3.4.2.1.4, Defining and Calculating PBR, of the DEIS) minus other sources of human-caused mortality. Table 4-9 illustrates how the limit would be calculated. The annual mortality limit would be one whale using the current values for the PBR formula and current levels of human-caused mortality. Similar to Alternative 3, Alternative 6 counts any struck and lost whales against the PCFG mortality limit based on their proportional presence in the coastal portion of the Makah U&A in March through May (currently 27%). Therefore, the maximum number of PCFG whales that could be killed would be equal to the overall strike limit. However, based on the population abundance updates provided in Chapter 3, the likely average annual mortality for the PCFG under Alternative 6 is one whale, if all allowable strikes are used (3.5 strikes times 27.1%)(Table 4-10). Of the 3.5 whales struck in a given year, 0.9 and 0.8 of them would belong to the OR-SVI and Makah U&A groups, respectively (3.5 times 25.9 and 22.54%, respectively)(Table 4-10). This level of mortality for

the PCFG is lower than would be expected under Alternatives 2 through 4, but higher than under Alternative 5 and the No-action Alternative. It is also lower than the informational PBR of 3.5 whales calculated by NMFS (Carretta et al. 2021). It is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Table 4-9. Alternative 6 method of calculating PCFG mortality limits.

Element	Current Value	Source for Establishing Value in Future Calculations ^a	Notes
One-half maximum net productivity rate (R _{max})	(½) 0.062 = 0.031	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Minimum abundance estimate of PCFG (N _{min})	227	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.3, PCFG Abundance and Trends
Recovery factor for PCFG	0.5	NMFS Stock Assessment Report (Carretta et al. 2021)	See DEIS Subsection 3.4.2.1.4, Defining and Calculating PBR
Other sources of human-caused mortality	1.7	NMFS' Stock assessment report (Carretta et al. 2021)	See DEIS Subsection 3.4.3.4.4 PCFG Status, Carrying Capacity (K), and Related Estimates
CURRENT RESULT	Total Mortality: (0.031) * (227) * 0.5 = 3.52 – 1.7 = 1.82 (rounded down to 1.0)		

^aValues for the elements used in this calculation are derived from NMFS Stock Assessment Reports, the most recent of which is Carretta et al. (2021). These values may change as new information becomes available. It is also possible that future reports could discontinue reporting values for PCFG whales. In that case, NMFS would base these calculations on an alternative source(s) for the best available scientific information regarding PCFG whales.

Likelihood of Striking a WNP Whale

Because the hunt would take place during the winter and spring months under Alternative 6, there is a possibility that WNP whales may be present in the hunt area while hunting activities are taking place. If all allowable strikes are used (3.5 per year), and given the mixing proportion of WNP whales in the area during these months, the expected annual number of strikes on a WNP whale would be 0.02, or 0.11 in the course of 6 years (Table 4-10). Although the risk posed to WNP gray whales is higher under Alternative 6 than under Alternative 4 and the No-action Alternative, it is lower than the risk posed by Alternatives 2, 3, and 5.

Potential Number of Unsuccessful Harpoon Attempts and Approaches

Table 4-10 shows the calculated probability of subjecting ENP, PCFG, OR-SVI, Makah U&A, and WNP whales to unsuccessful harpoon attempts and approaches. These calculations are based on the methods described in Subsection 4.1.6.4 of the 2015 DEIS and incorporate the most recent estimates of the mixing proportions of each stock/group described under Alternative 2 above.

Table 4-10. Estimated number of strikes, unsuccessful harpoon attempts, and approaches of ENP, PCFG, OR-SVI, Makah U&A (MUA), and WNP whales under Alternative 6.

Whales		Number of Strikes ^a			Number of Unsuccessful Harpoon Attempts ^b			Number of Approaches ^c		
		Annual	6-Year	10-Year	Annual	6-Year	10-Year	Annual	6-Year	10-Year
ENP ^d		3.5	21	35	21	126	210	353	2118	3530
PCFG ^e	27.1%	0.95	5.7	9.5	5.7	34.2	56.9	95.7	574	956.6
OR-SVI ^e	25.9%	0.9	5.4	9.1	5.4	32.6	54.4	91.4	548.6	914.3
MUA ^e	22.54%	0.79	4.7	7.9	4.7	28.4	47.3	79.6	477.4	795.7
WNP ^f	0.50%	0.02	0.11	0.18	0.11	0.64	1.06	1.79	10.71	17.86

a. Limited by regulation.

b. Calculated using number of unsuccessful harpoon attempts per successful strike (6:1), based on experience during 1999 and 2000 hunts combined.

c. Calculated using an estimate of 8.3 approaches per day of hunting and a total of 42.5 hunting days per year.

d. ENP estimates are maximum values.

e. Percentage estimates are based on the springtime whale analysis by Harris et al. (in prep.) that compares whales seen in the spring to the entire catalog of whales identified in the PCFG range during the summer/fall feeding period (in contrast to the definition we use in this EIS for PCFG whales, which requires a whale to have been seen in at least 2 years). This results in estimates that are likely higher and, therefore, more conservative than estimates that would be derived from a comparison with whales observed in at least 2 years. We conclude that this conservative approach is appropriate as it allows for the possibility that a whale sighted in the spring might later be seen for the second time in the PCFG seasonal range. Note that OR-SVI and MUA are nested regions within the PCFG range.

f. Median probability based on modeling by Moore and Weller (2019) using strike/attempt/approach estimates.

4.1.6 Alternative 7, Composite Alternative – Preferred

Alternative 7 is made up of various components from DEIS action alternatives 2 through 6.

There are two aspects of this composite alternative that differ from the other action alternatives:

- (1) It relies on an alternating-year hunt schedule whereby winter/spring hunts would begin in December of the same calendar year that summer/fall hunts occur, and summer/fall hunts would begin in the next calendar year following the end of a winter/spring hunt. The result is that there is a 1-month gap (November) between the end of a summer/fall hunt and the start of a winter/spring hunt and then a 13-month gap between the end of a winter/spring hunt and the start of the next summer/fall hunt, and so on. Therefore, there would be up to five winter/spring hunts and five summer/fall hunts over the 10-year waiver period.
- (2) It is evaluated both with and without low abundance thresholds for ENP gray whales and for the PCFG, below which hunting would cease. For our analysis, we have considered four potential scenarios: no low abundance threshold for the ENP stock, a threshold of 11,000 whales, a threshold of 16,000 whales, and a threshold of 18,000 whales. The thresholds are analyzed as Alternatives 7(a), 7(b), and 7(c), respectively. If an ENP abundance threshold is implemented and a cease-hunt were triggered by that threshold, hunting could resume once the ENP population abundance estimate increased above the

selected threshold. Two thresholds have been proposed for the PCFG in tandem with one another. They consist of a population abundance estimate of 192 whales and a minimum population abundance estimate of 171 whales. If either of these thresholds are triggered, hunting would cease until the abundance and minimum abundance estimates for the PCFG increased above their respective thresholds.

Under Alternative 7, in order to conduct hunting and training activities in the winter/spring months, the Tribe would need to obtain requisite authorization for the potential incidental take of WNP gray whales (due to the chance of taking such a whale in winter/spring hunts). If they do not obtain an ITA for WNP gray whales, they would only be authorized to hunt and train in the summer/fall months. This could also happen if the Tribe were to obtain such authorization and subsequently struck a WNP gray whale during a winter/spring hunt (a highly unlikely event that would cause such hunts to cease). For our analysis, we assume that the Tribe will either receive permits to hunt in all five winter/spring hunt seasons during the waiver period or that they will not receive permits for winter/spring hunts for the entirety of the 10-year waiver period, in which case only five summer/fall hunts would take place. It is, however, possible that the Tribe could receive permits for some of the winter/spring hunt years but not others.

Under Alternative 7, the Tribe would utilize the same hunt area and overlap with the same winter/spring hunting seasons (i.e., all or portions of the December 1 through May 31 time period) in alternating years. Like Alternatives 3 through 6, Alternative 7 also includes provisions to limit the number of struck and lost whales and measures to count struck and lost whales against the PCFG mortality limits. Alternative 7 also incorporates a similar, but shorter, summer/fall hunting season in alternating years to that described under Alternative 4. This split-season hunt design was first proposed under Alternative 5 to limit the likelihood that tribal hunters would strike or otherwise harm a WNP gray whale during the winter/spring migration period. However, it has been modified under Alternative 7 to further limit potential impacts on WNP whales by restricting hunts to the summer/fall season every other year to avoid the WNP gray whale migration period. Finally, Alternative 7 incorporates the 10-year waiver period and shorter-duration permits that were proposed as additional precautionary measures under Alternative 6.

Table 4-1 summarizes the key hunting components associated with this alternative. Although these components have already been analyzed under Alternatives 2 through 6, to aid comparison we analyze them here in aggregate with the strike limits and other provisions described in Subsection 2.1, Alternative 7.

4.1.6.1 Potential Timing of a Hunt and Number of Hunting Days

As described above, hunt seasons would alternate between winter/spring hunts and summer/fall hunts. The hunting season during the winter/spring hunt mirrors the December 1 – May 31 period proposed by the Tribe in Alternative 2. Subsection 4.1.2.1 of the DEIS describes the ocean and weather conditions that impact the number of days during which hunting activities might take place during this period. These conditions result in an estimated 42.5 days of hunting during winter/spring hunts. Of these 42.5 days, 33.2 would likely occur in March through May, when ocean and weather conditions are more favorable for hunting. The remaining 9.3 days would occur from December through February, when conditions could prohibit any hunting. While it is more probable that hunting would only take place on 33.2 days during the winter/spring hunts, we instead use the 42.5-day estimate to be more precautionary in our

analysis. In addition to the number of days in which a canoe-based hunt could occur, under Alternative 7 there may be days when a motorized vessel is used to scout for whales. Subsection 4.1.2.1, Potential Timing of a Hunt and Number of Hunting Days, describes how the number of scouting days was determined under the same hunting season described in Alternative 2. We estimate that there could be as many as 43.3 scouting days from March through May, and 17.1 days from December through February. Thus, we anticipate up to 60 days of hunting and hunting-related activities in winter/spring hunts under Alternative 7.

Summer/fall hunts are less restricted by ocean and weather conditions, as described in Subsection 4.1.4.1 of the DEIS. Instead, the estimated number of hunting days that may take place in the summer/fall hunting season is restricted only by the hunters' ability to locate and strike a whale. According to an analysis by the Tribe (J. Scordino, Pers. Comm., Makah Tribe Marine Mammal Biologist, July 31, 2013), a reasonable estimate for the maximum number of days it would take to locate and strike a *male PCFG* whale is 7 days. Under Alternative 7, the hunt is not restricted to known males during the summer/fall. Assuming a 50:50 sex ratio (see Subsection 3.2.1.3, Sex Ratio of PCFG Whales, of this SDEIS), the number of whales available to hunters under this alternative is effectively double what was used to estimate the amount of time it would take to locate and strike a known male. However, the analysis by the Tribe provides the best available data, so our analysis under Alternative 7 maintains the assumption that it will take a maximum of 7 days for hunters to locate and strike a whale. This allows for a precautionary approach in this case, as the Tribe may strike a male or female PCFG whale unless or until the limit of 8 PCFG females is reached. Also, Alternative 7 allows up to two strikes in summer/fall hunts but only if the first strike results in a struck and lost whale. Therefore, it is possible that summer/fall hunts would involve up to 14 days of hunting if the first strike does not result in a landed whale, or up to 7 days if the first struck whale is landed.

For the 10-year waiver period contemplated under this alternative, there could be five winter/spring hunting seasons and five summer/fall hunting seasons. This amounts to 300 days of hunting and hunting-related activities in winter/spring hunts during the waiver period (60 hunting days per year times 5 years) and 70 days of hunting-related activities in summer/fall hunts (14 hunting days per year times 5 years). Thus, under Alternative 7, there could be an average of 37 hunting days per year over the waiver period (370 total hunting days divided by 10 years).

However, it is possible that the Tribe may not receive a permit to hunt during the winter/spring months. This could happen if the Tribe did not obtain requisite authorization for the incidental take of WNP gray whales. It could also happen if the Tribe were to obtain such authorization and subsequently struck a WNP gray whale during a winter/spring hunt (a highly unlikely event that would cause such hunts to cease). Under these conditions, there could be just five summer/fall hunting seasons over the 10-year waiver period. This amounts to 70 days of hunting-related activities in summer/fall hunts (14 hunting days per year times 5 years) and an average of 7 hunting days per year throughout the waiver period (70 total hunting days divided by 10 years).

4.1.6.2 Potential Number and Types of Vessels

The hunt under Alternative 7 would involve the same number and types of vessels as the hunt under Alternative 2.

4.1.6.3 Potential Number of ENP and PCFG Whales Killed; Likelihood of Striking a WNP Whale; Likely Number of Whales Harvested

Potential Number of ENP Whales Killed and Harvested

The potential number of ENP whales killed or harvested under Alternative 7 would be 15 over a 6-year period and 25 over a 10-year waiver period (averaging 2.5 whales killed or harvested per year, or 0.0001% of the ENP gray whale stock) (Table 4-11). Up to three whales may be killed in winter/spring hunts, and up to two whales may be killed in summer/fall hunts, if the first whale was struck and lost. Only one whale may be harvested in summer/fall hunts, so it is possible that in some years only one will be killed. However, we assume that all struck and lost whales subsequently die. These same assumptions for summer/fall hunts apply in the event that winter/spring hunts are not authorized, resulting in up to six whales killed or harvested over a 6-year period and ten over the 10-year waiver period, or 0.00005% of the ENP gray whale stock per year (Table 4-11). Neither of these levels of mortality would have a discernable effect on the ENP stock's abundance or rate of growth, or an effect on the stock's abundance relative to OSP. If the Tribe receives authorization to hunt during the winter/spring season every year, Alternative 7 would result in higher mortality than the No-action Alternative and Alternatives 4 and 5 but lower mortality than Alternatives 2, 3, and 6. Removing the winter/spring hunts from the annual mortality estimation would reduce the overall mortality of the hunt under Alternative 7 to the same level as Alternative 4.

The total number of ENP whales killed under Alternative 7 may be limited by the number of PCFG whales struck, as well as the abundance estimates for the PCFG and the ENP stock in any given year. Hunting would cease under several potential scenarios: (1) the total PCFG strike limit of 16 whales is reached; (2) the total PCFG female strike limit of eight whales is reached; (3) the PCFG abundance estimate falls below 192 whales; (4) the PCFG minimum abundance estimate falls below 171 whales; or (5) NMFS sets a low abundance threshold for the ENP stock and the stock's abundance estimate falls below that threshold of either (a) 11,000, (b) 16,000, or (c) 18,000 whales. If either of the first two conditions were met, the hunt would cease for the remainder of the 10-year waiver period. If any of the abundance estimates for PCFG and ENP gray whales dropped below their thresholds, the hunt would cease until all estimates increased again above their respective thresholds.

Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed

Under Alternative 7, the maximum number of PCFG whales that may be killed is 16, with an additional limit of eight strikes on PCFG females. In summer/fall hunts, we assume that 100% of the whales struck would be members of the PCFG. Because the hunt would occur in the Makah U&A, any PCFG whale killed during the summer/fall would also be an OR-SVI and Makah U&A whale. Therefore, during summer/fall hunts when the strike limit is two whales, up to two PCFG whales—and, therefore, two OR-SVI and 2 Makah U&A whales—may be killed, unless the first strike results in a landed whale, which would end the hunt.

Although a total of 16 PCFG whales might be killed over the 10-year waiver period, it is unlikely that 16 would actually be killed, given the proportion of PCFG whales present in the Makah U&A during the winter and spring months. During winter/spring hunts, the mixing proportions for PCFG, OR-SVI, and Makah U&A whales during the time when the hunt would take place are 27.1%, 25.9%, and 22.54%, respectively, as described in subsection 4.1.1 above. If all three

strikes were used in a winter/spring hunt, it is likely that 0.8 of those would be on PCFG whales (3 strikes times 27.1%), 0.8 on OR-SVI whales (3 strikes times 25.9%), and 0.7 on Makah U&A whales (3 strikes times 22.54%). To aid comparison with other alternatives, Table 4-11 summarizes these Alternative 7 strike estimates annually and over the span of 6 and 10 years. Assuming that the Tribe receives authorization to hunt every year in alternating seasons, the average PCFG mortality would be 1.4 whales per year. This would be higher than expected under the No-action Alternative and under Alternatives 4 and 5, but less than under Alternatives 2, 3, and 6. It is also lower than the informational PBR of 3.5 whales calculated by NMFS (Caretta et al. 2021). It is not expected to have a discernable impact on the PCFG's use of the Makah U&A survey area.

Likelihood of Striking a WNP Whale

Moore and Weller (2019) provide a detailed analysis for the probability of striking a WNP whale under Alternative 7. Based on the best available information, that analysis assumed that WNP whales would only be encountered during winter/spring hunts because such whales have not been sighted in or near the Makah U&A during the summer/fall months. Using the best data currently available on the presence of WNP whales in the ENP range, they estimate that for an individual strike on a gray whale, the expected probability of it being a WNP whale is 0.5%. If all three strikes are utilized in a winter/spring hunt, up to 0.015 of those strikes would be on a WNP whale (0.5% times three strikes). In other words, we would expect one WNP whale to be struck every 67 years. To aid comparison with other alternatives, Table 4-11 summarizes these Alternative 7 strike estimates annually and over the span of 6 and 10 years. The risk to WNP whales under Alternative 7 is less than under Alternatives 2, 3, 5, and 6 but more than under the No-action Alternative and Alternative 4, assuming the Tribe receives authorization to hunt in the winter/spring months. Under this alternative, if a struck whale was identified as a member of the WNP stock, hunting would cease until measures have been taken to prevent striking another WNP whale.

4.1.6.4 Potential Number of Unsuccessful Harpoon Attempts and Approaches

Under Alternative 2 in the 2015 DEIS, we estimated that for each whale struck there would be six unsuccessful harpoon attempts, and for each day of hunting there would be 8.3 whales approached (Subsection 4.1.2.4). During winter/spring hunts under Alternative 7, we expect the ratio of unsuccessful harpoon attempts to successful strikes would be similar to Alternative 2, resulting in 18 unsuccessful harpoon attempts (three strikes times six unsuccessful harpoon attempts) on ENP gray whales. However, consistent with our assumptions for Alternative 4, the ratio could be lower during Alternative 7's summer/fall hunts because whales approached during the feeding season may be more likely to be milling and less likely to be traveling than whales found during the migratory season, making them more vulnerable to a successful strike. Nevertheless, for this analysis and consistent with our assumptions for Alternative 4, we use the observed ratio of 6:1 for Alternative 7, as that represents the best information available based on experience from the 1999 and 2000 hunts. With up to two strikes under Alternative 7, we would expect 12 unsuccessful harpoon attempts during summer/fall hunts. Unsuccessful harpoon attempts on a whale that has already been struck do not count against the limit of attempts that may be authorized under a permit. Assuming that the Tribe receives authorization to hunt in the winter/spring months, this would result in an average of 15 unsuccessful strike attempts per year over the 10-year waiver period. This would result in more behavioral disturbance from strike

attempts under Alternative 7 than under the No-action Alternative and Alternative 4, but less than under Alternatives 2, 3, 5, and 6.

Consistent with Alternatives 2, 3, and 6, we assume there could be a maximum of 353 approaches on ENP gray whales per year. This would result in more behavioral disturbance due to approaches than under the No-action Alternative and Alternatives 4 and 5, unless the Tribe does not receive authorization to conduct hunting and training activities in the winter/spring seasons. These would be in the form of hunt-related approaches or approaches made by crews/vessels training to hunt. Some of these approaches may be repeated incidents involving the same whale. We also estimated the number of PCFG, OR-SVI, and Makah U&A whales that may be subjected to unsuccessful harpoon attempts and approaches. However, if the Tribe is only authorized to hunt in the summer months, we assume that all whales approached would be PCFG whales. Therefore, the Tribe would be limited to 142 approaches per year. Our results are shown in Table 4-11.

Estimates for unsuccessful harpoon attempts and approaches on WNP whales are based on the analysis by Moore and Weller (2019). Their analysis assumed that all approaches (hunting and training) in a given year would occur during the winter/spring when WNP whales may be present. Given that assumption, if 353 approaches are made every year during the 10-year waiver, we would expect up to 18 WNP whales to be approached (0.5% times 3,530 approaches)(Table 4-11). Thus, Alternative 7 would result in more behavioral disturbance to WNP gray whales due to approaches than the No-action Alternative and Alternatives 4 and 5 but less than Alternative 2, 3, and 6. However, it is likely that fewer than 18 WNP whales would be approached because we would expect a substantial number of approaches to occur during the summer when ocean conditions are more favorable for training and, during summer/fall hunts, when approaches are restricted to July through October. If the Tribe does not receive permits for winter/spring hunts, unsuccessful strike attempts and approaches will be limited to the summer/fall hunt months when WNP gray whales are not expected to be present.

4.1.6.5 Potential Number of Shots Fired or Grenade Explosions

For the reasons described under Alternative 2 in the 2015 DEIS (Subsection 4.1.2.5), we estimate there would be 16 rifle shots and three grenade explosions for each harvested whale. In winter/spring hunts, we estimate up to 48 shots fired (16 shots times three whales harvested) and up to nine grenade explosions (three grenade explosions times three whales harvested) per year. In summer/fall hunts, only one whale may be harvested; however, two whales may be pursued and struck if the first whale is struck and lost. To be precautionary, in summer/fall hunts, we estimate up to 32 shots fired (16 shots times two whales) and up to six grenade explosions (three grenade explosions times two whales) per year (Table 4-11). However, it is unlikely that all of these shots and explosions would occur if (1) the first whale is harvested or (2) it was struck and lost and able to evade hunters quickly and not elicit all of the estimated shots and explosions. If the Tribe receives authorization to hunt in the winter/spring months, the maximum average annual number of rifle shots and grenade explosions under Alternative 7 would be 40 and 8, respectively.

It is likely that rifle shots and grenade explosions will result in behavioral disturbance of nearby whales. Grenade explosions may also cause temporary hearing threshold shifts in gray whales. However, it is unlikely that hunters would fire rifles or grenades at a whale before it has been

“made fast” with a harpoon attached to a buoy, largely limiting the impacts to the whale being harvested. Given these considerations and the small number of shots fired and grenade explosions that are expected per year under Alternative 7, it is unlikely that these activities will have a discernable impact on the ENP gray whale stock’s abundance, rate of growth, or distribution, or that these activities will affect their migration. Still, the risk of disturbance associated with rifle shots and grenade explosions under Alternative 7 is higher than under the No-action Alternative and Alternatives 4 and 5 but less than under Alternatives 2, 3, and 6.

Table 4-11. Estimated number of strikes, unsuccessful harpoon attempts, and approaches of ENP, PCFG, OR-SVI, Makah U&A (MUA), and WNP whales under Alternative 7.

Whales & Mixing Proportions	Number of Strikes				Number of Unsuccessful Harpoon Attempts				Number of Approaches		
	Winter/Spring Hunt / Summer/Fall Hunt				Winter/Spring Hunt / Summer/Fall Hunt						
	Annual	6-Yr	10-Yr	10-Yr Total ^a	Annual	6-Yr	10-Yr	10-Yr Total ^a	Annual	6-Yr Total	10-Yr Total ^a
ENP Winter/Spring = 100% Summer/Fall= 100%	3 / 2	9 / 6	15 / 10	25	18 / 12	54 / 36	90 / 60	150	353 ^b /142 ^c	2118 ^b /852 ^c	3530 ^b /1420 ^c
PCFG Winter/Spring = 27.1% Summer/Fall= 100%	0.8 / 2	2.4 / 6	4.1 / 10	14.1 ^d	4.9 / 12	14.6 / 36	24.4 / 60	84.4	142 ^e	852 ^e	1420 ^e
OR-SVI Winter/Spring = 25.9% Summer/Fall= 100%	0.8 / 2	2.3 / 6	3.9 / 10	13.9	4.7 / 12	14.0 / 36	23.3 / 60	83.3	142 ^e	852 ^e	1420 ^e
MUA Winter/Spring= 22.54% Summer/Fall= 100%	0.7 / 2	2.0 / 6	3.4 / 10	13.4	4.1 / 12	12.2 / 36	20.3 / 60	80.3	142 ^e	852 ^e	1420 ^e
WNP Winter/Spring= 0.5% Summer/Fall= 0%	0.01 / 0	0.05 / 0	0.08 / 0	0.08	0.09 / 0	0.27 / 0	0.45 / 0	0.45	1.77 ^f	10.6 ^f	17.65 ^f

a. The 10-Yr Total values for strike limits and unsuccessful harpoon attempts are based on the assumption that the Tribe will receive authorization for winter/spring hunts to occur in alternating years. Under this scenario, there will be 5 winter/spring hunts and 5 summer/fall hunts over the course of the waiver period. If the Tribe does not receive permits for winter/spring hunts, the 10-year totals are those values reported for Summer/Fall hunts under the preceding 10-yr columns.

b. The maximum approach estimates for ENP gray whales assume that the Tribe has received permits to conduct training and hunting approaches during the winter/spring months. The approach limits are the same for winter/spring hunt years and summer/fall hunt years, and they assume that each year the Tribe will make the maximum allowable approaches (hunting and training) on gray whales.

c. If the Tribe does not receive permits to conduct hunting and training activities in the winter/spring months, hunting and training approaches will be limited to the summer/fall months when we assume that every whale approached is a PCFG whale. Therefore, the number of approaches will be limited to 142 annually.

d. For comparison, the maximum allowable number of strikes on PCFG whales is 16 over the 10-year waiver period.

e. These PCFG, OR-SVI, and MUA approach estimates are conservative because they assume that all approaches (hunting and training) in a given year occur during the summer/fall period when 100% of the whales encountered are assumed to be PCFG, OR-SVI, and MUA whales, and that the Tribe will use all of the allowable approaches for PCFG whales (142 approaches). If the Tribe receives a permit to conduct hunting and training activities to occur in the winter/spring months, we would expect some of the approaches to occur during the winter/spring period.

f. These WNP approach estimates—based on Moore and Weller (2019)—are conservative because they assume that all approaches (hunting and training) in a given year occur during the winter/spring period when WNP whales may be present. Realistically we would expect a substantial number of approaches to occur outside this period, i.e., during the summer when ocean conditions are more favorable for training and, in summer/fall hunts, when hunting approaches are restricted to July–October.

4.1.6.6 Low Abundance Thresholds

The impacts to the affected environment under Alternative 7 are analyzed without a low abundance threshold for the ENP stock as well as with three potential thresholds, below which hunting would cease. Sub-alternative 7(a) would set a low abundance threshold of 11,000 ENP gray whales. This threshold represents the lowest estimated abundance from which the population has increased in the 53-year time series of data for the stock. Under Sub-alternative 7(b), the abundance threshold would be 16,000 animals. This threshold is based on the OSP analysis conducted by Punt and Wade (2012), which concluded that the MNPL for the ENP gray whale stock was approximately 16,000 whales. Setting the abundance threshold at the estimated MNPL for the stock will prevent a hunt from taking place if the population drops below OSP. Finally, under Sub-alternative 7(c), the abundance threshold would be 18,000 animals. This threshold uses the upper 95% confidence interval of the most recent abundance estimate before the start of the ongoing 2019 UME (30,000 whales) as an estimate of carrying capacity (K) to update the Punt and Wade (2012) analysis, resulting in an estimated MNPL of approximately 18,000 whales.

Alternative 7 would implement two abundance thresholds for PCFG gray whales in tandem with one another: an abundance estimate (N) of 192 whales and a minimum abundance estimate (N_{\min}) of 171 whales. The most recent abundance *and* minimum abundance estimates must remain above these levels for hunting to be authorized. These thresholds represent the lowest population abundance estimates during a recent stable period from which the population has grown in the time series of data from 1996 through 2017.

Although it is difficult to determine the likelihood of triggering any of the abundance thresholds during the 10-year waiver period, implementing such a threshold increases the probability that hunting may cease for one or more years. This would result in fewer whales struck, subjected to unsuccessful harpoon attempts, and approached than the estimates reported in Table 4-11.

4.2 Water Quality

Subsection 4.2.1 of the DEIS describes how hunt-related activities could affect water quality in two ways: (1) through fuel and contaminant spills from the vessels associated with the hunt; and (2) through the runoff of fluids from the harvested whale carcass temporarily stored at the Makah Transfer Station. The DEIS's evaluation of the risk of spills and groundwater contamination under each alternative was based on two parameters: the number of days with hunt-related trips and the total number of whales harvested. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the

analysis already completed under DEIS Subsection 4.2.3, Evaluation of Alternatives (Water Quality).

As with the other action alternatives, Alternative 7 could result in an increased risk of fuel or other contaminants being spilled into the marine environment compared to the No-action Alternative. During winter/spring hunts, an estimated 60 days of hunt-related activities would occur during a period with rough ocean conditions, increasing the risk of spills due to capsizing or colliding. During summer/fall hunts, there would be 7-14 days with hunt-related trips during a period when more favorable ocean conditions would lessen the risk of such spills. However, because of the more favorable conditions, more recreational vessels could be present in the action area, resulting in an increased risk of vessel collisions. This impact may be mitigated by the small number of days involving hunt-related trips, the location of the hunts in this large and remote area of the Pacific Ocean, the small size of vessels, and U.S. Coast Guard regulations associated with the moving exclusionary zone (see DEIS subsection 1.4.2).

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number of 37 days with hunt-related trips (300 winter/spring days plus 70 summer/fall days divided by the 10-year span of the waiver period). Alternative 7 would, therefore, result in a smaller risk of spills than Alternatives 2, 3, and 6 (each with 60 days of hunt-related trips). However, Alternative 7 would result in a greater risk than the No-action Alternative (0 days), as well as Alternatives 4 and 5 (14 and 22 days of hunt-related trips, respectively).

In any year, Alternative 7 would result in negligible impacts to groundwater quality because the portions of whales that hold the highest contaminant levels would likely be harvested from the carcasses before they are stored at the transfer station or disposed of at a distant landfill or at sea. Also, groundwater does not serve as a drinking water source in the project area. Under Alternative 7, a maximum of three whale carcasses would be stored at the Makah Transfer Station during winter/spring hunts and one carcass during summer/fall hunts). With an average harvest of two whales per year, any risk to groundwater quality under Alternative 7 would be lower than under Alternatives 2, 3, 5, and 6, which each allow for three to five carcasses to be stored at the transfer station per year. Alternative 7 would pose a small but higher risk than Alternative 4 (up to one carcass per year) and the No-action Alternative (0).

If the Tribe does not receive authorization to hunt during some or all of the winter/spring hunting seasons, the overall impacts of Alternative 7 on water quality could be lower than estimated here. However, it is difficult to determine the likelihood and magnitude of such a scenario in such a way as to compare it against the other six alternatives. Implementing one of the low abundance thresholds for the ENP stock included in Sub-alternatives 7(a) through (c) may also reduce the impacts on water quality below those analyzed above under Alternative 7 without a threshold. As described below in Subsection 4.4.1, Change in Abundance and Viability of the ENP Gray Whale Stock, of this SDEIS, the threshold under Sub-alternative 7(a) is the least likely to be triggered or reduce the number of authorized hunting years over the waiver period of the three sub-alternatives, and, therefore, the least likely to reduce the number of days with hunt-related trips and the number of whales harvested. Sub-alternative 7(c), on the other hand, carries the highest likelihood of being triggered and could reduce the number of authorized hunting years significantly. Therefore, if a low abundance threshold for the ENP stock is included in the final

rule, we expect impacts on water quality might be lowest under Sub-alternative 7(c) and highest under Sub-alternative 7(a).

4.3 Marine Habitat and Species

Subsection 4.3.1 of the DEIS describes how hunt-related activities could affect marine habitat and species in two ways: (1) potential direct effects from hunt-related activities, such as disturbance associated with marine vessel traffic or disposition of whale carcasses; and (2) potential indirect effects resulting from the removal or harassment of gray whales from the local ecosystem, such as reduced benthic disturbance by feeding whales and decreased consumption of pelagic and epibenthic prey. The DEIS's evaluation of impacts to marine habitat and species under each alternative was based on two parameters; the number of hunting days with hunt-related trips and the total number of whales harvested under each alternative. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.3.3, Evaluation of Alternatives (Marine Habitat and Species).

As with the other action alternatives, Alternative 7 would result in an increased risk of direct disturbance of fish and other pelagic species compared to the No-action Alternative. During winter/spring hunts, there would be an estimated 60 days of hunt-related trips and the hauling of up to three carcasses of harvested whales which might disturb fish or other pelagic species in the project area. During summer/fall hunts, there would be 7-14 days with hunt-related trips and the hauling of one harvested whale carcass. Any such disturbance would, however, likely be minor (vessels are small and the area is large and highly energetic), local (limited to waters near the activity), and of short duration (minutes to hours). Because any disturbance would be minor, localized, and short-term, it would be unlikely to result in an appreciable change in the presence, distribution, or abundance of fish and other pelagic species in the project area, compared to the No-action Alternative.

Also, as noted in DEIS Subsection 3.3.3.1, the consumption of pelagic prey by gray whales is not likely a significant factor in structuring pelagic communities relative to the highly variable and energetic oceanographic and climatic processes characteristic of the project area. The physical features and ephemeral, seasonal, interannual, and interdecadal physical oceanographic processes largely control the abundance, distribution, and species composition of pelagic prey in the region. However, even assuming that gray whales do play a substantial role in structuring pelagic communities, the potential relative change in the number of whales under this and the other action alternatives would probably not result in any appreciable ecological effects. The number of whales allowed to be removed represents far less than 1% of the ENP gray whale population. Furthermore, the number of whales potentially removed is substantially smaller than the observed levels of interannual variability in whale abundance within the project area. Consequently, any relative change in the quantity of pelagic prey consumed because of removal of whales under Alternative 7 would be negligible and lower than the expected levels of natural variability.

Hunting under Alternative 7 may remove gray whales from the Tribe's U&A during the summer feeding period. Given that consumption of pelagic prey by gray whales is not likely a significant factor in structuring pelagic communities, as described above, even this outcome would not affect pelagic communities in the project area.

The expected amount of disturbance to the benthic environment—especially eelgrass, surfgrass, kelp beds, and shellfish communities—would depend on the specific route of hunt-related vessels, as well as the location of these communities relative to the landing beach for any whale carcasses. Since the marine plant, macroalgal, and shellfish communities in the project area thrive in a highly energetic and disturbance-prone nearshore environment, any hunt-related disturbance effects would likely be negligible relative to the high levels of natural background disturbance. Furthermore, the high capacity of these species for growth and recolonization suggests that hunt-related disturbance effects, if any, would be short-lived. Similarly, any direct disturbance to kelp rafts would likely be negligible relative to the background physical processes affecting the generation and distribution of kelp rafts in the project area.

As discussed above, in evaluating the potential consequences for the pelagic environment of whale removal, the potential change in the number of whales under this and the other action alternatives would be small relative to the overall whale population and natural levels of variability in whale presence. Consequently, the removal of one to several whales per year would likely not appreciably change background levels of benthic disturbance or the quantity of benthic prey consumed. Furthermore, the best available information indicates that feeding aggregations (the whales) and feeding areas (the prey) are dynamic, with both small- and large-scale changes over time and space. Gray whales may play a role in structuring benthic and epibenthic communities in the project area, though the relative importance is unclear. Benthic communities are strongly affected by the presence of benthic features (e.g., submarine canyons), physical disturbance processes (such as storms, wave action, and the movement and accumulation of sediments), and ephemeral, seasonal, interannual, and interdecadal physical and biological processes affecting the delivery of organic material from productive surface waters.

Any whales struck and killed but lost would affect the benthic environment by providing “whale fall” microhabitats. This would also be the case for carcasses of any whales harvested and disposed of at sea. As a whale carcass decays on the ocean floor, it provides an ephemeral habitat associated with a unique and diverse invertebrate community. Whale falls occur naturally when individuals die and sink to the sea floor. Under Alternative 7, up to two or three whales may be struck and lost per year (presumably resulting in whale falls). No estimates are available for the annual level of natural mortality that may occur within the project area. Such an estimate would be useful for establishing a background level of whale falls expected to occur naturally in the project area, enabling a comparison with the number of additional whale falls that might be generated under the action alternatives. Compared to the annual level of natural mortality for the ENP gray whale stock as a whole (with an estimated annual mortality rate of about 2% (Punt and Wade 2012), which works out to approximately several hundred whales dying per year, most of which likely become whale falls either inside or outside of the project area), the addition of two to three whale falls annually under Alternative 7 would be minor.

To compare the overall impact of hunt-related trips on pelagic and benthic environments under Alternative 7 to the impacts of the other six alternatives, we use an annual average number of 37 days with hunt-related trips (300 winter/spring days plus 70 summer/fall days divided by the 10-year span of the waiver period). Alternative 7 would, therefore, result in a smaller risk of disturbance than Alternatives 2, 3, and 6 (each with 60 days of hunt-related trips per year). However, Alternative 7 would result in a greater risk than the No-action Alternative (0 days) as well as Alternatives 4 and 5 (14 and 22 days of hunt-related trips, respectively). The overall impact of whale falls/carcass disposal under Alternative 7 (2.5 whales per year on average)

would also be intermediate to the other alternatives, i.e., lower than the three to five whales under Alternatives 2, 3, 5 and 6, and slightly higher than the zero to one whales under the No-action Alternative and Alternative 4, respectively. If the Tribe does not receive authorization to hunt during some or all of the winter/spring hunting seasons, the overall impacts of Alternative 7 on the marine habitat could be lower than estimated here; however, it is difficult to determine the likelihood and magnitude of such a scenario in such a way as to compare it against the other six alternatives.

Implementing a low abundance threshold for the ENP stock may also reduce impacts on the marine habitat and species below those already analyzed under Alternative 7 without a threshold. As described below in Subsection 4.4.1, Change in Abundance and Viability of the ENP Gray Whale Stock, of this SDEIS, the threshold under Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips and the number of whales harvested over the waiver period of the three sub-alternatives. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to the marine habitat while 7(a) could result in the greatest potential impact.

4.4 Gray Whales

Subsection 4.4.1 of the DEIS addresses the potential for the alternatives to affect gray whales across a range of biological scales, from individual whales to entire stocks. Five criteria were used to determine the potential for effects on gray whales under the alternatives: (1) change in abundance and viability of the ENP gray whale stock; (2) change in abundance and viability of the WNP gray whale stock; (3) change in abundance and viability of PCFG whales; (4) change in numbers of gray whales that utilize the Makah U&A and OR-SVI survey areas; and (5) welfare of individual whales. The DEIS's evaluation was based on the following parameters: the number of whales struck, harvested, approached, and subjected to unsuccessful harpoon attempts. The updates provided in Chapter 3 of this SDEIS and in Subsection 4.1, Introduction—in particular new abundance and encounter rate estimates—do not change the analyses already completed for Alternatives 1 and 4 under DEIS Subsection 4.4.3, Evaluation of Alternatives (Gray Whales). However, changes in these estimates do affect these parameters for Alternatives 2, 3, and 6, and these changes are described where appropriate in the following sections. Also, for Alternatives 1 through 6, we have not reassessed the welfare of individual whales in this SDEIS because the method of approaching, striking, and killing of whales has not changed, nor have the related estimates of time to death and hunting efficiency.

4.4.1 Change in Abundance and Viability of the ENP Gray Whale Stock

At the time of the 2015 DEIS, the best available ENP gray whale population estimate was 20,990 whales in 2011 (Durban et al. 2013). Additional surveys since then have reported several years of high calf production and an increasing trend in population abundance to a high of 26,960 whales in 2016 (Durban et al. 2017) before dropping again to 20,850 in 2020 (Steward and Weller 2021). In 2019, the ENP population began experiencing a higher than normal number of strandings, leading NMFS to declare a UME, but we are not yet able to determine how the population will respond nor the factor(s) driving the event (see Subsection 3.2.2).

The updated abundance estimates do not affect the analysis of impacts on ENP whales described in the DEIS, nor do they affect the PBR-based estimates calculated for PCFG whales (a

component of the ENP stock) for Alternatives 2 through 6. The best available information continues to support a finding that the ENP gray whale stock remains well within the OSP range calculated by Punt and Wade (2012). The most recent NMFS stock assessment report (Carretta et al. 2021) notes that “[e]ven though the stock is within OSP, abundance will fluctuate as the population adjusts to natural and human-caused factors affecting carrying capacity” and it “is expected that a population close to or at carrying capacity will be more susceptible to environmental fluctuations.” That report also estimates an annual level of human-caused mortality and serious injury of 139 ENP gray whales, the vast majority of which (128) are whales killed by native Russian hunters.

As described in Subsection 4.1, Introduction, the catch limit for the ENP gray whale stock set by the IWC for 2019 through 2025 would remain the same for all seven alternatives—980 whales over 6 years and a strike limit of 140 in any one year. The difference among the alternatives is how much of that catch limit would be allocated to the Makah Tribe. Because it is likely the United States would transfer any unused share of the catch limit to Russia (Subsection 4.1, Introduction), and all action alternatives (including Alternative 7) contemplate the same overall catch limit for the stock, all of the alternatives would have the same effect on the abundance and viability of the ENP gray whale stock as a whole.

Even if the United States did not transfer any unused share of the catch limit to Russia, the annual removal of one to seven whales under any of the action alternatives (including the two to three whales contemplated under Alternative 7) would still keep human-caused mortalities to a level well below the annual PBR level of 801 animals per year (Carretta et al. 2021). In addition, under Alternative 7, the annual number of ENP whales approached (up to 353) or subjected to unsuccessful harpoon attempts (12-18) are the same or lower than the numbers analyzed in the DEIS for action Alternatives 2-6. Over the 10-year waiver period, this would result in up to 25 gray whales killed, 150 whales subjected to unsuccessful harpoon attempts, and 3,530 whales approached.

In order to determine the impacts of allowing hunting to continue until the ENP stock reaches a particular low abundance threshold on the viability of the ENP gray whale stock, we analyze the hunt in terms of the proportion of the population that would be impacted by strikes, unsuccessful strike attempts, and approaches at each threshold. The maximum number of whales that could be killed over the 10-year waiver period (25 whales) represents 0.2% of the low abundance threshold under Alternatives 7(a) and 7(b), and 0.1% of the threshold under Sub-alternative 7(c). The maximum number of whales that might be subjected to unsuccessful harpoon attempts and training throws (150 whales, assuming that each strike attempt is made on a different individual) represents 1.4% of the threshold under Sub-alternative 7(a), 0.9% of the threshold under Sub-alternative 7(b), and 0.8% of the threshold under Sub-alternative 7(c). Finally, the maximum number of whales that may be approached over the waiver period (3,530 whales, assuming that every approach is made on a different individual) represents 32.1% of the threshold under Sub-alternative 7(a), 22.1% of the threshold under Sub-alternative 7(b), and 19.6% of the threshold under Sub-alternative 7(c) (Table 4-12).

Table 4-12. Percent of the ENP gray whale stock that may be killed, subjected to unsuccessful harpoon attempts, or approached over the 10-year waiver period at each of three low abundance thresholds analyzed as Sub-alternatives.

Abundance Estimate (N)	Percent of the Population Killed^a	Percent of the Population Subjected to Unsuccessful Harpoon Attempts^b	Percent of the Population Approached^c
11,000	0.23	1.36	32.09
16,000	0.16	0.94	22.06
18,000	0.14	0.83	19.61

- a. These percentages assume that the Tribe would utilize all 25 strikes over the course of the 10-year waiver period and that all strikes would result in the death of the whale struck.
- b. These percentages represent precautionary estimates, as they assume that the Tribe would utilize all 150 allowable unsuccessful strike attempts and training harpoon throws over the course of the 10-year waiver period and that each attempt would be made on a different individual.
- c. These percentages represent precautionary estimates, as they assume that the Tribe would utilize all 3,530 allowable approaches over the course of the waiver period, and that each approach would be made on a different individual.

It is difficult to estimate the probability of any of these three thresholds being triggered. In the 55 years since systemic research monitoring of the ENP gray whale population began in 1967, the abundance estimate has fallen below these threshold levels 0, 8, 14 times, respectively. Because the threshold for Sub-alternative 7(a) represents the lowest abundance (approximately 11,000 whales in 1971-1972) in the time series from which the population has recovered, there are no empirical data to determine when or if the population has ever dropped below that threshold prior to 1967. The last time the abundance estimate dropped below 16,000 whales was during the 1992/1993 survey season, after the stock experienced a severe decline from the 1987/1988 estimate of 26,916 whales. The ENP stock increased the following year to 20,944 whales. The last time the abundance estimate for the ENP gray whale stock dropped below 18,000 whales was in the 2007/2008 survey season when the abundance of the stock was estimated at 17,820. Once again the stock rebounded the next year to 21,210 whales.

While we cannot assign a probability of being triggered to any of the three thresholds analyzed here, we can qualitatively determine that the threshold of Sub-alternative 7(a) is the least likely of the three to be triggered, while the threshold of Sub-alternative 7(c) is the most likely to be triggered. Once the threshold has been triggered, hunting would cease until the abundance estimate increased above the threshold once again. This could result in several years during the waiver period in which no hunting would be allowed. Therefore, it is possible that fewer whales may be killed under Sub-alternative 7(c) than under Sub-alternative 7(b), and that fewer whales may be killed under Sub-alternative 7(b) than under Sub-alternative 7(a). However, as highlighted in Table 4-12, the impacts to the population under all three of the thresholds are expected to be minimal.

Therefore, as with Alternatives 2 through 6, it is reasonable to conclude that Alternative 7 and each of its sub-alternatives are unlikely to have a measurable effect on the abundance and viability of the ENP gray whale stock as a whole. This conclusion is consistent with a recent analysis by the IWC Scientific Committee, which concluded that the hunt management plan met the conservation objectives of the IWC, including ensuring that ENP gray whales (including the PCFG component) would remain at or above the level resulting in the highest net recruitment (IWC 2018).

4.4.2 Change in Abundance and Viability of the WNP Gray Whale Stock

As noted in Subsection 3.2.1.1, Western North Pacific (WNP) Gray Whales, the most recent abundance estimate for the WNP gray whale stock is 290 whales, of which 175-192 whales are estimated to be predominantly part of a Sakhalin feeding aggregation (Cooke 2017; Cooke et al. 2018). The WNP stock is not targeted for harvest under any of the alternatives, and the IWC has not established a catch limit for WNP gray whales, nor are they included in the catch limit established for ENP gray whales (Subsection 3.4.3.2, Western North Pacific (WNP) Gray Whales, of the DEIS). Like Alternative 4, the timing of summer/fall hunts (July through October) under Alternative 7 is even more restrictive so as to completely avoid times when a WNP whale might be present in the hunt area. During winter/spring hunts under Alternative 7, the probability of an individual encounter being a WNP gray whale is very remote (0.05%; Moore and Weller 2019) and would be similar to other action alternatives allowing for springtime hunts (i.e., Alternatives 2, 3, 5, and 6). Additionally, in contrast to all other action alternatives, Alternative 7 would impose a precautionary measure requiring hunting to cease if NMFS determines that a WNP whale had been struck. Therefore, Alternative 7 and its sub-alternatives are not expected to have a detectable impact on the abundance or viability of WNP whales. This conclusion is consistent with a recent analysis by the IWC Scientific Committee, which concluded that WNP gray whales would remain viable under the hunt management plan (IWC 2018). Implementing a low abundance threshold for the ENP stock may further reduce the likelihood of encountering a WNP gray whales. Due to the relative likelihood of triggering the respective thresholds in Alternatives 7(a), 7(b), and 7(c), Sub-alternative 7(c) could result in the lowest relative risk to WNP gray whales, with Sub-alternative 7(a) posing the highest relative risk. This reduced risk would result from a reduction in the number of hunting years when the low abundance threshold was triggered during the waiver period.

4.4.3 Change in Abundance and Viability of PCFG Whales

As noted in Subsection 3.2.1.3, Pacific Coast Feeding Group (PCFG) of Gray Whales, the most recent abundance estimate for the PCFG is 212 whales and has generally increased over the past 20 years (Harris et al. in prep.). During winter/spring hunts under Alternative 7, encounter rates and impacts on PCFG whales would be similar to those experienced under other spring-time hunt Alternatives (2, 3, 5 and 6). During summer/fall hunts, impacts on PCFG whales would be similar to Alternative 4's summer/fall hunt, except that female PCFG whales would be subject to harvest under Alternative 7. The average number of PCFG whales killed under Alternative 7 would be 1.4 whales per year (based on halving the estimated 0.8 killed in winter/spring hunts and a maximum of 2.0 killed in summer/fall hunts; see Table 4-11), which is less than half the estimated PBR level of 3.5 whales per year (Carretta et al. 2021) and slightly more than one-tenth the number of whales estimated to recruit to the PCFG each year (10.4 whales; Harris et al. in prep.). Given these percentages and the increasing trends in the abundance of PCFG whales during the past 20 years, it is unlikely that the death of one to two whales per year would result in a detectable decrease in the abundance of the PCFG.

The overall impact on the viability of the PCFG from removing 1.4 PCFG whales per year under Alternative 7 would be intermediate to the other alternatives, i.e., lower than the 3-5 whales under Alternatives 2, 3, 5 and 6, and slightly higher than the 0-1 whales under the No-action Alternative and Alternative 4, respectively (see Table 4-13). The annual number of PCFG whales estimated to be approached (up to 142) would be the same as under Alternatives 2, 3, and 6 but

higher than under the No-action Alternative and Alternatives 4 and 5; however, the impacts of these approaches are likely to be minor and temporary. In addition, under Alternative 7, the number of PCFG whales subjected to unsuccessful harpoon attempts (5-12) under Alternative 7 is similar to or lower than the under Alternatives 2-6. Also, in contrast to the other action alternatives that rely on annual PCFG harvest or mortality limits, Alternative 7 would impose: (1) a mortality limit set at 16 PCFG whales over 10 years, no more than eight of which may be females; and (2) a stop-hunt trigger if the abundance estimate or forecasted abundance of the PCFG falls below 192 whales, or the minimum abundance falls below 171 whales. These safeguards—in addition to the small number of whales potentially killed relative to the informational PBR and the recruitment levels noted above—are expected to ensure the viability of the PCFG over time. This conclusion is consistent with a recent analysis by the IWC Scientific Committee which concluded that the PCFG of gray whales would remain viable under the hunt management plan specified by Alternative 7 (IWC 2018).

It is possible that the impacts to the PCFG could be further reduced if the Tribe does not receive the requisite authorization to conduct one or more winter/spring hunts, or if a low abundance threshold for the ENP stock is implemented and triggered during the waiver period, reducing the number of years during which hunting and hunt-related activities would be allowed to take place. Similar to the risk to WNP whales, due to the relative likelihood of triggering the respective thresholds in Alternatives 7(a), 7(b), and 7(c), Sub-alternative 7(c) could result in the lowest relative impact to PCFG gray whales, with Sub-alternative 7(a) posing the highest relative impact.

In 2019 the ENP population began experiencing a higher than normal level of strandings, leading NMFS to declare a UME for the stock, but it is too soon to determine how the population will respond nor the factor(s) driving the event (see Subsection 3.2.2, Strandings). To date, only two UME whales have been identified as PCFG animals (J. Calambokidis pers. comm., Cascade Research Collective, January 12, 2021). Although the abundance estimate for the ENP stock demonstrated a 23% decline from the 2015/2016 to 2019/2020 abundance surveys, the PCFG abundance estimate has not experienced a proportional decline from pre-UME levels to 2020 (Harris et al. in prep.).

4.4.4 Change in Numbers of Gray Whales in Repeatedly Sighted in the Makah U&A and OR-SVI Areas

As noted in Subsection 3.2.1.3, Pacific Coast Feeding Group (PCFG) of Gray Whales, the most recent estimates of the number of whales that have been sighted in the Makah U&A and OR-SVI survey areas in two or more years are 119 and 199, respectively. These estimates have steadily increased over the past 20 years (Harris et al. in prep.). During winter/spring hunts under Alternative 7, encounter rates and impacts on whales would be similar to those experienced under other spring-time hunt Alternatives (2, 3, 5 and 6). During summer/fall hunts, impacts on Makah U&A and OR-SVI whales would be similar to Alternative 4's summer/fall hunt, except that female whales would be subject to harvest under Alternative 7. The average number of Makah U&A and OR-SVI whales killed under Alternative 7 would be 1.4 whales per year (approximately 0.8 whales in even year hunts and two whales in summer/fall hunts). For Makah U&A whales, this level of removal is 12-31% of the 6.5 new whales seen within the Makah U&A each year (Harris et al. in prep.). For OR-SVI whales, this level of removal is 6-16% of the 12.7 new whales sighted in the OR-SVI each year (Harris et al. in prep.). Therefore, given these

percentages and the increasing trends in number of whales sighted in these subareas during the past 20 years, it is uncertain whether the death of one to two whales per year would result in a detectable decrease in numbers of whale repeatedly sighted in the Makah U&A and OR-SVI survey areas.

The overall impact on the abundance from removing 1.4 Makah U&A or OR-SVI whales per year under Alternative 7 would be intermediate to the other alternatives, i.e., lower than the three to five whales under Alternatives 2, 3, 5 and 6, and slightly higher than the zero to one whales under the No-action Alternative and Alternative 4, respectively (see Table 4-13). The annual number of Makah U&A and OR-SV whales estimated to be approached (up to 142) would be higher than the other alternatives; however, the impacts of these approaches are likely to be minor and temporary. In addition, under Alternative 7, the annual number of Makah U&A and OR-SVI whales estimated to be subjected to unsuccessful harpoon attempts (4-12) are similar to or lower than the numbers analyzed in the DEIS for action Alternatives 2-6. Also, in contrast to the other action alternatives that rely on annual PCFG harvest or mortality limits, Alternative 7 would impose: (1) a mortality limit set at 16 PCFG whales over 10 years, no more than eight of which may be females; and (2) a stop-hunt trigger if the forecasted abundance of the PCFG falls below 192 whales, or the minimum abundance falls below 171 whales. A low abundance threshold for ENP gray whales could also reduce the number of years in which hunting and hunt-related activities could take place during the waiver period. These safeguards would also accrue to Makah U&A and OR-SVI whales given that they belong to the PCFG.

In 2019, the ENP population began experiencing a UME, but it is too soon to determine how the population will respond or the factor(s) driving the event (see Subsection 3.2.2, Strandings). To date, only two UME whales have been identified as PCFG animals, and they had both been sighted previously in the Makah U&A and OR-SVI regions (Calambokidis et al. 2019; J. Calambokidis pers. comm., Cascade Research Collective, January 12, 2021). There is no evidence to suggest that the current UME is having a disproportionate impact on the PCFG (or whales in the Makah U&A and OR-SVI subareas) have occurred relative to the entire ENP stock.

Table 4-13. Number of PCFG, OR-SVI, and Makah U&A whales that may be killed under each alternative (maximum and likely), assuming a low abundance threshold is not triggered.

Group of Whales		No Action	Alternative 2 ^a	Alternative 3	Alternative 4	Alternative 5 ^b	Alternative 6	Alternative 7
		Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr	Annual / 6-Yr / 10-yr ^c
Maximum # Killed		0	5 ^d 30 50	4 ^e 24 40	1 ^f 6 10	1 6 10	3.5 21 35	Summer/fall 2; Winter/spring 3 15 25
PCFG Whales 27.1%	Likely # Killed^g	0	1.9 11 19	1.1 6.5 10.8	0.5 3 5	0.25 1.5 2.5	1.0 5.7 9.5	Summer/fall 2; Winter/spring 0.8 8 14
OR-SVI Whales 25.9%			1.8 11 18	1.0 6.2 10.4		0.24 1.4 2.4	0.9 5.4 9	Summer/fall 2; Winter/spring 0.8 8 14
Makah U&A Whales 22.54%			1.6 9.5 16	0.9 5.4 9		0.21 1.3 2.1	0.8 4.7 8	Summer/fall 2; Winter/spring 0.7 8 14

- Likely estimates for Alternative 2 are based on 7 strikes per year.
- Based on current estimates and assumes that all whales are struck and lost and subsequently die (see accounting rationale under Subsection 4.1.4 Alternative 5, Split-Season Hunt, *Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed*).
- Annual values based on a maximum of 2 whales struck in a summer/fall hunt and 3 whales struck in a winter/spring hunt. Six- and ten-year values are based on these alternating annual values.
- This would happen if two PCFG whales were struck and lost (under Alternative 2 they would not be counted against the harvest limit) before three PCFG whales were landed and identified.
- Based on current estimates and assumes that at least one of the four whales (maximum) is struck and lost (see accounting rationale under Subsection 4.1.2 Alternative 3, Offshore Hunt, *Maximum and Likely Number of PCFG, OR-SVI, and Makah U&A Whales Killed*).
- Only male PCFG whales can be approached under this alternative. Theoretically, a maximum of seven whales could potentially be killed under this alternative, but this would require the PCFG abundance to more than triple, which is highly unlikely. The likely estimates reported here are based on the assumption that all whales are PCFG, OR-SVI, and MUA whales, and the current estimate of 1 whale killed every 2 years (see accounting rationale under 4.1.3 Alternate 4, Summer/Fall Hunt).
- These numbers represent an estimate based on proportional presence in early season photo-identification data reviewed by Harris et al. (in prep.) and on an assumption of number of whales struck each year (see Tables 4-4, 4-6, 4-8, 4-10, and 4-12). Six- and ten-year estimates are rounded to the nearest whole number (except for Alternative 5 which relies on the carry-over of any unused fraction of the mortality limit to determine hunt frequency).

4.5 Other Wildlife

Subsection 4.5.1 of the DEIS describes how hunt-related activities could affect wildlife other than gray whales in three ways: (1) physical disturbance; (2) changes in prey availability; and (3) physical injury. These impacts could be the potential result of visual and noise disturbance from aircraft, boat traffic, and the use of guns and explosives. The DEIS's analysis of the risk to other wildlife focused on four of the hunt parameters: the number of days with hunt-related activities, the number of rifle shots or grenade explosions, the timing of the hunt, and the location of the hunt. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.5.3, Evaluation of Alternatives (Other Wildlife).

As with the other action alternatives, Alternative 7 would result in an increased risk of impacts to wildlife (other than gray whales) in the action area compared to the No-action Alternative. Under Alternative 7, the hunt would take place within the same geographic area as Alternatives 2, 4, 5, and 6 (the Makah U&A west of the Bonilla-Tatoosh line), without the explicit prohibition on striking whales within 200 yards of Tatoosh Island or White Rock, but with other site and time restrictions possible to protect the Olympic Coast National Marine Sanctuary resources. The hunt timing differs from other alternatives. It would follow a split-season schedule in which hunting would take place December 1 through May 31 during winter/spring hunts and July 1 through October 31 during summer/fall hunts (Subsection 2.1.2, Timing of Hunt). Much like Alternative 4, the summer/fall hunting seasons under Alternative 7 would take place when many species in the project area are engaged in activities that are associated with breeding, such as nesting, incubating, or feeding young. Based on estimates of the number of rifle shots or grenade explosions per whale harvested, Alternative 7 would likely result in as many as 40 shots fired and eight grenade explosions per year, on average, over ten years (240 shots fired in winter/spring hunts plus 160 shots fired in summer/fall hunts divided by ten years; 45 grenade explosions in winter/spring hunts plus 30 grenade explosions in summer/fall hunts divided by ten years).

The potential for any given hunt-related trip to result in adverse effects on birds, turtles, or marine mammals other than gray whales would be the same as under Alternative 2 in winter/spring hunts and Alternative 4 in summer/fall hunts. For this reason, this analysis considers the effects on marine mammals and all other wildlife species together. To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number of 37 days with hunt-related trips (300 winter/spring days plus 70 summer/fall days divided by the 10-year span of the waiver period) as well as the annual average number of rifle shots or grenade explosions reported above. Alternative 7 would therefore result in a smaller risk of disturbance to other wildlife than Alternatives 2, 3, and 6 (each with 60 days of hunt-related trips and higher numbers of shots/explosions). As with Alternative 4, however, Alternative 7 would result in a greater potential to disrupt key activities, such as breeding in the summer/fall hunting season. Alternative 7 would result in a greater risk than the No-action Alternative (0 days and 0 shots/explosions), as well as Alternatives 4 and 5, each with less than 22 days of hunt-related trips and fewer than 32 shots and six explosions. However, the overall number of days with hunt-related trips in the summer and fall months—when hunting activities would have the potential to disrupt key activities such as breeding for many species—is the same as Alternative 4 over the 10-year waiver period (35-70 under Alternative 4 versus 35-70 under Alternative 7). If the Tribe does not receive authorization to hunt during some or all of the winter/spring hunting seasons, the overall impacts of Alternative 7 on other wildlife could be lower than estimated here; however, it is not possible to determine the likelihood and magnitude of such a scenario in such a way as to compare it against the other six alternatives.

Implementing a low abundance threshold for the ENP stock may reduce the impacts on other wildlife below those already analyzed under Alternative 7 without a threshold. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on other wildlife, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of hunt-related trips, rifle shots, and explosive projectiles used over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to

occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to other wildlife while 7(a) could result in the greatest potential impact.

4.6 Economics

Subsections 4.6.1 and 4.6.2 of the DEIS describe the potential for hunt-related activities to affect economic conditions in five different economic sectors of the project area: (1) tourism; (2) the household use of whale products, including the manufacture and sale of handicrafts; (3) the whale-watching industry; (4) shipping and ocean sport/commercial fishing; and (5) hunt-related management and law enforcement. The DEIS's evaluation of the potential for impacts in these five sectors depended largely on five hunt parameters: the total number of whales killed, the number of strikes, the number of harpoon attempts, and the number of approaches. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.6.3, Evaluation of Alternatives (Economics).

Compared to the No-action Alternative, under which there would be no hunting, Alternative 7 would likely result in: (1) minor short-term increases in tourism on or near the approximately 37 days per year when hunt-related trips would be expected to occur (based on the 10-year span of the waiver period); (2) an increase of one to three whales annually available for household use; (3) negligible changes in whale-watching revenues, (4) minor increases in the potential for interference with shipping and sport/commercial fishing, and (5) an increase in expenditures for management and law enforcement during the average of 37 days per year with hunt-related trips (see Table 4-14 below).

Alternative 7 would have the same conditions as Alternative 2 regarding the hunt area and methods and, in winter/spring hunts, would have the same hunt season. In summer/fall hunts, the timing of the hunt would be similar to Alternative 4. Assuming the Tribe receives authorization to hunt during all five winter/spring hunt seasons over the 10-year waiver period, hunt-related trips would likely occur on an average of 37 days per year, with approximately 60 days with hunt-related trips annually in winter/spring hunts and up to 14 days with hunt-related trips annually in summer/fall hunts. As a result of this alternating hunt season schedule under Alternative 7, potential impacts to tourism, commercial shipping traffic, sport and commercial fisheries, and management and law enforcement sectors are difficult to compare with Alternatives 2 through 6. Over the proposed 10-year waiver period, impacts to these sectors under Alternative 7's winter/spring hunts would occur on half the number of days estimated for Alternatives 2, 3, and 6. These hunts would also occur during the winter/spring when there would be less activity in these sectors. Impacts under Alternative 7's summer/fall hunts would occur over an estimated 70-140 days during the summer/fall, which is the same or less than estimated for Alternatives 4 and 5 (up to 140 and 220 days over 10 years, respectively). It is expected that hunt-related activities would have greater impacts during the summer/fall when there is generally more traffic and tourism in the vicinity of the hunt area. For this reason, it is possible that Alternative 7 would result in greater impacts to these economic sectors than Alternatives 2, 3, and 6, which do not allow hunting during the summer/fall. Similarly, Alternative 7 would likely have greater impacts than Alternatives 4 and 5 due to the additional large number of days (300 over 10 years) that would occur as a result of the winter/spring hunts.

Table 4-14. Estimated costs of enforcement-related activities and resources.

Entity	Unit Cost	No-action Alternative		Alternatives 2, 3 & 6		Alternative 4		Alternative 5		Alternative 7	
		Freq.	Cost	Freq.	Cost	Freq.	Cost	Freq.	Cost	Freq.	Cost
U.S. Coast Guard	\$86,068 per day	*	*	60 days	\$5.2 million	7 days	\$602,476	22 days	\$1.9 million	37 days	\$3.2 million
Washington Department of Fish and Wildlife Police	\$1,427 per day	*	*	60 days	\$85,620	7 days	\$9,989	22 days	\$31,394	37 days	\$52,799
Clallam County Sheriff	\$2,089 per day	*	*	60 days	\$125,340	7 days	\$14,623	22 days	\$45,958	37 days	\$77,293
NMFS Enforcement and Monitoring	\$2,086 per day	*	*	60 days	\$125,160	7 days	\$14,602	22 days	\$45,892	37 days	\$77,182
NMFS Gray Whale Monitoring	\$75,000 per year	*	*	Annual	\$75,000	Annual	\$75,000	Annual	\$75,000	Annual	\$75,000
Total Annual Costs (rounded)		*		\$5.6 million		\$717,000		\$2.1 million		\$3.5 million	

Implementing a low abundance threshold for the ENP stock may reduce the economic impacts to these sectors below those already analyzed under Alternative 7 without a threshold. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on the tourism, commercial shipping, sport and recreational fishing, and enforcement sectors, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to these sectors while 7(a) could result in the greatest potential impact.

Alternative 7, resulting in a maximum of 2.5 whales killed per year on average, would include greater restrictions than Alternatives 2, 3, and 6 on the maximum number of whales that could be killed per year. As a result, Alternative 7 would result in an increase, compared to the No-action Alternative, in the amount of whale products available for household consumption and the manufacturing and selling of traditional handicrafts. This increase would be less than Alternatives 2, 3, and 6 (under which a maximum of 4, 4 and 3.5 whales may be harvested per year, respectively) but greater than Alternatives 4 and 5 (under which one whale may be harvested per year under current conditions). However, if the Tribe does not receive authorization to hunt during one or more winter/spring hunting seasons, the total number of whales harvested over the waiver period could be reduced, decreasing the availability of whale products for household consumption and the manufacturing and selling of handicrafts.

Implementing a low abundance threshold for the ENP stock may reduce the availability of whale products available to the Tribe. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on the availability of whale products, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the number of

whales harvested over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(a) is likely to result in the highest availability of whale products, while 7(c) may restrict the availability of such products the most.

As noted in the DEIS (Subsection 4.6.2.3, Whale-watching Industry), it is unlikely that Makah whale hunting under any of the action alternatives would have more than a negligible effect on whale watching. To the extent such an impact did occur, the amount of risk would probably depend on the number of whales that could be killed, struck, or exposed to unsuccessful harpoon attempts and approaches. Under Alternative 7, such risks would be associated with an annual average of 15 whales exposed to unsuccessful harpoon attempts, one to three whales struck, and 353 whales approached (Table 4-11). These estimates indicate that any risks under Alternative 7 would be intermediate to those of the other action alternatives, i.e., while these estimates are greater than those associated with the relatively limited hunting allowed under Alternative 4, nearly all of these values are less than or equal to those expected under Alternatives 2, 3, 5, and 6. Although it is not possible to estimate the amount of decrease that might occur in revenues or employment associated with whale watching as a result of any action alternative, for the reasons provided in Subsection 4.6.2.3 of the DEIS, Whale-watching Industry, it is unlikely that whale hunting under Alternative 7 and its sub-alternatives would have more than a negligible effect.

4.7 Environmental Justice

Executive Order 12898, *Environmental Justice*, requires that federal agencies identify and address the “disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” As described in Subsection 3.7, Environmental Justice, of the 2015 DEIS, the Makah Tribe is a low-income, as well as a minority, population. Utilizing the guidance developed by the EPA Office of Civil Rights and Environmental Justice, the DEIS identifies three relevant environmental justice indicator categories to be evaluated for this action: economics, the social environment, and ceremonial and subsistence resources. These categories correspond to effects discussed elsewhere in the DEIS and this SDEIS (Subsections 4.6, 4.8, and 4.10, respectively of the DEIS and SDEIS), however this section specifically analyses impacts in these sectors to the Makah Tribe. The EPA guidelines also indicate that impacts on human health should be considered. However, as discussed in Subsection 4.16, Human Health, of the DEIS, available information is insufficient to assess the potential of any of the alternatives to affect human health, either positively or negatively.

The following subsections compare the potential for the alternatives to affect conditions in the affected area as they pertain to environmental justice. For each alternative, the discussion addresses the potential economic, ceremonial and subsistence resources, social environment, and human health effects on the Makah Tribe and other low-income or minority populations. The DEIS’s evaluation of the potential for economic impacts related to tourism-related benefits to the tribe and household consumption of whales depended largely on two hunt parameters: the number of days per year with hunt-related trips and the number of whales harvested. Effects on ceremonial and subsistence resources and the social environment would be related to the extent to which hunting is allowed. The updates provided in Chapter 3 of the SDEIS do not alter these parameters under Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.7.3, Evaluation of Alternatives (Environmental Justice).

4.7.1 Economics

Business activity at tourist-related enterprises in Neah Bay generates jobs and income for tribal members (Subsection 3.6.3.2.4 of the DEIS, Contribution of Tourism to the Local Economy). Here we analyze the impacts of the Preferred Alternative on tourism in Neah Bay to determine if there are any adverse effects on the Makah Tribe and other low-income or minority populations in or near the action area. Alternative 7 would have the same conditions as Alternative 2 regarding the hunt area and methods and, in winter/spring hunts, would have the same hunt season. In summer/fall hunts, the timing of the hunt would be similar to Alternative 4. Hunt-related trips would likely occur on an average of 37 days per year over the proposed 10-year waiver period, with approximately 60 days with hunt-related trips annually in the winter/spring hunts and up to 14 days with hunt-related trips annually in summer/fall hunts. As a result of this alternating hunt season schedule under Alternative 7, potential impacts to tourism are difficult to compare with Alternatives 2 through 6. Over the proposed 10-year waiver period, impacts under Alternative 7's winter/spring hunts would occur on half the number of days estimated for Alternatives 2, 3, and 6. These hunts would also occur during the winter/spring when there would be less activity in these sectors. Impacts under Alternative 7's summer/fall hunts would occur over an estimated 70-140 days during the summer/fall, which is the same or less than estimated for Alternatives 4 and 5 (up to 140 and 220 days over 10 years, respectively). It is expected that hunt-related activities would have greater impacts during the summer/fall when there is generally more traffic and tourism in the vicinity of the hunt area. For this reason, it is possible that Alternative 7 would result in greater impacts to tourism than Alternatives 2, 3, and 6, which do not allow hunting during the summer/fall. Similarly, Alternative 7 would likely have greater impacts than Alternatives 4 and 5 due to the additional large number of days (300 over 10 years) that would occur as a result of the winter/spring hunts, unless the Tribe does not receive permits for any winter/spring hunts. The relative impacts to tourism of Alternative 7's three sub-alternatives are described above in Subsection 4.6, Economics, of this SDEIS.

Alternative 7 would include greater restrictions than Alternatives 2, 3, and 6 on the maximum number of whales that could be killed per year, resulting in a maximum of 2.5 whales killed per year on average. As a result, Alternative 7 would result in an increase, compared to the No-action Alternative, in the amount of whale products available for household consumption, and the manufacturing and selling of traditional handicrafts. This increase would be less than Alternatives 2, 3, and 6 (under which a maximum of 4, 4 and 3.5 whales may be harvested per year, respectively), but greater than Alternatives 4 and 5 (under which one whale may be harvested per year under current conditions). A reduction in the number of winter/spring hunts over the waiver period, however, could reduce the availability of whale products for household consumption. The relative impacts of Alternative 7's three sub-alternatives on the availability of whale products are described above in Subsection 4.6, Economics, of this SDEIS.

4.7.2 Ceremonial and Subsistence Resources

In contrast to the No-action Alternative, Alternative 7 would have multiple positive ceremonial and subsistence effects on the Makah Tribe associated with a resumption of whale hunting. Alternative 7, like the other action alternatives, would be consistent with the Makah's stated need for the whale hunt, which is to allow the Tribe to exercise its whale hunting rights to provide a traditional subsistence resource to the community and to sustain and revitalize the ceremonial, cultural, and social aspects of its whale hunting traditions.

Under Alternative 7, the maximum number of whales harvested would be limited to three in winter/spring hunts and one in summer/fall hunts. This results in an average of 2.5 whales per year over the 10-year waiver period if the Tribe receives authorization to hunt in the winter/spring months. Therefore, the positive effects that the Makah would experience as a result of a resumption of whale hunting could be larger under Alternative 7 than under Alternatives 4 or 5, but smaller than under Alternatives 2, 3, and 6. If the Tribe does not receive authorization to hunt in any winter/spring seasons, the effects under Alternative 7 would be the same as under Alternative 4, but still larger than under Alternative 5. Implementing a low abundance threshold for the ENP stock may reduce the number of whales harvested under Alternative 7 by reducing the number of authorized hunting years. It is possible that Sub-alternative 7(c) could provide the fewest ceremonial and subsistence resources of the three sub-alternatives, with 7(a) being the likeliest to provide the most, based on the relative likelihood of triggering the three potential thresholds.

4.7.3 Social Environment

In contrast to the No-action Alternative, the environmental justice benefits to the social environment (for example, increased social bonding within the Makah Tribe) that the Tribe attributes to whale hunting would be realized under Alternative 7. However, social tensions exist between tribal members who support the hunt and those who don't. Whale hunts under Alternative 7 may exacerbate these tensions. There is insufficient information to determine whether the potential social benefits to the Makah Tribe would offset the potential adverse social effects. Consequently, it is impossible to determine if Alternative 7 would result in disproportionately high adverse effects.

Alternative 7 would make it possible for the Tribe to carry on traditional whale hunting that is sanctioned by the IWC. In contrast to the No-action Alternative, official recognition that traditional activities such as whale hunting are culturally valuable, despite their controversial nature, would likely be reassuring to other Native American individuals and communities. Strike limits under Alternative 7 would provide fewer opportunities for hunting than under Alternatives 2, 3, and 6, and, therefore, less social benefit to the Makah Tribe. Conversely, there would be a greater number of whale hunts than under Alternatives 4 and 5, resulting in greater social benefits. Implementing a low abundance threshold for the ENP stock may reduce the number of whale hunts under Alternative 7. By potentially reducing the number of authorized hunting years and, therefore, the number of strikes over the 10-year waiver period, it is possible that Sub-alternative 7(c) could provide the fewest opportunities for hunting and, therefore, the least social benefit of the three sub-alternatives, with 7(a) being the likeliest to provide the most opportunities for hunting based on the relative likelihood of triggering the three potential thresholds. The social benefit to the Tribe could be reduced under Alternative 7 if they do not receive authorization for one or more winter/spring hunts.

4.8 Social Environment

Subsection 4.8 of the DEIS addresses the potential for the alternatives to affect the social environment of the Makah Tribe, other tribes, and the public. NMFS' decision to authorize or deny the hunt could create tension between the various groups opposed to and in support of the hunt, and like-minded groups could experience moments of increased social bonding under either scenario. Under the action alternatives, each hunt attempt would probably result in protests

and media coverage, with the associated effects described in Subsection 4.8.2, Evaluation Criteria (Social Environment), of the DEIS. On the other hand, each hunt would also be expected to result in increased opportunities for social bonding between like-minded observers and members of the Makah Tribe. Therefore, the DEIS determined that the hunt parameter most likely to affect the social environment of the Makah Tribe, other tribes, and the general public was the number of days with hunt-related activities that may result in both protests and increased social bonding. The updates provided in Chapter 3 of the SDEIS do not alter the number of days with hunt-related activities under Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.8.3, Evaluation of Alternatives (Social Environment).

Under Alternative 7, there would likely be 60 days with hunt-related trips in winter/spring hunts and 7 to 14 days with hunt-related trips in summer/fall hunts, or an average of 37 days per year over ten years (300 days for winter/spring hunts and up to 70 days for summer/fall hunts, each divided by 10 years). This would be fewer than under Alternatives 2, 3, and 6, with up to 60 days with hunt-related activities each. Alternatives 4 and 5 involve fewer days with hunt-related activities (14 and 22, respectively) and, therefore, would provide fewer opportunities for both social tension and bonding, unless the Tribe does not receive authorization for any winter/spring hunts during the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce number of hunting days under Alternative 7. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on the social environment of the Makah Tribe, other tribes, and the public, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(a) is likely to result in the most opportunities for social tension and bonding while 7(c) may provide the fewest opportunities.

As noted in the DEIS, the degree of tension expressed by some hunt opponents might also be affected by the number of PCFG whales likely to be killed. Using current population parameters (see Subsection 4.1 and Table 4-13), it is likely that an average of one to two PCFG whales would be killed per year under all of the action alternatives, except Alternative 5's one whale every 4 years.

4.9 Cultural Resources

Subsection 4.9 of the DEIS addresses the potential for the alternatives to affect cultural resources in the project area, including historical sites, archaeological sites, and traditional cultural properties. Two historical sites listed on the National Register of Historic Places occur in the waters or shoreline of the Makah U&A, Tatoosh Island and the Wedding Rock petroglyphs (described in DEIS Subsection 3.9.3.1, National Historic Register Sites). Fort Núñez Gaona–Diah Veterans Park, another culturally important site, is located in Neah Bay. The DEIS considers the impacts of the action alternatives in aggregate and concludes that it is improbable that any of these sites would be affected by activities under any alternative directly related to harvesting a whale, such as towing a whale to shore, butchering, and transporting whale products from the landing site or trampling of these sensitive sites by observers and hunters. It also concludes that under the action alternatives, the cultural value of unlisted sacred sites would be

enhanced by their use for whale hunting-related ceremonies. The updates provided in Chapter 3 of this SDEIS and the addition of Alternative 7 and its sub-alternatives do not change the analysis already completed under DEIS Subsection 4.9, Cultural Resources.

4.10 Ceremonial and Subsistence Resources

Subsection 4.10 of the DEIS addresses the potential for the alternatives to affect the Makah Tribe's efforts to revive ceremonial and subsistence practices associated with hunting and using whales, which in turn affect Makah culture. The DEIS's evaluation used several criteria to determine the potential for effects on these practices: (1) access to whale hunting opportunities; (2) subsistence use; (3) traditional knowledge and activities; (4) spiritual connection to whale hunting; and (5) cultural identity. Key parameters in that evaluation included the harvest limit, the number of days of hunting, the time of year the hunts occur, and the location of the hunt. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.10.3, Evaluation of Alternatives (Ceremonial and Subsistence Resources).

As with the other action alternatives, Alternative 7 would enable tribal members to engage in subsistence use activities and, thus, increase from no opportunity to hunt whales (under the No-action Alternative) to an opportunity to hunt in the coastal portion of the Tribe's U&A. During winter/spring hunts, there would be an estimated 60 days of hunt-related activities for tribal hunters to harvest up to 3 whales. During summer/fall hunts there would be 7-14 days with hunt-related trips for tribal hunters to harvest one whale. Due to the alternating hunt years' framework under Alternative 7, there would be a substantial 13-month period (from June 1 to July 1 of the following year) during which hunters would not be able to pursue whales for harvest. However, ceremonial and subsistence practices would be promoted by hunt training, which could occur year-round so long as no more than 353 gray whales were approached each year during hunting expeditions or training exercises. Also, tribal hunters could make training harpoon throws (using a mock harpoon) on up to 18 whales at any time during winter/spring hunt years and on up to 12 whales between July and October in summer/fall hunt years (although these annual limits also include unsuccessful harpoon attempts during actual hunts). The benefits of utilizing ceremonial and subsistence practices could be reduced, however, if the Tribe does not receive authorization for one or more winter/spring hunts during the course of the waiver period.

In addition to the satisfaction tribal members would derive from the increased subsistence use of harvested whales under Alternative 7, their spiritual connection to whaling would be current and ongoing, rather than a connection to a past activity that can no longer be pursued. New generations of Makah would have active whalers as role models and be able to participate in whale hunting activities and develop, apply, and transmit traditional knowledge of whale hunting; and learn and use words related to whale hunting. Also, the whale-hunting ceremonies that whalers and family members would follow for the hunt (e.g., hunting rituals, spiritual training, songs, and dances) could provide the Makah with an additional social framework, which could contribute to social and spiritual community stability.

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number (based on the 10-year span of the waiver period) of two whales harvested per year and 37 days with hunt-related trips. Therefore, ceremonial and subsistence practices associated with whale harvests under Alternative 7 would be lower than action Alternatives 2, 3, 5, and 6 (each of which allow for the annual harvest of three to five whales)

and higher than Alternative 4 (one whale per year)—unless the Tribe does not receive authorization for any winter/spring hunts during the waiver period—and the No-action Alternative (0 whales). Similarly, ceremonial and subsistence practices associated with whale hunts under Alternative 7 would be lower than action Alternatives 2, 3, and 6 (each with 60 days of hunt-related trips) and higher than Alternatives 4 and 5, each with less than 22 days of hunt-related trips— unless the Tribe does not receive authorization for any winter/spring hunts— as well as the No-action Alternative (no trips).

Implementing a low abundance threshold for the ENP stock may reduce the number of days with hunt-related trips relative to that which is already analysed under the Preferred Alternative without a threshold. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on the Tribe's efforts to revive ceremonial and subsistence practices, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the number of whales harvested and the number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(a) is likely to result in more opportunities to employ ceremonial and subsistence practices, while 7(c) may result in the fewest.

4.11 Noise

Subsection 4.11 of the DEIS describes the potential for the alternatives to affect sensitive noise receptors in the project area, specifically receptors in the human environment exposed to hunt-related noise (including vessels, aircraft, or firearms). The DEIS's evaluation used two criteria to determine the potential for effects on sensitive noise receptors under the alternatives. The first is the anticipated intensity and duration of noise produced by hunt-related activities (including vessels, vehicles, and aircraft involved in the hunt, protests, media coverage, and law enforcement, as well as weapons used to strike and/or kill a whale). The second is anticipated noise levels at sensitive sites, as indicated by the distance between noise sources and potential receptors. These criteria were based on three parameters: the number of days of scouting and hunting, the number of rifle shots or grenade explosions, and the distance from shore of hunt-related discharges. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.11.3, Evaluation of Alternatives (Noise).

As with the other action alternatives, Alternative 7 would result in increased effects on sensitive noise receptors compared to the No-action Alternative (although much of the hunting-related noise under Alternative 3 would likely be inaudible to sensitive receptors on shore because it would occur more than 5 miles (8 km) from shore). These noise effects would come from motorized vessels and aircraft on days when tribal members are scouting or hunting for whales, and from weapons discharged during a hunt. The area with the greatest potential for disturbance from hunt-related activities under any of the action alternatives is Neah Bay, where most protests and law enforcement activities occurred during the previous hunts. If protest vessels moor at Clallam Bay, as they did during the previous hunts, increased noise levels would also be expected there and possibly along the travel route between Clallam Bay and Neah Bay.

During winter/spring hunt seasons, whale hunts would likely occur on approximately 60 days from December through May, provided the Tribe receives an ITA for WNP whales, allowing

them to hunt in those months. Based on estimates of the number of rifle shots or grenade explosions per whale harvested, Alternative 7 would be likely to result in as many as 48 rifle shots or nine grenade explosions annually. In contrast to the No-action Alternative (under which there would be no hunt-related noise), increased noise from vessels, aircraft, and weapons associated with whale hunts under Alternative 7 may be audible to recreational users of the OCNMS, the Makah Reservation, and the Olympic National Park. The number of recreational visitors who may be affected would be limited, however, because hunting would be restricted to the winter and early spring months when visitation is comparatively low.

During summer/fall hunt seasons, whale hunts would likely occur on 7-14 days from July through October. Based on estimates of the number of rifle shots or grenade explosions per whale harvested, Alternative 7 would be likely to result in as many as 32 rifle shots or six grenade explosions annually. In contrast to the No-action Alternative, increased noise from vessels, aircraft, and weapons associated with whale hunts under Alternative 7 may be audible to recreational users of the OCNMS, the Makah Reservation, and the Olympic National Park. Like Alternative 4, Alternative 7 would have a greater potential to result in the disturbance of recreational users in the project area than the other action alternatives because whale hunts would likely occur during the peak period of recreational use and may target whales that are feeding relatively close to shore (compared to whales that are migrating farther off shore at other times of year). The elevated potential for disturbance would occur on fewer days, however (e.g., 7-14 days under Alternative 7 versus 22-60 days under Alternatives 2,3,5 and 6).

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number (based on the 10-year span of the waiver period) of 37 days with hunt-related trips and up to 40 rifle shots and 7.5 explosive projectiles to harvest two whales per year. Alternative 7 would therefore result in a lower potential for adverse aesthetic effects than Alternatives 2, 3, and 6, each with 60 days of hunt-related trips and higher numbers of shots/explosions. However, Alternative 7 would result in a greater risk than the No-action Alternative (0 days and 0 shots/explosions), as well as Alternatives 4 and 5, each with less than 22 days of hunt-related trips and fewer than 32 shots and six explosions, unless the Tribe does not receive authorization for any winter/spring hunts over the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce the overall amount of noise generated during the 10-year waiver period compared. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c), we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of hunt-related trips, rifle shots, and explosive projectiles used over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to sensitive noise receptors while 7(a) could result in the greatest potential noise impact.

4.12 Aesthetics

Subsection 4.12 of the DEIS describes the potential for the alternatives to result in adverse aesthetic effects on observers, based on the potential for viewers to see the whale hunt, either directly or through the media. Whale hunting and related activities under the action alternatives would be short-term and localized and would take place upon the water; such activities,

therefore, would not affect natural visual resources in the project area, such as stacks, pillars, and islands. The DEIS's evaluation used two criteria to determine the potential for aesthetic effects under the alternatives. The first criterion is the anticipated number of persons who may be present at sites that may offer views of hunt-related activities, as well as their expectations (that is, whether individuals may encounter views of hunt-related activities without intending to do so). The second criterion includes the anticipated amount, intensity, duration, scope, and content of media coverage. These criteria were based on two parameters: the likely number of hunting days each year and the likely number of days with hunt-related trips. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.12.3, Evaluation of Alternatives (Aesthetics).

As with the other action alternatives, Alternative 7 would result in increased aesthetic effects compared to the No-action Alternative (which would have adverse aesthetic effects on interested observers who desire to view a hunt). Under all of the action alternatives, interested observers could view a whale being hunted, towed to shore, or butchered from numerous points along the shoreline near Neah Bay and, to a lesser degree, the Pacific coast portion of the Makah U&A. Viewers not desiring to see a hunt, such as recreational users in the portions of the OCNMS, Olympic National Park, and Makah Reservation, may encounter views of hunt-related activities without expecting to do so.

During winter/spring hunt seasons, whale hunts would likely occur on approximately 60 days from December through May, provided the Tribe receives an ITA for WNP whales, allowing them to hunt in those months. Hunts might be visible to observers at beaches and vantage points along the Pacific coast portion of the project area. Hunt-related activities would take place during the winter and spring when recreational use of these areas is typically lower than during the summer and fall months. Compared to the No-action Alternative, Alternative 7 would result in an increased potential for persons in the project area to view (intentionally or unintentionally) a whale being hunted, towed to shore, or butchered. During winter/spring hunts, this increased potential would occur on approximately 33 days per year. The number of potentially affected casual observers would be limited by the timing of the hunt during periods of relatively low visitation.

During summer/fall hunt seasons, whale hunts would likely occur on 7-14 days from July through October. Hunts might be visible to observers at beaches and vantage points along the Pacific coast portion of the project area. As with Alternative 4—but in contrast to most of the other action alternatives—hunt-related activities under Alternative 7's summer/fall hunts would likely take place during a period when recreational use of these areas is typically at its peak. In addition, whale hunting would target PCFG whales that are feeding in the project area and may, therefore, take place closer to shore than hunting that targets migrating whales further off shore. Compared to the No-action Alternative, Alternative 7 would result in an increased potential for persons in the project area to view (intentionally or unintentionally) a whale being hunted, towed to shore, or butchered. This increased potential would occur on approximately 7-14 days per year.

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number of 37 days with hunt-related trips (300 winter/spring days plus 70 summer/fall days divided by the 10-year span of the waiver period). Alternative 7 would

therefore result in lower potential for adverse aesthetic effects than Alternatives 2, 3, and 6 (each with 60 days of hunt-related trips). However, Alternative 7 would result in a greater risk than the No-action Alternative (0 days), as well as Alternatives 4 and 5 (14 and 22 days of hunt-related trips, respectively), unless the Tribe does not receive authorization for any winter/spring hunts over the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce the potential for adverse aesthetic effects. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on aesthetics, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential for adverse aesthetic effects while 7(a) could result in the greatest potential for adverse effects.

4.13 Transportation

Subsection 4.13 of the DEIS describes the potential for the alternatives to affect transportation resources in the project area. Each alternative is analyzed to determine the potential for a whale hunt and hunt-related activities in the project area to interfere with normal traffic patterns on highways, marine waters, and air routes near Neah Bay. In addition, the analysis addresses the potential for changes in traffic patterns to result in an increased risk of traffic accidents or to impede access by emergency services. The DEIS's evaluation was based on the amount of hunt-related activity, which in turn relied on the number of days of hunting and the time of year the hunts occur. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.13.3, Evaluation of Alternatives (Transportation).

As with the other action alternatives, Alternative 7 could elevate levels of marine and air traffic associated with whale hunts and would have the potential to interfere with normal traffic patterns and could increase the risk of accidents relative to the No-action Alternative. Although none of the alternatives would be likely to increase the volume of highway traffic, it is possible there could be road blockages associated with protests and ensuing law enforcement responses, creating the possibility of traffic accidents or impediments to access by emergency services.

During winter/spring hunt seasons, whale hunts would likely occur on approximately 60 days from December through May, provided the Tribe receives an ITA for WNP whales, allowing them to hunt in those months. These hunts would not overlap the peak periods for highway and air traffic. If most hunts take place during April and May, they would overlap the period during which there is a high volume of marine vessel traffic, particularly for recreational fishing in May. During summer/fall hunt seasons, an estimated 7-14 days with hunt-related trips would occur when highway, vessel, and air traffic are highest. Whale hunts during the summer and fall months would thus have a greater potential to affect traffic, especially commercial and recreational fishing traffic, compared to activities at other times of year.

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number (based on the 10-year span of the waiver period) of 37 days with hunt-related trips. The increased potential for effects on traffic would be less under Alternative 7 than Alternatives 2, 3, and 6, each with 60 days of hunt-related trips. However, Alternative 7

would result in greater impacts on traffic than the No-action Alternative (0 days), as well as Alternatives 4 and 5 with 14 and 22 days of hunt-related trips, respectively, unless the Tribe does not receive authorization for any winter/spring hunts over the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce the impacts of the hunt on transportation by reducing the number of authorized hunting years, should the selected threshold be triggered. As the highest threshold, Sub-alternative 7(c) carries the highest likelihood of being triggered and reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to transportation resources while 7(a) could result in the greatest potential impact.

4.14 Public Services

Subsection 4.14 of the DEIS describes the potential for the alternatives to affect public services in the project area. Each alternative is analyzed to determine the potential for the hunt and hunt-related activities to impede the ability of law enforcement to maintain order, and medical professionals and facilities to treat injuries. The DEIS's evaluation was based on the number of events requiring the attention of law enforcement and medical personnel, which in turn relied on the number of days of hunting and the time of year the hunts occur. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.14.3, Evaluation of Alternatives (Public Services).

As with the other action alternatives, Alternative 7 would increase adverse effects to public services compared to the No-action Alternative. During winter/spring hunt seasons, an estimated 60 days of hunt-related trips would occur during a period when vessels engaged in hunt-related trips would face an elevated risk of encountering unanticipated storms and capsizing, resulting in injuries. During summer/fall hunt seasons, an estimated 7-14 days with hunt-related trips would occur during a period when more favorable ocean conditions would lessen the risk of such accidents and injuries. During winter/spring hunts, inclement weather would result in comparatively fewer recreational visitors in the project area, reducing the likelihood that hunt-related incidents might occur when public services resources were engaged elsewhere. Summer/fall hunts would, however, occur during a comparatively busy time of year when law enforcement and medical services are more likely to be engaged elsewhere.

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number (based on the 10-year span of the waiver period) of 37 days with hunt-related trips. The increased potential for diversion of law enforcement resources or the occurrence of injuries that exceed the capabilities of local health facilities would be less under Alternative 7 than Alternatives 2, 3, and 6, each with 60 days of hunt-related trips. However, Alternative 7 would result in greater impacts on public services than the No-action Alternative (0 days), as well as Alternatives 4 and 5 with 14 and 22 days of hunt-related trips, respectively, unless the Tribe does not receive authorization for any winter/spring hunts over the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce adverse effects to public services under Alternative 7. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and

7(c) on public services, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could result in the lowest potential impact to public services while 7(a) could result in the greatest potential impact.

4.15 Public Safety

Subsection 4.15 of the DEIS describes how hunt-related activities could affect public safety due to injuries from weapons, boating accidents (including those associated with protest activities on the water), or from land-based protest activities. The DEIS's evaluation of the risk of injury under each alternative was based on three parameters: the harvest limit, the number of days of hunting, the time of year the hunts occur, and the location of the hunt. The updates provided in Chapter 3 of this SDEIS do not alter these parameters for Alternatives 1 through 6. Therefore, they do not change the analysis already completed under DEIS Subsection 4.15.3, Evaluation of Alternatives (Public Safety).

As with the other action alternatives, Alternative 7 would result in an increased risk to public safety compared to the No-action Alternative. During winter/spring hunt seasons, an estimated 60 days of hunt-related trips to harvest up to three whales (with up to 48 rifle shots and nine explosive projectiles) would occur during a period of rough ocean conditions, thereby increasing the risk of accidents, assuming the Tribe receives authorization to hunt during these months. During summer/fall hunts, an estimated 7-14 days with hunt-related trips to harvest one whale (with up to 32 shots and six explosive projectiles) would occur during a period when more favorable ocean conditions would lessen the risk of accidents.

To compare the overall impact of Alternative 7 to the impacts of the other six alternatives, we use an annual average number (based on the 10-year span of the waiver period) of 37 days with hunt-related trips and up to 40 rifle shots and 7.5 explosive projectiles to harvest two whales per year. Alternative 7 would, therefore, result in a smaller risk of injury from weapons, boating accidents, and protest activities to hunt participants, protestors, and bystanders than Alternatives 2, 3, and 6, each with 60 days of hunt-related trips and higher numbers of shots/explosions. However, Alternative 7 would result in a greater risk than the No-action Alternative (0 days and 0 shots/explosions) as well as Alternatives 4 and 5, each with less than 22 days of hunt-related trips and fewer than 32 shots and six explosions, unless the Tribe does not receive authorization for any winter/spring hunts over the waiver period.

Implementing a low abundance threshold for the ENP stock may reduce the risk to public safety under Alternative 7. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on public safety, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Sub-alternative 7(c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the annual average number of days with hunt-related trips, rifle shots, and explosive projectiles used over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to allow hunting to occur during all 10 years of the proposed waiver period. As such, of the three sub-alternatives, 7(c) could have the lowest potential impact to public safety while 7(a) could have the greatest potential impact.

4.16 Human Health

Subsection 4.16 of the DEIS discusses the issues that pertain to human health and hunt-related activities, specifically: (1) the potential nutritional benefits associated with consuming whale food products; (2) the potential for exposure to contaminants in food items from whale harvests; and (3) the potential for exposure to food-borne pathogens in food items from whale harvests. The DEIS's evaluation of each alternative was based on three criteria. The first is the change in nutritional benefits the Makah Tribe could experience under any of the alternatives. The second is the amount of environmental contamination tribal members might be exposed to as a result of consuming gray whale products. The last is the extent to which Makah tribal members would be exposed to food-borne pathogens as a result of processing and consuming whale products. The updates provided in Chapter 3 of this SDEIS do not change the analysis already completed for Alternatives 1-6 under DEIS Subsection 4.16.3, Evaluation of Alternatives (Human Health).

As with the other action alternatives, Alternative 7 would result in the consumption of freshly harvested gray whale food products. Consumption could increase exposure to contaminants or food-borne pathogens and would depend in part on the number of whales likely to be harvested per year. Using estimates in the DEIS analysis, harvesting an average of two gray whales per year under Alternative 7 (i.e., up to three whales in winter/spring hunts and one whale in summer/fall hunts) would yield 4 to 10 pounds (2 to 10 kg) of meat per capita and 8 to 10 pounds (4 to 10 kg) of oil or blubber per capita. Therefore, with an average harvest of two whales per year, any human health impacts under Alternative 7 would be lower than action Alternatives 2, 3, 5, and 6 (each of which allow for the annual harvest of three to five whales) and higher than Alternative 4 (zero to one whale per year) as well as the No-action Alternative (no whales per year).

Implementing a low abundance threshold for the ENP stock may reduce the amount of edible gray whale products available to the Tribe under Alternative 7. To compare the relative impacts of Sub-alternatives 7(a), 7(b), and 7(c) on human health, we consider the relative likelihood of triggering the low-abundance threshold of each sub-alternative. Of the three sub-alternatives, (c) carries the highest likelihood of reducing the number of authorized hunting years and, therefore, the total number of whales harvested over the waiver period. Sub-alternative 7(a), on the other hand, is most likely to result in the harvest of the full amount permitted under the waiver (20 whales). As such, of the three sub-alternatives, 7(c) could have the lowest potential impact to human health while 7(a) could have the greatest potential impact.

4.17 Regulatory Environment Governing Harvest of Marine Mammals

Subsection 4.17 of the DEIS assesses the potential for the alternatives to affect the regulatory environment governing the harvest of marine mammals. We used three criteria in that assessment. The first is the potential change in requests for waiver of the MMPA take moratorium to allow harvest in the United States of marine mammals other than whales. The second is the potential change in requests for regulatory action to authorize harvest of whales in the United States, which would require the application to the IWC for a catch limit, waiver of the MMPA take moratorium (with associated MMPA regulatory actions following NEPA review), and completion of a cooperative agreement under the Whaling Convention Act (WCA). The third is the potential change in IWC regulation of commercial, scientific, or aboriginal subsistence whaling. The updates provided in Chapter 3 of this SDEIS do not alter our assessment of the above criteria for Alternatives 1 through 6. Therefore, they do not change the

analysis already completed under DEIS Subsection 4.17.3, Evaluation of Alternatives (Regulatory Environment Governing Harvest of Marine Mammals).

Under Alternative 7, we would waive the take moratorium, adopt regulations, and issue permits under the MMPA in a manner consistent with the other action alternatives. Also, just as with Alternative 6, under Alternative 7 the waiver and implementing regulations would lapse after 10 years, and it is not possible to predict whether they would be replaced with a new waiver and implementing regulations or what the terms of any new waiver and regulations would be. We do not expect there to be a significant difference between the three sub-alternatives with respect to the impacts on the regulatory environment. Therefore, the overall impact of Alternative 7 is expected to be identical to Alternative 6, specifically:

- National Regulation of Marine Mammal Harvests – There could be an increased likelihood of future waiver requests from other applicants. However, we consider the increased likelihood to be small due to the complexity of the waiver process, the length of time required to complete the process, and the lack of resulting harvest opportunities. These factors would continue to limit interest in seeking MMPA waivers, even if a Makah whale hunt were authorized under one of the action alternatives. The most likely increase in waiver applications would come from other treaty tribes, who might view the approval of the Makah's application as a precedent for approval of additional waiver applications to take marine mammals that they had harvested traditionally and that remained important to them for cultural or other reasons. If authorization of a Makah hunt did lead to additional waiver requests, the outcome of any process to consider them would depend on a number of facts specific to the requests that are not presently known, making it speculative to conclude that the harvest of marine mammals nationally would change. Any additional waiver requests for marine mammals other than whales would be subject to analyses under NEPA and the MMPA.
- National Regulation of Whaling – The complexity of the process and length of time required to complete a waiver review for gray whales or other species would probably limit the interest of most potential tribal applicants, including the Makah Tribe. If authorization of an ENP gray whale hunt did lead to an additional waiver request by the Makah Tribe or other tribes, the outcome of any process would depend on a number of facts specific to those requests that are not presently known, making it speculative to conclude that the harvest of whales nationally would change as a result of issuing a waiver to the Makah Tribe.
- International Regulation of Whaling – Given the consistent U.S. position of opposing commercial and lethal scientific whaling while supporting aboriginal subsistence whaling, it is unlikely that NMFS' authorization of a Makah tribal hunt would change the United States' position on commercial and lethal scientific whaling or its ability to actively pursue its position. If a Makah whale hunt were to have a precedential effect on subsistence whaling, it is likely such an effect would have been manifested following approval of the initial U.S. request for a catch limit on the Makah Tribe's behalf. Therefore, we also consider it unlikely that authorization of a Makah whale hunt would change the international regulatory landscape for aboriginal subsistence whaling or lead to the increased harvest of whales in aboriginal subsistence whale hunts (relative to the No-action Alternative).

5.0 CUMULATIVE EFFECTS

5.1 Background

Section 5 of the 2015 DEIS considers the cumulative effects of each alternative on each resource in the context of the effects of past actions, current conditions, and reasonably foreseeable future actions and conditions, and is hereby incorporated by reference. This SDEIS includes the seventh alternative in our analysis, and examines the effects of the previously considered alternatives in light of the new information provided in Sections 3 and 4.

5.1.1 Geographical Area and Temporal Scope for Analysis

As described in Sections 1 and 2 and consistent with the other action alternatives, Alternative 7 would restrict gray whale hunts to the coastal portion of the Makah Tribe's U&A situated within the larger project area defined as the entire U&A and adjacent marine waters and land areas (refer to Figure 1-1). In accordance with CEQ guidance—and consistent with the DEIS—we consider this project impact zone (i.e., “project area”) as well as the entire range of the ENP stock (from the Arctic to Mexico) as the area best suited for analyzing cumulative impacts. This area contains essential breeding, feeding, and migration habitats for the ENP stock of gray whales (which the Tribe proposes to hunt), as well as the PCFG whales that are a key resource of interest. Also, within this area there are a wide range of activities that affect gray whales, ranging from site-specific impacts like ship strikes to large-scale impacts like climate change.

To determine the temporal scope of our cumulative impact analysis, we reviewed guidance by the CEQ (1997) that notes the appropriate time frame should account for how far into the future the effects of the proposed action are projected to last. Similarly, guidance by the EPA (1999) notes that the most common temporal scope is the life of the project and that the analysis “should extend until the resource has recovered from the impact of the proposed action.” In the 2015 DEIS, we concluded that it was not appropriate to limit our cumulative impact analysis to a specific time frame because the tribe's proposed action (Alternative 2) and all but one of the other action alternatives would have impacts for an indefinite period of time. Alternative 7 presented in this SDEIS is based on proposed hunt regulations that are expected to expire after 10 years; however, they could be extended. Therefore, we continue to conclude that because whales are long-lived animals and take 6 to 12 years to mature it may take a long time to detect if Alternative 7 is affecting gray whales as expected under current harvest models. In so doing, we recognize the long-term nature of Alternative 7 and its potential effects by acknowledging and considering them in the future.

5.1.2 Past, Present, and Reasonably Foreseeable Future Actions

Relevant past and present actions are those that have influenced the current condition of the resource. For the purposes of this SDEIS, past and present actions include both human-controlled events (such as subsistence harvest) and natural events (such as strandings) that also can be influenced by human activity. The cumulative impact analysis relies on the descriptions of current conditions (based on past and present actions) presented in Section 3 (Affected Environment). Reasonably foreseeable future actions are those that (1) have already been or are in the process of being funded or permitted, (2) are described or included as priorities in government planning documents, or (3) are likely to occur or continue based on traditional or past patterns of activity. Since the release of the DEIS, there are two classes of actions, harvest

and natural mortality, that warrant updates in this cumulative impact analysis. The basis for these updates and our assessment, which now includes Alternative 7, are described in the subsections below.

5.1.2.1 Harvest

Gray whales have been harvested by aboriginal hunters in the North Pacific for more than a thousand years (Krupnik 1984; O’Leary 1984). Details and issues related to past and present aboriginal harvest of gray whales can be found in the following subsections of the DEIS:

- 1.2.4.1.3, IWC Aboriginal Subsistence Whaling
- 1.4.1, Summary of Aboriginal Subsistence Whaling Catch Limits
- 3.4.3.3.4, ENP Status, Carrying Capacity, and Related Estimates
- 3.4.3.6.1, Aboriginal Subsistence Whaling
- 4.1.1.3, Potential Number of ENP and PCFG Whales Killed; Likelihood of Striking a WNP Whale; Likely Number of Whales Harvested
- 4.17, Regulatory Environment Governing Harvest of Marine Mammals

In this SDEIS, we have updated the estimates of aboriginal subsistence harvest (see Table 3-7), and note that there has been no substantive change in the recent harvest rates, i.e., 123 whales per year in the DEIS versus 122 whales per year during 2015-2019. However, as noted in Subsection 3.3 of this SDEIS (National and International Regulatory Environment), in 2018 the IWC adopted several new provisions in the ASW quota allocation process through amendments to the IWC Schedule (IWC 2018b). These provisions were aimed at easing the burden placed on ASW countries in obtaining and renewing their quotas, as well as allowing some stability and security for the indigenous subsistence hunters they represent.

Since 2004, the IWC Schedule has read as follows for the ENP gray whale stock catch limit:

The taking of gray whales from the Eastern stock in the North Pacific is permitted, but only by aborigines or a Contracting Government on behalf of aborigines, and then only when the meat and products of such whales are to be used exclusively for local consumption by the aborigines. (IWC Schedule 2005 and subsequent years, paragraph 13(b)(2))

Paragraph 13(b) of the current Schedule (IWC 2018b) sets catch limits for 2019 through 2025. Paragraph 13(b)(2) sets a catch limit of 980 ENP gray whales that is limited to 140 whales per year (reviewable annually by the IWC and its Scientific Committee). The catch limit (as conveyed in the Schedule) has stayed the same for more than 20 years, notwithstanding requests by the Chukotkans for more whales and notwithstanding the NMFS analysis that the ENP stock has a much higher PBR level (Subsection 3.2.1.2, Eastern North Pacific (ENP) Gray Whales). Also, during the past four Schedule cycles, when the Makah Tribe has not been able to harvest whales, the Chukotkans have harvested them instead (Subsection 4.4.1, Change in Abundance and Viability of the ENP Gray Whale Stock).

In this SDEIS, we have identified Alternative 7, which is based on proposed hunt regulations that require consistency with the IWC Schedule, including provision §216.113(a)(4)(v) which states:

“...the number of gray whales that the hunt permit may authorize to be landed in any calendar year will not exceed the number agreed between the United States and the Russian Federation as the U.S. share of the catch limit established by the International Whaling Commission” (66 FR 13604, April 5, 2019).

Given these considerations, we conclude that gray whales will continue to be harvested in aboriginal subsistence hunts at current or very similar levels with oversight by the IWC, regardless of whether a Makah hunt is authorized. We conclude that subsistence harvest of ENP gray whales at current levels, with close oversight by the IWC, is a reasonably foreseeable future action in the Chukotkan region (and possibly in the coastal portion of the Makah U&A if NMFS were to authorize a hunt) that will continue to impact gray whales.

5.1.2.2 Natural Mortality

Since January 2019, there has been an elevated number of gray whale strandings along the west coast of North America from Mexico through Alaska. This event was declared an Unusual Mortality Event (UME) in May 2019; see Subsection 3.2.2, Strandings. As of June 3, 2022, the UME is ongoing with 578 gray whales stranded along the coast of Mexico, the U.S., and Canada, with the greatest number of strandings concentrated in the U.S. (see Table 3-8). The UME coincides with a 24% decline in ENP gray whale abundance since 2016 (Stewart and Weller 2021). It resembles a similar 23% decline documented after a UME 20 years earlier, which we addressed in Subsection 3.4.3.1.7 of the DEIS. Full or partial necropsy examinations have been conducted on a subset of whales that have stranded in the current UME. Preliminary findings for several of the whales have shown evidence of emaciation; however, these findings are not consistent across all of the whales examined, so more research is needed.

As part of the UME investigation process, NMFS has assembled an independent team of scientists from the U.S., Canada, and Mexico to coordinate with the Working Group to review the data collected, sample stranded whales, consider possible causal-linkages between the mortality event and recent ocean and ecosystem perturbations, and determine the next steps for the investigation. The investigation may require months or even years of data collection, analysis, and interpretation.

Consistent with our assessment in the DEIS, we conclude that natural mortality is a reasonably foreseeable future event that will continue to impact North Pacific gray whales, and that the ENP gray whale stock will continue to fluctuate as it adjusts to natural and human-caused factors affecting the carrying capacity of the environment (Carretta et al. 2021). As described in Subsection 4.4 (Gray Whales), only two UME whales have been identified to date as PCFG animals. There is no evidence to suggest that the current UME is having a disproportionate impact on the PCFG relative to the entire ENP stock. If such impacts caused a significant decline in the PCFG, Alternative 7 contains conservative strike caps and low-abundance triggers that would prohibit hunting until the population increased above minimum abundance thresholds (see Subsections 2.1.5 and 4.4.3). The overall mortality resulting from the hunt under Alternative 7 is lower than the levels observed in the UME, and represents a small fraction of the population (0.0001% of the ENP stock). Therefore, the additional mortality resulting from the hunt would not have a discernable impact on the stock's abundance.

5.2 Gray Whales

Subsection 3.4 of the DEIS and Subsection 3.2 of this SDEIS provide a comprehensive review of the North Pacific gray whale stocks (both WNP and ENP) and the PCFG feeding aggregation inhabiting the project area. Subsection 4.4 of the DEIS and this SDEIS consider the potential impacts of the alternatives on the welfare of individual gray whales, as well as impacts on the abundance and viability of the larger stocks and PCFG (including whales in local survey areas within the PCFG range). The updates in abundance estimates presented in this SDEIS do not affect the analysis of impacts on ENP whales described in the DEIS, nor do they affect the conclusions reached for impacts to gray whales under Alternatives 2 through 6. The best available information continues to support a finding that the ENP gray whale stock remains well within the OSP range calculated by Punt and Wade (2012). As described in Subsection 4.4, Alternative 7 is expected to result in impacts on North Pacific gray whales that are similar or intermediate to the other action alternatives. Therefore, it is unlikely to have an appreciable effect on the abundance and viability of the ENP gray whale stock as a whole.

Since publishing the DEIS, the most significant change affecting our assessment of cumulative effects on gray whales is the recent and ongoing UME. In DEIS Subsection 5.4 we stated:

“It is too speculative to conclude that another mass stranding is likely in the future; however, it would be possible to mitigate for such a possible event by including measures in hunting regulations that would constrain hunting in the event of a mass stranding.”

While there is no evidence that the current UME has had a disproportionate impact on WNP and PCFG whales, in this SDEIS we have identified Alternative 7, which includes mitigating measures specifically designed to safeguard these populations. As noted in Subsection 5.1.3.4, we are actively investigating the current UME in conjunction with scientists in Canada and Mexico. In addition, the Scientific Committee of the IWC annually monitors the status of ENP gray whales. In the event that gray whale abundance declines as a result of human activities or other unforeseen causes, the IWC has a process in place to adjust catch limits for aboriginal subsistence hunting (Subsection 1.2.4.1.3, IWC Aboriginal Subsistence Whaling). Consistent with the framework of Alternative 7, such adjustments to catch limits could in turn affect the issuance of hunt permits under the proposed hunt regulations. This SDEIS also considers three Sub-alternatives to the Preferred Alternative that would implement an abundance threshold for the ENP stock below which hunting would cease. Such a threshold, if implemented, could serve as an additional precaution to protect the ENP stock. .

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