APPENDIX O

Biological Assessments

- U.S. Fish & Wildlife Service Letter of Concurrence dated November 2, 2017.
- U.S. Fish & Wildlife Service Biological Assessment - Section 7, V1.7, September 2017.
- National Marine Fisheries Service Letter of Concurrence dated March 29, 2018.
- National Marine Fisheries Service Biological Assessment - Section 7, V1.7, November 2017.

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U.S. Fish & Wildlife Service Letter of Concurrence dated November 2, 2017

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Anchorage Fish and Wildlife Conservation Office
4700 BLM Road
Anchorage, Alaska 99507-2546

IN REPLY REFER TO:
FWS/AFES/AFWCO

November 2, 2017

EMAILED TO:
Mr. Richard Darden
U.S. Army Corps of Engineers
Post Office Box 6898
Joint Base Elmendorf Richardson, Alaska 99506-0898

Subject: Donlin Gold Mine Project, Alaska (*Consultation 2017-I-0343*)

Dear Mr. Darden:

Thank you for requesting informal consultation with the U.S. Fish and Wildlife Service (Service), pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq., as amended; ESA), by correspondence received October 3, 2017. The U.S. Army Corps of Engineers (Corps) is requesting informal consultation on the proposed Donlin Gold Mine Project near the Native Village of Crooked Creek, Alaska. The Corps has determined that the action may affect, but is not likely to adversely affect Pacific walrus (*Odobenus rosmarus*) a candidate species, federally endangered short-tailed albatross (*Phoebastria albatrus*), threatened spectacled eider (*Somateria fisheri*), threatened Alaska breeding population of the Steller's eider (*Polysticta stelleri*), and the threatened southwest Alaska distinct population segment of northern sea otter (*Enhydra lutris kenyoni*; hereafter referred to as sea otter) and federally-designated sea otter critical habitat.

The proposed mine would be located on Alaska's west coast in the upper Kuskokwim River watershed. Components include an open surface mine, transportation and port facilities on the Kuskokwim River, and a 315-mile (507-kilometer) natural gas pipeline from Cook Inlet to the mine location. Marine barging is proposed to occur during the ice free season, May to September, and would include the following components:

- Cargo vessels from Vancouver or Washington to Bethel, with 12 round-trips per year carrying supplies, equipment, and chemicals including sodium cyanide and mercury;
- Fuel vessels from Dutch Harbor to Bethel with 14 round-trips per year using double-hulled barges with up to 2.9 million gallons of ultra-low sulfur diesel fuel; and
- Barges traveling across Cook Inlet with up to 1 million gallons of diesel fuel, from either Anchorage or Kenai to a beach landing site 3.8 miles (6.1 kilometers) south of the Beluga Airport and 7.3 miles (11.7 kilometers) south of the mouth of the Beluga River.

Consultation History

The following is a summary of the consultation history for this project:

- On March 28, 2013, the Corps began discussions with the Service under section 7 of the ESA.
- On February 10, 2014, the Corps and Service discussed potential timing for formal consultation.
- On August 2, 2016, the Service met with the Corps and project proponent to discuss an early draft of the biological assessment included as an Appendix to the Draft Environmental Impact Statement for the Donlin Gold Mine Project. The Service recommended the Corps consider conducting spill fate analysis for spills near the mouth of the Kuskokwim River and include analysis of effects on the marbled murrelet (*Brachyramphus marmoratus*), a species that occurs along the shipping route from the west coast.
- On August 24, 2017, the Corps provided a revised biological assessment, which included a spill fate assessment but did not include analysis of marbled murrelet.
- September 19, 2017 to October 17, 2017, the Service and the Corps discussed expanding the action area to include the entire shipping route and analysis of marbled murrelet.
- On October 3, 2017, the Corps submitted a revised biological assessment and requested our concurrence with their determination that the project may affect but is not likely to adversely affect listed species.
- On October 20, 2017, the Corps confirmed they would limit their ESA analysis and effects determinations to the shipping routes and species discussed in their biological assessment, October 3, 2017.

Species Occurrence in the Action Area

The Corps limited their ESA analysis and effects determinations to the shipping routes through the Aleutians, from Dutch Harbor to Bethel, and within the upper portions of Cook Inlet (Figure 1). Pacific walrus, short-tailed albatross, spectacled eider, Steller's eider, sea otter and sea otter critical habitat may occur along various portions of this section of the action area.

Pacific walrus are highly mobile, and like many ESA-listed species in Alaska, their distribution varies in response to seasons and ice cover. During summer, several thousand Pacific walrus occur in the action area, migrating from breeding areas to the north to foraging areas and coastal haulouts between Kuskokwim Bay and the Alaska Peninsula. Pacific walruses feed primarily on clams, gastropods, and polychaete worms.

Short-tailed albatross may occur in the action area with highest concentrations along continental shelf breaks and slope regions. They breed in winter on remote islands in the North Pacific Ocean and travel great distances from the Sea of Okhotsk to the west coast of North America. There are large numbers that occur in the Bering Sea and in the Aleutians, the Aleutians are especially important during molting (USFWS 2015). Short-tailed albatross are adapted for soaring just above the water surface they forage diurnally and possibly nocturnally feeding on squid, flying fish, and shrimp. They have also been known to scavenge from commercial fisheries.

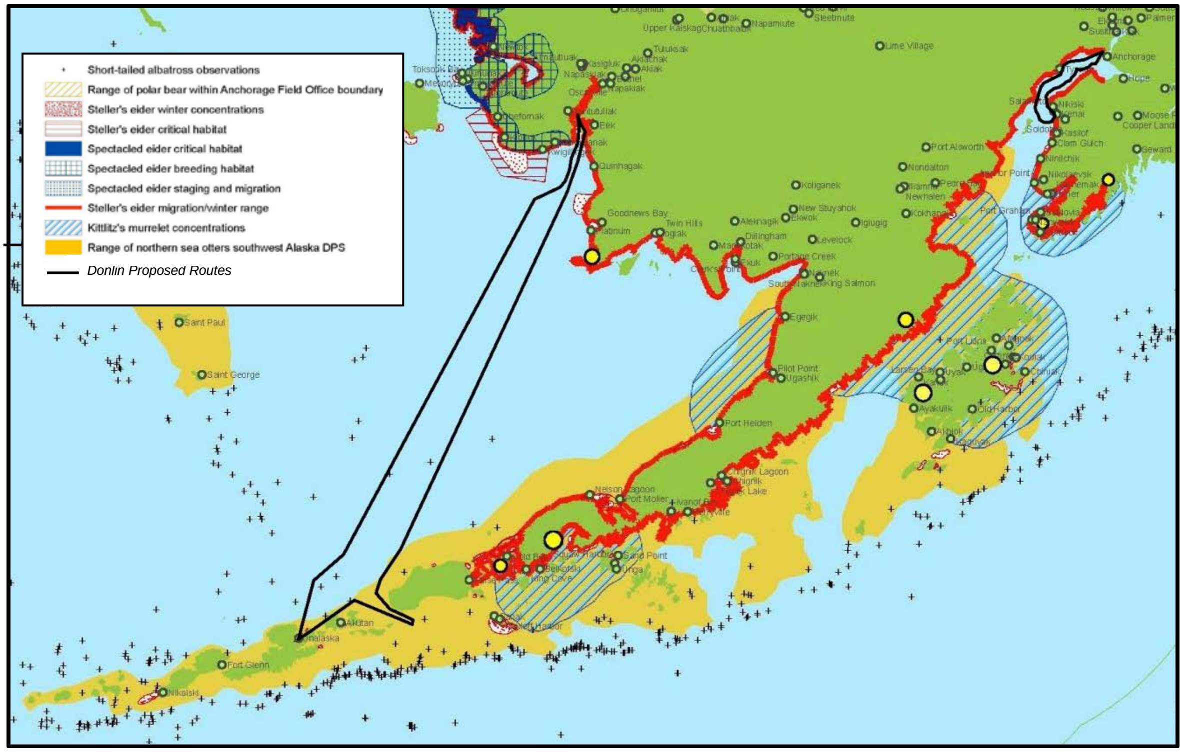

Figure 1. Shipping routes and proximity of listed species.

Spectacled eiders may be found in the norther portions of the Dutch Harbor to Bethel shipping route, near Kuskokwim Bay. Though most occur to the north of the proposed shipping route on the Yukon-Kuskokwim Delta (Y-K Delta), spectacled eider nesting habitat extends from near the mouth of the Kuskokwim River to the north along the coast to Norton Sound. Federally-designated critical habitat is identified in Norton Sound, to the north, and also about mid-way on the Y-K Delta, Figure 1. Spectacled eiders travel mostly over water from wintering areas in the northern Bearing Sea to spring staging areas as they wait offshore for ice to retreat and breeding grounds to thaw (Sexson et al. 2014). Females with broods move from freshwater breeding habitat to marine water prior to fall migration when they migrate north along the coast to molting areas in Norton Sound. Spectacled eiders feed primarily on plants, benthic mollusks, and crustaceans (50 FR 27474).

Steller's eiders also occur in the action area; during migration a large number pass through the Kuskokwim Bay area. In spring, large flocks concentrate close to shore in bays waiting for sea ice to retreat and migratory routes to open to breeding areas in the north. Steller's eiders breed over summer mainly in Russia and on the western Alaska Coastal Plain in northern Alaska. After breeding, both Russia and Alaska Steller's eiders move to marine waters where they undergo a 3-week flightless molt. The Russia and Alaska eiders remain mixed over winter in shallow bays in southcentral Alaska and Cook Inlet. Due to mixing, we have estimated less than

1 percent of molting and wintering Steller's eiders are from the listed Alaska breeding population. Steller's eiders feed on mollusks and crustaceans.

The southwest Alaska distinct population segment (DPS) of the northern sea otter could occur within the action area year-round. Their range stretches from lower Cook Inlet to the west side of the Aleutian Islands. The entire range of the DPS is considered federally-designated critical habitat, from the mean high tide line seaward for a distance of 328.1 feet (100 meters), to a water depth of 65.6 feet (20 meters) but excludes existing structures such as piers, docks, harbors, marinas unless the specific action would affect the adjacent critical habitat (50 FR 51988). Sea otters forage in nearshore marine and intertidal habitat and eat a wide variety of benthic invertebrates including burrowing clams, sea urchins, mussels, crabs, and octopus.

Potential Effects on Listed Species

Many of these species use areas that intersect the action area. Increased marine traffic could impact these species through visual disturbance, auditory effects, direct collision, and habitat modification. However, shipping is proposed to be conducted in existing shipping corridors and at existing harbors. Effects may occur, but other than direct collision, they may not be detectable. According to the Corps (2017), proposed barging would account for less than 1 percent of existing vessel traffic in the region, noise from engines would be relatively less than noise from other louder commercial vessels, and habitat near existing harbors is already somewhat degraded.

Fuel spills and associated response actions could increase risk to listed species, prey, and habitat (USFWS 2015). The Corps conducted spill risk and spill fate analyses and determined the probability of a spill was so low that effects on listed species would be discountable because a spill would be extremely unlikely to occur (Corps 2017). To reduce spill risk the project proponent has committed to using double-hauled barges, shipping during the ice-free season, May to September, maintaining vessel speeds of 10 knots or less, and implementing Oil Discharge Prevention and Contingency Plans for docks and vessel operations, which identify environmentally sensitive areas.

Conclusion

After reviewing the proposed action and the applicant's avoidance and minimization measures, the Service concurs with the Corps' determination that activities associated with the Donlin Gold Mine Project may affect but are not likely to adversely affect listed species or their critical habitat. We have based this concurrence on the low percent increase in noise and visual disturbance, the low likelihood of collision with vessels, the low probability of large chemical or oil spills, and the avoidance and minimization measures listed above. Our concurrence relates only to federally listed or proposed species and/or designated or proposed critical habitat under our jurisdiction. It does not address species under the jurisdiction of National Marine Fisheries Service, or responsibilities under the Migratory Bird Treaty Act, Marine Mammal Protection Act, Clean Water Act, Fish and Wildlife Coordination Act, National Environmental Policy Act, Bald and Golden Eagle Protection Act, or other legislation.

Based on your request and our concurrence, requirements of section 7 of the ESA have been satisfied. However, obligations under section 7 of the ESA must be reconsidered if new information reveals project impacts that may affect listed species or critical habitat in a manner not previously considered, if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat is designated that may be affected by the proposed action.

Thank you for your cooperation in meeting our joint responsibilities under the ESA. For more information or if you have any questions please contact Ms. Jennifer Spegon at (907) 271-2768 or at jennifer_j_spegon@fws.gov and refer to consultation number 2017-I-0343.

Sincerely,

Douglass M. Cooper
Chief, Ecological Services Branch

Literature Cited

Sexson, M.G., J.M. Pearce, and M.R. Petersen. 2014. Spatiotemporal distribution and migratory patterns of spectacled eiders. BOEM 2014-665. Bureau of Ocean Energy Management, Alaska Outer Continental Shelf Region, Anchorage, Alaska. September 2014.

[Corps] U.S. Army Corps of Engineers. 2007. Biological assessment Donlin Gold, LCC project. Revsion v 1.7. September 2017. Anchorage, Alaska.

[USFWS] U.S. Fish and Wildlife Service. 2015. Biological Opinion. Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges. February 2015. Anchorage, Alaska.

U.S. Fish & Wildlife Service Biological Assessment - Section 7, V1.7, September 2017

U.S. Fish & Wildlife Service

Biological Assessment – Section 7

September 2017
Revision v1.7

Prepared for:

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ACRONYMS AND ABBREVIATIONS

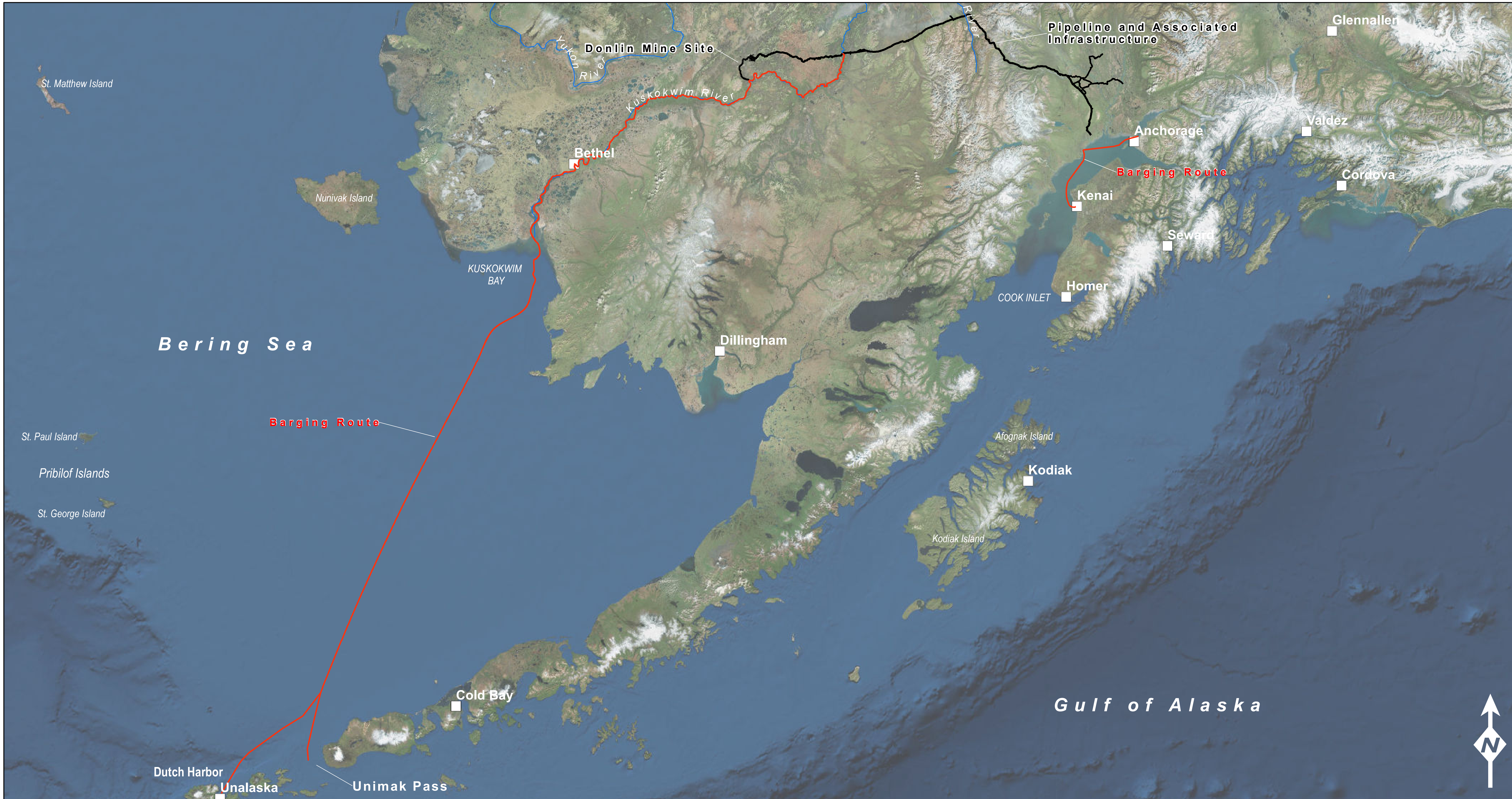
% ....percent
μPa ....microPascal
AAC ....Alaska Administrative Code
ADEC...............Alaska Department of Environmental Conservation
BA.....................Biological Assessment
BMP..................Best Management Practice(s)
CFR..................Code of Federal Regulation
CWA ....Clean Water Act
dB.....................decibel
DEIS..................Draft Environmental Impact Statement
Donlin Gold .....Donlin Gold LLC
DPS ....Alaska Distinct Population Segment
EPA..................U.S. Environmental Protection Agency
ESA..................Endangered Species Act
FRP ....Facility Response Plans
ft.......................foot/feet
gal.....................gallon(s)
hr ....hour
Hz.....................hertz
kHz...................kilohertz
km ....kilometer
km^2....................square kilometer(s)
kt ....knot(s)
lb......................pound(s)
m ....mete(m)
mi ....statute mile(s)
mi^2.....................square mile(s)
MSGP...............Multi-sector General Permit
NOAA...............National Oceanic and Atmospheric Administration
OCC..................Owens Coastal Consultants, Ltd.
ODPCP.............oil discharge prevention and contingency plan
PTS...................permanent threshold shift
rms ....root mean square
SPCC................Spill Prevention Control and Countermeasure
st.......................short ton
TRB..................Transportation Research Board
TTS ....temporary threshold shift
ULSD................ultra-low sulfur diesel
U.S. ....United States
USACE ............U.S. Army Corps of Engineers

USFWS……….U.S. Fish and Wildlife Service
USCG...............U.S. Coast Guard
VRP..................Vessel Response Plan
WQS.................Water Quality Standards

1. INTRODUCTION

In July 2012, Donlin Gold submitted a preliminary permit application, as per Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (CWA), to the U.S. Army Corps of Engineers (USACE) to develop an open pit, hardrock gold mine approximately 10 miles (mi) (16 kilometers [km]) north of the village of Crooked Creek, in western Alaska. The proposed Donlin Gold Project has four primary components: 1) mine site facilities, 2) a 315-mi (507-km) natural gas pipeline, 3) oceanic supply barging, and 4) river supply barging (Figure 1). All barging will occur in the ice- free months from May to September. The marine barging components of the project could encounter species listed under the Endangered Species Act of 1973 (ESA) at locations described in this Biological Assessment (BA).

Five species under ESA jurisdiction of the United States Fish and Wildlife Service (USFWS) are evaluated in this BA on the potential and magnitude of effect of activities to each of the listed species. Activities of the proposed project that could affect the listed species include: noise from vessel propulsion, vessel strikes, accidental spill, incidental spill, and effects to prey. This BA also provides substantial detail on the listed species distribution, feeding, reproduction, natural mortality, and use of the proposed action area, all of which are necessary to conduct the detailed effects analysis.



☐	Place of Interest
(blue line)	Major Rivers
(red line)	Barge Route
(black line)	Project Components

VICINITY MAP

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

PROJECT COMPONENTS

SCALE: 0 25 50 100 Miles; 0 37.5 75 150 Kilometers

Figure: 1

ORNRC: DGP0034.mxd, 4/14/17, R00

2. ACTION AREA AND LOGISTICS

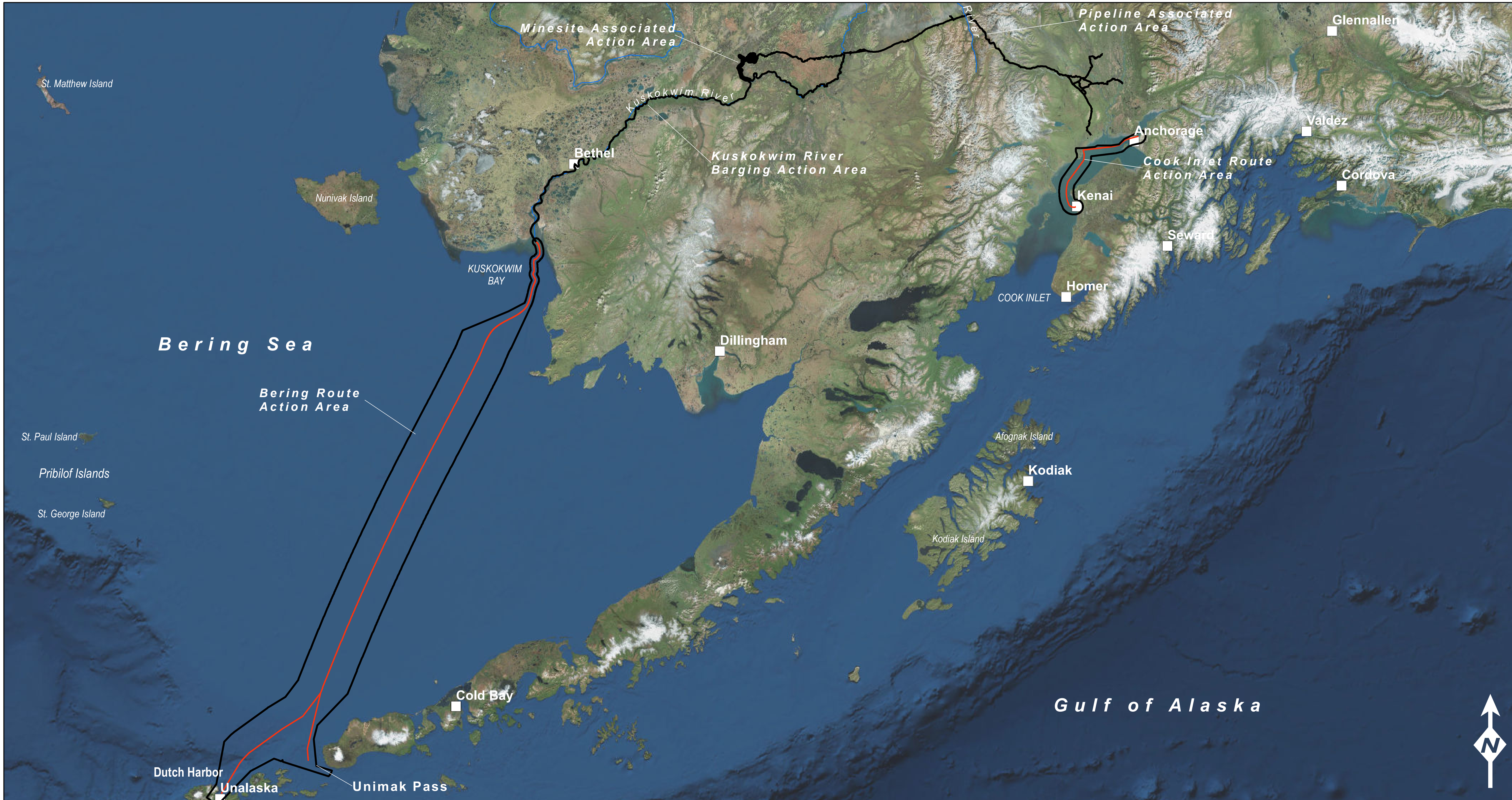
2.1. Action Area

The Donlin Gold Project action area includes the following proposed project components: mine site; natural gas pipeline; access road; Jungjuk Port; river transportation route; and the marine barging routes within the Bering Sea and Cook Inlet (Figure 2). Only the marine barging routes are addressed in this BA as they are the only project component intersecting habitat used by species under the ESA. The Bering Sea marine barging routes extend from Unimak Pass to the mouth of the Kuskokwim River (supply), and Dutch Harbor to the Kuskokwim River (fuel). The Cook Inlet marine barging route runs between Beluga and Anchorage to Beluga and/or Beluga and Nikiski. The action area, established by USACE in consultation with the USFWS, is shown in Figure 2.

Donlin Gold's proposed oceanic barging program consists of two marine barging routes as described:

1. **Bering Sea Route**: the 458-mi (737-km) marine waters portion of the route between Dutch Harbor and Bethel that includes the 410-mi (660-km) marine route between Unimak Pass and Bethel (Figure 3).
2. **Cook Inlet Route**: a 40-mi (64-km) supply barge route between Anchorage and a barge landing south of Beluga (Figure 4). Fuel may come from Nikiski, which is considered in the analysis.

The Bering Route includes the harbor waters of Dutch Harbor, and Bristol and Kuskokwim bays within the Bering Sea. Route lines in the figures are the best approximation of the routes to be followed. Actual routes may vary from those depicted in the figures, but not appreciably enough to alter the effects analysis results presented in this BA.



□	Place of Interest
red line	Marine Barge Route
black box	Proposed Action Area

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

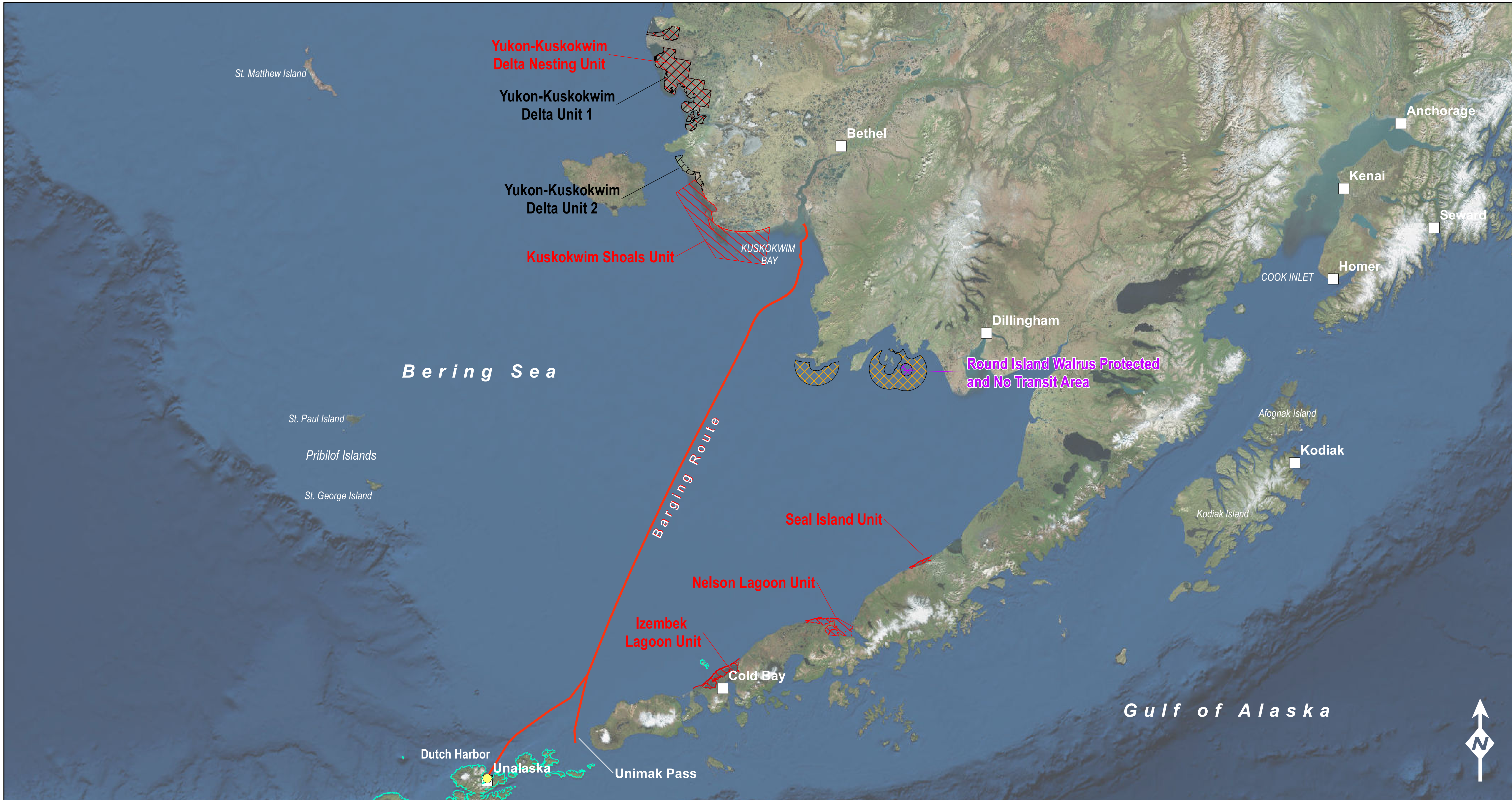
DONLIN GOLD

PROPOSED ACTION AREA

SCALE: 0 25 50 100 Miles; 0 37.5 75 150 Kilometers

Figure: 2

ORNRC: DGP0033.mxd, 4/14/17, R00



□ Place of Interest	Spectacled Eider Critical Habitat Units
Barge Route	Steller's Eider Critical Habitat Units
	Sea Otter Critical Habitat
	Walrus Protected Areas
	Round Island Walrus Protected and No Transit Area

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

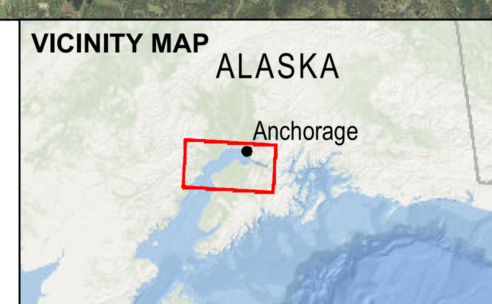
BERING SEA ROUTE

SCALE: 0 25 50 100 Miles; 0 37.5 75 150 Kilometers

Figure: 3

ORNRC: DGP0035.mxd, 4/14/17, R01

☐	Place of Interest
▬ (red line)	Barge Route



Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

COOK INLET ROUTE

SCALE:

0 3 6 12 Miles

0 4.25 8.5 17 Kilometers

Figure: 4

ORNRC: DGP0036.mxd, 4/14/17, R00

2.2. Cargo Logistics

Barging of cargo from the west coast ports will occur between May and September when all waters are clear of ice, and seasonal storms have abated. Barging will take place over the estimated 4 years of mine construction and the 27.5 years of operation. During operations three sets of cargo barges launching from Seattle or Vancouver will make approximately 12 trips (24 transits) annually, each round-trip taking about 32 days. Each barge will have a deadweight capacity of 11,500 tons (10,433 tonnes) and a net cargo capacity of 9,480 tons (8,600 tonnes), and will be hawser-towed by a 4,200-horsepower oceanic tugboat. Cargo will include annual consumables and general cargo consolidated as bulk in containers, bulk in Super Sacks ®, loose or palletized break-bulk, small packages, and liquid in small tanks. Included in this cargo are a number of chemicals required in gold processing. The list of chemicals and the annual amounts that will be transported to and from the mine are provided in Table 1.

TABLE 1: KEY CHEMICALS TRANSPORTED ANNUALLY DURING MINE OPERATION PHASE

Chemicals[1]	Est. Annual Transport (Short Tons)
Ammonium Nitrate (bulk)	33,000
Potassium Amyl Xanthate	4,189
Methyl Isobutyl Carbinol and F-549	1,984
Nitric Acid	661
Sodium Cyanide	2,535
Lime	21,027
Activated Carbon	220
Caustic soda (Sodium hydroxide)	358
Mercury Suppressant (UNR 829)	44
Flocculants	3,527
Sulfur	1,414
Copper sulfate	2,425
Fluxes (borax, sodium nitrate, and silica sand)	165
Water Softening and Anti-Scalant Agents	1,081
Ferric Sulphate	440
Sulphuric Acid	18
Sodium hydroxide	13
Polymer[3]	2
Potassium Permangenate	13
Sodium Metabisulfite	7
Cleaning-In-Place (HCl, NaOH)	Less than 1 (~ 250 pounds [lb])
Microsand	8
Liquid Elemental Mercury	11
Spent Activated Carbon (Mercury)	5.5

[1]- The estimates are based on the current level of engineering design, and are applicable only to the mine operations phase. These chemicals would not be required during construction or the reclamation and closure phase of the project. The list of chemical amounts is subject to change along with future engineering design. Additional chemicals could/would be added, substituted, or amounts increased or decreased.

During operations, fuel will be transported from Dutch Harbor to Bethel using a single double-hulled barge holding up to 2.9 million U.S. gallons (gal) of fuel towed by a 3,000-horsepower tug. Fuel demand varies over the mine life, but the peak of operations will require a maximum of about 14 barge roundtrips per year across Kuskokwim Bay. Fuel demands during construction are significantly lower and would require between 3 and 6 trips per year.

Up to 20 construction barge trips (40 transits) will run from Anchorage to Beluga, but all trips will occur within one construction season, and gas line pipe will be the primary cargo, but Donlin Gold is also considering transport of 1 million gal of diesel fuel across Cook Inlet needed to support the pipeline construction. This fuel could come from either Anchorage or Kenai. Donlin Gold is examining several options for fuel transport, but transporting the fuel in mobile tank trailers on a deck barge is the mostly likely option. The beach landing site is 3.8 mi (6.1 km) south of the Beluga Airport and 7.3 mi (11.7 km) south of the mouth of the Beluga River.

3. SPECIES POTENTIALLY AFFECTED

Two species of marine mammals, one species of seabirds, and two species of sea ducks, are currently listed, or are candidates for listing, under the ESA, and occur seasonally or year-round within the action area (Table 2). Northern sea otters are found along the Pacific nearshore waters of Alaska, including the Bering Sea side of the Alaska Peninsula and eastern Aleutian Islands; only those sea otters west of Cook Inlet are listed under the ESA. Several thousand male Pacific walrus summer in the Bering Sea, hauling out at Round Island, Cape Peirce, and Cape Newhalem, and a few lesser used sites. Short-tailed albatross are pelagic wandering species occasionally seen in Alaskan offshore waters, and both spectacled and Steller’s eiders seasonally inhabit the Bering Sea, although the former is generally found north of the action area. Polar bears (*Ursus maritimus*) occasionally range in the winter as far south as the Yukon-Kuskokwim Delta (USFWS 1994), but not as far south as the action area (*e.g.*, Kuskokwim Bay) and, therefore, are not addressed in this assessment. None of these species are found in the vicinity of the upper Cook Inlet barging route or other Project components including the mine site, pipeline route, access roads, and river barging route; thus, this assessment focuses on only the marine barging routes.

TABLE 2: USFWS-LISTED MARINE MAMMALS, SEABIRDS, AND SEA DUCKS POTENTIALLY OCCURRING ALONG DONLIN GOLD’S PROPOSED BARGING ROUTES

Species	Latin Name	ESA Status	Route	
			Bering Sea	Cook Inlet
Northern Sea Otter	*Enhydra lutris kenyoni*	Threatened	X	
Pacific Walrus	*Odobenus rosmarus*	Candidate	X	
Short-tailed Albatross	*Phoebastria albatrus*	Endangered	X	
Spectacled Eider	*Somateria fischeri*	Threatened	X	
Steller’s Eider	*Polysticta stelleri*	Threatened	X	

4. STATUS OF LISTED SPECIES

Five ESA-listed species and one candidate species under the jurisdiction of the USFWS have been identified that could potentially occur within the action area (Table 2). The ESA status, biological status, and use of the action area of each are addressed below.

4.1. Northern Sea Otter (*Enhydra lutris kenyoni*)

4.1.1. ESA Status

The Southwest Alaska Distinct Population Segment (DPS) of the northern sea otter was listed as threatened in 2005 after declining an estimated 50 percent (%) since the 1980s. This population stretches from the western shoreline of lower Cook Inlet to the western end of the Aleutian Islands. The entire range of this DPS was designated as critical habitat in 2009 (Figure 1), and a recovery plan was finalized in 2013.

4.1.2. Biological Status

4.1.2.1. Abundance and Trends

Recovery of the worldwide sea otter population began at the cessation of commercial harvest in 1911. Sea otter populations in the western Aleutian Islands began reaching pre-exploitation levels in the 1940s (Kenyon 1969), and remained at about equilibrium to late in the 20th Century (Estes 1990). However, while otter populations elsewhere continued to increase and reoccupy historical habitat, populations in the Aleutian Islands began to rapidly decline (Estes *et al.* 1998, Doroff *et al.* 2003, Burn and Doroff 2005), resulting in the 2005 listing under ESA. The Southwest Alaska DPS is divided into five management units and the Pacific Inland barging route largely travels through the length of two of them — the Kodiak, Kamishak, Alaska Peninsula and the South Alaska Peninsula management units — and small portions of the Eastern Aleutian and Bristol Bay management units. The South Alaska Peninsula (-74%), Eastern Aleutian (-56%), and Bristol Bay (-39%) management units have all experienced significant population declines since the mid-1980s and early 1990s, while the Kodiak, Kamishak, Alaska Peninsula management unit has remained stable or increased (Bodkin *et al.* 2003, Doroff *et al.* 2003, Burn and Doroff 2005, Estes *et al.* 2005). Overall, including the Western Aleutian management unit, the Southwest Alaska DPS declined between 43% and 58% from approximately between 94,050 and 128,650 animals in 1979 to the most recent estimate of 53,674 (USFWS 2013).

4.1.2.2. Distribution and Habitat Use

Sea otters once occurred in a near continuous distribution from central Baja California north to Alaska, along the Aleutian Islands to the Commander Islands and Kamchatka Peninsula then south to northern Japan (Kenyon 1969). By 1911, when otters were protected under the International Fur Seal Treaty, the world population had been reduced to a few remnant populations, most in Alaska. Sea otters have recovered nearly all their former range in Alaska. The habitat includes nearshore waters inside the 328-foot (ft) (100-meter [m]) isobath, with about 80% use in waters less than 131 ft (40 m) deep (Bodkin and Udevitz 1999). Nearly all their foraging strategy requires diving to the seafloor (Bodkin 2001), and Bodkin *et al.* (2004) found that 84% of the actual foraging occurs in waters less than 98 ft (30 m) deep. Northern sea otters feed over both rocky and soft-sediment ocean floors.

4.1.2.3. Feeding and Prey Selection

Northern sea otters feed on a wide variety of prey (Estes and Bodkin 2002), although the diet is dominated by mollusks, crustaceans, and echinoderms (USFWS 2013). In soft-sediment substrates these otters feed largely on infaunal clam species, while urchins and mussels are more important on rocky substrates. Crabs, snails, and sea cucumbers are also important, but can quickly be overharvested. Green and Brueggeman (1991) found male sea otters inhabiting the north side of the Alaska Peninsula subsisting on nearly a pure diet of 1- to 2-year-old mussels, indicative of an overexploitation of food resources. The diet diversity generally increases over time as abundant prey are consumed and otters are forced to feed on less preferred prey (Estes *et al.* 1981, Estes and Bodkin 2002).

4.1.2.4. Reproduction

Male sea otters become sexually mature at age 3, but generally cannot successfully compete for mating until age 5 or older (Garshelis 1983). Females are sexually mature at the earlier ages of 2 or 3 (Bodkin *et al.* 1993). Copulation and pupping can occur at any time of the year, although there is seasonal synchronicity at some locations (Bodkin and Monson 2002). Gestation, including delayed implantation, is about 6 months, and females usually give birth to a single pup (USFWS 2013). Reproductive rates are relatively high ranging between 80% and 98% (see USFWS 2013).

4.1.2.5. Natural Mortality

Natural mortality in sea otter populations has been difficult to quantify (USFWS 2013). Primary causes of mortality in Alaska include severe winter weather, especially when coupled with low seasonal food supply (Kenyon 1969). Sea ice events on the north side of the Alaska Peninsula have resulted in overland movements of large numbers of otters where they have become susceptible to terrestrial predators. Bald eagles (*Haliaeetus leucocephalus*) are a regular predator of pups (USFWS 2013) and killer whale (*Orcinus orca*) predation was a leading cause of sea otter decline in the Aleutians in the 1990s (Estes *et al.* 1998). Infectious diseases are major sources of mortality in California (Thomas and Cole 1996, Kreuder *et al.* 2003). Sea otter mortality is variable in the first year of life, but annual survival rate is generally high (90%) after that (USFWS 2013). Maximum ages in the wild have been 22 years for females and 15 years for males (USFWS 2013).

4.1.3. Species Use of the Action Area

Listed northern sea otters inhabit the nearshore waters of the Aleutian Islands, and could be encountered by the fuel barge entering and exiting Dutch Harbor and Unalaska Bay. There are no sea otters anywhere near Kuskokwim Bay, or in upper Cook Inlet, where barge landings would occur.

4.2. Pacific Walrus (*Odobenus rosmarus divergens*)

4.2.1. ESA Status

The Pacific walrus was petitioned for listing in 2008. After a 12-month review ending in 2011, the USFWS concluded that listing was warranted, but precluded by higher priority listing actions. In the interim, the Pacific walrus has been placed on the Candidate species list. The primary reason listing is warranted is the expected effects of declining sea ice on walrus ecology. There is no designated critical habitat for an unlisted species, although important walrus haulout sites in the Bering Sea are protected under state and federal refuge systems. Also, Walrus Protection Areas have been established for the federal waters within 12 nautical mi (22.2 km) of Cape Peirce, The Twins, and Round Island, and proposed for Hagemeister Island (MacLean 2012; Figure 1). Should Pacific walrus become listed, it is likely these protection areas will become designated critical habitat.

4.2.2. Biological Status

4.2.2.1. Abundance and Trends

Fay (1982) estimated that prior to the 19th Century, commercial harvest the Pacific walrus was at a minimum 200,000 animals. To what extent the 19th Century harvest left the population is unknown, but a second wave of commercial harvest in the 20th Century was thought to have reduced the population to between 50,000 and 100,000 animals by the mid-1950s (Fay *et al.* 1997). Once released from harvest, the population increased rapidly and was again at or above carrying capacity by the late 1970s or early 1980s (Fay *et al.* 1989, 1997). Joint Russian-American surveys began in 1975 and were conducted every 5 years until 1990. These surveys produced Pacific walrus population estimates of approximately 200,000 to 300,000, but were based on fall counts at terrestrial haulout sites and a small sample of ice-edge habitat. Also, these estimates were not able to accurately account for animals that were swimming at sea. Due to difficulties in accounting for bias, accurate variances for these population estimates could not be generated, and were presumed to be high (Gilbert *et al.* 1992, Gilbert 1999, Udevitz *et al.* 2001). The estimates could not be used in detecting trends (Gilbert *et al.* 1992, Hills and Gilbert 1994). In 2000, United States (U.S.) and Russian scientists revisited the problems associated with the survey methodologies and began collective research using new technology to identify and reduce bias (Garlich-Miller and Jay 2000). Over the next few years, new study designs and methods were developed and a bilateral survey was again conducted in spring 2006 (Speckman *et al.* 2011). This survey resulted in an estimate of 129,000, albeit with high confidence limits of between 55,000 and 507,000. Also, beset by weather problems, only a portion of the study area was successfully surveyed, leaving the estimate to represent only about half the potential walrus spring habitat (Speckman *et al.* 2011). This, and unknown bias effects to previous surveys, limit the ability to determine if the current Pacific walrus population is increasing, declining, or stable.

4.2.2.2. Distribution and Habitat Use

Seasonal distribution of walrus varies in response to sea ice conditions. During the winter, walrus can range as far south as the Alaska Peninsula, especially during years of extensive sea ice. During summer, they will travel with the ice to the northern reaches of the Chukchi Sea, where the continental shelf gives way to the Arctic Ocean basin. However, the primary distribution is the shelf waters of the Chukchi Sea during the summer and northern Bering Sea during the winter following the advance and retreat of sea ice. During summers, when the ice-edge retreats north in the deep Arctic Ocean basin waters, large numbers of walrus will haulout on Wrangel Island or the Chutkokta coast (Fay 1982).

4.2.2.3. Feeding and Prey Selection

Pacific walrus feed primarily on benthic bivalves, using their muzzles and whiskers to detect prey, and their noses, flippers, and jetted water to extract them from the sediment (Fay 1982). They use mouth suction to remove soft tissue from the shells (Fay 1982). Feeding is not limited to bivalves. Other benthic invertebrates are also consumed, as are occasionally fish and vertebrates, including seals (Fay 1982, Sheffield *et al.* 2001, Sheffield and Grebmeier 2009). Local diet is generally reflective of what is available (Sheffield and Grebmeier 2009), and walrus play a major role in the benthic ecosystem (Garlich-Miller *et al.* 2011).

4.2.2.4. Reproduction

Fay (1982) stated that walrus have the lowest production rate of any pinniped. While females attain sexual maturity at 4 to 7 years of age, males are unlikely to successfully compete or breed until they are about 15 years old (Fay 1982, Garlich-Miller *et al.* 2006). Generally, a single calf is produced and is typically nursed for up to two years. Thus, calving intervals can be three years or more (Garlich-Miller and Stewart 1999). Low birth rates are offset by high parental care leading to relatively high first year survival rates (Fay *et al.* 1997). Adult survival is especially high at over 96% for age classes 4 to 20 (DeMaster 1984, Fay *et al.* 1997), declining to zero by about age 40 (Chivers 1999). The maximum population growth rate has been estimated at 8% (Chivers 1999).

4.2.2.5. Natural Mortality

Walrus calves and pregnant females are more susceptible than males to death from trampling and polar bear predation. Fay and Kelly (1980) identified the principal cause of death of several hundred carcasses at coastal haulouts in the Bering Sea to trauma from trampling, during either stampedes or battles between bulls. Early research on walrus found little actual evidence of polar bear predation on walrus other than the potential for predation on calves (Fay 1982). Later research by Calvert and Stirling (1990) found polar bears to be important predators of walruses in the central Canadian High Arctic in late winter and early spring, and predation has been witnessed both on land and ice in the Bering and Chukchi seas (Stirling 2011). Killer whales also prey on walrus (Jefferson *et al.* 1991), especially in the Anadyr Gulf of Russia (Kryukova *et al.* 2012).

4.2.3. Species Use of the Action Area

During the January to March breeding season, walrus breeding aggregations (tens of thousands) form in the ice lee south of Nunivak Island and just west of Kuskokwim Bay (Garlich-Miller *et al.* 2011). However, as the sea ice begins to deteriorate, these walrus migrate north and by May most of the population is concentrated near the Bering Straits (Fay 1982). These wintering and breeding herds do not temporally overlap with barging activity to and from Bethel. However, a few thousand walrus, mostly males, remain all summer in the Bering Sea (Garlich-Miller *et al.* 2011). Most of these summering males haulout just south of Kuskokwim Bay at Cape Newenham, Cape Peirce, and Round Island, and at Cape Seniavin on the north side of the Alaska Peninsula (Garlich-Miller *et al.* 2011). Lesser used haulout sites include Hagemeister, Crooked, Twin, and Amak islands, and Cape Constantine. Cape Newenham is about 30 mi (48 km) east of the proposed barging route into Kuskokwim Bay, while Cape Peirce is approximately 50 mi (80 km) away and Round Island 115 mi (185 km). Amak Island is 60 mi (97 km) east of the barging route coming out of Unimak Pass or Dutch Harbor. Jay and Hills (2005) satellite-tagged 59 adult male walrus at Cape Seniavin, Cape Peirce, Cape Newenham, and Round Island and found that these animals forage primarily inside Bristol Bay (southward of the haulout sites) during May through August. Kuskokwim Bay became an important foraging area September through December, especially during October. Based on these study results, a few foraging walrus might be encountered during summer barging immediately west of Cape Newenham, and within Kuskokwim Bay during September. However, Bering Sea barging routes largely bypass walrus summer haulout and foraging areas, and are well outside the established Bristol Bay Walrus Protection Zones (Figure 1).

4.3. Short-tailed Albatross (*Phoebastria albatrus*)

4.3.1. ESA Status

The short-tailed albatross was listed as endangered throughout its range in 2000. Prior to the turn of the 20th Century, millions of these birds had been harvested for their feathers bringing the species to near extinction by the mid-20th century (USFWS 2008). One island alone, Torishima, supported at least 300,000 breeding pairs prior to exploitation. By 1949 there were no breeding pairs remaining on any of the 14 islands of Japan and Taiwan where they previously nested, and the species was thought to have gone extinct (Austin 1949). However, soon after this declaration, a few birds that presumably had been wandering the North Pacific during the final years of slaughter began returning to Torishima Island where eventually they formed two breeding colonies. Breeding pairs began appearing at Minami Kojima Island in the Senkaku Islands group in the early 1970s (USFWS 2008).

4.3.2. Biological Status

4.3.2.1. Abundance and Trends

The worldwide short-tailed albatross population has grown steadily since reestablishing breeding in the early 1950s. The 2007-2008 estimated population for breeding birds was 1,114, and the subadult population estimated at 1,292, or 2,406 (USFWS 2008). More than 82% of the population originated from Torishima, where the colony has been growing at an annual rate of 6.5% to 8.0% (USFWS 2008).

4.3.2.2. Distribution and Habitat Use

Short-tailed albatross originally nested at 14 islands offshore of Japan and Korea, but currently only nest on the Japanese-managed island of Torishima, and Minami Kojima Island located about 110 mi (177 km) northeast of Taiwan, where its ownership is under dispute by Taiwan, China, and Japan (USFWS 2008). Efforts are undergoing to establish colonies elsewhere. During the four-month non-breeding season, male adult short-tailed albatross largely travel to feeding waters of the Bering Sea and Aleutian Islands, while females are more likely to feed in Japanese and Russian waters (Suryan *et al.* 2007a). Juveniles and subadults; however, range a far wider area of the North Pacific, including down the U.S. west coast, before returning to their breeding colony of origin at 5 to 6 years of age.

Foraging short-tailed albatross spend most of their time in shelf waters less than 3,281 ft (1,000 m) deep, and rarely in waters deeper than 9,843 ft (3,000 m) outside Japan (Suryan *et al.* 2007b, USFWS 2008). These birds concentrate in upwelling areas off Japan, along the shelfbreaks of the Aleutian Islands and the Gulf of Alaska, and along the edge of the Bering Sea shelf (Suryan *et al.* 2006, Piatt *et al.* 2006b). Juveniles and subadults off the United States west coast also spend most their time near the continental shelf edge, while birds that have been satellite-tracked in deeper pelagic waters appear to be transiting between foraging areas (Suryan *et al.* 2007b).

These birds were once thought to be coastal because of their prevalence in Native midden sites from southern California to St. Lawrence Island (Murie 1959, Piatt *et al.* 2006b). However, Piatt *et al.* (2006b) has shown that these birds concentrate at the shelf edge and over submarine canyons, and aboriginal hunting would likely have occurred as the birds moved through the Aleutian passes and where “hotspot” upwelling sites are close enough the coast to have been reached by boat-based Native hunters.

4.3.2.3. Feeding and Prey Selection

Short-tailed albatross feed largely on squid, shrimp, and schooling fish (Hasegawa and DeGange 1982), and fish offal discarded from fishing vessels (Melvin *et al.* 2001). These birds feed on squid more than other species of albatross (USFWS 2008). Piatt *et al.* (2006b) found that in Alaska, short-tailed albatross are concentrated along the shelf edges from the Gulf of Alaska through the Aleutians, and particularly along the edge of the Bering Sea shelf where upwelling brings squid to the surface, making them available to the shallow-diving albatross.

4.3.2.4. Reproduction

Short-tailed albatross are slow reproducing birds that can live to 40 years of age (USFWS 2011). They begin breeding at about age 5 or 6, and lay a single egg. Slow-growing chicks are dependent on their parents until fledging at about 5 months. In all, the breeding season lasts about 8 months.

4.3.2.5. Natural Mortality

Apparently crows (*Corvus macrorhynchos*) preyed heavily on albatross chicks at Torishima prior to 1949 (Austin 1949), but are not present on the island today (USFWS 2008). Sharks and Steller’s sea eagles (*Haliaeetus pelagicus*) may occasionally take fledglings, but adult short-tailed albatross have few natural threats to survival. Monsoon rains have destroyed nesting habitat leading to chick mortality, and because Torishima is an active volcano, an eruption could have a catastrophic impact to the world population (USFWS 2008).

4.3.3. Species Use of the Action Area

More than 1,300 sighting records from Alaskan waters clearly show that short-tailed albatross concentrate along the Aleutian Islands, Bering Sea, and Gulf of Alaska shelf edges. The Pacific Offshore barging route briefly crosses shelf edge habitat before entering Unimak Pass, as does the Bering Sea route coming out of Dutch Harbor. Unimak Pass may also be a pathway for albatross moving between Bering Sea and Pacific habitats, although sighting records suggest that farther west Aleutian passes may be much more important.

4.4. Spectacled Eider (*Somateria fischeri*)

4.4.1. ESA Status

The spectacled eider was listed as threatened under the ESA in 1993 after the Yukon-Kuskokwim Delta breeding population declined from about 48,000 in the 1970s to only about 2,000 in the early 1990s (Stehn *et al.* 1993, Ely *et al.* 1994). Reasons for the decline are unknown, but appear to be related to adult mortality outside the breeding season (Flint *et al.* 2000), and may relate to ingestion of toxic lead shot (Grand *et al.* 1998). Critical habitat, targeting protection of Yukon-Kuskokwim Delta breeding habitat (Figure 1) and molting habitat in Ledyard Bay and Norton Sound, was designated in 2001. A recovery plan was finalized in 1996.

4.4.2. Biological Status

4.4.2.1. Abundance and Trends

The range-wide spectacled eider population appears to have remained stable or increased slightly in recent years. Petersen *et al.* (1999) estimated the 1997 population at 363,000, while Larned *et al.* (2012) estimated the 2010 wintering population at 369,122. However, significant declines have occurred in Alaska at least. The Yukon-Kuskokwim Delta breeding population used to be larger than the Russian and northern Alaska population combined with an estimated 48,000 to 70,000 pairs annually breeding there prior to 1972 (Dau and Kistchinski 1977). However, by 1992, only an estimated 2,000 pairs remained (Stehn *et al.* 1993). Since then, the Yukon-Kuskokwim Delta breeding population has grown at an annual rate of about 7%, and the number of breeding birds exceeded 12,000 by 2010 (Platte and Stehn 2011).

Breeding population estimates are unavailable for the North Slope before 1992 other than Warnock and Troy (1992) who documented an 80% decline in nesting in the Prudhoe Bay area between 1981 and 1991. Stehn *et al.* (2006) used data collected from 2002 to 2006 to estimate the 2006 North Slope breeding population at 13,000 birds. From data collected by Larned *et al.* (2011) between 2007 and 2010, the estimate was less at about 11,000.

4.4.2.2. Distribution and Habitat Use

Spectacled eiders breed in coastal habitats at three locations in Arctic Russia, and on the North Slope and the Yukon-Kuskokwim Delta in Alaska, usually arriving in May (Johnson and Herter 1989). During late May and June, Alaskan males leave the breeding grounds and concentrate at molting areas in Ledyard Bay and Norton Sound (Petersen *et al.* 1995). Successful females and juveniles arrive at these molting areas in September. The range-wide population winters in the polynyas that form south of St. Lawrence Island (Petersen *et al.* 1999) in an area of only about 1,500 mi^2 (3,885 km^2).

4.4.2.3. Feeding and Prey Selection

Spectacled eider diet during the breeding season is composed largely of freshwater flies, shrimp, snails, and pondweeds (Petersen *et al.* 2000). In marine molting and wintering areas, these eiders eat primarily snails, clams, mussels, amphipods, and juvenile crabs (Petersen *et al.* 2003), although Macoma clams were the dominant food occurring in 72% of the samples (Petersen *et al.* 1998). Spectacled eiders were found to forage for this prey at depths between 150 and 230 ft (45 and 70 m) (Petersen *et al.* 1998).

4.4.2.4. Reproduction

Spectacled eiders prefer to nest on islands and peninsulas or along pond shorelines (Petersen *et al.* 2000) where escape to protective water is nearby. Clutch size can vary from 1 to 11, with the average size 5 eggs on the Yukon-Kuskokwim Delta and 3.5 eggs for the North Slope (Petersen *et al.* 2000). The incubation period is 24 days, and chicks fledge at 45 to 50 days (Petersen *et al.* 2000). Hens will occasionally re-nest if the first nest is lost.

About half the females nest in their second year, and generally nest for 5 consecutive years. Nesting success varies greatly depending on predator densities and weather conditions and ranged on the Yukon-Kuskokwim Delta from 12% to 78% (Grand and Flint 1997). Flint and Grand (1997) studied spectacled eider reproduction on the Yukon-Kuskokwim Delta and found that over the first 30 days of life, duckling survival was only 34%, but increased to 71% for the next 30 days. Grand *et al.* (1998) found that the adult females not exposed to lead shot contamination had a higher annual survival rate (78%) than those that were exposed (44%).

4.4.2.5. Natural Mortality

The primary nest predators are gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), foxes (red [*Vulpes vulpes*] and arctic [*Vulpes lagopus*]), and mink (*Mustela vision*), depending on the nesting area. Foxes and mink will also prey on nesting adults. These predators may have recently increased on the North Slope in response to increased human development (Day 1998). There is no information on natural mortality at sea. Storm tides can destroy nests and drown hatchlings (Petersen *et al.* 2000).

4.4.3. Species Use of the Action Area

None of Donlin Gold's barging routes intersect breeding, molting, or wintering habitat used by spectacled eiders. However, the South Yukon-Kuskokwim Delta critical habitat breeding area is located immediately north of Kuskokwim Bay (approximately 80 mi [129 km] north of the actual Bering Sea barging route) and could be affected by an oil spill event inside Kuskokwim Bay given the prevailing northward flow of the West Alaska Current (the Bering Sea extension of the Alaska Coastal Current).

4.5. Steller's Eider (*Polysticta stelleri*)

4.5.1. ESA Status

Steller's eider is a small, bottom-foraging diving duck with breeding populations in Russia and the U.S. Because of significant population declines, the U.S. breeding population was listed as threatened in 1997, and critical habitat was designated in 2001, with the Kuskokwim Shoals unit the nearest critical habitat to the proposed barging routes (Figure 1). A recovery plan was finalized in 2002.

4.5.2. Biological Status

4.5.2.1. Abundance and Trend

While the Russian Pacific population of the Steller's eider numbers between 50,000 and 100,000, the U.S. breeding population may number only about 500 (USFWS 2001). The Alaska breeding population experienced a significant decline in the late 20th Century (Quakenbush *et al.* 1999); low breeding density and great interannual variation in breeding locations make it difficult to determine whether the population is beginning to stabilize or increase.

4.5.2.2. Distribution and Habitat Use

Steller's eiders arrive on their Siberian and Alaskan breeding grounds in late May and early June. In Alaska, breeding is confined to the Arctic Plain, with concentrations near Barrow, although nowhere is it common (Quakenbush *et al.* 2002). These eiders also once nested on the Yukon-Kuskokwim Delta, but no significant breeding activity has been observed there for several decades (Kertell 1991, Flint and Herzog 1999). A historical breeding record (Dall 1873) from Unalaska Island is unsubstantiated, and there are no recent summer records for this location (Quakenbush *et al.* 2002). Males begin leaving the breeding grounds in early July, arriving at Southwest Alaska molting areas. Females remain on breeding grounds until broods have fledged, then migrate to molting areas or directly to wintering grounds farther south. Most Pacific populations of eiders molt within the lagoons along the Alaska Peninsula, especially Nelson and Izembek lagoons (Petersen 1981), although small numbers molt along the nearshore waters throughout Bristol Bay, including northern Kuskokwim Bay where about 5,000 birds have been found (Larned and Tiplady 1996, Wilson *et al.* 2012). Based on limited satellite tracking data, Kuskokwim Shoals may be especially important for Alaska breeders (Rosenberg *et al.* 2011).

During the fall, U.S. Steller's eider populations are joined by thousands of unlisted Russian Steller's eiders along the north side of the Alaska Peninsula, where they undergo several weeks of molt (Jones 1965, Ward and Stehn 1989, Laubhan and Metzner 1999). In late November, they begin moving to overwintering areas in the Aleutian Islands, the south side of the Alaska Peninsula, Kodiak Archipelago, and Cook Inlet (Petersen 1981, USFWS 2002). A number of these birds overwinter in Unalaska Bay (Quakenbush *et al.* 2002). During April and May, nearly the entire population wintering in Alaska concentrates in Bristol and Kuskokwim bays as they wait for the sea ice to retreat and breeding ponds to thaw (USFWS 2001).

4.5.2.3. Feeding and Prey Selection

Steller's eiders are reported to consume a diverse diet of invertebrates, suggesting they are nonselective foragers (Petersen 1980, 1981; Metzner 1993; Bustnes and Systad 2001) whose main diet consists of bivalves, gastropods, and crustaceans such as crabs, shrimp, and amphipods (Vang Hirsh 1980, Goudie and Ankney 1986, Metzner 1993, Ouellet *et al.* 2013). Goudie and Ankney (1986) suggested that small ducks wintering in northern latitudes, such as Steller's eiders, do so at the edge of their energetic limits.

4.5.2.4. Reproduction

Steller's eiders begin courtship and pairing in April often while still on the spring staging grounds (Fredrickson 2001). Nest-building begins within days of arriving on the nesting grounds, with egg-laying occurring mid-June (Quakenbush and Cochrane 1993). Clutches average about 6 eggs, which hatch 26 to 27 days after laying the first egg (Fredrickson 2001). There are no re-nesting opportunities in the short Arctic summer. In Russia, successful females and fledglings leave the nesting grounds in late August to mid-September (Solovieva 1997). Nesting success is highly variable in Alaska, and appears related to the number of lemmings, an alternative prey for local nest predators (Quakenbush and Suydam 1999).

4.5.2.5. Natural Mortality

Maximum longevity is more than 20 years, and there is little information on major causes of Steller's eider adult mortality (Fredrickson 2001), although in Alaska, jaegers and common ravens have been identified as egg predators (Quakenbush and Suydam 1999). Presumably, red foxes (*Vulpes vulpes*) and arctic foxes (*V. lagopus*) are potential predators of both nests and nesting adults.

4.5.3. Species Use of the Action Area

Some Steller's eiders overwinter in both Unalaska Bay and Captains Bay at Dutch Harbor. However, barging will not occur during the November to April wintering period, thus there is no temporal overlap with barging and wintering eiders. Four Bering Sea areas important to spring staging and fall molting are designated critical habitat. These include Izembek Lagoon, Nelson Lagoon, Seal Islands, and Kuskokwim Shoals (Figure 1). All of these areas are used by Steller's eiders for spring staging during the early barging season (May) and as molting during the late barging season (August and September). However, neither Bering Sea barging route (from either Unimak Pass or Dutch Harbor) intersect designated critical habitat, although barging through Kuskokwim Bay passes within about 50 mi (80 km) of the 1,472 square miles (mi^2) (3,813 square kilometers [km^2]) Kuskokwim Shoals critical habitat annually used by about 5,000 birds. Although not designated at critical habitat, the nearshore waters of both sides of Kuskokwim Bay are also used by staging and molting eiders. Barging activity would approach to within about 7 mi (11 km) of these areas.

5. CONSEQUENCES OF PROPOSED ACTION

Two activities proposed by Donlin Gold project's construction and operation have the potential to impact wildlife species under the jurisdiction of the USFWS: Supply barging between Unimak Pass and Bethel and fuel barging between Dutch Harbor and Bethel. Potential effects include disturbance from noise generated by the tug propellers, an accidental oil or chemical spill from an at-sea accident including collision with other vessels or grounding, and incidental fuel spills (*e.g.,* fuel transfer) contributing to impaired harbor waters. Vessel strike is not considered a risk for any of the species addressed in this assessment given the animals' ability to maneuver and the slow speeds of the barges (<10 knots [kt] [18.5 km/hour [hr]]), and is not addressed further. The other three potential stressors are addressed below.

5.1. Disturbance

Disturbance concerns include visual disturbance at important wildlife concentration areas, such as sea duck molting areas and walrus haulouts, and underwater noise disturbance produced by the tug. However, as the tug/barge will follow established travel lanes and will not approach walrus haulout sites or nearshore habitats used by sea otters and molting Steller's eiders, potential disturbance is limited. Both sea otters and Steller's eiders would likely be encountered during fuel barge passage in and out of Dutch Harbor and Iliuliuk Bay, but these animals would be well conditioned to boat and ship traffic given the normal summer fishing activity at Dutch Harbor. Visual disturbance to short-tailed albatross and spectacled eiders is of little concern given the small likelihood of encounter based on rarity of these species in the travel corridors during the summer months.

Apart from any potential for damaging marine mammal hearing, loud vessels can disrupt normal behaviors of marine mammals either through auditory or visual harassment. Disturbed animals may quit feeding, move away from feeding areas, display overt reactions, or display other behaviors that expend undue energy potentially culminating in lowered fitness.

Relative to marine mammals, man-made noise introduced into the marine environment can result in impaired hearing, disturbance of normal behaviors (*e.g.,* feeding, resting, social interactions), mask calls from other species members, disrupt echolocation capabilities, and mask sounds generated by approaching predators. Behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen *et al.* 2006). Behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, interruption of vocal activity, and modification of vocal patterns (Watkins and Scheville 1975, Malme *et al.* 1984, Bowles *et al.* 1994, Mate *et al.* 1994). Long-term exposure can lead to fitness-reducing stress levels, and in some cases, physical damage leading to death can occur (*e.g.,* Balcomb and Claridge 2001).

Most pinnipeds have peak sensitivities between 1 and 20 kilohertz (kHz) (National Research Council 2003), with phocids such as ringed and harbor seals peaking at over 10 kHz and showing good sensitivity to approximately 30 kHz (Wartzok and Ketten 1999). Relative to other pinnipeds, however, Pacific walrus are sensitive to lower frequency underwater sounds. Kastelein *et al.* (2002) found maximum walrus sensitivity at 12 kHz with best sensitivity between 1 and 12 kHz. Unlike other pinnipeds, walrus hearing sensitivity drops sharply beyond 12 kHz. Also, Kastelein *et al.* (1996) found in-air walrus hearing to be less sensitive than that of sea lions and harbor seals.

Underwater hearing ability of sea otters is significantly less than that of pinnipeds (Ghoul and Reichmuth 2014). Their ear structure suggests that there has been little change since their terrestrial origin. Unlike other marine mammals, the sea otter ear canal remains fully open and not closed as in cetaceans or reduced as in pinnipeds. Their one adaption appears to be an earflap that closes over the ear canal during diving, trapping air inside. While this mechanism would protect the inner ear, an ear canal filled with air can cause an impedance mismatch reducing sound conduction to the middle and inner ears (Wartzok and Ketten 1999). Ghoul and Reichmuth (2014) found sea otters have poor hearing sensitivity below 1 kHz, and best sensitivity between 2 and 26 kHz, but the lowest threshold (69 decibels [dB] referenced at [re] 1 micropascal [μPa] in meters) at between 8 and 16 kHz was much higher than pinnipeds. In sum, sea otters do not appear to be particularly adapted to hearing underwater sounds, which is supported by the lack of evidence of underwater communication (Ghoul and Reichmuth 2012). Sea otters do communicate above water, especially with loud screams between separated mothers and pups (McShane *et al.* 1995). Ghoul and Reichmuth (2012) measured these vocalizations and found that the intensity of these calls ranged between 50 and 113 dB with sound pressure level (SPL) re 20 μPa (dB SPL re 20 μPa), and were loud enough that they can be heard by humans at distances exceeding 0.62 mi (1 km) (McShane *et al.* 1995). Aerial hearing in sea otters is similar to terrestrial carnivores with best sensitivity between 1.2 and 27 kHz (Ghoul and Reichmuth 2014).

Disturbance thresholds from impulsive underwater noise has been established for marbled murrelets and has been used to assess potential seismic and pile driving effects on Steller's eiders. However, noise generated by the barging operation is continuous, and there are no continuous noise criteria for birds.

5.1.1. Threshold Shift

When exposed to intense sounds, the mammalian ear will protect itself by decreasing its level of sensitivity (shifting the threshold) to these sounds. Stereocilia are the sound sensing organelles of the middle and inner ear. They are the "hairs" of the specialized cells that convert sound wave energy to electrical signals. When sound intensity is low, the hairs will bend towards the incoming waves, thereby increasing sensitivity. If the sound intensity is high, the hairs will bend away in an effort to reduce wave energy damage to the sensitive organelles, which includes a reduction in sensitivity. If the sound levels are loud enough to damage the hairs, the reduction in sensitivity will remain, resulting in a shift in hearing threshold. These threshold shifts can be temporary (temporary threshold shift [TTS]) or permanent (permanent threshold shift [PTS]) (Weilgart 2007) depending on the recovery ability of the stereocilia and connecting hair cells. Over-activation of hair cells can lead to fatigue or damage that remains until cells are repaired or replaced.

Exposure to intense impulsive noises can disrupt and damage hearing mechanisms, leading to a threshold shift. However, these threshold shifts are generally temporary (TTS), as the hair cells have some ability to recover between and after the intermittent sound pulses. Long-term exposure to continuous noise, even noise of moderate intensity, can lead to a PTS. This is because the continuous wave energy does not allow hair cells to recover. If the exposure is long enough, the ability to replace damaged hair cells after the exposure has ceased is also reduced, and the threshold shift becomes permanent.

Anthropogenic sources of underwater impulsive noises that could lead to TTS include seismic surveys, pile driving, and blasting. However, Donlin Gold's barging operation will not produce impulsive noises, so these TTS concerns do not apply. The primary underwater noise associated with the proposed barging operations is the continuous cavitation noise produced from the twin-screw propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the firing rate of the main engine, but both are subordinate to the blade rate harmonics (Gray and Greeley 1980). These continuous sounds for small ships have been measured at up to 171 dB re 1 μPa root mean square (rms) at 1-m source (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles *et al.* 1987, Richardson *et al.* 1995, Simmonds *et al.* 2004). Measured cavitation noise from modern cargo ships have peak energies less than 100 Hertz (Hz) (Areveson and Vendittis 2000, McKenna *et al.* 2012), resulting from both the blade rate harmonics and the chaotic collapse of cavities (cavitation), with a rapid drop off of about 6 dB per octave on a constant-bandwith plot (Areveson and Vendittis 2000). Cavitation noise is a potential source for PTS depending on the received noise level (a function of the distance the animal is to the vessel) and duration (dependent on the period animal and vessel are in proximity). There is some overlap between the hearing in walrus and sea otters and cavitation noise, as the best underwater hearing sensitivity for walrus is between 1 to 12 kHz (Kastelein *et al.* 2002) and for sea otters is between 2 and 26 kHz (Ghoul and Reichmuth 2014). However, peak cavitation frequencies (<100 Hz) do not overlap with peak hearing sensitivities (>1 kHz) thereby reducing PTS risk. More importantly, walrus and sea otter exposure to continuous tug noise is limited to the dive duration. The average dive time of a northern sea otter has been measured at only 85 seconds (Bodkin *et al.* 2004) to 149 seconds (Wolt *et al.* 2007), far too short a period for the onset of PTS. Walrus dive times are longer (5 to 10 minutes; USFWS 2009), but still well short of PTS impacts. Thus, hearing loss in walrus and sea otters is not of concern from the proposed oceanic barging operations.

No data currently exists on the physiological effect of anthropogenic noise on seabirds and, like sea otters and walrus, the exposure duration (limited to the short dive period) from the moving vessels is far too short to induce PTS regardless. (The USFWS has adopted impulsive underwater noise injury criteria for marbled murrelets, but no criteria have been developed for continuous noise.) New research by Therrien (2014) suggests that ducks hear best underwater at low frequencies between 0.5 and 2.86 kHz, or at frequencies similar to cavitation noise and, therefore, might be susceptible to masking. However, other research to date has failed to show significant seabird response to even loud seismic noises (Stemp 1985, Turnpenny and Nedwell 1994). Further, dive durations for albatrosses and eiders are generally a minute or less (Strachan *et al.* 1995, Heath *et al.* 2007, Evers *et al.* 2010) with longer rest periods between dives. Noise exposure is limited to when a dive event coincides to the short time a travel vessel is in effective hearing range.

5.1.2. Masking

Masking occurs when louder noises interfere with marine mammal vocalizations or their ability to hear natural sounds in their environment (Richardson *et al.* 1995), which limit their ability to communicate or avoid predation or other natural hazards. Masking is of particular concern with baleen whales because low-frequency anthropogenic noises overlap with their communication frequencies, but less so for pinnipeds. Pinnipeds in general hear well in noisy backgrounds (Southall *et al.* 2000), probably as an adaption to hearing when exposed to surf and other wave noise. Pacific walrus males produce loud underwater “songs” during the winter breeding season (Fay 1982, Schusterman and Reichmuth 2008), but apparently not at other times of the year, and there is no evidence of females or calves vocalizing underwater (Schusterman and Reichmuth 2008). Any communication or masking concerns would, therefore, be limited to outside the barging season. None of the other animals addressed in this assessment are known to communicate underwater.

Masking can prevent marine animals from hearing approaching predators. However, predation is not a primary mortality factor for summering male walrus or diving seabirds. Also, underwater noise would not contribute to increased sea otter mortality from an aerial predator such as a bald eagle, although it might for an underwater predator such as a killer whale. Still, sea otters spend the great majority of their time with their head out of the water and are likely to use visual cues more than auditory to detect approaching killer whales.

5.1.3. Chronic Disturbance

Continued exposure to low levels of noise and disturbance can lead to chronic stress, potentially further leading to stress-related responses such as immune system suppression, reproductive failure, slowed growth, and an overall decline in fitness. Chronic stress is exposure to stressors that last for days or longer, and does not apply to a passing barge. However, disturbance noise from a passing barge (acute stress) can add to the overall stress budget (known as the allostatic load; Romero *et al.* 2009) of an individual marine mammal contributing to a general distress and deleterious effects. Additional barging (multiple passes) would, of course, contribute further to the stress load.

Donlin Gold's planned barging has some additive effect to the overall anthropogenic noise budget. Donlin Gold plans 12 cargo barging round-trips (24 transits) annually from Seattle to Bethel. These transits represent 0.5% of the 4,500 commercial vessels that annually pass through Unimak Pass (Transportation Research Board [TRB] 2008).

Most information on the reaction of pinnipeds to boats relates to disturbance of hauled out animals. None of the proposed barging routes will come within disturbance distance to walrus haulouts. There is little information on the reaction of pinnipeds to ships while in the water other than some anecdotal information that sea lions are often attracted to boats (Richardson *et al*. 1995).

5.1.4. Relevance to Donlin Gold Barging

Donlin Gold's proposed oceanic barging program will contribute to existing vessel traffic noise along all four barging routes. At times, the tugboat/barge may temporarily disturb marine wildlife, resulting in acute stress levels and adding to the animal's overall stress budget. However, the overall effect is probably minimal given that the Donlin Gold's barging traffic would be well less than 1% of the total vessel traffic in the region, and by traveling at a normal speed of less than 10 kt (18.5 km/hr), the individual noise source contribution is relatively less than other commercial vessels. Further, the propellers on ocean tugboats are generally recessed under the vessel hull to reduce cavitation and protect the nozzled propellers from damage during a grounding event. As a result, much of the noise emanating from the propellers is blocked (acoustical shadow) by the tugboat's hull, especially forward of the tug. Moreover, the nozzles themselves reduce cavitation, thereby further reducing noise levels to some degree. Overall, Donlin Gold's barging program is unlikely to result in undue disturbance and stress increase in listed marine wildlife.

5.2. Accidental Spill

A barge-related oil spill would potentially be a large spill (hundreds to millions of gal) involving the rupture of a vessel or transported fuel tank, usually as a result of a collision, sinking, fire, or running aground. Oil effects to marine wildlife that could result include skin contact with the oil, ingestion of oil, respiratory distress from hydrocarbon vapors, contaminated food sources, fouled feathers and fur, and displacement from feeding areas (Geraci 1990). Actual impacts would depend on the extent and duration of contact, and the characteristics (age) of the oil. Most likely, the effects of oil would be irritation to the respiratory membranes and absorption of hydrocarbons into the bloodstream (Geraci 1990). If a marine animal was present in the immediate area of fresh oil, it is possible that it could inhale enough vapors to affect its health. Inhalation of petroleum vapors can cause pneumonia in humans and animals due to large amounts of foreign material (vapors) entering the lungs (Lipscomb *et al.* 1994). Contaminated food sources and displacement from feeding areas also may occur as a result of an oil spill. Long-term ingestion of pollutants, including oil residues, could affect reproductive success, but data is lacking to determine how oil may fit into this scheme for marine wildlife. Seabirds and sea otters are so dependent on the insulative value of their feathers and fur that even a small amount of fouling can lead to death (Levy 1980, Burger and Fry 1993, O'Hara and Morandin 2010). In fact, it is generally accepted that feather fouling is the primary cause of mortality to seabirds in an oil spill event (Leighton 1991), and the *Exxon Valdez* spill in 1989 was thought to have killed nearly 4,000 sea otters in Prince William Sound (DeGange *et al.* 1994).

Further, the remoteness of the barging routes may make it difficult for a quick oil spill response. The longer the oil remains in the marine environment the harder it becomes to collect it.

The risk and effects of a potential chemical spill has not been previously assessed. Information on the chemicals to be transported and the risk of a spill are found in Section 6.1.2.

5.2.1. Relevance to Donlin Gold Barging

Each fuel barge launching from Dutch Harbor has the capacity to carry 2.9 million U.S. gal of ultra-low sulfur diesel (ULSD) fuel. Part of the barging route will cross the Great Circle route shipping lanes entering and exiting Unimak Pass. About 6,000 fishing and commercial vessels annually pass through Unimak Pass (TRB 2008), which is nearly double that of all Alaskan ports combined. Given traffic volume, currents (up to 7 kt [13 km/hr]), weather conditions (*e.g.*, fog), mixture of vessel speeds (*e.g.*, slow tug/barges vs. much faster container ships), and remoteness, Unimak Pass has a high risk for collision (Ports and Waterways Safety Assessment 2006), potentially resulting in an oil spill. Unimak Pass traffic also poses a collision risk for Donlin Gold barges coming from Seattle, although the potential oil spill volume is limited to what fuel remains in the tugboat tanks. Unimak Pass and the entry into Dutch Harbor are also lined with rocky hazards, which could result in a grounding due to engine failure or other accidental reasons. Groundings in remote and rocky Alaska often result in oil release.

However, in Alaska, operations relative to marine fuel transport and transfer are regulated by both Federal and State agencies, more specifically, the U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (EPA), and the State of Alaska Department of Environmental Conservation (ADEC). The USCG requires Vessel Response Plans (VRP) that comply with 33 CFR 155 subparts D, F, G, and I.

The fuel barges from Dutch Harbor would be double-hulled, specifically designed to reduce the risk of oil release in the event of a collision. Based on worldwide oil spills analyzed between 1991 and 2003, of 53 accidents with double-hulled tankers, only four resulted in an oil spill, totaling 115,000 gal (DeCola 2009). This compares to 105 accidents involving single-hulled tankers (without segregated ballast tanks), where 14 involved spills totaling over 70 million gal.

Donlin Gold is considering transporting 1 million gal of diesel fuel from Anchorage to Beluga in support of the pipeline construction. While Donlin Gold is considering several options, transport will most likely involve transporting the fuel in mobile tank trailers secured aboard a cargo deck barge. These tank trailers would hold about 10,000 gal each, and would be driven on- and off the barge. Other options include using a small double-hulled tank barge with a tank capacity of 130,000 gal. The fuel would be loaded and offloaded using a hose system and onshore holding tanks. However, all this fuel transport activity would occur in upper Cook Inlet over 80 mi (129 km) from the nearest location (Clam Gulch) where USFWS listed species (northern sea otter) can be found. This activity is not considered further in this assessment.

A chemical spill could also occur during a collision or allision event, including during a grounding while traveling up and down the Kuskokwim River. However, the safety measures addressed above regarding reducing oil spill risk, also apply to a chemical spill risk.

5.3. Incidental Spill

Incidental spills are chemicals spills which can be safely controlled at the time of release by shipboard personnel, do not have the potential to become an emergency within a short time, and are of limited quantity, exposure, and potential toxicity. Incidental spills also include normal vessel operational discharges such as release of bilge water that might contain oils or oily detergents from deck washdown operations. They further include accidental releases of small volumes of hydraulic fluids, motor fuels and oils, and other fluids used in normal ship operation, usually as a result of overfilling tanks. Incidental spills can also occur during vessel and transportation tank fueling at Dutch Harbor docks. The accumulation of a number of small spills can lead to impaired marine waters.

5.3.1. Relevance to Donlin Gold Barging

Incidental spills associated with Donlin Gold's barging program are most likely to occur in port (Dutch Harbor, Bethel, Anchorage, or Beluga) during fuel and supply transfer, with the greatest risk during fuel barge filling operations at Dutch Harbor and offloading at Bethel. However, given Bethel is located nearly 70 mi (113 km) upstream from the mouth of Kuskokwim River, incidentally spilled diesel fuel will most likely have dispersed or evaporated long before reaching marine waters used by listed marine mammals.

Facility Response Plans (FRP) are also required by the USCG for transfer of fuel from marine tank vessels to shore-based fuel storage facilities. These FRP requirements are described in 33 CFR 154 subparts F, H, and I and typically regulate fuel transfer operations from the vessel to the marine header at the fuel storage terminal.

The EPA requires both Spill Prevention Control and Countermeasure (SPCC) Plans and FRPs for shore-based fuel storage facilities where over-water fuel transfers occur. These requirements are described in 40 CFR part 112.

ADEC regulates marine tank vessels in state waters, transfer of fuel across the water, and fuel storage and distribution through the requirements of 18 AAC 75. All of these various regulations stem from and are integrated through the Oil Pollution Act of 1990 (OPA 90), promulgated following the Exxon Valdez oil spill which occurred in 1989. They focus on spill prevention by specifying construction standards, use of established procedures (for example fuel transfer procedures), conduct of regular equipment inspections, and personnel training. They also focus on spill response by requiring pre-staged spill response equipment, pre-identification of sensitive areas, personnel training, and regular spill drills. Agency inspections are also important elements of assuring spill response prevention, preparation and readiness. In Alaska, both dock and vessel operations relative to fuel transfer are required to develop Oil Discharge Prevention and Contingency Plans (ODPCPs) as regulated under 18 AAC 75. The plans must include a response action plan in the event of a spill, a prevention plan detailing the best management practices that will be implemented to avoid a spill occurrence, and a review of the best available technology for detecting and recovering oil discharges.

Spill response crisis management systems that conform to the National Incident Management System are also required. This assures seamless integration with state and federal response resources in the event that they are needed.

Both Dutch and Iliuliuk harbors were listed as impaired waters for settleable solids, dissolved oxygen, and petroleum hydrocarbons. In 1995 a Total Maximum Discharge Load was established related to waste discharges from Seafood Processors. Further sampling from 2006 to 2008 indicated that while the water column met State of Alaska Water Quality Standards (WQS), sediments did not. Focus since that time has been on best management practices to minimize further petroleum hydrocarbon and other contaminant inputs.

North Pacific Fuel is regulated through an Alaska Pollutant Discharge Elimination System Multi-sector General Permit (MSGP) number AKR05DB55. The MSGP is designed to assure that all discharges from regulated facilities meet WQS. Sediment contamination is thought to be a result of historic spills, perhaps occurring as long ago as World War II when more than a million gal of fuel was released during a Japanese bombing attack, as well as stormwater discharges from upland contaminated sites. Small spills at or near docks continue to contribute to impairment with an average of 1,000 gal of petroleum products spilled annually into the waters or onto adjacent shorelines of Dutch and Iliuliuk harbors (ADEC 2010).

ADEC (2010) has evaluated the three bulk-fuel storage and transfer facilities (Delta Western and two North Pacific Fuel facilities) and written “The three facilities appear to have implemented BMPs (Best Management Practices], developed the appropriate plans for spill scenarios, and properly managed their operations. There is no indication that these facilities are chronic sources of petroleum pollutants for the study area”. But they did recognize that the almost 20 million gal of fuel stored does pose a potential high risk to water quality.

The primary issue with incidental spills is the chronic impairment of water quality, and in this case sheen on sediment. O’Hara and Morandin (2010) studied the effects of petroleum sheens on pelagic seabirds and found that even very small quantities of oil sheen can change the microstructure of feathers leading to lethal thermoregulation problems in seabirds. Sea otters are also susceptible to oil fouling their fur and reducing the animal’s ability to thermoregulate (Kenyon 1969, Geraci and Williams 1990). Cimberg and Costa (1985) found that even lightly oiled animals spent an inordinate amount of time and energy grooming to remove the oil, and for the most part only spread it into clean areas and deeper into the fur. Geraci and Williams (1990) described the consequences as such:

> "A more extensive coating of oil would likely have tipped the balance and delivered the otters….in a tightening metabolic spiral: oil fouls the fur, reduces its insulative properties, and increases heat loss; the animal compensates by increasing its metabolic rate which, in turn, it must fuel by consuming more food; but eating gives way to vigorous grooming, and that energy squandered on spreading the oil, is not restored; body mass decreases and more heat is lost."

Pups are most vulnerable.

5.4. Effects to Prey

For the listed species addressed in this assessment, four species are primarily benthic feeders (northern sea otter, Pacific walrus, spectacled eider, and Steller's eider), while the remaining (short-tailed albatross) feed on small schooling fish, shrimp, squid, and zooplankton. Sessile bivalves are major component of the diet of otters, walrus, and eiders, although eiders and otters also feed on crustaceans. In addition, otters in the Aleutians feed on urchins. All these benthic species could become contaminated from spills leading to bioaccumulation or biomagnification of toxins in listed species, although diesel has a low specific gravity and does not sink and, thus, rarely reaches the seafloor. Contamination risks would be highest where otters feed near fuel transportation facilities, or after a major oil spill that results in oil reaching nearshore benthic habitats (perhaps where dispersants result in floating oil particles sinking to the seafloor).

Barging activity can directly affect plankton, fish eggs, fish larvae, and small fish through hull shear, entrainment through the propulsion system, exposure to turbulence in the propeller wash, and wake stranding (Odom *et al.* 1992). However, studies have found it difficult to detect barge-related mortality (Holland 1986, Odom *et al.* 1992), and have found fish larvae to be relatively resilient. Wake stranding, the depositing of fish onto shore by vessel-induced waves, is a function of wave amplitude, which further is a result of vessel size, draft, speed, and distance of vessel from shore (Bauersfeld 1977). Ackerman (2002) studied salmonid stranding in the lower Columbia River and found that shallow-draft tugs pulling barges produced much smaller wake amplitudes (average of 0.52 ft [0.15 m]) than larger, deep-draft ships (1.7 ft [0.52 m]), and all but one of the observed salmonid strandings were associated with deep-draft ships. The distances to shore during this study ranged from 780 to 1,630 ft (238-497 m), or much closer to shore than the proposed travel routes for the Donlin Gold barging. Thus, the Donlin Gold barges probably do not produce large enough wakes and are not close enough to shore to cause any significant wave mortality stranding of prey fish.

Acoustical effects to prey resources are also limited. Christian *et al.* (2004) studied seismic energy impacts on male snow crabs (*Chionoecetes* sp.) and found no significant increases in physiological stress due to exposure. No acoustical impact studies have been conducted to date on Alaskan fish species, but studies have been conducted on Atlantic cod (*Gadus morhua*) and sardine (*Clupea* sp.). Davis *et al.* (1998) cited various studies and found no effects to Atlantic cod eggs, larvae, and fry when received levels were 222 dB. Effects found were to larval fish within about 16.4 ft (5 m), and from air guns with volumes between 3,000 and 4,000 cubic inches. Similarly, effects to sardines were greatest on eggs and 2-day larvae, but these effects were also confined to 16.4 ft (5 m). Further, Greenlaw *et al.* (1988) found no evidence of gross histological damage to eggs and larvae of northern anchovy (*Engraulis mordax*) exposed to seismic air guns, and concluded that noticeable effects would result only from multiple, close exposures. All these studies involved impulsive noise of very high energy, much higher than the continuous noise associated with tug propeller cavitation. Given the little response of potential prey to impulsive noise, the noise associated with barging activity is not likely to affect benthic or fish prey.

6. DIRECT EFFECTS

6.1. Insignificant and Discountable Effects

The Endangered Species Consultation Handbook describes insignificant effects as those that are so small that they "should never reach the scale where take occurs", and discountable effects "are those extremely unlikely to occur". A Donlin Gold barging accident resulting in an oil or chemical spill represents a low likelihood, high impact event. The impacts of a spill could range from negligible to high depending on the nature and amount of material spilled, environmental factors, and response. Neither an oil nor chemical spill event, should it occur, could be considered insignificant if listed species were present in the affected area. However, if the risk of such a spill were low enough, the effects would be discountable. The following sections address the oil and chemical spill risk associated with Donlin Gold's proposed barging relative to spill risk and presence of listed species.

6.1.1. Risk of Oil Spill

Donlin Gold contracted ERM (2016) to prepare an oil spill risk assessment for the proposed fuel barging between Dutch Harbor and Bethel. They used available data to assess the risk of a fuel spill during oceanic transit and fuel transfer activities associated with diesel fuel transport from Dutch Harbor. The results are presented below.

6.1.1.1. Risk during Barge Transit

Donlin Gold plans to annually contract 14 fuel barge roundtrips between Dutch Harbor and Bethel, equating to 6,418 mi (10,329 km) of ocean transit each year. Based on this exposure and available data, ERM (2016) calculated an annual spill rate of 0.03, or one spill approximately every 31 years. Half the expected spills would be less than 5 gal and 17% greater than 1,000 gal (they found no data for spills greater than 10,000 gal). The rate for a spill of 1,000 to 10,000 gal was calculated as 0.005 spills annually, or one every 188 years.

6.1.1.2. Fate and Transport of a Transit Spill

The potential impact of a transit spill on listed wildlife species is not only a function of the spill risk, but also the location of the spill relative to the location of where species of concern occur. Spills occurring in Kuskokwim Bay (Steller's eiders) or Unalaska Bay (sea otters) have a higher risk to listed species than a spill in open sea many miles from listed wildlife high use areas. To determine locations along the route where spill risk is highest relative to the fate and transport of a spill, Owl Ridge Natural Resource Consultants, Inc. contracted Owens Coastal Consultants Ltd. (OCC) to develop fate and transport scenarios for a hypothetical 10,000-gal spill in Kuskokwim Bay. This was considered a worst-case scenario for potential impacts to staging and molting Steller's eiders in Kuskokwim Bay.

To determine oil fate, OCC used the National Oceanic and Atmospheric Administration (NOAA) ADIOS oil weathering model for an instantaneous 10,000-gal spill of diesel (with no assumed containment or cleanup) in summer water conditions expected in Kuskokwim Bay (water temperature 50°F, salinity 32 parts per thousand, sediment load 5 grams per cubic meter, and current 2 kt). The model output for six different wind speed scenarios is provided in Table 3 and indicates that in winds over 10 kt, the diesel has nearly all evaporated in 24 hr. The oil is predicted by the model to persist for a longer period, but OCC considered this persistence to be unrealistic given the evaporative properties of diesel and should be viewed as worst-case only.

TABLE 3: PERSISTENCE OF DIESEL RELATIVE TO WIND SPEED

Wind Speed (kt)	Percentage of Product Remaining after:				
	24 hr	48 hr	72 hr	96 hr	120 hr
2	47	39	36	33	31
5	39	33	29	26	23
6	36	28	23	19	16
7	21	10	5	2	1
10	3	0	0	0	0
15	2	0	0	0	0

OCC also modeled transportation fate based on local currents and tides relative to five wind speed scenarios (Table 4). There are no values in the gray boxes as the diesel fuel would have evaporated under these higher wind conditions (Table 3). This information was used to assess potential impacts to Steller's eiders and sea otters.

TABLE 4: DISTANCE OF DIESEL TRAVEL BEFORE EVAPORATION. NEGATIVE VALUES INDICATE MOVEMENT TO THE SOUTH (CURRENT) AND POSITIVE VALUES MOVEMENT TO THE NORTH (WIND)

Time (hr)	Transportation relative to release point (mi)				
	0 kt wind	5 kt S wind	7 kt S wind	10 kt S wind	15 kt S wind
0	0.0	0.0	0.0	0.0	0.0
6.5	-2.3	-1.2	-0.7	-0.1	1.1
13	-1.2	1.1	2.0	3.3	5.6
19.5	-3.5	-0.1	1.3	3.3	6.6
26	-2.3	2.2	4.0	6.7	11.2
32.5	-4.6	1.0	3.3	6.6	
39	-3.5	3.3	6.0	10.0	
45.5	-5.8	2.1	5.2	10.0	
52	-4.6	4.4	8.0		
58.5	-6.9	3.2	7.2		
65	-5.8	5.5	10.0		
71.5	-8.1	4.3	9.2		
78	-6.9	6.6	11.9		
84.5	-9.2	5.4	11.2		
91	-8.1	7.7	13.9		
97.5	-10.4	6.5	13.2		
104	-9.2	8.7	15.9		
110.5	-11.5	7.6	15.2		
117	-10.4	9.8	17.9		
123.5	-12.7	8.7	17.2		

6.1.1.3. Risk during Fuel Transfer

Loading or offloading a barge from Dutch Harbor would result in a transfer of about 2.9 million gal of diesel fuel. At a transfer rate of 85,000 gal per hour, the process would take about 36 hours to complete. A spill can occur during the transfer process due to equipment malfunction (*e.g.*, a faulty shutoff valve or hose leak) or human error (*e.g.*, misconnecting a hose or overtopping a tank). Typically, these incidental fuel transfer spills are small. ERM (2016) found that 95% of transfer spills are less than 50 gal, and only 0.2% of the spills were greater than 1,000 gal (and none greater than 10,000 gal). Based on 28 transfers per year, ERM estimated that a spill of any size could occur on average every 6 years, but a spill greater than 1,000 gal would occur approximately every 3,022 years.

It is possible that during infrequent periods of low water in the river, the deeper-draft ocean fuel barge may need to transfer fuel to a river barge in Kuskokwim Bay. Further, if a small tank barge is used to transport fuel across Cook Inlet, fuel would be transferred at both Anchorage and the barge landing near Beluga. But in both cases, the fuel transfer spill risk modeled by ERM (2016) would still apply.

6.1.2. Risk of Chemical Spill

The risk of a chemical spill during barging that would result in not just a spill, but a release of a size that could adversely affect a listed species or critical habitat is extremely low. The pathway for a chemical spill to affect a listed species or critical habitat would start with a barging accident that affected the particular chemical container. That container would need to be breached and the contents come into contact with the environment. Finally, there would need to be receptors (listed species) present to be exposed to the contaminated water. The details regarding spill risk and controls can be found in Section 3.24 of the Donlin Gold Project Draft Environmental Impact Statement (DEIS).

A chemical spill into water would likely be the result of a major or catastrophic barge incident. Saricks and Tompkins (1999) estimated the risk of a barge accident (allisions, collisions, breakaways, fires, explosions, groundings, structural failures, flooding, capsizing, and sinking) that occurred within 100 mi (160 km) of the coastline. The risk is 5.29 x10^{-7} accident per 500 short ton (st) /km. Over the life of the mine operations this translates to 0.00014[1] accidents. It is important to note that a barge accident may or may not result in a chemical spill to water. Therefore, the risk of a chemical spill would be less than 0.00014 over the life of the mine. Similarly, the DEIS stated that the risk of a cyanide spill would be very low (defined as a probability approaching zero).

This is an extremely low accident risk and, based on precedent, is discountable for the purposes of the ESA.

6.2. Northern Sea Otter

6.2.1. Disturbance

Available evidence suggests that sea otters are little disturbed by vessel noises. Visual encounters with otters are most likely to occur during fuel barge trips in and out of Unalaska Bay, although these otters are well accustomed to vessel noise given the fishing vessel traffic in the bay. The proposed barging operations

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[1] (Accident Rate) x $\frac{Total\ distance\ traveled\ with\ Cargo\ (km)}{Total\ Cargo\ \ (st)}$ therefore $5.29\ \cdot 10^{-7} \cdot \frac{500\ st}{1\ km} \cdot \frac{1{,}973{,}277.6\ km}{3{,}612{,}000\ st} = 0.00014$

are unlikely to disturb listed northern sea otters to any levels of concern. However, given the presence of otters and the fact that pupping probably occurs in Unalaska Bay, the determination is **May Affect, Not Likely to Adversely Affect** for disturbance.

6.2.2. Accidental Oil or Chemical Spill

A major oil spill event could have a dramatic impact on sea otter populations as evidenced by the several thousand killed during the *Exxon Valdez* spill event in 1989. However, while USFWS (2013) recognized the particular vulnerability of sea otters to oil, they classified oil spills as a risk factor of only low to moderate importance. This is because of the infrequency of bulk oil tanker traffic in the DPS range (about 40 pass through Unimak Pass annually), and that most spills would be of smaller volumes of diesel fuel. Diesel fuel is "less toxic and disperses and evaporates much more rapidly than crude oil" (USFWS 2013). A moderate ranking for oil spill risk was justified for the sea otter management units associated with Unimak Pass and the shipping routes into Cook Inlet due to the traffic volume, but the management potential for cleanup and containment of a small spill was thought to be high. Thus, while a diesel fuel spill might result in the harm of a number of local sea otters, the potential volume of spill, and rate of dispersion and evaporation, would limit the area impacted and depend on whether a tug fuel tank or fuel barge is involved.

The Donlin Gold fuel barging program will reduce oil spill risk by operating in summer months when weather conditions are moderate, by using barges with double-hull tanks to reduce the potential for complete tank rupture, and by using updated radar equipment to avoid other vessels traveling in the proximity. While the risk of an oil spill associated with Donlin Gold's barging operations is highest while traveling in the vicinity of Unimak Pass, the overall risk is low to the point of discountable, based on the safety measures mentioned in Section 6.1.1. Further, the spill risk modeling conducted by ERM indicated an annual spill risk of 0.005 (one every 188 years) for large spills of 1,000 to 10,000 gal. OCC determined that the maximum distance a 10,000-gal diesel spill could travel before evaporating was about 18 mi. Only the first 42 mi (68 km; 9.2%) of 458-mi (737-km) barge route between Dutch Harbor and Bethel occurs within 18 mi of where sea otters are found, thus the annual risk of a large spill occurring where it reaches sea otter habitat reduces to a discountable 0.00046 (9.2% x 0.005), or one every 2,043 years (188 years/9.2%). Finally, the risk of a chemical spill is discountable based on the spill risk analysis in Section 6.1.2. Thus, the determination is **May Affect, Not Likely to Adversely Affect** for accidental oil or chemical spill.

6.2.3. Incidental Oil Spill

Surface waters in Dutch and Iliuliuk harbors are no longer considered impaired by incidental discharges from industrial and fishing activities at Dutch Harbor and Unalaska, but sediments remain impaired due to lingering petroleum sheens. These petroleum sheens could affect northern sea otters, if benthic feeding individuals were to come into contact with them, by reducing the thermoregulatory properties of their fur (see Section 5.3.1). Also, sea otters are often observed near the docks and could be present during an incidental spill event. Based upon the known distribution of sea otters in Unalaska Bay, a 1,000-gal spill could reach sea otters at concentrations greater than silver sheen if the spill were to occur at one of the fuel docks located in the sub-bay Iliuluk Bay, but not from one of the fuel docks in Captains Bay. In either event, individual sea otters could be harmed, but population level affects would not occur. The determination is **May Affect, Not Likely to Adversely Affect** for incidental oil spill.

6.2.4. Effects to Critical Habitat

The proposed barging routes will pass very close to northern sea otter designated critical habitat where it traverses through the Semidi, Shumagin, and Sanak islands south of the Alaska Peninsula, and during travel in and out of Dutch Harbor. Thus, barging has a chance, albeit low, of disturbing sea otters or exposing them to an incidental spill at Dutch Harbor. A large accidental spill might have a population effect on local sea otters given the otter densities and their susceptibility to oil fouling of their insulating fur. However, the risk of an accidental spill is discountable. Thus, the determination for Donlin Gold's barging project is **May Affect, Not Likely to Adversely Affect** for northern sea otter critical habitat.

6.3. Pacific Walrus

6.3.1. Disturbance

Bristol Bay walrus haulout sites occur from 30 mi to 115 mi (48 to185 km) from the proposed Bering Sea route between Dutch Harbor/Unimak Pass and Bethel. Thus, disturbance risk to these summer haulouts is non-existent. The determination for disturbance risk is **No Effect**.

6.3.2. Accidental Oil or Chemical Spill

Collision and grounding risks are low given the lower large vessel traffic in Bristol Bay and shoreline topography. Further, diesel is of low viscosity and rapidly dilutes when spilled, and is much lighter than water and will not accumulate in bottom sediments. Thus, any diesel fuel reaching areas used by walrus is expected to be diluted to levels well below contact harm, and would not accumulate in the benthic feeding habitat. A collision with one of the 40 crude oil tankers that annually pass through Unimak Pass; however, might result in a crude oil spill with coastal currents transporting this oil well into Bristol Bay, although this collision risk is very low and considered discountable (see Section 6.1.1). Also, as described in Section 6.1.2, the risk of a chemical spill is discountable. The determination is **May Affect, Not Likely to Adversely Affect** for accidental oil or chemical spill.

6.3.3. Incidental Oil Spill

Walrus do not occur near Dutch Harbor or upriver at Bethel and would not be exposed to an incidental spill that might occur at these locations. The determination for incidental spill risk is **No Effect**.

6.3.4. Effects to Critical Habitat

Critical habitat has not been designated for Pacific walrus.

6.4. Short-Tailed Albatross

6.4.1. Disturbance

Short-tailed albatrosses are primarily a shelf edge species in Alaska. Potential encounters with Donlin Gold proposed barging is limited to where the route crosses Bering Sea shelf edge waters near Dutch Harbor or Unimak Pass. This species commonly feeds on offal from fishing factory ships, thus is relatively immune to vessel noise. Also, the probability of a barge encountering an albatross such that it would result in a behavioral effect is unlikely. The determination is **No Effect** for disturbance.

6.4.2. Accidental Oil or Chemical Spill

The greatest risk to short-tailed albatrosses from barging activity is probably an oil spill event resulting from a collision in the traffic-crowded Unimak Pass. Oil spill trajectories north or south of the pass could reach short-tailed albatross feeding habitat. However, this risk is low to the point of discountable, thus the determination for accidental oil spill is **May Affect, Not Likely to Adversely Affect**.

6.4.3. Incidental Oil Spill

Albatrosses are not found in harbor waters where they could be exposed to an incidental spill. The determination for incidental spill is **No Effect**.

6.4.4. Effects to Critical Habitat

The USFWS has determined that designating critical habitat is not prudent for the short-tailed albatross.

6.5. Spectacled Eider

6.5.1. Disturbance

The nearest spectacled eider use area to a proposed barging route is the Yukon-Kuskokwim Delta nesting area located over 80 mi (129 km) north of the Bering Sea route. Therefore, the Donlin Gold barging activity will have **No Effect** on these sea ducks from disturbance.

6.5.2. Accidental Oil or Chemical Spill

The only risk to the spectacled eiders that nest in the Yukon-Kuskokwim Delta, the nearest spectacled eider use to the barging routes, is from an oil spill that might transport north from a spill event in Kuskokwim Bay. However, the risk is discountable as results from OCC's modeling indicate that the maximum distance for travel for a worst-case 10,000-gal diesel spill before evaporation is 18 mi (29 km), or well short of the 80 mi (129 km) to the nearest spectacled eider habitat. Further, diesel fuel does not sink down to bottom sediments where eider benthic prey reside, and much of the eider feeding during the breeding season occurs in freshwater ponds. Also, as discussed in Section 6.1.2, the chances of an accident leading to a chemical spill are remote and discountable. The determination for accidental oil or chemical spill is **May Affect, Not Likely to Adversely Affect**.

6.5.3. Incidental Oil Spill

Spectacled eiders do not inhabit the port waters of Dutch Harbor and, therefore, are unlikely to be exposed to an incidental spill that might be associated with fuel transfer at the harbor. The determination is **No Effect** for incidental oil spill.

6.5.4. Effects to Critical Habitat

The nearest spectacled eider critical habitat occurs over 80 mi (129 km) north of the Bering Sea barging route. At this distance, the likelihood of an oil spill from a Donlin Gold barging accident reaching this critical habitat during the nesting season is discountable as the maximum transport of a worst-case 10,000-gal spill is 18 mi (29 km) (Table 4). Thus, the barging activity will have **No Effect** on spectacled eider critical habitat.

6.6. Steller’s Eider

6.6.1. Disturbance

Direct encounters of Steller’s eiders with barging operations are not likely. Late summer molting occurs in the lagoons along the north side of the Alaska Peninsula and at Kuskokwim Shoals at the north end of Kuskokwim Bay (Figure 1), and eider use in Unalaska Bay and south of the Alaska Peninsula occurs during the fall and winter outside the barging season. These eiders do not breed anywhere along the barging routes. Thus, barging operations would not directly disturb these eiders because there is no temporal overlap of common use areas. The determination is **No Effect** for disturbance to Steller’s eiders.

6.6.2. Accidental Oil or Chemical Spill

Both staging (early summer) and molting (late summer) Steller’s eiders can be found within a 4-mi (6.4-km) wide band along the Kuskokwim Bay shoreline during the period fuel barging from Dutch Harbor would occur. These birds would be vulnerable should a barge spill occur with Kuskokwim Bay. ERM conducted spill risk modeling and determined that the annual risk of a large 1,000- to 10,000-gal spill was only 0.005 (one every 188 years). OCC modeled both the fate and transportation of a hypothetical 10,000-gal diesel spill in Kuskokwim Bay and concluded that such a spill could travel between 9 and 18 mi (14 and 29 km) before evaporating depending on wind speeds at the time of spill. Of the 458-mi (737-km) fuel route between Dutch Harbor and Bethel, 70 mi (113 km) (15.3%) occurs within 18 mi (29 km) of areas identified in NOAA’s Environmental Sensitivity Index maps as seasonally important (staging and molting) to Steller’s eiders, and 30 mi (48 km; 6.5%) occurs within 9 mi (14 km) of these areas. Thus, the maximum annual risk of a spill occurring where it could potentially reach Steller’s eiders is a discountable 0.00076 (15.3% x 0.005), or one every 1,229 years (188 year/15.3%). Also, the risk of a chemical spill is discountable (see Section 6.1.2). Therefore, the determination for accidental oil or chemical spill is **May Affect, Not Likely to Adversely Affect** for Steller’s eiders.

6.6.3. Incidental Oil Spill

For the same reason described in Section 6.7.1 (no temporal overlap), any incidental spill associated with a Donlin Gold barging operation in Dutch Harbor would not directly impact Steller’s eiders using Unalaska Bay months later. For incidental oil spill the determination is **No Effect**.

6.6.4. Effects to Critical Habitat

Steller’s eider critical habitat occurs at the Kuskokwim Shoals unit molting area, and at three molting/wintering areas along the northwest coast of the Alaska Peninsula (Izembek Lagoon, Nelson Lagoon, and Seal Island units). The Kuskokwim Shoals area is located about 50 mi (80 km) northwest of the Bering Sea barging route, while the three Alaska Peninsula units are about 100 to 200 mi (160-320 km) from the Bering Sea route. None of these areas would be affected by barging disturbance or incidental spill. Modeling conducted by OCC indicates that a worst-case 10,000-gal diesel spill would only travel a maximum of 18 mi (29 km) before evaporating, or well short of any of the aforementioned critical habitat areas. Therefore, the Donlin Gold barging project will have **No Effect** on Steller’s eider designated critical habitat.

7. INDIRECT EFFECTS

The Donlin Gold barging program will be implemented to supply fuel and cargo to a planned gold mine located more than 250 mi (400 km) up the Kuskokwim River. Other than the barging activity addressed in this assessment, there are no other mine components or activities that involve marine waters, other than additional fuel transport to Dutch Harbor to supply Donlin Gold's fuel vendors located at Dutch Harbor. This fuel transport is not specifically addressed in this assessment as it is part of normal business operation for Dutch Harbor fuel vendors. Until fuel transport to Dutch Harbor is better understood, this future activity and associate risk remain speculative.

The risk of an oil spill has already been determined to be a discountable direct effect. However, should a spill occur, there are potential indirect effects associated with cleanup. The type of synthetic materials used to disperse or clean up fuel can influence the magnitude of effect on listed wildlife (Ober 2013). While dispersants can increase the rate of oil degradation and thereby reduce the effects from surface toxicity or degradation of shoreline habitats, they also are surfactants that can reduce the insulation abilities of bird feathers and cause floating oil particles to sink down to benthic habitats. Dispersants are rarely used for diesel spills, because the fuel evaporates and dissipates quickly. In addition, cleanup involves a large amount of human activity with associated additional disturbance risk to wildlife.

No other indirect effects have been identified.

8. CUMULATIVE EFFECTS ANALYSIS

For purposes of consultation under the ESA, cumulative effects are future state or private activities that are reasonably certain to occur within the action are, that do not involve federal activities subject to consultation. Relative to barging, the action areas are the barging routes between Unimak Pass and Bethel, Dutch Harbor and Bethel, and Anchorage and Beluga. Actions similar to Donlin Gold's barging program are the existing shipping traffic along these routes that also contribute to noise and spill hazard. Donlin Gold's operation will add to the shipping traffic in Washington, British Columbia, and Alaska, but by no more than 0.5% over existing traffic. However, with the expected increase in shipping traffic volume through the Strait of Juan de Fuca and Unimak Pass over the approximate 35-year barging program, especially with anticipated increases in tanker ship traffic carrying Canadian crude oil to China over the Great Circle route, Donlin Gold cargo barges will be traversing more crowded shipping lanes leading to an increase in collision risk. Further, Unimak Pass is a conduit to oil and gas exploration and increased cargo traffic to and through the Alaskan Arctic. Donlin Gold barging can expect to be part of an anticipated increase in Alaskan shipping traffic congestion. Several projects are planned for Cook Inlet that would also contribute noise risk to local marine mammals including the Alaska Liquefied Natural Gas pipeline project and several oil and gas seismic and drilling programs planned in both upper and lower Cook Inlet. All these projects will have associated mitigation and monitoring plans designed to limit impacts to Cook Inlet marine mammals.

9. DETERMINATION OF EFFECTS SUMMARY

A determination of effects for each species for the three evaluated risk categories is found in Table 5.

TABLE 5: DETERMINATION OF EFFECTS FOR EACH ESA LISTED SPECIES POTENTIALLY OCCURRING ALONG DONLIN GOLD'S PROPOSED BARGING ROUTES.

Species	Disturbance	Accidental Oil Spill	Incidental Oil Spill	Critical Habitat	Overall
Northern Sea Otter	NLAA	NLAA	NLAA	NLAA	NLAA
Pacific Walrus	NE	NLAA	NE	N/A	NLAA
Short-tailed Albatross	NE	NLAA	NE	N/A	NLAA
Spectacled Eider	NE	NLAA	NE	NE	NLAA
Steller's Eider	NE	NLAA	NE	NE	NLAA

NE = No Effect
NLAA = May Affect, Not Likely to Adversely Affect
N/A = Not Applicable

10. LITERATURE CITED

Ackerman, N.K. 2002. Effects of vessel wake stranding of juvenile salmonids in the lower Columbia River, 2002 – a pilot study. S.P. Cramer & Associates report to USACOE, Portland. 47 pp.

Alaska Department of Environmental Conservation (ADEC). 2010. Total Maximum Daily Loads (TMDLs) for Petroleum Hydrocarbons in the Waters of Dutch Harbor and Iliuliuk Harbor in Unalaska, Alaska. Alaska Department of Environmental Conservation, 555 Cordova Street, Anchorage, Alaska 99501. 75 pp.

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of Occurrence Rates for Offshore Oil Spills. OCS Report BOEM 2012-069 and BSEE 2012-069. 76 pp.

Arveson, P.T. and D.J. Vendittis. 2000. Radiated noise characteristics of a modern cargo ship. Journal of the Acoustical Society of America 107:118–129.

Austin, O.L. 1949. The Status of Steller's Albatross. Pacific Science 3:283-295.

Balcomb, K.C. and D.E. Claridge. 2001. A mass stranding of cetaceans caused by naval sonar in the Bahamas. Bahamas Journal of Science 8:1-12.

Bassett C., B. Polagye, M. Holt, and J. Thomson. 2012. A vessel noise budget for Admiralty Inlet, Puget Sound, Washington (USA). Journal of the Acoustical Society of America 132:3706-3719.

Bauersfeld, K. 1977. Effects of peaking (stranding) of Columbia River Dams on juvenile anadromous fishes below the Dalles Dam, 1974 and 1975. State of Washington Department of Fisheries report to the U.S. Army Corps of Engineers, Contract DACW 57-74-C-0094, 32 pp.

Bodkin, J.L., D. Mulcahy, and C.J. Lensink. 1993. Age-specific reproduction in female sea otters (*Enhydra lutris*) from south-central Alaska: analysis of reproductive tracts. Canadian Journal of Zoology. 71:1811-1815.

Bodkin, J.L. and M.S. Udevitz. 1999. An aerial survey method to estimate sea otter abundance, pg. 13-27 In: Marine Mammal Survey and Assessment Methods. Garner, G.W., Amstrup, S.C., Laake, J.L., Manly, B.J.F., McDonald, L.L., and Robertson, D.G., eds., AA Balkema, Rotterdam, Netherlands.

Bodkin, J.L. 2000. Sea otters past and present perspectives. Alaska Geographic 7:73-93.

Bodkin, J.L. and D.H. Monson. 2002. Sea otter population structure and ecology on Alaska. Arctic Research of the United States 16:31-36.

Bodkin, J.L., D.H. Monson, and G.E. Esslinger. 2003. A report on the results of the 2002 Kenai Peninsula and Lower Cook Inlet aerial sea otter survey. USGS Report. 10 pp.

Bodkin, J.L., Esslinger, G.J., Monson, D.H. 2004. Foraging depths of sea otters and implications to coastal marine communities. Marine Mammal Science 20:305-321.

Bowles, A.E., Smultea, M., Würsig, B., DeMaster, D.P. & Palka, D. 1994. Relative abundance and behavior of marine mammals exposed to transmissions from the Heard Island Feasibility Test. Journal of the Acoustical Society of America 96:2469–2484.

Burger, A. and D. Fry. 1993. Effects of oil pollution on seabirds in the northeast Pacific. In: Vermeer, K., Briggs, K., Morgan, K. & Siegel-Causey, D. (eds). The status, ecology, and conservation of marine birds of the North Pacific. Ottawa: Canadian Wildlife Service. pp. 254–263.

Burn, D.M. and A.M. Doroff. 2005. Decline in sea otter (*Enhydra lutris*) populations along the Alaska Peninsula, 1986-2001. Fishery Bulletin, 103:270-279.

Bustnes, J.O. and Systad, G.H. 2001. Habitat use by wintering Steller's Eiders *Polysticta stelleri* in northern Norway. Ardea 89:267-274.

Calvert, W. and Stirling I. 1990. Interactions between polar bears and overwintering walruses in the central Canadian High Arctic. International Conference on Bear Research and Management 8:351-356.

Chivers, S.J. 1999. Biological indices for monitoring population status of walrus evaluated with an individual-based model. Pages 239-247, *In:* Garner, G.W., S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald, and D.G. Robertson (eds.), Marine Mammal Survey and Assessment Methods. A. A. Balkema, Rotterdam, 287 pp.

Christian, J.R., A. Mathieu, and R.A. Buchanan. 2004. Chronic effects of seismic energy on snow crab (*Chionoecetes opilio*). Environmental Studies Research Funds Report No. 158, Calgary, AB.

Cimberg, R.L. and D.P. Costa. 1985. North Aleutian Shelf sea otters and their vulnerability to oil. In: Oil Spill Conference proceedings (prevention, behavior, control, cleanup). Los Angeles, CA. Amer. Petroleum Institute Publ. No. 4385:211-217.

Dall, W.H. 1873. Notes on the avifauna of the Aleutian Islands, especially those west of Unalaska. Proc. Calif. Acad. Sci. (first series) 5:270-281.

Dau, C.P. and S.A. Kistchinski. 1977. Seasonal movements and distribution of the spectacled eider. Wildfowl. 28:65–75.

Davis, R.A., D. Thomson, and C.I. Malme. 1998. Environmental assessment of seismic exploration of the Scotian Shelf. Unpublished Report by LGL Ltd., environmental research associates, King City, ON and Charles I. Malme, Engineering and Science Services, Hingham, MA for Mobil Oil Canada Properties Ltd, Shell Canada Ltd., and Imperial Oil Ltd.

Day, R.H. 1998. Predator populations and predation intensity on tundra–nesting birds in relation to human development. Report prepared by ABR Inc., for Northern Alaska Ecological Services, U.S. Fish and Wildlife Service, Fairbanks, Alaska. 106 pp.

DeCola, E. 2009. A review of double hull tanker oil prevention considerations. Nuka Research & Planning Group report to Prince William Sound RCAC. 34 pp.

DeGange, A.R., A.M. Doroff and D.H. Monson. 1994. Experimental recovery of sea otter carcasses at Kodiak Island following the Exxon Valdez oil spill. Mar. Mamm. Sci. 10:496-501.

DeMaster, D.P. 1984. An analysis of a hypothetical population of walruses. Pg. 77-80, *In* F.H. Fay and G.A. Fedoseev (eds.), Soviet American Cooperative Research on Marine Mammals, vol. 1, Pinnipeds. NOAA Technical Report, NMFS 12, 104 pp.

Donlin Gold. 2012. Vessel Operations, Oil Discharge Prevention and Contingency Plan – Plan of Operations - Volume VI B, Donlin Gold Project.

Donlin Gold. 2015. Response to RFAI #56 – Mercury and Cyanide Spill Response.

Doroff, A.M., J.A. Estes, M.T. Tinker, D.M. Burn, and T.J. Evans. 2003. Sea otter population declines in the Aleutian Archipelago. J. Mammalogy, 84:55-64.

Ely. C.R., C.P Dau, and C.A. Babcock. 1994. Decline in a population of Spectacled Eiders nesting on the Yukon-Kuskokwim Delta, Alaska. Northwestern Nat. 75:81-87.

Estes, J.A., R.J. Jameson, and A.M. Johnson. 1981. Food selection and some foraging tactics of sea otters. Pages 606-641 in J.A. Chapman and D. Pursley, eds. Worldwide furbearer conference proceedings, Frostburg, MD.

Estes, J.A. 1990. Indices used to assess status of sea otter populations: a reply. Journal of Wildlife Management. 54:270-272.

Estes, J.A., Tinker, M.T., Williams, T.M., and D.F. Doak. 1998. Killer whale predation on sea otters linking oceanic and nearshore ecosystems. Science 282:473-476.

Estes, J.A. and J.L. Bodkin. 2002. Otters. Pages 842-858 *in* W.F. Perrin, B. Wursig, and J.G.M. Thewissen, eds. Encyclopedia of marine mammals. Academic Press, San Diego.

Estes, J.A., Tinker, M.T., Doroff, A.M. and Burn, D.M. 2005. Continuing sea otter population declines in the Aleutian archipelago. Marine Mammal Science 21:169-172.

Evers, D.C., J.D. Paruk, J.W. McIntyre, and J.F. Barr. 2010. Common Loon (*Gavia immer*). The Birds of North America Online (A. Poole, ed.) Ithaca: Cornell Lab of Ornithology (http:bna.birds.cornell.edu/bna/species/313).

Fay, F.H. and B.P. Kelly. 1980. Mass natural mortality of walruses (*Odobenus rosmarus*) at St. Lawrence Island, Bering Sea, autumn 1978. Arctic 33:226-245.

Fay, F.H. 1982. Ecology and Biology of the Pacific Walrus (*Odobenus rosmarus* divergens). North American Fauna 74. U.S. Fish and Wildlife Service, Washington, DC. 279 pp.

Fay, F.H., B.P. Kelly, and J.L. Sease. 1989. Managing the exploitation of Pacific walruses: A tragedy of delayed response and poor communication. Marine Mammal Science 5:1-16.

Fay, F.H., L.L. Eberhardt, B.P. Kelly, J.J. Burns, and L.T. Quakenbush. 1997. Status of the Pacific walrus population, 1950-1989. Marine Mammal Science 13:537-565.

Flint, P.L and J.B. Grand. 1997. Survival of spectacled eider adult females and ducklings during brood rearing. Journal of Wildlife Management 61:217–221.

Flint, P. L. and M. P. Herzog. 1999. Breeding of Steller's Eiders on the Yukon-Kuskokwim Delta, Alaska. Canadian Field-Naturalist 113:306–308.

Flint, P.L., J.B. Grand, J.A. Morse, and T.F. Fondell. 2000. Late summer survival of adult female and juvenile spectacled eiders on the Yukon–Kuskokwim Delta, Alaska. Waterbirds 23:292–297.

Fredrickson, L. H. 2001. Steller's eider *Polysticta stelleri*. No. 177 *In* A. Poole and F. Gill (eds.). The Birds of North America. The Academy of Natural Sciences, Philadelphia, and The American Ornithologist's Union, Washington, D.C.

Garlich-Miller, J.L. and R.E.A. Stewart. 1999. Female reproductive patterns and fetal growth of Atlantic walruses *Odobenus rosmarus rosmarus* in Foxe Basin NT, Canada. Marine Mammal Science 15:179-191.

Garlich-Miller, J.L. and C.V. Jay. 2000. Proceedings of a workshop concerning walrus survey methods. USFWS R7/ MMM Technical Report 00-2, 92 pp.

Garlich-Miller, J.L., L.T. Quakenbush, and J.F. Bromaghin. 2006. Trends in age structure and productivity of Pacific walruses harvested in the Bering Strait region of Alaska, 1952-2002. Marine Mammal Science 22:880-896.

Garlich-Miller, J.L., J.G. MacCracken, J. Snyder, R. Meehan, M.J. Myers, J.M. Wilder, E. Lance, and A. Matz. 2011: Status review of the Pacific walrus (*Odobenus rosmarus divergens*). U.S. Fish and Wildlife Service, Marine Mammals Management, January 2011, Anchorage, AK, 155 pp.

Garshelis, D.L. 1983. Ecology of sea otters in Prince William Sound, Alaska. Ph.D. dissertation, University of Minnesota, Minneapolis, MN. 321 pp.

Geraci J.R. 1990. Physiologic and toxic effects on cetaceans. Pg. 167-197 In: Geraci JR, editor; St Aubin DJ, editor. Sea Mammals and Oil: Confronting the Risks. San Diego, CA, USA: Academic Press.

Geraci, J.R., and T.D. Williams. 1990. Physiologic and toxic effects on sea otters. Pgs. 211-221. In: J.R Geraci and D.J. St. Aubin (eds.). Sea mammals and oil: confronting the risks. Academic Press, Inc. 282 pp.

Ghoul, A. and C. Reichmuth. 2012. Aerial hearing sensitivity in a southern sea otter (*Enhydra lutris nereis*). 164th Meeting of the Acoustical Society of America. Kansas City, Missouri, 22-26 October, p. 2008.

Ghoul, A. and C. Reichmuth. 2014. Hearing in the sea otter (*Enhydra lutris*): auditory profiles for an amphibious marine carnivore. Journal of Comparative Physiology A, Original Paper. 15 pp.

Gilbert, J., G. Fedoseev, D. Seagars, E. Razlivalov, and A. Lachugin. 1992. Aerial census of Pacific walrus 1990. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Technical Report MMM 92-1, Anchorage, AK, 33 pp.

Gilbert, J.R. 1999. Review of previous Pacific walrus surveys to develop improved survey designs. Pg. 75-84 in: Garner, G.W., S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald, and D.G. Robertson (Eds), Marine mammal survey and assessment methods. A.A. Balkema, Rotterdam, The Netherlands.

Goudie R.I. and C.D. Ankney. 1986. Body size, activity budgets, and diet of sea ducks wintering in Newfoundland. Ecology 67:1475–1482

Grand, J.B. and P.L. Flint. 1997. Productivity of nesting spectacled eiders on the Lower Kashunuk River, Alaska. The Condor 99:926–932.

Grand, J.B., P.L. Flint, and M.R. Petersen. 1998. Effect of lead poisoning on spectacled eiders survival rates. Journal of Wildlife Management 62:1103–1109.

Gray, L.M. and D.S. Greeley. 1980. Source level model for propeller blade rate radiation for the world's merchant fleet. Journal of the Acoustical Society of America 67:516–522.

Green, G.A., and J.J. Brueggeman. 1991. Sea otter diets in a declining population in Alaska. Marine Mammal Science 7:395-401.

Greenlaw, C.F., D.V. Holliday, R.E. Pieper, and M.E. Clark. 1988. Effects of airgun energy releases on the northern anchovy. Journal of the Acoustical Society of America 84:S165.

Hasegawa, H. and A.R. DeGange. 1982. The Short-tailed Albatross, *Diomedea albatrus*: its status, distribution and natural history. American Birds 6:806-814.

Heath, J.P., H.G. Gilchrist, and R.C. Ydenberg. 2007. Can dive cycle models predict patterns of foraging behaviour? Diving by common eiders in an Arctic polynya. Animal Behaviour 73:877–884.

Hills, S., and J.R. Gilbert. 1994. Detecting Pacific walrus population trends with aerial survey —a review. Transactions North American Wildlife and Natural Resource Conference.

Holland, L.E. 1986. Effects of barge traffic on distribution and survival of ichthyoplankton and small fishes in the upper Mississippi River. Trans. Am. Fish. Soc. 115:162-165.

Jay, C.V., and S. Hills. 2005. Seasonal haul-out use and offshore foraging areas of walruses in Bristol Bay, Alaska. Arctic 58:192–202.

Jefferson T.A., P.J. Stacey, R.W. Baird. 1991. A review of killer whale interactions with other marine mammals: predation to co-existence. Mammal Review 21:151–180.

Johnson, S.R. and D.R. Herter. 1989. The birds of the Beaufort Sea. BP Exploration (Alaska), Inc., Anchorage, Alaska.

Jones, R.D., Jr. 1965. Returns of Steller's Eiders banded in Izembek Bay, Alaska. Wildfowl 16:83-85.

Kastelein, R.A., P. Mosterd, B. van Santen, M. Hagedoorn, and D. deHaan. 2002. Underwater audiogram of a Pacific walrus (*Odobenus rosmarus divergens*) mea- sured with narrow-band frequency-modulated signals. Journal of the Acoustical Society of America 112:2173-2182.

Kastelein, R.A., J.L. Dubbeldam, M.A.G. de Bakker, and N.M. Gerrits. 1996. The Anatomy of the walrus head *Odobenus rosmarus*. IV. The ears and their function in aerial and underwater hearing. Aquatic Mammals 22:95–125.

Kenyon, K.W. 1969. The sea otter in the Eastern Pacific Ocean. Dover Publications, New York. 352 pp.

Kertell, K. 1991. Disappearance of the Steller's eider from the Yukon-Kuskokwim Delta, Alaska. Arctic 44:177-187

Kreuder, C., M.A. Miller, D.A. Jessup, L.J. Lowenstein, M.D. Harris, J.A. Ames, T.E. Carpenter, P.A. Conrad, and J.A.K. Mazet. 2003. Patterns of mortality in southern sea otters (*Enhydra lutris nereis*) from 1998-2001. Journal of Wildlife Diseases 39:495-509.

Kryukova, N.V., E.P. Kruchenkova, and D.I. Ivanov. 2012. Killer whales (*Orcinus orca*) hunting for walruses (*Odobenus rosmarus divergens*) near Retkyn Spit, Chukotka. Biology Bulletin 39:768–778.

Larned, W.W. and T. Tiplady. 1996. Distribution and abundance of sea ducks in Kuskokwim Bay, Alaska, September 1996. Unpublished Report. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska, USA.

Larned, W., R. Stehn, and R. Platte. 2011. Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2010. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK. 52 pp.

Larned, W., R. Stehn, and R. Platte. 2012. Waterfowl breeding population survey, Arctic Coastal Plain, Alaska, 2011. Unpublished Report, U.S. Fish and Wildlife Service, Anchorage, AK. 51 pp.

Laubhan, M.K. and K.A. Metzner. 1999. Distribution and diurnal behavior of Steller's eiders wintering on the Alaska Peninsula. The Condor 101:694-698.

Leighton, F.A. 1991. The Toxicity of Petroleum Oils to Birds: An Overview in The Effects of Oil on Wildlife: Research, Rehabilitation and General Concerns. White, J., Frink L. (eds.) IWRC, CA. pp. 43-57.

Levy, E.M. 1980. Oil pollution and seabirds: Atlantic Canada 1976-77 and some implications for northern environments. Marine Pollution Bulletin 11:51-56.

Lipscomb, Thomas P., Richard K. Harris, Alan H. Rebar, Brenda E. Ballachey, and Romona J. Haebler. 1994. "Pathology of Sea Otters." Marine Mammals and the Exxon Valdez. 1st ed. Ed. Thomas R. Loughlin San Diego: API, 1994. Pp. 265-80.

MacLean S.A. 2012. Establishing a Transit Corridor through the Round Island Walrus Habitat Protection Area – Scope, Purpose and Need of the Action. North Pacific Fishery Management Council. Round Island Transit Corridor. 7 pp.

Madsen, P.T., M. Wahlberg, J. Tougaard, K. Lucke and P. Tyack. 2006. Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. Marine Ecology Progressive Series 309:279-295.

Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird. 1984. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. Phase II: January 1984 migration (BBN Report No. 5586; NTIS PB86-218377). Report from Bolt Beranek and Newman Inc. for U.S. Minerals Management Service, Anchorage, AK.

Mate, B.R., K.M. Stafford, and D.K. Ljungblad. 1994. A change in sperm whale (*Physeter macrocephalus*) distribution correlated to seismic surveys in the Gulf of Mexico. Journal of the Acoustical Society of America 96:3268–3269.

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131:92-103.

McShane L.J., J.A. Estes, M.L. Riedman, and M.M. Staedler. 1995. Repertoire, structure and individual variation of vocalizations in the sea otter. Journal of Mammalogy 76:414–427.

Melvin, E.F., J.K. Parrish, K.S. Dietrich, and O.S. Hamel. 2001. Solutions to seabird bycatch in Alaska's demersal longline fisheries. Washington Sea Grant Program. Project A/FP-7. http://wsg.washington.edu/communications/online/seabirds/seabirdpaper.html

Metzner, K.A. 1993. Ecological strategies of wintering Steller's Eiders on Izembek Lagoon and Cold Bay, Alaska. M.S. thesis, University of Missouri, Columbia, MO. 193 pp.

Miles, P.R., C.I. Malme, and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea, BBN Report No. 6509, OCS Study MMS 87-0084. Reb. From BBN Labs Inc., Cambridge, MA, for U.S. Minerals Managements Service, Anchorage, AK. NTIS PB88-158498.

Murie, O.J. 1959. *Diomedea albatrus*: short-tailed albatross. *In*: Murie, O.J. and V.B. Scheffer (Eds.). Fauna of the Aleutian Islands and Alaska Peninsula. North American Fauna 61:36-39.

National Research Council (NRC). 2003. Ocean noise and marine mammals. Washington DC: National Academies Press. 617 pp.

Ober, H.K. 2013. Effects of oil spills on marine and coastal wildlife. University of Florida IFAS Extension Publication #WEC285. 4 pp.

Odom, M.C., D.J. Orth, and L.A. Nielsen. 1992. Investigation of barge-associated mortality of larval fishes in the Kanawha River. Virginia Journal of Science 43:41-45.

O'Hara, P.D. and L.A. Morandin. 2010. Effects of sheens associated with offshore oil and gas development on the feather microstructure of pelagic seabirds. Marine Pollution Bulletin 60:672-678.

Ouellet, J-F, C. Vanpé, M. Guillemette. 2013. The Body Size-Dependent Diet Composition of North American Sea Ducks in Winter. PLoS ONE 8(6):e65667.

Papanikolaou, A., E. Eleftheria, A. Aimilia, A, Seref, T. Cantekin, D. Severine, and M. Nikos. 2006. Impact of Hull Design on Tanker Pollution. Proceedings of the Ninth International Marine Design Conference, Ann Arbor, MI.

Petersen, M.R. 1980. Observations of wing-feather molt and summer feeding ecology of Steller's eiders at Nelson Lagoon, Alaska. Wildfowl 31:99-106

Petersen, M.R. 1981. Population, feeding ecology and molt of Steller's eiders. The Condor 83:256-262.

Petersen, M.R., B.J. McCaffery, and P.L. Flint. 2003. Post-breeding distribution of Long-tailed Ducks *Clangula hyemalis* from the Yukon-Kuskokwim Delta, Alaska. Wildfowl 54:103-113.

Petersen, M.R., D.C. Douglas, and D.M. Mulcahy. 1995. Use of implanted satellite transmitters to locate Spectacled Eiders at sea. The Condor 97:276-278.

Petersen, M.R., J.F. Piatt, and K.A. Trust. 1998. Foods of Spectacled Eiders *Somateria fischeri* in the Bering Sea, Alaska. Wildfowl 49:124–128.

Petersen, M.R., W.W. Larned, and D.C. Douglas. 1999. At–sea distribution of spectacled eiders: a 120–year–old mystery resolved. The Auk 116:1009–1020.

Petersen, M.R., J.B. Grand, and C.P. Dau. 2000. Spectacled Eider (*Somateria fischeri*). In: A. Poole and F. Gill, editors. The Birds of North America, No. 547. The Birds of North America, Inc., Philadelphia, PA.

Piatt, J.F., J. Wetzel, K. Bell, A.R. DeGange, G.R. Balogh, G.S. Drew, T. Geernaert, C. Ladd, and G.V. Byrd. 2006b. Predictable hotspots and foraging habitat of the endangered short-tailed albatross (*Phoebastria albatrus*) in the North Pacific: implications for conservation. Deep Sea Research II 53:387-398.

Platte, R.M. and R.A. Stehn. 2011. Abundance and trend of waterbirds on Alaska's Yukon–Kuskokwim Delta coast based on 1988 to 2010 aerial surveys. Unpublished report, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska. April 29, 2011. 43 pp.

Ports and Waterways Safety Assessment. 2006. Workshop Report: Aleutian Islands. 41 pp. Online at: http://www.aleutiansriskassessment.com/documents/aleutian_islands_finalrpt.pdf

Quakenbush, L.T. and J. Cochrane. 1993. Report on the conservation status of the Steller's eider (*Polysticta stelleri*), a Candidate Threatened and Endangered Species. U.S. Fish and Wildlife Service, Anchorage, Alaska. 26 pp.

Quakenbush, L.T. and R.S. Suydam. 1999. Periodic non–breeding of Steller's eiders near Barrow, Alaska, with speculation on possible causes. Pages 34–40 *in* R.I. Goudie, M.R. Petersen, and G.J. Robertson, editors. Behavior and ecology of sea ducks. Occasional Paper Number 100. Canadian Wildlife Service, Ottawa.

Quakenbush, L.T., R.H. Day, B.A. Anderson, F.A. Pitelka, and B.J. McCaffery. 2002. Historical and present breeding season distribution of Steller's eiders in Alaska. Western Birds 33:99-120.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego. 576 pp.

Romero L.M., J.M. Dickens, and N.E. Cyr. 2009. The reactive scope model – a new model integrating homeostasis, allostasis and stress. Hormonal Behavior 55:375–389.

Rosenberg, D.A., M.J. Petrula, D. Zwiefelhofer, T. Holmen, D.D. Hill, and J.L. Schamber. 2011. Seasonal movements and distribution of Pacific Steller's eiders (*Polysticta stelleri*). Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, Anchorage, Alaska. 44 pp.

Saricks, C.L. and M.M. Tompkins. 1999. State-Level Accident Rates of Surface Freight Transportation: A Reexamination. Argonne National Laboratory publication ANL/ESD/TM-150. 62 pp.

Sheffield, G.G., F.H. Fay, H. Feder, and B.P. Kelly. 2001. Laboratory digestion of prey and interpretation of walrus stomach contents. Marine Mammal Science 17:310–330.

Sheffield G. and J.M. Grebmeier. Pacific walrus (*Odobenus rosmarus divergens*): differential prey digestion and diet. 2009. Marine Mammal Science 25:761–777.

Schusterman, R.J. and C. Reichmuth. 2008. Novel sound production through contingency learning in the Pacific walrus (*Odebenus rosmarus divergens*). Animal Cognition 11:319-327.

Simmonds, M., S. Dolman, and L. Weilgart. 2004. Oceans of Noise. Science report prepared by the Whale and Dolphin Conservation Society (WDCS). Chippenham, United Kingdom. 168 pp.

Solovieva, D. 1997. Timing, habitat use and breeding biology of Steller's Eiders in the Lena Delta, Russia. Pp. 35–39, in S. Phil and T. Fox, eds. Wetlands International Seaduck Specialist Group Bulletin No. 7.

Southall, B. L., R.J. Schusterman, and D. Kastak. 2000. Masking in three pinnipeds: Underwater, low-frequency critical ratios. Journal of the Acoustical Society of America 108:1322–1326

Speckman S.G., V. Chernook, D.M. Burn, M.S. Udevitz, A.A. Kochnev, A. Vasilev, *et al.* 2011. Results and evaluation of a survey to estimate Pacific walrus population size, 2006. Marine Mammal Science 27:514–553.

Stehn R.A., C.P. Dau, B. Conant, and W.I. Butler, Jr. 1993. Decline of Spectacled Eiders Nesting in Western Alaska. Arctic 46:264-277.

Stehn, R., W. Larned, R. Platte, J. Fischer, and T. Bowman. 2006. Spectacled eider status and trend in Alaska. U.S. Fish and Wildlife Service, Anchorage, Alaska. Unpublished Report. 17 pp.

Stemp, R. 1985. Observations on the effects of seismic exploration on seabirds, pp. 217- 233. *In*: G.D. Greene, F.R. Engelhardt & R.J. Paterson (eds), Proceedings of the Workshop on Effects of Explosives Use in the Marine Environment, January 29-31, 1985, Halifax. Canada Oil and Gas Lands Administration, Environmental Protection Branch, Technical Report No. 5.

Stirling, I. 2011. Polar Bears: The Natural History of a Threatened Species. Fitzhenry and Whiteside. Markham, ON. 334 pp.

Suryan, R.M., F. Sato, G.R. Balogh, K.D. Hyrenbach, P.R. Sievert, and K. Ozaki. 2006. Foraging destinations and marine habitat use of short-tailed albatross: A multi-scale approach using first-passage time analysis. Deep-Sea Research II 53:370–386.

Suryan, R.M., K.S. Dietrich, E.F. Melvin, G.R. Balogh, F. Sato, and K. Ozaki. 2007a. Migratory routes of short-tailed albatrosses: Use of exclusive economic zones of North Pacific Rim countries and spatial overlap with commercial fisheries in Alaska. Biological Conservation 137:450-460.

Suryan, R.M., G.R. Balogh, and K.N. Fischer. 2007b. Marine Habitat Use of North Pacific Albatross during the Non-breeding Season and Their Spatial and Temporal Interactions with Commercial Fisheries in Alaska. North Pacific Research Board Project 532 Final Report. 69 pp.

Therrien, S.C. 2014. In-air and underwater hearing of diving birds. PhD Dissertation. University of Maryland, College Park.

Thomas N. and R.A. Cole. 1996. The Risk of Disease and Threats to the Wild Population. Endangered Species Update 13:23-27.

Transportation Research Board (TRB). 2008. Rick of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment. TRB Special Report 293

Turnpenny, A.W.H. and J.R. Nedwell. 1994. The effects of marine fish, diving mammals and birds of underwater sound generated by seismic surveys. Subacoustech Report FCR 089/94. Available from: www.subacoustech.com.

Udevitz, M.S., J.R. Gilbert, and G.A. Fedoseev. 2001. Comparison of method used to estimate numbers of walruses on sea ice. Marine Mammal Science 17:601-616.

U. S. Fish and Wildlife Service. 1994. Conservation Plan for the Polar Bear in Alaska. Unpubl. Rept. Marine Mammals Management, U.S. Fish and Wildlife Service, Anchorage, AK. 79 pp.

U.S. Fish and Wildlife Service. 2001. Endangered and Threatened Wildlife and Plants; Final determination of critical habitat for the Alaska–breeding population of the Steller's eider. Final rule. Published 2 February 2001 by the U.S. Fish and Wildlife Service. Federal Register 66:8849–8884.

U.S. Fish and Wildlife Service. 2002. Steller's Eider Recovery Plan. Fairbanks, Alaska.

U.S. Fish and Wildlife Service. 2008. Short-tailed Albatross Recovery Plan. Anchorage, AK. 105 pp.

U.S. Fish and Wildlife Service. 2009. Pacific Walrus (*Odobenus rosemarus divergens*). 2 pp.

U.S. Fish and Wildlife Service. 2011. Threatened and Endangered Species, Short-Tailed Albatross (*Phoebastria albatrus*). 2 pp.

U.S. Fish and Wildlife Service. 2013. Draft Revised Northern Sea Otter (*Enhydra lutris kenyoni*): Southwest Alaska Stock Assessment. Marine Mammals Management Office, Region 7, Anchorage, Alaska. 21 pp.

Van Dorp, J.R. and J. Merrick. 2014. Final Report: VTRA 2010: Preventing oil spill from large ships and barges in northern Puget Sound & Strait of Juan de Fuca. The George Washington University report to Puget Sound Partnership. 166 pp.

Vang Hirsh, K. 1980. Winter ecology of sea ducks in the inland marine waters of Washington. MSc thesis, University of Washington.

Vermeer, K., K.H. Morgan, R.W. Butler, and G.E.K. Smith. 1989. Population, nesting habitat and food of Bald Eagles in the Gulf Islands. Pg. 123-130 *In*: The Status and Ecology of Marine and Shoreline Birds in the Strait of Georgia, British Columbia (K. Vermeer and R.W. Butler, Eds.). Canadian Wildlife Service Special Publication, Ottawa: Canadian Wildlife Service.

Ward, D.H., and R.A. Stehn. 1989. Response of Brant and Canada Geese to aircraft disturbance at Izembek Lagoon, Alaska. Final Rep. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center, Anchorage, AK.

Warnock, N. and D. Troy. 1992. Distribution and abundance of spectacled eiders at Prudhoe Bay, Alaska: 1991. Unpublished report prepared for BP Exploration (Alaska) Inc., Environmental and Regulatory Affairs Department, Anchorage, Alaska, by Troy Ecological Research Associates (TERA), Anchorage, Alaska. 20 pp.

Wartzok, D. and D.R. Ketten. 1999. Marine Mammal Sensory Systems. Pg. 117-175 *In*: J. E. Reynolds III & S. A. Rommel (eds) Biology of Marine Mammals. Smithsonian Institution Press, Herndon, Virginia.

Washington Department of Ecology. 2014. VEAT 2013. Ecology Publication 14-8-004. 5 pp.

Watkins, W.A, and W.E. Scheville. 1975. Sperm whale react to pingers. Deep Sea Research 22:123-129.

Weilgart, L.S. 2007. The impacts of anthropogenic ocean noise on cetaceans and implications for management. Canadian Journal of Zoology 85:1091–1116.

Wilson, H.M., T.D. Bowman, W.W. Larned, and J.B. Fischer. 2012. Testing the feasibility and effectiveness of a fall Steller's eider molting survey in southwest Alaska. Unpublished Report. USFWS, Migratory Bird Management, Anchorage Alaska. http://alaska.fws.gov/mbsp/mbm/waterfowl/surveys/pdf/swsteimolt.pdf

Wolt, R.C., F.P. Gelwick, F. Weltz, and R.W. Davis. 2012. Foraging behavior and prey of sea otters in a soft- and mixed-sediment benthos in Alaska. Mammal Biology 77:271-280.

National Marine Fisheries Service Letter of Concurrence dated March 29, 2018

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
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March 29, 2018

Col. Michael Brooks
US Army Corps of Engineers, Alaska District
Regulatory Division
PO Box 6898
JBER, Alaska 99506-0898

Re: Donlin Gold Mine Letter of Concurrence, POA-1995-120, NMFS #AKR-2018-9745

Dear Col. Brooks:

The National Marine Fisheries Service (NMFS) has completed informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) regarding the proposed barging activities associated with the Donlin Gold Mine located in the Bering Sea and Cook Inlet (Figure 1). The United States Army Corps of Engineers (USACE) requested written concurrence that the proposed action may affect, but is not likely to adversely affect, western Distinct Population Segment (DPS) Steller sea lions (*Eumetopias jubatus*), Mexico DPS humpback whales (*Megaptera novaeangliae*), western North Pacific DPS humpback whales, North Pacific right whales (*Eubalaena japonica*), fin whales (*Balaenoptera physalus*), Cook Inlet beluga whale (*Delphinapterus leucas*) or designated Steller sea lion, North Pacific right whale, or Cook Inlet beluga whale critical habitat. Based on our analysis of the information you provided to us, and additional literature cited below, NMFS concurs with your determination.

This letter underwent pre-dissemination review in compliance with applicable Data Quality Act guidelines. A complete administrative record of this consultation is on file in this office.

Consultation History

NMFS initially met with the USACE and Donlin Gold, LLC (Donlin) on September 14, 2016 to discuss the proposed project and possible mitigation measures. NMFS sent the USACE and Donlin Gold LLC (Donlin Gold) standard North Pacific right whale mitigation measures and research papers on September 22, 2016. NMFS received the USACE's request for consultation on August 23, 2017. NMFS requested information about the proposed project via email on October 19, 2017. On November 6, 2017, the USACE provided NMFS with an updated Biological Assessment with additional information regarding the project schedule and proposed mitigation measures. NMFS requested additional information regarding mitigation measures proposed via email from November 29, 2017 through February 26, 2018. NMFS, the USACE, and Donlin Gold also met on January 24, 2018 to discuss the proposed project. ESA Section 7 consultation was initiated on February 26, 2018.

Description of the Proposed Action

The proposed Donlin Gold Project has four primary components: 1) mine site facilities, 2) a natural gas pipeline 315-miles (mi; 507 kilometers [km]) in length, 3) oceanic supply barging in Cook Inlet and in the Bering Sea; and 4) river supply barging (Figure 1). The marine barging routes are the only proposed project component that occur in habitat used by ESA-listed species. Our analysis of effects is therefore limited to this proposed project component and associated effects (e.g. risk of fuel spills).

Donlin Gold's proposed oceanic barging program consists of three marine barging routes as described (Figure 1):

1. Dutch Harbor to Bethel Route: Barges traveling along this 458-mi (737-km) Bering Sea route will carry fuel.
2. Unimak Pass and Bethel: Barges traveling along this 410-mi (660-km) marine route will carry supplies including hazardous chemicals required for gold ore processing.
3. Cook Inlet Route: a 40-mi (64-km) supply barge route between Anchorage and a barge landing south of Beluga. Fuel may also be transported from Nikiski to the Beluga barge landing.

Barging will take place over the estimated 4 years of mine construction and the 27.5 years of operation. All barging will occur in the ice-free months from May to September. Table 1 summarizes the maximum number of barging trips per year for construction and operations.

Table 1. Summary of Barging Operations for the Donlin Gold Project

Route	Construction (Years 1-4)	Operations (Years 5-27.5)
Dutch Harbor to Bethel	3 – 6 round trips per year	Up to 14 round trips per year
Unimak Pass to Bethel	Up to 16 round trips per year	Up to 12 round trips per year
Cook Inlet Route	20 round trips during 1 year of construction	None

Fuel will be transported from Dutch Harbor to Bethel using a single double-hulled barge holding up to 2.9 million U.S. gallons (gal) of fuel, towed by a 3,000-horsepower tug. Fuel demand varies over the mine life, but the peak of operations will require a maximum of about 14 annual barge roundtrips per year across Kuskokwim Bay. Fuel demands during construction are significantly lower and will require between 3 and 6 trips over the construction period.

Supply barges traveling from Unimak Pass to Bethel will include the following cargo: annual consumables and general cargo consolidated as bulk in containers, bulk in Super Sacks ®, loose or palletized break-bulk, small packages, and liquid in small tanks. Included in this cargo are a number of hazardous chemicals required in gold ore processing (Table 2).

Up to 20 construction barge trips will run from Anchorage to Beluga, all trips will occur within one construction season and gas line pipe will be the primary cargo. Donlin Gold is also considering transport of 1 million gallons of diesel fuel across Cook Inlet needed to support the pipeline construction. This fuel could come from either Anchorage or Kenai. Donlin is considering several options to transport fuel, including fuel being flown to various project locations for construction, transporting the fuel in mobile tank trailers secured aboard a cargo deck barge, and/or the use of small double-hulled tank barges. Donlin expects a maximum of 3 trips by barge to transport fuel across Cook Inlet. Tank trailers would hold about 10,000 gallons each, and would be driven on and off the barge. Other options include using a small double-hulled tank barge with a tank capacity of 130,000 gallons. The fuel would be loaded and offloaded using a hose system and onshore holding tanks. The beach landing site is 3.8 mi (6.1 km) south of the Beluga Airport and 7.3 mi (11.7 km) south of the mouth of the Beluga River.

Table 2 Key chemicals transported annually during operations

Chemicals[1]	Est. Annual Transport (Short Tons)
Ammonium Nitrate (bulk)	33,000
Potassium Amyl Xanthate	4,189
Methyl Isobutyl Carbinol and F-549	1,984
Nitric Acid	661
Sodium Cyanide	2,535
Lime	21,027
Activated Carbon	220
Caustic soda (Sodium hydroxide)	358
Mercury Suppressant (UNR 829)	44
Flocculants	3,527
Sulfur	1,414
Copper sulfate	2,425
Fluxes (borax, sodium nitrate, and silica sand)	165
Water Softening and Anti-Scalant Agents	1,081
Ferric Sulphate	440
Sulphuric Acid	18
Sodium hydroxide	13
Polymer	2
Potassium Permangenate	13
Sodium Metabisulfite	7
Cleaning-In-Place (HCl, NaOH)	Less than 1 (~ 250 pounds [lb])
Microsand	8
Liquid Elemental Mercury	11
Spent Activated Carbon (Mercury)	5.5

[1]*-The estimates are based on the current level of engineering design, and are applicable only to the mine operations phase. These chemicals would not be required during construction or the reclamation and closure phase of the project. The list of chemical amounts is subject to change along with future engineering design. Additional chemicals could/would be added, substituted, or amounts increased or decreased.*

Action Area

The action area is defined in the ESA regulations (50 CFR 402.02) as the area within which all direct and indirect effects of the proposed project will occur. The action area is distinct from and larger than the proposed project footprint because some elements of the proposed project may affect listed species some distance from the proposed project footprint. The action area, therefore, extends out to a point where no measurable effects from the proposed project are expected to occur.

Since 1997 NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater sounds that might result in impacts to marine mammals (70 FR 1871) (Table 3). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary threshold shifts (PTS and TTS; Level A harassment) (81 FR 51693). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[1], expressed in root mean square[2] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA):

- impulsive sound: 160 decibels (dB) referenced at 1 micropascal in meters (μPa) root mean square (rms)
- continuous sound: 120 dB re 1μPa_{rms}

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016a). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds and L_E for non-impulsive sounds:

[1] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.

[2] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

Table 3. PTS Onset Acoustic Thresholds

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of $1\mu Pa^2s$. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

NMFS defines the action area for this proposed project as the area within which project-related noise levels are ≥120 dB re 1μParms (i.e., the point where no measurable effect from the project will occur). Received sound levels of approximately 171 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1μParms within 2,600 meters (m; 2.6 km) of the source. To define the action area, we also considered barge contractors will be instructed to operate within a 36 mi (57.9 km) wide travel lane, except when safety issues dictate otherwise or mitigation measures do not allow for transiting near major western DPS Steller sea lion haulouts or rookeries or important Cook Inlet beluga whale critical habitat (i.e. Susitna Delta).

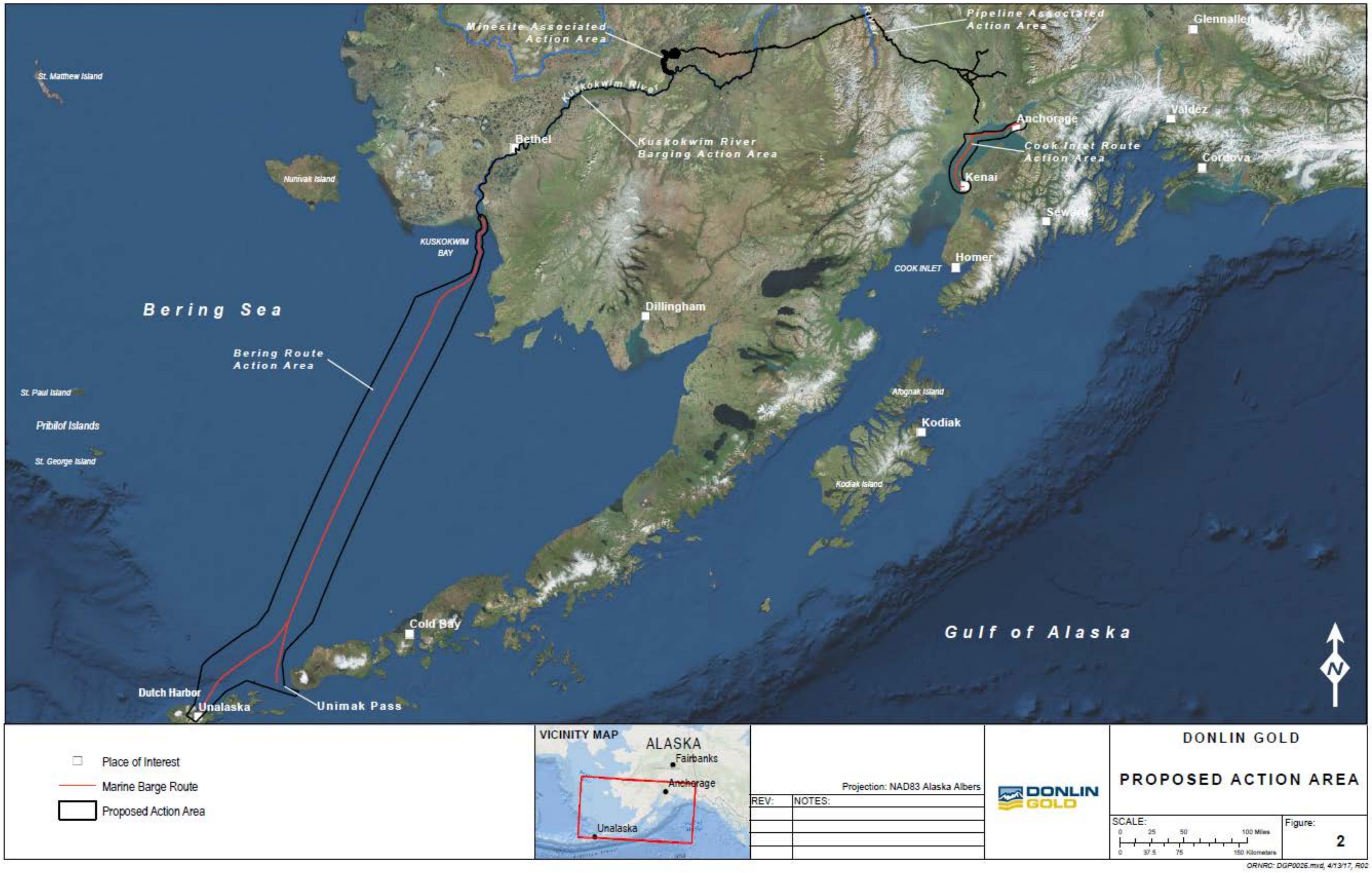

Figure 1. Project Action Area

Mitigation Measures

The USACE informed NMFS via email on February 23, 2018, March 6, 2018, and March 27, 2018 that the proposed project will incorporate the following mitigation measures to avoid impacts to western DPS Steller sea lions, Mexico DPS humpback whales, western North Pacific DPS humpback whales, North Pacific right whales, fin whales, Cook Inlet beluga whales, and designated Steller sea lion, North Pacific right whale, and Cook Inlet beluga whale critical habitat.

Project Specific Barging

These procedures apply to all vessels operating under direct contract for Donlin Gold, LLC. These mitigation procedures are not intended to apply to common maritime traffic in the area that is not under Donlin Gold LLC contract.

Marine Barging

1. Donlin Gold will implement measures to minimize risk of spilling hazardous substances. These measures will include: avoiding operation of watercraft in fall and winter in the presence of sea ice to the extent practicable, using double-hull tanks for fuel transport (from Dutch Harbor to Bethel) to reduce tank rupture risk, and using fully-operational vessel navigation systems composed of radar, chartplotter, sonar, marine communication systems, and satellite navigation receivers, as well as Automatic Identification System (AIS) for vessel tracking. All project barges operating in Cook Inlet will maintain a distance of 1.5 miles from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River) (Figure 2).

2. Barges will either: a) avoid transiting through designated North Pacific right whale critical habitat (73 FR 19000) (Figure 3); or b) implement mitigation measures 2a-2e while traveling within North Pacific right whale critical habitat.

    a. Operators will maintain a ship log indicating the time and geographic coordinates at which vessels enter and exit North Pacific right whale critical habitat.

    b. Vessels will travel at speeds of 10 knots (kn; 18.52 kilometers per hr [km/h]) or less while traveling within the boundaries of designated North Pacific right whale critical habitat.

    c. A minimum of two Protected Species Observers (PSOs) or trained crew members will alternate shifts during travel through North Pacific right whale critical habitat. PSOs or trained crew members will maintain a constant watch for all marine mammals from the bridge or other similar vantage points. At least one dedicated observer will vigilantly scan for whales at all times. Scanning will involve the use of 10-power binoculars or greater.

    d. PSO’s or trained crew members will maintain direct contact with the vessel pilot, advising the pilot/operator of the position of all observed marine mammals as soon as they are observed.

3. The vessel operator will not purposely approach within 3 nautical miles (nm; 5.5 km) of major Steller sea lion rookeries or haulouts where vessel safety requirements allow and/or where practicable. Vessels will remain 3 nm (5.5 km) from all Steller sea lion rookery sites listed in paragraph 50 CFR 224.103 (d)(1)(iii) (Table 4).

4. The following actions will be taken in response to marine mammal sightings:

    a. If a North Pacific right whale is observed at a distance greater than 800 m (874 yards [yd]) from the vessel's intended course line, or other marine mammal is observed within 91 m (100 yd) of the vessel's intended course line, monitoring of the marine mammal(s) location will continue, and for whales, the direction of the vessel will be altered to maintain these minimum distances from the observed whale (s). Course alterations made to avoid cetacean disturbance will be made in a manner that avoids sudden changes in revolutions per minute (RPM) and cutting in front of their direction of travel.

    b. If a North Pacific right whale is observed within 800 m (874 yd) of the vessel's intended course line, or other whale species is observed within 274 m (300 yd) of the vessel's intended course line, vessel speeds will be reduced to no greater than 5 kn, sea conditions permitting, to minimize the risk of injurious collision. While avoiding collisions with marine mammals may necessitate sudden changes in vessel RPM and heading, course alterations made to avoid marine mammal disturbance will be made in a manner that avoids sudden changes in RPM and cutting in front of their direction of travel. Vessel speed may resume to normal operating speed when North Pacific right whales are greater than 800 m (874 yd) and other whale species are greater than 274 m (300 yd) from the vessel and its intended course.

    c. The vessel operator will avoid: i) direct approach of whales; ii) separating members of any group of whales from other members of that group; iii) causing a whale of any species to make multiple changes in direction.

    d. If the vessel is taken out of gear, vessel crew will ensure that no whales are within 50 m of the vessel when propellers are re-engaged, thus minimizing risk of marine mammal injury.

Aircraft

5. All aircraft will transit at an altitude of 1,500 feet or higher, to the extent practicable and excluding takeoffs and landing, while transiting over Cook Inlet and while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 1,500 feet due to environmental conditions, aircraft will make course adjustments, as needed, to maintain at least 1,500 foot separation from all observed marine mammals. Helicopters will not hover or circle above marine mammals.

Marine Mammal Monitor Requirements & Training

6. Marine mammal monitors (MMOs) will either be PSOs or crew members who have received standard PSO training from experienced trainers. MMOs must be able to accurately identify and distinguish between species of cetaceans under field conditions.

7. MMOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from marine mammal monitoring duties between shifts. MMOs will not perform MMO duties for more than 12 hours in a 24-hour period (to reduce fatigue).

8. While functioning as an MMO, that individual will have no other duty which could distract them from keeping careful watch for marine mammals near the vessel and along its intended course. At least one MMO will be actively engaged in scanning the surrounding waters at all times while transiting through North Pacific right whale critical habitat.

9. Prior to each transportation season, MMOs will attend a 1-day PSO training course (taught by an experienced trainer following a course syllabus approved by NMFS). Training may be delivered by video using the same syllabus. This course will: a) provide ecological information on Bering Sea marine mammals and specifics on the ecology and management concerns of North Pacific right whales; b) teach proper equipment use and methodologies in marine mammal observation and recording; and c) provide clarification of obligations including log keeping and seasonal reporting.

Data Collection and Reporting

10. MMOs will record all marine mammals observed within North Pacific right whale critical habitat (Figure 3) using NMFS-approved observation forms. Sightings of North Pacific right whales will be transmitted to NMFS (see mitigation measure 12) within 24 hours. These sighting reports will include the following information:

    a. Date, time, and geographic coordinates of the sighting(s).

    b. Species observed, number of animals observed per sighting event; and number of adults/juveniles/calves per sighting event (if determinable).

    c. Because sightings of North Pacific right whales are uncommon, and photographs that allow for identification of individual whales from markings are extremely valuable, photographs will be taken if feasible, but in a way that does not involve disturbing the animal (e.g., if vessel speed and course changes are not otherwise warranted, they will not take place for the purpose of positioning a photographer to take better photos. Any photographs taken of North Pacific right whales will be submitted to NMFS (see mitigation measure 12).

11. Donlin will designate an individual who is familiar with NMFS reporting procedures to collect, organize, and report on vessel travel within North Pacific right whale critical habitat and marine mammal observations that occur within that critical habitat. These reports will be submitted to NMFS by the end of each calendar year (see mitigation measure 11). The end-of-year report will outline the following information:

a. Ship logs (time and location for when a vessel entered and exited North Pacific right whale critical habitat).

b. Species, date, and time for each sighting event.

c. Number of animals per sighting event; and number of adults/juveniles/calves per sighting event (if determinable).

d. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard (and defined) coordinate system).

e. Environmental conditions as they existed during each sighting event, including sea conditions, weather conditions, visibility (km/mi), lighting conditions, and percent ice cover.

f. Any photographs taken.

12. NMFS Contact Info: Reports, observation forms, ship logs, and North Pacific right whale sightings will be transmitted to: National Marine Fisheries Service, Protected Resources Division at greg.balogh@noaa.gov, verena.gill@noaa.gov, and alicia.bishop@noaa.gov (individual North Pacific Right Whale sightings may also be called in to (907) 271-3023) or 907-271-1937. In the event that this contact information becomes obsolete, call 907-271-5006 for updated contact information.

If Take Occurs

Though take is not authorized, if a listed marine mammal is struck by a vessel, it must be reported to NMFS within 24 hrs. The following will be included when reporting take of a listed species:

a. All the information that would otherwise be listed in the PSO report.

b. Number of listed animals taken.

c. The date, time, and location of the take.

d. The cause of the take (e.g., vessel strike).

e. The time the animal(s) was first observed and last seen.

f. Mitigation measures implemented prior to and after the animal was taken.

g. Contact information for MMO on duty at the time of the collision, ship's Pilot at the time of the collision, or ship's Captain.

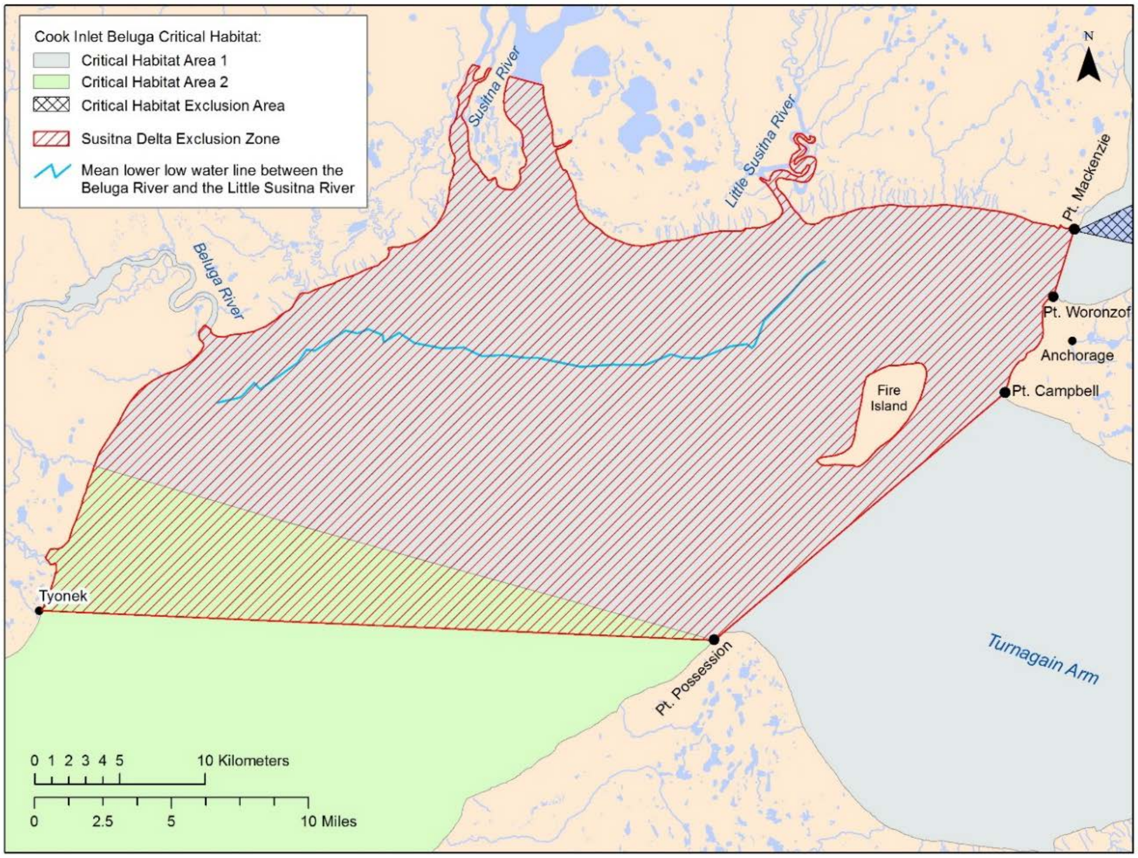

Figure 2. Susitna Delta Exclusion Zone, showing MLLW line between the Beluga and Little Susitna Rivers.

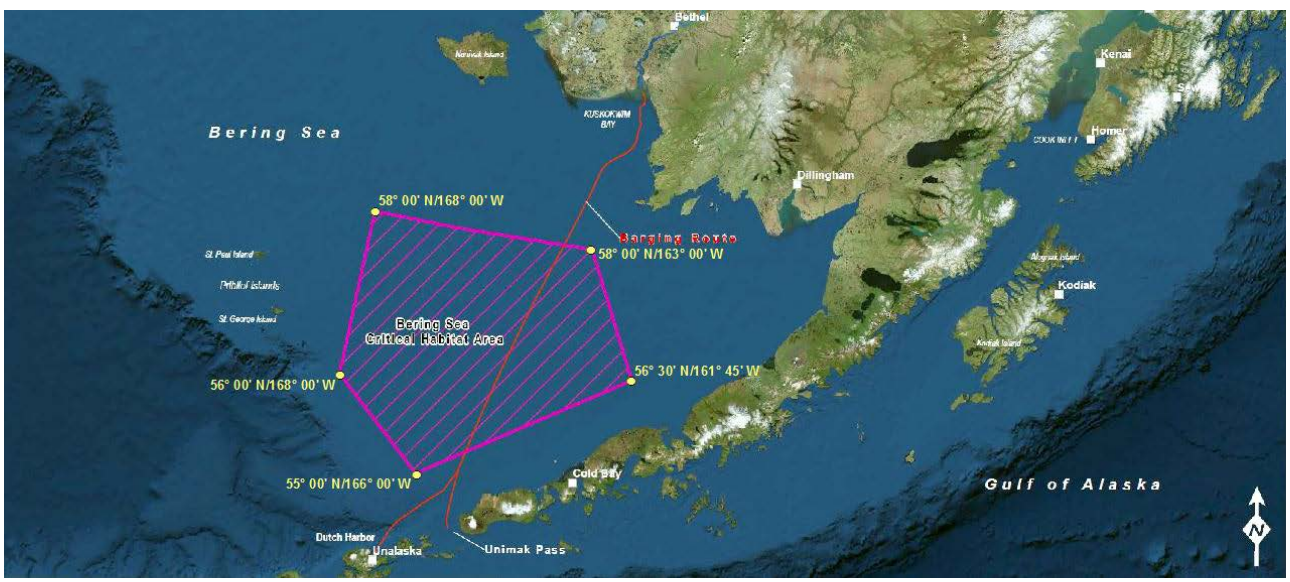

Figure 3. North Pacific Right Whale designated critical habitat and proposed vessel transit routes.

Table 4. Listed Steller Sea Lion Rookery Sites (50 CFR 224.103 (d)(1)(iii))

Island	From		To		NOAA Chart	Notes
	Latitude	Longitude	Latitude	Longitude		
1. Outer I.	59°20.5 N	150°23.0 W	59°21.0 N	150°24.5 W	16681	S quadrant.
2. Sugarloaf I.	58°53.0 N	152°02.0 W	-	-	16580	Whole island.
3. Marmot I.	58°14.5 N	151°47.5 W	58°10.0 N	151°51.0 W	16580	SE quadrant.
4. Chirikof I.	55°46.5 N	155°39.5 W	55°46.5 N	155°43.0 W	16580	S quadrant.
5. Chowiet I.	56°00.5 N	156°41.5 W	56°00.5 N	156°42.0 W	16013	S quadrant.
6. Atkins I.	55°03.5 N	159°18.5 W	-	-	16540	Whole island.
7. Chernabura I.	54°47.5 N	159°31.0 W	54°45.5 N	159°33.5 W	16540	SE corner.
8. Pinnacle Rock	54°46.0 N	161°46.0 W	-	-	16540	Whole island.
9. Clubbing Rks (N)	54°43.0 N	162°26.5 W	-	-	16540	Whole island.
Clubbing Rks (S)	54°42.0 N	162°26.5 W	-	-	16540	Whole Island.
10. Sea Lion Rks	55°28.0 N	163°12.0 W	-	-	16520	Whole island.
11. Ugamak I.	54°14.0 N	164°48.0 W	54°13.0 N	164°48.0 W	16520	E end of island.
12. Akun I.	54°18.0 N	165°32.5 W	54°18.0 N	165°31.5 W	16547	Billings Head Bight.
13. Akutan I.	54°03.5 N	166°00.0 W	54°05.5 N	166°05.0 W	16520	SW corner, Cape Morgan.
14. Bogoslof I.	53°56.0 N	168°02.0 W	-	-	16500	Whole island.
15. Ogchul I.	53°00.0 N	168°24.0 W	-	-	16500	Whole island.
16. Adugak I.	52°55.0 N	169°10.5 W	-	-	16500	Whole island.
17. Yunaska I.	52°42.0 N	170°38.5 W	52°41.0 N	170°34.5 W	16500	NE end.
18. Seguam I.	52°21.0 N	172°35.0 W	52°21.0 N	172°33.0 W	16480	N coast, Saddleridge Pt.
19. Agligadak I.	52°06.5 N	172°54.0 W	-	-	16480	Whole island.
20. Kasatochi I.	52°10.0 N	175°31.5 W	52°10.5 N	175°29.0 W	16480	N half of island.
21. Adak I.	51°36.5 N	176°59.0 W	51°38.0 N	176°59.5 W	16460	SW Point, Lake Point.
22. Gramp rock	51°29.0 N	178°20.5 W	-	-	16460	Whole island.
23. Tag I.	51°33.5 N	178°34.5 W	-	-	16460	Whole island.
24. Ulak I.	51°20.0 N	178°57.0 W	51°18.5 N	178°59.5 W	16460	SE corner, Hasgox Pt.
25. Semisopochnoi	51°58.5 N	179°45.5 E	51°57.0 N	179°46.0 E	16440	E quadrant, Pochnoi Pt.

Island	From		To		NOAA Chart	Notes
	Latitude	Longitude	Latitude	Longitude		
25a. Semisopochnoi	52°01.5 N	179°37.5 E	52°01.5 N	179°39.0 E	16440	N quadrant, Petrel Pt.
26. Amchitka I.	51°22.5 N	179°28.0 E	51°21.5 N	179°25.0 E	16440	East Cape.
27. Amchitka I.	51°32.5 N	178°49.5 E	-	-	16440	Column Rocks.
28. Ayugadak Pt.	51°45.5 N	178°24.5 E	-	-	16440	SE coast of Rat Island.
29. Kiska I.	51°57.5 N	177°21.0 E	51°56.5 N	177°20.0 E	16440	W central, Lief Cove.
30. Kiska I.	51°52.5 N	177°13.0 E	51°53.5 N	177°12.0 E	16440	Cape St. Stephen.
31. Walrus I.	57°11.0 N	169°56.0 W	-	-	16380	Whole island.
32. Buldir I.	52°20.5 N	175°57.0 E	52°23.5 N	175°51.0 E	16420	Se point to NW point.
33. Agattu I.	52°24.0 N	173°21.5 E	-	-	16420	Gillion Point.
34. Agattu I.	52°23.5 N	173°43.5 E	52°22.0 N	173°41.0 E	16420	Cape Sabak.
35. Attu I.	52°54.5 N	172°28.5 E	52°57.5 N	172°31.5 E	16681	S Quadrant.
Note: Each site extends in a clockwise direction from the first set of geographic coordinates along the shoreline at mean lower low water to the second set of coordinates; or, if only one set of geographic coordinates is listed, the site extends around the entire shoreline of the island at mean lower low water.						

Listed Species and Critical Habitat

Endangered western DPS Steller sea lions, endangered western North Pacific DPS humpback whales, threatened Mexico DPS humpback whales, endangered North Pacific right whales, endangered fin whales, and endangered Cook Inlet beluga whales may occur in the action area. Critical habitat has not been designated for humpback whales or fin whales but has for Steller sea lions, North Pacific right whales, and Cook Inlet beluga whales (58 FR 45269, 73 FR 19000, 76 FR 20180).

The winter distribution of ringed seals (*Phoca hispida*) and bearded seals (*Erignathus barbaus*) overlaps the Bering Sea barging route. However, barging will occur during the summer months and these species are not expected to be encountered during the proposed project's barging activities. Occurrence of the western North Pacific gray whale (*Eshrichtius robustus*) in Alaska is putative. Weller et al. (2012) confirmed a few individuals of the Western North Pacific stock (photographed in the Sakhalin Islands [in Russia]) were occasionally found wintering with the Eastern North Pacific stock in Mexico (Laguna San Ignacio). Presumably, this interchange included passage through Alaskan waters. However, there is no evidence that the distribution of these few listed individuals will overlap with the proposed barging activities. Therefore, these species will not be discussed further.

Western DPS Steller Sea Lions

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions into two DPSs based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66139). Information on Steller sea lion biology and habitat (including critical habitat) is available at: http://alaskafisheries.noaa.gov/pr/steller-sea-lions

During summer Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nm of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites. We assume western DPS Steller sea lions may be present in and along parts of the barging route because Steller sea lions are highly mobile and have large ranges.

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hertz (Hz) and 39 kilohertz (kHz) in water (NMFS 2016a).

Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). In Alaska, designated critical habitat includes the following areas as described at 50 CFR §226.202.

1. Terrestrial zones that extend 3,000 feet (ft [0.9 km]) landward from each major haulout and major rookery.
2. Air zones that extend 3,000 ft (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.
3. Aquatic zones that extend 3,000 ft (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144 degrees (^{o}) longitude.
4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144^{o} W longitude.
5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR §226.202(c).

The action area includes designated Steller sea lion critical habitat. Table 5 shows the distances from the action area to the nearest western DPS Steller sea lion rookeries and haulouts. Barging activities will also traverse through the Bogoslof critical habitat foraging area. Figure 4 shows western DPS Steller sea lion critical habitat along with the proposed barging route.

Table 5. Minimum distances from the action area to Steller sea lion major rookeries and haulouts.

Rookery/Haulout	Distance (nm/km)
Akutan Island	8.1 nm (15 km)
Akun Island	3.0 nm (5.6 km) [a]
Ugamak Island	3.6 nm (6.7 km)
Tigalda Island	10.0 nm (18.5 km)
Tanginak Island	7.3 nm (13.5 km)
Akutan Reef-Lava	3.0 nm (5.6 km) [a]
Old Man Rocks	11.9 nm (22 km)
Cape Sedanka	13.9 nm (25.7 km)
Cape Newenham	10.6 nm (19.6 km)
[a]Mitigation measures include that vessel operators will not approach within 3 nm (5.5 km) of any major Steller sea lion rookeries or haulouts except in emergency situations.	

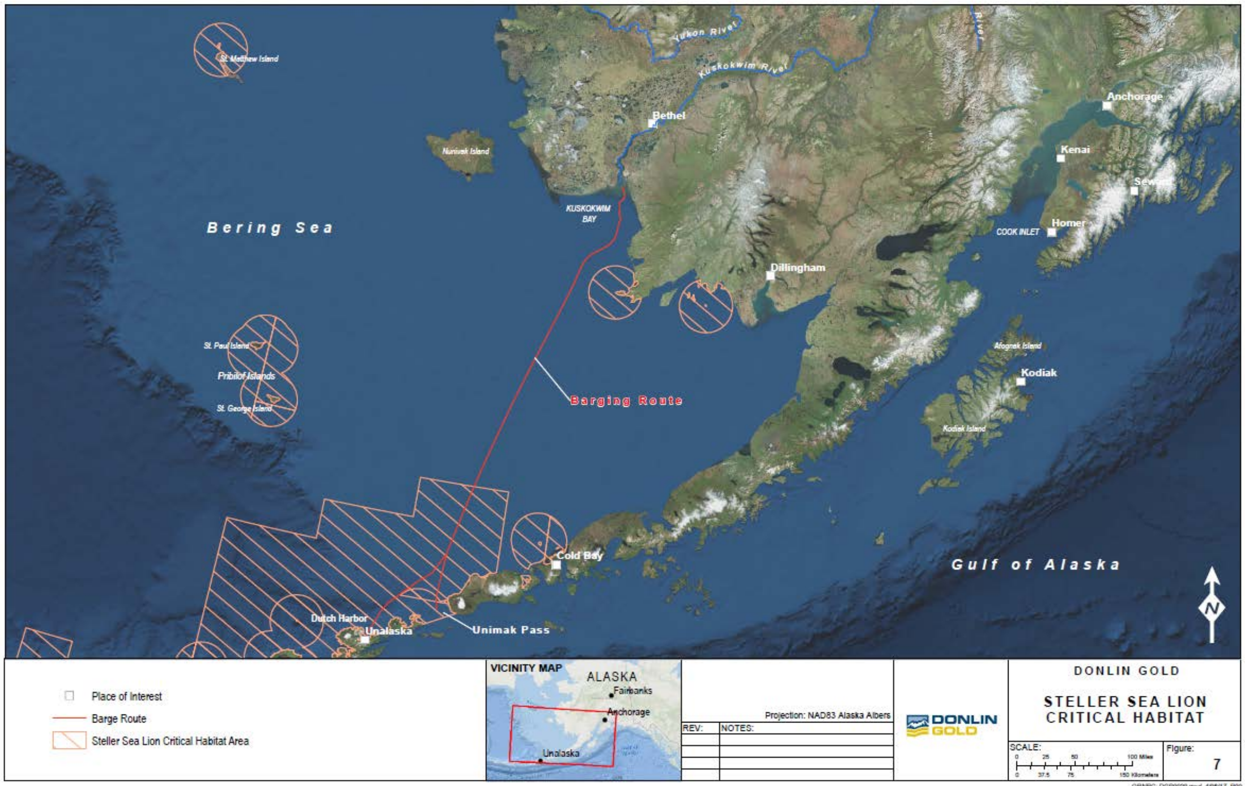

Figure 4. Western DPS Steller sea lion critical habitat in the Bering Sea

Western North Pacific and Mexico DPS Humpback Whales

The humpback whale was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The western North Pacific DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, and Gulf of Alaska) is listed as endangered; the Mexico DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is listed as threatened, and the Hawaii DPS (which includes most humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is not listed (81 FR 62260; September 8, 2016). Critical habitat has not been designated for the western North Pacific or Mexico DPSs.

The abundance estimate for humpback whales in the Bering Sea Aleutian Islands is estimated to be 2,427 (CV= 0.2) animals which includes whales from the Hawaii DPS (86.5 percent), Mexico DPS (11.3 percent), and western North Pacific DPS (4.4 percent[3]; NMFS 2016b, Wade et al. 2016).

[3] For endangered Western North Pacific DPS we chose the upper limit of the 95 percent confidence interval from the Wade et al. (2016) estimate in order to be conservative due to their status.

Unalaska Island is situated between Unimak and Umnak Passes, which are important humpback whale migration routes and feeding areas. Humpback whales tagged from August to September in Unalaska Bay, the waterbody adjacent to Captains Bay, were detected in Captains Bay (Kennedy et al. 2014). Given the documented presence of humpback whales, we assume humpback whales may be present during the proposed barging activities.

Humpback whales have also been documented in Cook Inlet, and on occasion have wandered into upper Cook Inlet, but their presence near barges traveling to Beluga from either Anchorage or Kenai while making a small number of deliveries during a single year is expected to be rare.

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970, Tyack and Whitehead 1983, Payne and Payne 1985, Silber 1986, Thompson et al. 1986, Richardson et al. 1995, Au 2000, Frazer and Mercado III 2000, Erbe 2002, Au et al. 2006, Vu et al. 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016a).

Additional information on humpback whale biology and natural history is available at:
http://www.nmfs.noaa.gov/pr/species/mammals/whales/humpback-whale.html
http://alaskafisheries.noaa.gov/pr/humpback
http://www.nmfs.noaa.gov/pr/sars/pdf/stocks/alaska/2016/ak2016_humpback-wnp.pdf
http://www.nmfs.noaa.gov/pr/sars/pdf/stocks/alaska/2016/ak2016_humpback-cnp.pdf

North Pacific Right Whales

The North Pacific right whale was listed as an endangered species under the ESCA on June 2, 1970 (35 FR 8491), and continued to be listed as endangered following passage of the ESA. NMFS later divided the listing into two separate endangered species: North Pacific right whales and North Atlantic right whales (73 FR 120424; March 6, 2008). Only the North Pacific right whale occurs in Alaska. Information on biology and habitat of the North Pacific right whale is available at:
https://alaskafisheries.noaa.gov/pr/npr-whale
http://www.adfg.alaska.gov/index.cfm?adfg=rightwhale.main

The North Pacific right whale is distributed from Baja California to the Bering Sea with the highest concentrations in the Bering Sea, Gulf of Alaska, Okhotsk Sea, Kuril Islands, and Kamchatka area. They are primarily found in coastal or shelf waters but sometimes travel into deeper waters. In the spring through the fall their distribution is dictated by the distribution of their prey. In the winter, pregnant females move to shallow waters in low latitudes to calve; the winter habitat of the rest of the population is unknown.

Right whales have been consistently detected in the southeastern Bering Sea within designated critical habitat during spring and summer feeding seasons (Goddard and Rugh. 1998, Moore 2000, Moore et al. 2002, Zerbini et al. 2009, Rone et al. 2010, Rone et al. 2012). Of the 184 recent right whale sightings reported north of the Aleutian Islands, 182 occurred in critical habitat. More recently, Wade et al. (2011) made the first abundance estimates for the eastern North Pacific population using mark-recapture data from the Bering Sea and Aleutian Islands, resulting in abundance estimates of 31 individuals (95 percent confidence interval of 23–54 individuals) and 28 individuals (95 percent confidence interval of 24–42 individuals) using photographic and genetic identification techniques, respectively.

Analysis of the data from bottom-mounted acoustic recorders deployed during October 2000, January 2006, May 2006, and April 2007 indicates that right whales remain in the southeastern Bering Sea from May through December with peak call detection in September (Munger and Hildebrand 2004, Stafford and Mellinger 2009). Recorders deployed from 2007 to 2013 have not yet been fully analyzed, but indicate the presence of right whales in the southeastern Bering Sea almost year-round, with peak acoustic detections in August and a sharp decline in detections in early January (Pers. Comm. Catherine Berchok, AFSC-NMML, 7600 Sand Point Way NE, Seattle, WA; unpublished data).

A study of right whale ear anatomy suggests a hearing rage of 10 Hz to 22 kHz (Parks et al. 2007). NMFS categorizes right whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016a).

North Pacific Right Whale Critical Habitat

Critical habitat for the North Pacific right whale was designated in the eastern Bering Sea and in the Gulf of Alaska on April 8, 2008 (73 FR 19000). The physical or biological features (PBFs) deemed necessary for the conservation of North Pacific right whales include the presence of specific copepods (*Calanus marshallae, Neocalanus cristatus*, and *N. plumchris*), and euphausiids (*Thysanoessa Raschii*) that act as primary prey items for the species, and physical and oceanographic forcing that promote high productivity and aggregation of large copepod patches.

The action area includes designated North Pacific right whale critical habitat (Figure 3).

Fin Whales

The fin whale was listed as an endangered species under the ESCA on December 2, 1970 (35 FR 18319), and continued to be listed as endangered following passage of the ESA. Information on fin whale biology and habitat is available at:
https://www.fisheries.noaa.gov/species/fin-whale
http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/alaska/2014/ak2014_finwhale.pdf
http://www.nmfs.noaa.gov/pr/sars/pdf/ak_2016_final_sars_june.pdf

Coastal and pelagic catch data from the first half of the twentieth century indicate that fin whales were not uncommon near Unalaska Bay and around Unalaska Island (Nishiwaki 1966, Reeves et al. 1985); however, fin whales have been documented infrequently around Unalaska Island since whaling ended (Stewart et al. 1987, Zerbini et al. 2006). Fin whales have recently been observed during summer feeding in the waters of the northern Bering Sea and southern Chukchi Sea. These whales likely pass through Unimak Pass to reach these feeding grounds where they might be encountered by barging operations.

Fin whales produce a variety of low-frequency sounds in the 10 Hz to 0.2 kHz range (Watkins 1981, Watkins et al. 1987, Edds 1988, Thompson et al. 1992). While there is no direct data on hearing in low-frequency cetaceans, the assumed applied frequency range is between 7 Hz and 35 kHz (NMFS 2016a). Synthetic audiograms produced by applying models to X-ray computed tomography scans of a fin whale calf skull indicate the range of best hearing for fin whale calves to range from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

Cook Inlet Beluga Whales

The best available historical abundance estimate of the Cook Inlet beluga whale population is from a survey in 1979 which resulted in an estimate of 1,293 whales (Calkins 1989). NMFS began conducting comprehensive and systematic aerial surveys of the beluga population in 1993. These surveys documented a decline in beluga abundance from 653 whales in 1994 to 347 whales in 1998, a decline of nearly 50 percent. In response to this decline NMFS designated the Cook Inlet beluga whale population as depleted under the Marine Mammal Protection Act in 2000. Abundance data collected since 1999 indicate that the population has not increased, and the lack of population growth led NMFS to list the Cook Inlet beluga whale as endangered under the ESA on October 22, 2008 (73 FR 62919). The 2014 population abundance estimate was 340 whales, indicating a 10 year decline of 0.4 percent per year (Shelden et al. 2015). The 2016 beluga aerial survey resulted in a population estimate of 328. Further analyses is required to ascertain a valid population trend through 2016 (NMFS, MML, Unpublished data, 2017).

The distribution of Cook Inlet belugas has changed significantly since the 1970s. There have been fewer sightings of belugas in lower Cook Inlet in recent decades (Hansen and Hubbard 1999; Speckman and Piatt 2000; Rugh et al. 2000, 2010) indicating that the summer range has contracted to the mid and upper Inlet, coincident with their decline in population size. The range contraction brings animals in a small range proximal to Anchorage during summer months, where there is increased potential for disturbance from human activities. The Susitna River Delta, Turnagain Arm, Kenai River, and Knik Arm are known to be important current or historic feeding grounds for Cook Inlet beluga whales (NMFS 2016c), although belugas remain largely absent from the waters in and around the Kenai River during the very large summer salmon runs in that river. Information on Cook Inlet beluga whale biology and habitat (including critical habitat) is available at:
http://alaskafisheries.noaa.gov/pr/ci-belugas
https://www.fisheries.noaa.gov/species/beluga-whale/spotlight

NMFS categorizes Cook Inlet beluga whales in the mid-frequency cetacean functional hearing group, with an applied frequency range between 150 Hz and 160 kHz (NMFS 2016a).

Cook Inlet Beluga Whale Critical Habitat

NMFS designated critical habitat for the Cook Inlet beluga whale on April 11, 2011 (76 FR 20180). NMFS excluded all waters off the Port of Anchorage east of a line connecting Cairn Point (61°15.4’N., 149° 52.8’W.) and Point MacKenzie (61°14.3’N., 149° 59.2’W.) and north of a line connecting Point MacKenzie and the north bank of the mouth of Ship Creek (61°13.6’N., 149° 53.8’W.; see Figure 5). The action area includes designated Cook Inlet beluga critical habitat.

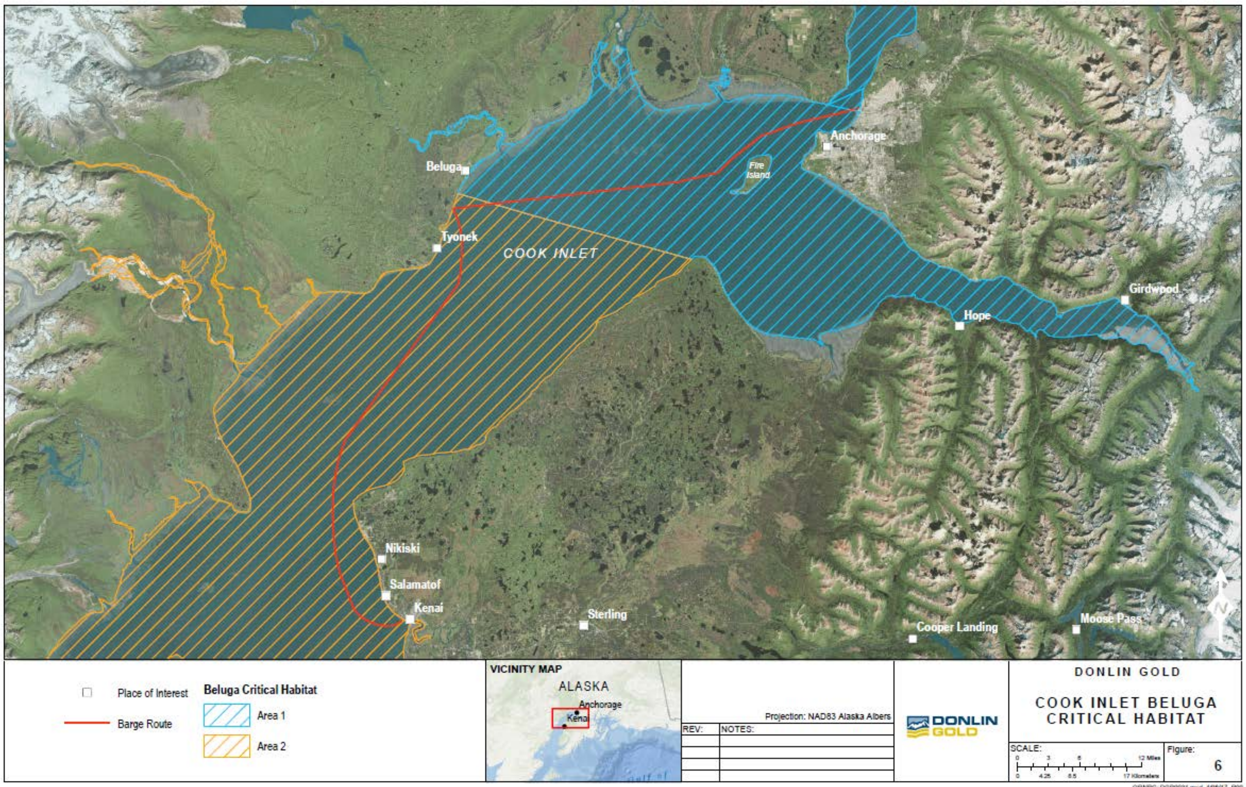

Figure 5. Cook Inlet beluga whale critical habitat within and near the action area (76 FR 20180).

Effects of the Action

For purposes of the ESA, “effects of the action” means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is “not likely to adversely affect” listed species or critical habitat is that all of the effects of the action are expected to be insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and are those that one will not be able to meaningfully measure, detect, or evaluate, and should never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects to the species.

This consultation includes recent NMFS guidance on the term "harass," which means to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016).

The potential effects of the proposed action on listed species and critical habitat include auditory or visual disturbance, physical effects such as vessel collisions, exposure to potentially harmful materials, and effects to prey species.

Auditory or Visual Disturbance

Auditory or visual disturbance to listed species could occur during all barging activities and the potential use of aircraft to transport fuel across Cook Inlet. An animal is disturbed when human activities alter an animal's natural behavior. A listed species could react to project activities by either investigating or being startled by barges or tugs. Disturbance from vessels could temporarily increase stress levels or displace an animal from its habitat.

The primary underwater noise associated with the proposed barging operations is the continuous noise produced from propellers and other on-board equipment. Cavitation noise is expected to dominate vessel acoustic output when tugs are pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the main engine, but both are subordinate to propeller harmonics (Gray and Greeley 1980) and cavitation. These continuous sounds for small ships have been measured at up to 171 dB re 1 μParms at 1-m source (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles et al. 1987, Richardson et al. 1995, Simmonds et al. 2004). Received sound levels associated with the tugs are anticipated to decline to 120 dB re 1 μParms within 2,843 yards (2,600 meters).

Underwater noise from barges may temporarily disturb or mask communication of marine mammals. Behavioral reactions from vessels can vary depending on the type and speed of the vessel, the spatial relationship between the animal and the vessel, the species, and the behavior of the animal prior to the disturbance from the vessel. Response also varies between individuals of the same species exposed to the same sound. If animals are exposed to vessel noise they may exhibit deflection from the noise source, engage in low level avoidance behavior, exhibit short-term vigilance behavior, or experience and respond to short-term acoustic masking behavior, but these behaviors are not likely to result in significant disruption of normal behavioral patterns. Individual whales' past experiences with vessels appear to be important in determining individual whale response (Shell 2012). Vessels moving at slow speeds and avoiding rapid changes in direction or engine RPM may be tolerated by some species. Other individuals may deflect around vessels and continue on their migratory path. Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). Whales have been known to tolerate slow-moving vessels within several hundred meters, especially when the vessel is not directed toward the animal and when there are no sudden changes in direction or engine speed (Wartzok et al. 1989, Richardson et al. 1995, Heide-Jorgensen et al. 2003).

Few authors have specifically described the responses of Steller sea lions to vessels. However, the mere presence and movements of ships in the vicinity of pinnipeds can cause disturbance to their normal behaviors (Henry and Hammill 2001, Shaughnessy et al. 2008, Jansen et al. 2010), especially if they are hauled out on land. During the open water season in the Chukchi Sea, bearded and ringed seals have been commonly observed close to vessels where received sound levels were low (e.g., (Harris et al. 2001, Moulton and Lawson 2002, Blees et al. 2010, Funk et al. 2010b). Funk et al. (2010a) noted among vessels operating in the Chukchi Sea where received sound levels were <120 dB, 40 percent of observed seals showed no response to a vessel's presence, slightly more than 40 percent swam away from the vessel, 5 percent swam towards the vessel, and the movements of 13 percent of the seals were unidentifiable. Bisson et al. (2013) reported a total of 938 seals observed during vessel-based monitoring of exploratory drilling activities by Shell in the Chukchi Sea during the 2012 open water season. The majority of seals (42 percent) responded to moving vessels by looking at the vessel, while the second most noted behavior was no observable reaction (38 percent). The majority of seals (58 percent) showed no reaction to stationary vessels, while looking at the vessel was the second most common behavioral response (38 percent). Other common reactions to both moving and stationary vessels included splashing and changing direction. Barge and tug traffic is not expected to significantly disrupt normal pinniped behavioral patterns (breeding, feeding, sheltering, resting, migrating, etc.), because the majority of pinniped/vessel interactions documented during arctic oil and gas exploration operations in the Chukchi Sea show little to no observable behavioral reactions due to vessels. Therefore, visual harassment to Steller sea lions is unlikely and therefore discountable. If behavioral reactions do occur from the visual presence of vessels, reactions are expected to be limited to very minor or no behavioral change and therefore are insignificant.

Although some marine mammals could receive sound levels in exceedance of the historical acoustic threshold of 120 dB from the tugs during this proposed project, take is unlikely to occur. Barging activities for this proposed project are not likely to acoustically harass listed species, per the steps to assess harassment in the Interim Guidance on the ESA Term "Harass" (Wieting, D. 2016). While listed marine mammals will likely be exposed to acoustic stressors from this proposed project, the nature of the exposure (primarily tug noise) will be low-frequency, with much of the acoustic energy occurring below frequencies associated with best hearing for the marine mammals expected to occur in the area. The duration of the exposure will be temporary, because vessels will be in transit. At 10 knots, vessels will ensonify a given point in space to levels above 120dB for less than 9 minutes. Because barges and tugs will be emitting continuous sound as they transit through the area, barging activities will alert marine mammals of their presence before the received level of sound exceeds 120 dB. Therefore, a startle response is not expected. Rather deflection and avoidance are expected to be common responses in those instances where there is any response at all. The implementation of mitigation measures is expected to further reduce the number of times marine mammals react to transiting vessels. Consequently, barge traffic is not expected to significantly disrupt normal marine mammal behavioral patterns (breeding, feeding, sheltering, resting, migrating, etc.), making acoustic harassment of listed marine mammals very unlikely. Therefore, we have determined that vessel traffic is very unlikely to harass listed marine mammals, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, and such effects are therefore discountable.

Cook Inlet beluga whales could react to aircraft flying overhead; however, considering air traffic from Anchorage to the project location is likely to occur north over upland areas, aircraft are unlikely to fly over Cook Inlet. With several airports in the Anchorage area (including Ted Stevens Anchorage International, Lake Hood, Merrill field, and Elmendorf Air Force Base airports), commercial, cargo, military, and small residential aircraft regularly fly over Cook Inlet. Cook Inlet beluga whales continually chose to use this area despite anthropogenic noise from aircraft. Additionally, Donlin Gold will fly aircraft at an altitude of 1,500 feet or higher, to the extent practical and excluding takeoffs and landing, while transiting over Cook Inlet and while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 1,500 feet due to environmental conditions, aircraft will make course adjustments, as needed, to maintain at least 1,500 foot separation from all observed marine mammals. Helicopters will not hover or circle above marine mammals. Considering all of these factors, any effects to Cook Inlet beluga whales from aircraft flying overhead are expected to be too small to detect or measure, and therefore insignificant.

Physical Effects

Barges and tugs transiting the marine environment have the potential to collide with, or strike, marine mammals (Laist et al. 2001, Jensen and Silber 2003). From 1978 to 2012, there were at least 108 recorded whale-vessel collisions in Alaska, with the majority occurring in Southeast Alaska (Neilson et al. 2012; Figure 6). Among larger whales, humpback whales are the most frequently documented victims of ship strikes in Alaska, accounting for 86 percent of all reported collisions. Fin whales accounted for 2.8 percent of reported collisions, gray whales 0.9 percent, and sperm whale 0.9 percent. Six of the whales (5.6 percent) were unidentifiable and the remaining are of non-listed species. The probability of strike events depends on the frequency, speed, and route of the marine vessels, as well as distribution and density of marine mammals in the area. Vanderlaan and Taggart (2007) used observations to develop a model of the probability of lethal injury based upon vessel speed. They projected that the chance of lethal injury to a whale struck by a vessel travelling at speeds over 15 kn (27.78 km/hr) is approximately 80 percent while for vessels travelling between 8.6 and 15 kn (15.92 km/hr), the probability that a struck whale would be lethally injured was about 20 percent of the time.

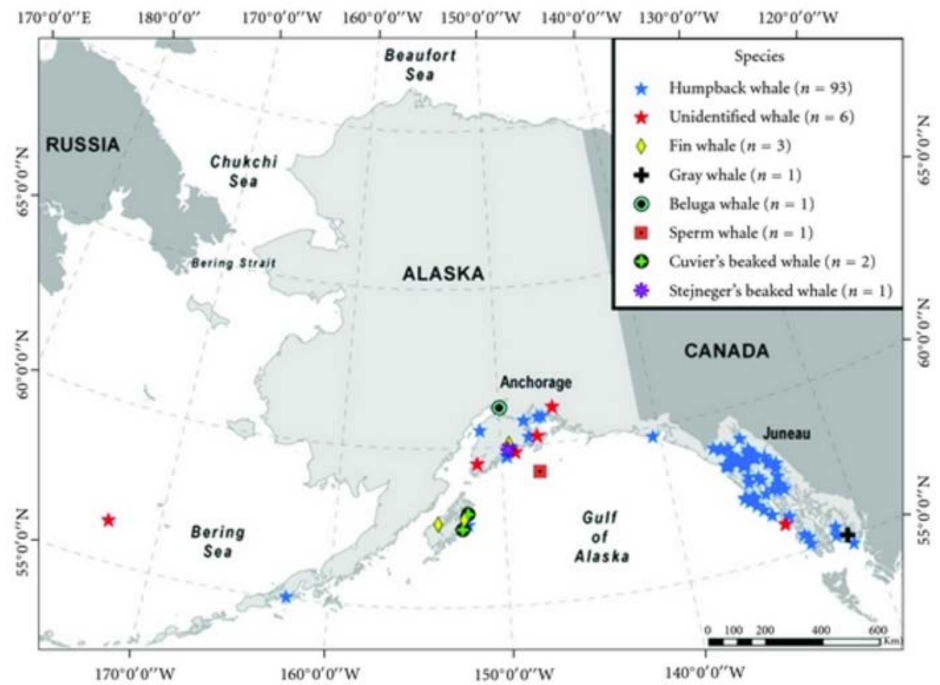

Figure 6. Location of whale-vessel collision reports in Alaska by species 1978–2011 (n = 108) from Nielson et al. (2012).

Although risk of ship strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated [e.g., near rookeries or haulouts; (NMFS 2008)]. To minimize this risk, project vessels will not travel within 3 nm (5.5 km) of major Steller sea lion haulouts or rookeries.

Project vessels will not approach any species of whales within 100 yd (91.4 m) or a North Pacific right whale within 874 yd (800 m). Collision with pinnipeds is not expected to occur due to their speed and maneuverability and the slow velocity of project vessels. Project vessels will either avoid North Pacific right whale designated critical habitat (where encounters with North Pacific right whales are most likely to occur) or they will travel through designated critical habitat at speeds less than 10 kn (18.52 km/h) with a trained MMO that will maintain a vigilant watch intended to avoid the occurrence of whale collisions. Given the expected effectiveness of these measures, the low density of North Pacific right whales and other listed cetaceans, and the ability of pinnipeds to avoid vessels due to their maneuverability, we have determined that this action is extremely unlikely to result in a vessel strike of listed marine mammals, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, and we conclude that these effects are discountable.

Exposure to Potentially Harmful Materials

ESA listed species could be exposed to harmful materials, fuel, oil, or chemicals (Table 2) through incidental and accidental spills during barging activities. Incidental spills are small spills which can be safely controlled at the time of release by shipboard personnel, do not have the potential to become an emergency within a short time, and are of limited quantity, exposure and potential toxicity. Incidental spills also include normal vessel operational discharges such as release of bilge water that might contain oils or oily detergents from deck washdown operations. They also include releases of small volumes of hydraulic fluids, motor fuels and oils, and other fluids used in normal ship operation, usually as a result of overfilling tanks. Incidental spills can also occur during vessel and transportation tank fueling at docks.

Incidental spills associated with Donlin Gold's barging program are most likely to occur in port (Dutch Harbor, Bethel, Anchorage, Nikiski, or Beluga) during fuel and supply transfer, with the greatest risk during fuel barge filling operations at Dutch Harbor and offloading at Bethel. However, because Bethel is located nearly 70 mi (113 km) upstream from the mouth of the Kuskokwim River, incidentally spilled diesel fuel will most likely have dispersed or evaporated long before reaching marine waters commonly used by listed marine mammals. If Donlin Gold uses a small tank barge to transport fuel across Cook Inlet, then there is a small spill risk during loading and offloading of fuel. However, if Donlin Gold uses mobile tank trailers, then fueling and draining of tanks will occur on land.

Loading or offloading a barge will result in a transfer of about 2.9 million gallons of diesel fuel per trip for each of 28 trips per year. A spill can occur during the transfer process due to equipment malfunction (*e.g.*, a faulty shut off valve or hose leak) or human error (e.g., misconnecting a hose or overtopping a tank). Typically, these incidental fuel transfer spills are small. ERM (2014) indicated that 95 percent of transfer spills are less than 50 gallons, and only 0.2 percent of the spills were greater than 1,000 gallons (and none greater than 10,000 gallons). Based on 28 transfers per year, ERM estimated that a spill during fuel transfer could occur on average every 6 years, but a spill greater than 1,000 gallons will occur approximately every 3,022 years (Table 6).

Accidental spills are large spills involving the rupture of a vessel or transported fuel tank, usually as a result of a collision, sinking, fire, or running aground. A barging accident resulting in an oil or chemical spill represents a low likelihood, high impact event. The impacts of a spill could range from negligible to high, depending on the nature and amount of material spilled, environmental factors, and response. Table 1 summarizes the number of barge trips during each phase of the proposed project (i.e. construction and operation). Based on the annual exposure during operations from fuel barges (from Dutch Harbor to Bethel) and available data, ERM calculated an annual spill rate of 0.03, or one spill approximately every 31 years for barging operations to and from Bethel. Half the expected spills will be less than 5 gallons and 17 percent greater than 1,000 gallons (they found no data for spills greater than 10,000 gallons). The rate for a large accidental spill during barging of 1,000 to 10,000 gallons was calculated as 0.005 spills annually, or one every 188 years.

The likelihood of an incidental or accidental fuel spill of any size occurring is 1 in 5 per year (Table 6). Over the life of the proposed project, we expect 5 to 6 spills of some size will occur. These spills are expected to be small (less than 50 gallons due to fuel transfer and less than 5 gallons due to barging). While it is likely that small spills will occur, we expect that small spills of diesel-weight fuels associated with this proposed project will dissipate and evaporate, or become entrained in the water column quickly (on the order of 24 hours), and will therefore have insignificant effects. Spills greater than 5 gallons due to barging or greater than 50 gallons due to fuel transfer have about a 1 in 43 chance of occurring per year, or a 1 in 1.6 chance of occurring during the life of the project, although the distribution of spill sizes is very biased towards small spills. In examining the spill data summarized in Table 6, we see that the largest contributor to this probability of larger spills comes from the 0.01 probability of spills of 5-1000 gallons due to barging.

Table 6. Probability of spills for this proposed project (taken or derived from ERM 2016)

Type of spill	Chance of spill per year	Annual probability
Spills during fuel transfers		
Fuel spill of any size, due to fuel transfer	1 in 6	0.167
Fuel spills <50 gal. due to fuel transfer	1 in 6.25	0.16
Fuel spills 50-1000 gal due to fuel transfer	1 in 125	0.008
Fuel spills >1000 gal due to fuel transfer	1 in 3022	0.00033
Spills during barging of fuel		
Fuel spills due to barging of fuel	1 in 31	0.03
Fuel spills <5 gal due to barging of fuel	1 in 62	0.016
Fuel spills 5-1000 gal. due to barging of fuel	1 in 100	0.009
Fuel spills 1,000-10,000 gal due to barging of fuel	1 in 188	0.005
Any fuel spill, any size, due to transfer and barging	1 in 5	0.2
Spill of gold-extracting hazardous chemicals	1 in 196,420	0.0000051

While we were not provided with the distribution of spill sizes within this category, we assume that it is similar to the spill size distribution reported by the Alaska Department of Environmental Conservation for spills that occurred between 1996 and 2002 (ADEC 2003), where 84 percent of diesel spills statewide were under 100 gallons in size. Therefore, the annual probability of larger spills occurring due to this proposed project (1 in 43) is likely to be heavily weighted towards smaller spills that will dissipate or become entrained in the water column quickly (on the order of 24 hours). Spills of sufficient size to persist in the environment long enough to cause adverse effects to marine mammals will be very rare, although we were not provided enough data to quantify the likelihood of spills less than 100 gallons; a common reporting category for ADEC.

Among fuel transfer spills, many will occur at transfer locations where the spill can be contained and prevented from entering the marine system (e.g. spills due to overtopping fuel tanks will likely be captured in containment systems surrounding the tanks). We conclude that the effects of small spills on listed marine mammals will be very small, and the probability of large spills capable of causing harm is extremely small. Therefore, we have determined that, for this project, the effects of fuel spills on listed marine mammals, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, will be either insignificant or discountable.

Supply barges will be carrying chemical substances used to extract gold (Table 2). Marine mammals or their prey could come into direct contact with these toxic materials causing skin irritation or sickness. Impacts to marine mammals will depend on the extent and duration of exposure to the toxic materials. Marine mammals could come into contact with toxic materials through skin contact, inhalation of vapors, or ingestion through contaminated food sources. Oil can reduce the thermal effects of hair on sea lions, possibly resulting in death. Pups would be more vulnerable to such a fate than adults with a higher body mass and thicker blubber. If inhaled, oil or toxic chemicals could irritate the respiratory membranes and result in hydrocarbons in the exposed animal's bloodstream (Geraci 1990). Marine mammals could ingest contaminated prey, leading to bioaccumulation or biomagnification. Long-term ingestion of pollutants could affect marine mammals physiologically, including reduced reproductive success.

These chemicals are shipped in highly protected containers. Therefore, a chemical spill into marine waters would likely be the result of a catastrophic barge incident. Saricks and Tompkins (1999) estimated the risk of a barge accident (allisions, collisions, breakaways, fires, explosions, groundings, structural failures, flooding, capsizing, and sinking) that occurred within 100 mi (160 km) of the coastline. The risk is estimated at 5.29 $x10^{-7}$ accident per 500 short ton/km. Over the life of the mine operations (27.5 years) this translates to 0.00014 accidents. It is important to note that a barge accident may or may not result in a chemical spill to water. Therefore, the risk of chemical spill is very small (with a probability of occurrence of less than 1 in 7,143 over the life of the mine or 1 in 196,420 per year).We therefore conclude that the effects of non-fuel hazardous substances upon listed marine mammals, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, are discountable.

Should a spill occur, there are potential indirect effects associated with cleanup. The type of synthetic materials used to disperse or clean up fuel can influence the magnitude of effect on listed wildlife. While dispersants can increase the rate of oil degradation and thereby reduce the effects from surface toxicity or degradation of shoreline habitats, they also are surfactants that can reduce the insulation abilities of bird feathers and cause floating oil particles to sink into the water column or to benthic habitats, making the oil more available to pelagic, demersal and benthic prey. Dispersants are rarely used for diesel spills because the fuel evaporates and dissipates quickly. In addition, cleanup involves a large amount of human activity with associated additional disturbance risk to wildlife.

The risk of an incidental or accidental spill has been determined to be very low. In addition, several agencies, including the United States Coast Guard, Environmental Protection Agency, and Alaska Department of Environmental Conservation, regulate fuel transport and transfer in marine waters. They require multiple plans (i.e. Facility Response Plans, Spill Prevention Control and Countermeasure Plans, Oil Discharge Prevention and Contingency Plans) that outline protocols to prevent spills from occurring and an Oil spill Response Plan if a spill was to occur. The likelihood of toxic discharge is very low, therefore we conclude the effects to listed marine mammals from associated cleanup, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, is discountable.

Effects to Prey Species

ESA-listed species feed on prey species (such as small schooling fish, shrimp, squid, and zooplankton) that could be effected by spills and vessel operation. Prey species could become contaminated during an oil or chemical spill. Bioaccumulation of toxic materials in prey species could also occur, however most prey species are short lived and do not live long enough to accumulate higher levels of toxins in the body.

Fish can be physiologically and behaviorally affected by noise (Normandeau Associates, Inc. 2012.). The acoustic threshold criteria for physiological impacts on fish were based on impacts from pile driving (Hastings and Popper 2005); however, these criteria are generally applied to other human-generated sound sources. Assuming spherical spreading loss, the behavioral effects threshold of 150 dB re 1μPa rms for fish would be reached at a distance of about 25 m (115 ft) from project vessels with acoustic output of 171 dB. Because there will be no sudden onset of noise related to project vessel activity, the impact to fish from vessel noise is expected to be limited to temporary avoidance of waters in the immediate vicinity (within a few meters) of the vessel.

Barging activities can directly affect plankton, fish eggs, fish larvae, and small fish through hull shear, entrainment through the propulsion system, exposure to turbulence in the propeller wash, and wake stranding (Odom et al. 1992). However, studies indicate it is difficult to detect barge-related mortality (Holland 1986, Odom et al. 1992), and have found fish larvae to be relatively resilient to barge-induced disturbance. Wake stranding, the depositing of fish onto shore by vessel-induced waves, is a function of wave amplitude, which further is a result of vessel size, vessel draft, vessel speed, and distance of vessel from shore (Bauersfeld 1977). Ackerman (2002) studied salmonid strandings in the lower Columbia River and found that shallow-draft tugs pulling barges produced much smaller wake amplitudes (average of 0.52 feet [ft] [0.15 meters [m]) than larger, deep-draft ships (1.7 ft [0.52 m]), and all but one of the observed salmonid strandings were associated with deep-draft ships. The distances to shore during this study ranged from 780 to 1,630ft (238 to 497m); much closer to shore than the proposed barging routes for this project. Thus, the Donlin barges are unlikely to produce large enough wakes and are not close enough to shore to cause any significant mortality of marine mammal prey due to wake stranding. Furthermore, the proportion of available prey that may be so affected is miniscule.

Given the low probability of an oil or chemical spill occurring and the very small effects on prey caused by project vessels, we have determined that effects of vessel-related activity on prey species are either highly unlikely or very minor in magnitude, and therefore any effects to marine mammals, including western DPS Steller sea lions, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, fin whales, and Cook Inlet beluga whales, will be discountable and insignificant..

Effects to Critical Habitat

The proposed project occurs within designated critical habitat for North Pacific right whales, Steller sea lions, and Cook Inlet beluga whales, and may impact critical habitat during barging activities. We evaluate effects to each of the physical and biological features of North Pacific right whale, Steller sea lion, and Cook Inlet beluga whale critical habitat below.

North Pacific Right Whale

NMFS identified physical and biological features essential for conservation of North Pacific right whales (also known as primary constituent elements, or PCEs) in the final rule to designate critical habitat (73 FR 19000; April 8, 2008, 71 FR 38277; July 6, 2006). NMFS determined that the PCEs for the North Pacific right whale are species of large zooplankton in areas where right whale are known or believed to feed. The critical habitat encompasses areas in which the physical and biological oceanography combines to promote high productivity and aggregation of large copepods into patches of sufficient density for right whales. As outlined above, prey species could be effected by spills. However, the probability of a fuel or chemical spill occurring that would have more than a de minimus effect on the right whales planktonic prey is very small (Table 6). Furthermore, vessel traffic associated with this proposed project represents a very small incremental increase in vessel traffic in an area that is subjected to notable commercial fishing effort. We therefore conclude that the effects of this proposed project on North Pacific right whale critical habitat, including the planktonic prey that comprise the PBF for this critical habitat, are either insignificant (small fuel spills, vessel traffic noise) or discountable (large fuel spills, non-fuel hazardous chemical spills).

Steller Sea Lion Critical Habitat

NMFS identified physical and biological features essential for conservation of Steller sea lions in the final rule to designate critical habitat (58 FR 45269; August 27, 1993) including terrestrial, air, and aquatic habitats (as described at 50 CFR §226.202) that support reproduction, foraging, rest, and refuge. Construction of the proposed project may impact Steller sea lion critical habitat through barging activities. We evaluate effects to each of the physical or biological features below.

1. *Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska.*

   Project activities are not located in a terrestrial zone that is 3,000 ft (0.9 km) landward from a major haulout or rookery and any effects are extremely unlikely to occur in those areas. Therefore, effects to the terrestrial zones are discountable.

2. *Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.*

   Project activities are not located in an air zone that is 3,000 ft (0.9 km) above a major haulout or rookery and any effects are extremely unlikely to occur in those areas. Therefore, effects to the air zones are discountable.

3. *Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144º W longitude.*

   Project activities are not located in an aquatic zone that is 3,000 ft (0.9 km) seaward of a major haulout or rookery east of 144º W longitude and any effects are extremely unlikely to occur in those areas. Therefore, effects to these aquatic zones are discountable.

4. *Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144º W longitude.*

   A small portion of the proposed barging route is located within or adjacent to aquatic zones comprising this PBF (Figure 4). Effects to this PBF are expected to be limited to the introduction of barge and tug noise, the visual presence of vessels, and the associated risk of fuel or hazardous chemical spills (Table 6). Waters near Unalaska and Unimak Pass are frequently used by many ocean-going and commercial fishing vessels. The incremental increase in vessel traffic due to this action will be extremely small. Project vessels will be present within or adjacent to waters comprising this PBF for a very short period of time (about 3 hours), and they will most likely occur only along the outermost edge of this PBF, too far away from haulouts and rookeries to cause visual or acoustic disturbance at those sites. The transiting of the vessels is not expected to have adverse impacts upon these waters, and the likelihood of a spill of any size occurring in these waters is exceedingly small, much smaller than the already low probabilities for spills occurring anywhere within the action area (Table 6). Small spills that may occur in these waters will evaporate, dissipate or become entrained within 24 hours. Therefore we conclude that the proposed project will have insignificant and discountable effects on this PBF.

5. *Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR §226.202(c).*

   The proposed barging route transverses through the Bogoslof foraging area. Effects to this PBF are expected to be limited to the introduction of barge noise, the visual presence of vessels, and the associated risk of fuel or hazardous chemical spills. Waters within the Bogoslof special aquatic foraging area are frequently used by many ocean-going and commercial fishing vessels. The incremental increase in vessel traffic due to this action will be extremely small. Project vessels will be present within waters comprising this PBF for about 20 hours per traverse.

   The transiting of the vessels is not expected to have adverse impacts upon these waters, including upon sea lion forage fish that occur in this foraging zone. The likelihood of a spill of any size occurring in these waters is very small, much smaller than the already low probabilities for spills occurring anywhere within the action area (Table 6). Small spills that may occur in these waters will evaporate, dissipate or become entrained within 24 hours. Therefore we conclude that this proposed project will have insignificant and discountable effects on this PBF.

Cook Inlet Beluga Whale Critical Habitat

NMFS identified five primary constituent elements (PCEs) essential for conservation of Cook Inlet beluga whales (76 FR 20180; April 11, 2011). Since that designation, NMFS has changed its terminology, and now refers not to PCEs, but to physical and biological features (PBFs) as the components of critical habitat. . Construction of the proposed project may impact Cook Inlet beluga whale critical habitat through barging activities. We evaluate effects to each of the physical and biological features below.

1. *Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within 5 miles of high and medium flow anadromous fish streams.*

The proposed barging route will transverse waters with depths of <30 feet (MLLW) and within 5 miles of high and medium flow anadromous fish streams. Effects of this proposed project on Cook Inlet beluga whale critical habitat are expected to be limited to noise from barges traversing through critical habitat and the associated risk of fuel or hazardous chemical spills. All project vessels transiting across Cook Inlet will maintain a distance of greater than 1.5 miles from the MLLW line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River), thus avoiding some of the most-used critical habitat in the inlet. In addition, barge presence in these waters will be temporary in nature (making deliveries of fuel, pipe and other equipment), and low in impact (transitory acoustic effects that do not likely result in harassment, as established earlier in this document). The acoustic effects upon this PBF would be very small, and would be limited to an anticipated decline to 120 dB re 1μParms within 2,600 m (2.6 km) of the vessel (based on received sound levels of approximately 171 dB at 1 meter). This PBF could be effected by spilled fuel or other petroleum products. However, the likelihood of a spill is low (Table 6) and is limited to a single season of transport of 1 million gallons of fuel and small volumes of other petroleum products across Cook Inlet. The extreme tidal currents in Cook Inlet would act to quickly dissipate spilled product, and small spills would remain on the surface for only a very short time (on the order of hours), and would have a very small effect on this PBF, likely not encountering more than one 5-mile radius zone associated with a single anadromous fish stream. The probability of larger spills occurring is very low (Table 6). We therefore conclude that the effects of proposed project vessel traffic and associated spills is insignificant (vessel noise, small spills) or discountable (large spills).

2. *Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.*

Fish, which comprise the primary diet of Cook Inlet beluga whales, can also be affected physiologically and behaviorally by noise (Normandeau Associates, Inc. 2012).). The acoustic threshold criteria for physiological impacts on fish were based on impacts from pile driving (Hastings and Popper 2005); however, these criteria are generally applied to other human-generated sound sources. Assuming spherical spreading loss, the behavioral effects threshold of 150 dB re 1μPa rms for fish would be reached at a distance of about 25 m (115 ft) from project vessels with acoustic output of 171 dB. Because there will be no sudden onset of noise related to project vessel activity, the impact to fish from vessel noise is expected to be limited to temporary avoidance of waters in the immediate vicinity (within a few meters) of the vessel. Therefore, we expect the acoustic impacts upon this PBF will be insignificant.

Prey species could also be effected by non-acoustic aspects of vessel operation. Prey species could be effected through hull shear, entrainment through the propulsion system, exposure to turbulence in the propeller wash, and wake stranding (Odom et al. 1992). However, studies have found it difficult to detect barge-related mortality (Holland 1986, Odom *et al.* 1992), and have found fish larvae to be relatively resilient to such disturbances. Furthermore, such effects would be limited to a de minimus proportion of prey within critical habitat.

Prey may also be adversely affected by fuel spills. However, as we previously established in our evaluation of PBF 1 and elsewhere in this document, the probability of large fuel spills is very small (Table 6), and the effects of small fuel spills in Cook Inlet are expected to be minor. We therefore conclude that the effects of this proposed project on PBF 2 are insignificant (small spills, vessel noise, non-acoustic impacts of vessels on fish) or discountable (large spills).

3. Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.

Cook Inlet beluga whale critical habitat could be contaminated if a spill of petroleum products occurred. The risk of a large spill is considered to be very low (Table 6). The risk of a small spill is higher, but as previously discussed under PBF 1, its effects are likely to be very small. We therefore conclude that the effects of this proposed project on PBF 3 are insignificant (small spills) or discountable (large spills).

4. *Unrestricted passage within or between the critical habitat areas.*

Barging activities are not expected to restrict the passage within or between the critical habitat areas. Cook Inlet is on average 20 to 32 miles (32.2 or 51.5 km) wide in the Northern and Central regions, respectively (ADF&G 2018), allowing beluga whales to move away from or around barges and tugs. Additionally, vessels will maintain a minimum distance of 91.4 m (100 yd) from Cook Inlet beluga whales and will reduce speeds to 5 kn when the vessel is within 274 m (300 yd) of beluga whales. Course alterations will be made to avoid marine mammal disturbance in a manner that avoids cutting in front of the direction of travel of marine mammals. Transiting vessels are not novel within Cook Inlet, and we have no information that suggests that belugas are restricted in their movements due to the presence of individual transitory vessels. We have therefore determined that this proposed project is very unlikely to result in unrestricted passage of belugas within or between critical habitat areas, and conclude that the proposed project's effects on PBF 4 are discountable.

5. *Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.*

Received sound levels associated with the tugs are anticipated to decline to 120 dB re 1 μPa rms within 2,600 m (2,843 yd). Although some marine mammals could receive sound levels in exceedance of 120 dB from project vessels, in-water noise is not expected to cause Cook Inlet beluga whales to abandon critical habitat areas. With the possible exception of waters off of the Kenai River during the summer salmon fishing season, we have no information suggesting that any anthropogenic activities have excluded Cook Inlet belugas from any portion of their critical habitat. The transitory nature of project barging activities, the relatively low magnitude of acoustic output from vessels, and the small number of trips expected to be made by these vessels make it very unlikely that this proposed project will result in any abandonment of critical habitat areas by Cook Inlet Beluga Whales. Therefore, we conclude that the effects of this proposed project on PBF 5 are discountable.

Conclusion

Based on this analysis, NMFS concurs with your determination that the proposed action may affect, but is not likely to adversely affect, western DPS Steller sea lions (*Eumetopias jubatus*), Mexico DPS humpback whales (*Megaptera novaeangliae*), western North Pacific DPS humpback whales, North Pacific right whales (*Eubalaena japonica*), fin whales (*Balaenoptera physalus*), Cook Inlet beluga whale (*Delphinapterus leucas*) or designated Steller sea lion, North Pacific right whale, or Cook Inlet beluga whale critical habitat**.** Reinitiation of consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and if (1) take of listed species occurs, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter, or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

Please direct any questions regarding this letter to Bonnie Easley-Appleyard at bonnie.easley-appleyard@noaa.gov or (907) 271-5172.

Sincerely,

Robert D Mecum

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References

Ackerman, N.K. 2002. Effects of vessel wake stranding of juvenile salmonids in the lower Columbia River,2002 – a pilot study. S.P. Cramer & Associates report to USACOE, Portland. 47 pp.

ADEC. 2003. Statewide summary of oil and hazardous substance spill data (fiscal years 1996-2002). Provisional Report. dec.alaska.gov/spar/ppr/docs/7year_rpt/7year_all.pdf

ADF&G. 2018. Commercial Fisheries Overview - Upper Cook Inlet Management Area. Available online at http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareauci.main

Au, W. W. L. 2000. Hearing in whales and dolphins: An overview. Pages 1-42 *in* W. W. L. Au, A. N. Popper, and R. R. Fay, editors. Hearing by Whales and Dolphins. Springer-Verlag, New York.

Au, W. W. L., A. A. Pack, M. O. Lammers, L. M. Herman, M. H. Deakos, and K. Andrews. 2006. Acoustic properties of humpback whale songs. Journal of the Acoustical Society of America 120:1103-1110.

Bauersfeld, K. 1977. Effects of peaking (stranding) of Columbia River Dams on juvenile anadromous fishes below The Dalles Dam, 1974 and 1975. State of Washington Department of Fisheries report to the U.S. Army Corps of Engineers, Contract DACW 57-74-C-0094, 32 pp.

Blees, M. K., K. G. Hartin, D. S. Ireland, and D. Hannay. 2010. Marine mammal monitoring and mitigation during open water seismic exploration by Statoil USA E&P Inc. in the Chukchi Sea, August–October 2010: 90-day report. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for by Statoil USA E&P Inc., Nat. Mar. Fish. Serv., and U.S. Fish and Wild. Serv.

Bisson, L.N., H.J. Reider, H.M. Patterson, M. Austin, J.R. Brandon, T. Thomas, and M.L. Bourdon. 2013. *Marine mammal monitoring and mitigation during exploratory drilling by Shell in the Alaskan Chukchi and Beaufort seas, July–November 2012: Draft 90-Day Report.* Editors: D.W. Funk, C.M. Reiser, and W.R. Koski. LGL Rep. P1272D–1. Rep. from LGL Alaska Research Associates Inc., Anchorage, Alaska, USA, and JASCO Applied Sciences, Victoria, BC, Canada, for Shell Offshore Inc, Houston, TX, USA, Nat. Mar. Fish. Serv., Silver Spring, MD, USA, and U.S. Fish and Wild. Serv., Anchorage, Alaska, USA. 266 pp, plus appendices.

Normandeau Associates, Inc. 2012. Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities. A Workshop Report for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management. Contract # M11PC00031. 72 pp. plus Appendices.Calkins D.G. 1989. Status of belukha whales in Cook Inlet. In: Jarvela LE, Thorsteinson LK (eds) Gulf of Ala ka, Cook Inlet, and North Aleutian Basin information update meeting. Anchorage, AK, Feb. 7 – 8, 1989, USDOC, NOAA, OCSEAP, Anchorage, AK, pp. 109–112.

Cranford, T. W., and P. Krysl. 2015. Fin whale sound reception mechanisms: skull vibration enables low-frequency hearing. PLoS ONE 10:e0116222.

Edds, P. L. 1988. Characteristics of finback Balaenoptera physalus vocalizations in the St. Lawrence Estuary. Bioacoustics 1:131-149.

Erbe, C. 2002. Hearing abilities of baleen whales. Defense Research and Development Canada.

ERM. 2014. Kuskokwim River Fuel Barge Oil Spill Risk Assessment. Prepared for Donlin Gold, LLC. By ERM Alaska, Inc.

Frazer, L. N., and E. Mercado III. 2000. A sonar model for humpback whale song. IEEE Journal of Oceanic Engineering 25:160-182.

Funk, D. W., D. S. Ireland, R. Rodrigues, and W. R. Koski. 2010a. Joint monitoring program in the Chukchi and Beaufort Seas, open water seasons, 2006-2008: Draft Final Report.

Funk, D. W., R. Rodrigues, D. S. Ireland, and W. R. Koski. 2010b. Summary and assessment of potential effects on marine mammals. Pages 11-11 - 11-59 *in* I. D. Funk DW, Rodrigues R, and Koski WR, editor. Joint Monitoring Program in the Chukchi and Beaufort seas, open water seasons, 2006–2008.

Geraci, J.R. 1990. Physiologic and Toxic Effects on Cetaceans. Chapter 6: J.R. Geraci and D.J. St. Aubin (eds.), Sea Mammals and Oil: Confronting the Risks. San Diego, California: Academic Press, Inc., pp. 167-197.

Goddard, P. D., and D. J. Rugh. 1998. A group of right whales seen in the Bering Sea in July 1996. Marine Mammal Science 14:344-349.

Gray, L.M. and D.S. Greeley. 1980. Source level model for propeller blade rate radiation for the world's merchant fleet. Journal of the Acoustical Society of America 67:516–522.

Hansen, D. J., and J. D. Hubbard. 1999. Distribution of Cook Inlet beluga whales (Delphinapterus leucas) in winter. Final Report OCS Study MMS 99-0024. U.S. Dep. Int., Minerals Management Service, Alaska OCS Region, Anchorage, AK.

Harris, R. E., G. W. Miller, and W. J. Richardson. 2001. Seal responses to airgun sounds during summer seismic surveys in the Alaskan Beaufort Sea. Marine Mammal Science 17:795-812.

Hastings MC, Popper AN (2005). Effects of Sound on Fish. California Department of Transportation Contract 43A0139, Task Order 1.

Heide-Jorgensen, M. P., K. L. Laidre, O. Wiig, M. V. Jensen, L. Dueck, L. D. Maiers, H. C. Schmidt, and R. C. Hobbs. 2003. From Greenland to Canada in ten days: Tracks of bowhead whales, *Balaena mysticetus*, across Baffin Bay. Arctic 56:21-31.

Henry, E., & Hammill, M. O. 2001. Impact of small boats on the haulout activity of harbour seals (Phoca vitulina) in Metis Bay, Saint Lawrence Estuary, Quebec, Canada. Aquatic Mammals. 27(2): 140-148.

Holland, L.E. 1986. Effects of barge traffic on distribution and survival of ichthyoplankton and small fishes in the upper Mississippi River. Trans. Am. Fish. Soc. 115:162-165.

Jansen, J. K., Boveng, P. L., Dahle, S. P., & Bengtson, J. L. 2010. Reaction of harbor seals to cruise ships. The Journal of Wildlife Management. 74(6): 1186-1194.

Jensen, A.S. and G.K. Silber. 2003. Large whale ship strike database. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-OPR-25.

Kennedy, A. S., A. N. Zerbini, B. K. Rone, and P. J. Clapham. 2014. Individual variation in movements of satellite-tracked humpback whales *Megaptera novaeangliae* in the eastern Aleutian Islands and Bering Sea. Endangered Species Research 23:187-195.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science, 17:35-75.

Loughlin and York 2000 Loughlin, T. R., and A. E. York. 2000. An accounting of the sources of Steller sea lion, *Eumetopias jubatus*, mortality. Marine Fisheries Review 62:40-45.

Mellinger, D. K., K. M. Stafford, S. E. Moore, U. Munger, and C. G. Fox. 2004. Detection of North Pacific right whale (*Eubalaena japonica*) calls in the Gulf of Alaska. Marine Mammal Science 20:872-879.

Merrick, R. L., and T. R. Loughlin. 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. Can. J. Zool. 75:776–786.

Miles, P.R., C.I. Malme, and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. Report prepared by BBN Laboratories Inc., Cambridge, MA and LGL Ltd., King City, ON for the U.S. Department of the Interior Minerals Management Service, Alaska OCS Office, Anchorage, AK.

Moore, S. 2000. Detecting right whales using passive acoustics in SE Bering Sea.

Moore, S. E., J. M. Waite, N. A. Friday, and T. Honkalehto. 2002. Cetacean distribution and relative abundance on the central-eastern and the southeastern Bering Sea shelf with reference to oceanographic domains. Progress in Oceanography 55:249-261.

Moulton, V. D. and J. W. Lawson. 2002. Seals, 2001.*in* W. J. Richardson, editor. Marine mammal and acoustical monitoring of Western Geco's open water seismic program in the Alaskan Beaufort Sea, 2001. LGL, Inc.

Munger, L., and J. Hildebrand. 2004. Final Report: Bering Sea Right Whales: Acoustic recordings and public outreach. NPRB Grant T-2100.

Neilson, J.L., C.M. Gabriele, A.S. Jensen, K. Jackson, and J.M. Straley. 2012. Summary of reported whale vessel collisions in Alaskan waters. Journal of Marine Biology 2012:1-18.

Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. Pages 171-191 Whales, Dolphins and Porpoises. University of California Press, Berkeley.

NMFS. 2016a. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p.

NMFS. 2016b. Occurrence of Distinct Population Segments (DPSs) of Humpback Whales off Alaska. National Marine Fisheries Service, Alaska Region. Revised December 12, 2016.

NMFS. 2016c. Recovery Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas). National Marine Fisheries Service, Alaska Region, Protected Resources Division, Juneau, AK.

Odom, M.C., D.J. Orth, and L.A. Nielsen. 1992. Investigation of barge-associated mortality of larval fishes in the Kanawha River. Virginia Journal of Science 43:41-45.

Parks, S. E., D. R. Ketten, J. T. O'Malley, and J. Arruda. 2007. Anatomical predictions of hearing in the North Atlantic right whale. Anatomical Record. 290(6):734-744.

Payne, K., and R. Payne. 1985. Large scale changes over 19 years in songs of humpback whales in Bermuda. Zeitschrift fur Tierpsychologie 68:89-114.

Payne, R. 1978. A note on harassment. Pages 89-90 *in* K. S. Norris and R. R. Reeves, editors. Report on a workshop on problems related to humpback whals (*Megaptera novaeangliae*) in Hawaii. Sea Life Inc., Makapuu Pt., HI.

Reeves, R. R., S. Leatherwood, S. A. Karl, and E. R. Yohe. 1985. Whaling results at Akutan (1912-39) and Port Hobron (1926-37), Alaska. Report of the International Whaling Commission 35:441-457.

Richardson, W. J., C. R. Greene Jr., C. I. Malme, and D. H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, California.

Rone, B. K., C. L. Berchok, J. L. Crance, and P. J. Clapham. 2012. Using air-deployed passive sonobuoys to detect and locate critically endangered North Pacific right whales. Marine Mammal Science 28:E528-E538.

Rone, B. K., A. Zerbini, A. S. Kennedy, and P. J. Clapham. 2010. Aerial surveys in the southeastern Bering Sea: Occurrence of the endangered North Pacific right whale (Eubalaena japonica) and other marine mammals during the summers of 2008 and 2009. Page 149 Alaska Marine Science Symposium, Anchorage, Alaska.

Rugh, D. J., K. E. W. Shelden, and B. Mahoney. 2000. Distribution of beluga whales in Cook Inlet, Alaska, during June/July, 1993 to 1999. Mar. Fish. Rev. 62(3):6-21.

Rugh D. J., K. E. W. Shelden, and R. C. Hobbs. 2010. Range contraction in a beluga whale population. Endang. Species Res. 12:69-75

Salden, D. R. 1993. Effects of research boat approaches on humpback whale behavior off Maui, Hawaii, 1989-1993. Page 94 Tenth Biennial Conference on the Biology of Marine Mammals, Galveston, Texas.

Saricks, C.L. and M.M. Tompkins. 1999. State-Level Accident Rates of Surface Freight Transportation: A Reexamination. Argonne National Laboratory publication ANL/ESD/TM-150. 62 pp.

Shaughnessy, P. D., Nicholls, A. O., & Briggs, S. V. 2008. Do tour boats affect fur seals at Montague Island, New South Wales?. Tourism in Marine Environments. 5(1): 15-27.

Shelden, K. E., C. L. Sims, L. Vate Brattström, K. T. Goetz, and R. C. Hobbs. 2015. Aerial surveys of beluga whales (Delphinapterus leucas) in Cook Inlet, Alaska, June 2014.

Silber, G. K. 1986. The relationship of social vocalizations to surface behavior and aggression in the Hawaiian humpback whales (*Megaptera novaeangliae*). Canadian Journal of Zoology 64:2075-2080.

Simmonds, M., S. Dolman, and L. Weilgart. 2004. Ocean of noise – A WDCS Science report. Whale and Dolphin Conservation Society. 164 pp.

Speckman, S.G., and Piatt, J.F. 2000. Historic and current use of lower Cook Inlet, Alaska, belugas, *Delphinapterus leucas*. Marine Fisheries Review 62:22-26.

Stafford, K. M., and D. K. Mellinger. 2009. Analysis of acoustic and oceanographic data from the Bering Sea, May 2006 – April 2007. North Pacific Research Board Final Report, NPRB Project #719, 24 pp.

Stewart, B. S., S. A. Karl, P. K. Yochem, S. Leatherwood, and J. L. Laake. 1987. Aerial surveys for cetaceans in the former Akutan, Alaska, whaling grounds. Arctic 40:33-42.

Thompson, P. O., W. C. Cummings, and S. J. Ha. 1986. Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska. Journal of the Acoustical Society of America 80:735-740.

Thompson, P. O., L. T. Findley, and O. Vidal. 1992. 20-Hz pulses and other vocalizations of fin whales, *Balaenoptera physalus*, in the Gulf of California, Mexico. Journal of the Acoustical Society of America 92:3051-3057.

Tyack, P., and H. Whitehead. 1983. Male competition in large groups of wintering humpback whales. Behaviour 83:132-154.

Vanderlaan, A.S.M., and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science, 23:144-156.

Vu, E. T., D. Risch, C. W. Clark, S. Gaylord, L. T. Hatch, M. A. Thompson, D. N. Wiley, and S. M. Van Parijs. 2012. Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. Aquatic Biology 14:175-183.

Wade, P. R., A. Kennedy, R. Leduc, J. Barlow, J. Carretta, K. Shelden, W. Perryman, R. Pitman, K. Robertson, B. Rone, J. C. Salinas, A. Zerbini, R. L. B. Jr, and P. J. Clapham. 2011.

The world's smallest whale population? (Eubalaena japonica). Biology Letters 7(1):83-85.
Wade, P. R., T. J. Quinn II, J. Barlow, C. S. Baker, A. M. Burdin, J. Calambokidis, P. J. Clapham, E. Falcone, J. K. B. Ford, C. M. Gabriele, R. Leduc, D. K. Mattila, L. Rojas-Bracho, J. Straley, B. L. Taylor, J. Urbán R., D. Weller, B. H. Witteveen, and M. Yamaguchi. 2016. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA21 submitted to the Scientific Committee of the International Whaling Commission, June 2016, Bled, Slovenia.
Wartzok, D., W. A. Watkins, B. Wursig, and C. I. Malme. 1989. Movements and behaviors of bowhead whales in response to repeated exposures to noises associated with industrial activities in the Beaufort Sea. AMOCO Production Co., Anchorage, Alaska.
Watkins, W. A. 1981. Activities and underwater sounds of fin whales. Scientific Reports of the Whales Research Institute 33:8 3-117.
Watkins, W. A., P. Tyack, K. E. Moore, and J. E. Bird. 1987. The 20-Hz signals of finback whales (*Balaenoptera physalus*). Journal of the Acoustical Society of America 82:1901-1912.
Weller, D.W., A. Klimek, A.L. Bradford, J. Calambokidis, A.R. Lang, B. Gisborne, A.M. Burdin, W. Szaniszlo, J. Urban, A. Gomez-Gallardo Unzueta, S. Swartz, and R.L. Jr Brownell. 2012. Movements of gray whales between the western and eastern North Pacific. Endangered Species Research 18:193-199.
Wieting, D. 2016. Interim Guidance on the Endangered Species Act Term "Harass". National Marine Fisheries Service, Office of Protected Resources. Silver Spring, MD. October 21, 2016.
Winn, H. E., P. J. Perkins, and T. C. Poulter. 1970. Sounds of the humpback whale. Pages 39-52 Seventh Annual Conference on Biological Sonar and Diving Mammals, Stanford Research Institute, Menlo Park, California.
Zerbini, A. N., A. S. Kennedy, B. K. Rone, C. Berchok, P. J. Clapham, and S. E. Moore. 2009. Occurrence of the critically endangered North Pacific right whale (*Eubalaena japonica*) in the Bering Sea (Abstract). Pages 285-286 18th Bienn. Conf. Biol. Mar. Mamm, Québec, Canada.
Zerbini, A. N., J. M. Waite, J. L. Laake, and P. R. Wade. 2006. Abundance, trends and distribution of baleen whales off Western Alaska and the central Aleutian Islands. Deep Sea Research Part I: Oceanographic Research Papers 53:1772-1790.

National Marine Fisheries Service Biological Assessment - Section 7, V1.7, November 2017

National Marine Fisheries Service

Biological Assessment – Section 7

November 2017
Revision v1.7

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ACRONYMS AND ABBREVIATIONS

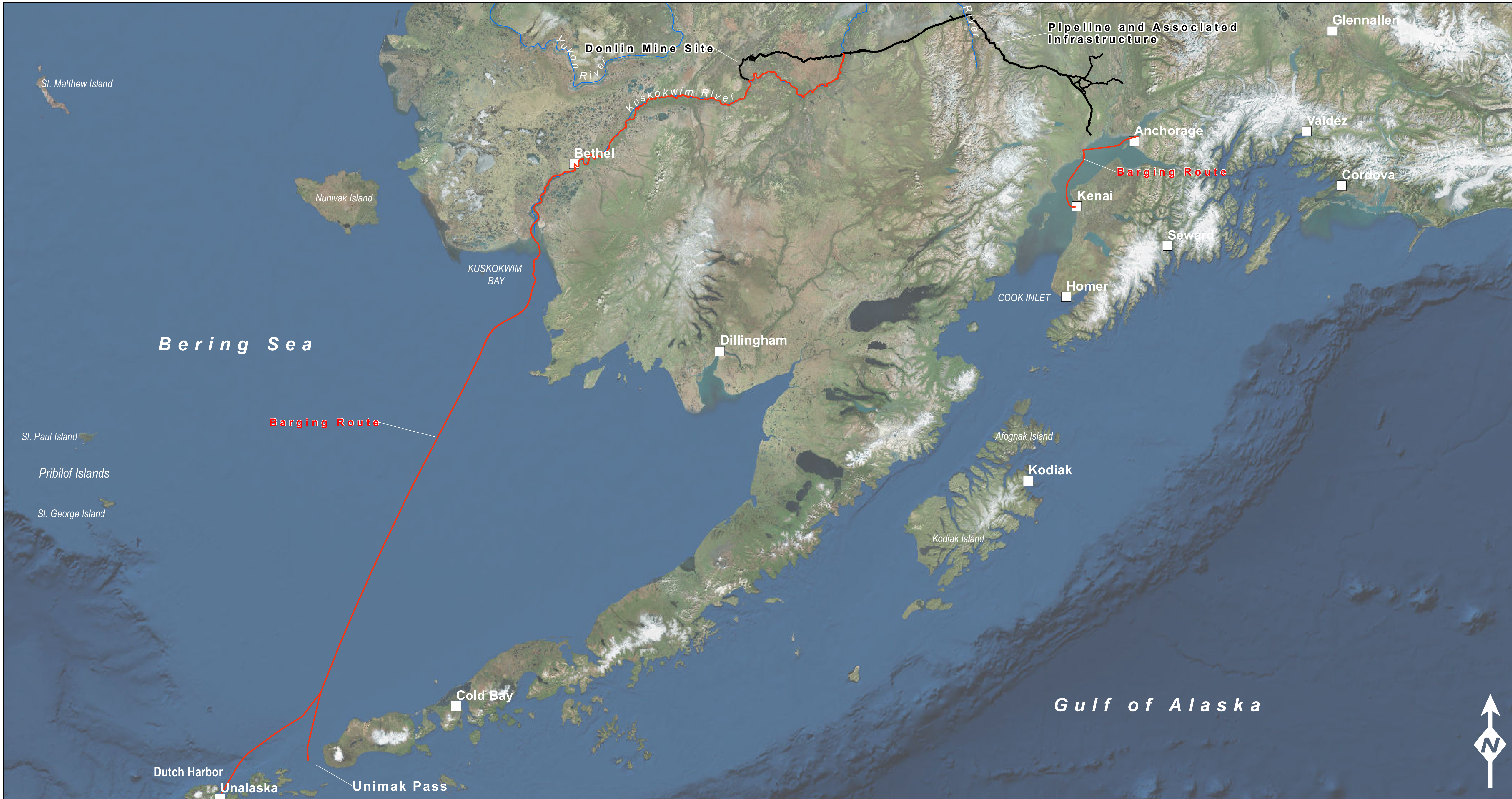
% ....percent
μPa..................micropascal
AAC................Alaska Administrative Code
ACC................Alaska Coastal Current
ADEC ....Alaska Department of Environmental Conservation
BA....................Biological Assessment
BMP..................Best Management Practice(s)
CFR.................Code of Federal Regulation
CI......................Cook Inlet
CWA...............Clean Water Act
dB ....decibel(s)
DEIS..................Draft Environmental Impact Statement
Donlin Gold......Donlin Gold LLC
DPS.................distinct population segment(s)
EPA ................U.S. Environmental Protection Agency
ESA.................Endangered Species Act
FRP.................Facility Response Plans
ft ....foot/feet
gal....................gallon(s)
hr.....................hour
Hz ....hertz
kHz..................kilohertz
km...................kilometer(s)
km^2....................square kilometer(s)
kt.....................knot(s)
lb.......................pound(s)
m.....................meter(s)
mi....................statute mile(s)
mi^2.....................square mile(s)
MSGP..............Multi-sector General Permit
NMFS..............National Marine Fisheries Service
OCC.................Owens Coastal Consultants, Ltd.
ODPCP ....oil discharge prevention and contingency plan
PSO..................protected species observer
PTS ....permanent threshold shift
r ....radius
re.......................referenced at
rms ....root mean square
SPCC................Spill Prevention Control and Countermeasure
SPLASH..........Structures of Population, Levels of Abundance and Status of Humpback Whales

st.......................short ton
TRB ....Transportation Research Board
TTS ....temporary threshold shift
ULSD................ultra-low sulfur diesel
U.S..................United States
USACE ...........U.S. Army Corps of Engineers
USCG..............U.S. Coast Guard
VRP................. Vessel Response Plan
WPN.................Western Pacific Stock
WQS ....Water Quality Standards

1. INTRODUCTION

In July 2012, Donlin Gold LLC (Donlin Gold) submitted a preliminary permit application, as per Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (CWA), to the U.S. Army Corps of Engineers (USACE) to develop an open pit, hardrock gold mine approximately 10 miles (mi) (16 kilometers [km]) north of the village of Crooked Creek, in western Alaska (project). The proposed Donlin Gold Project has four primary components: 1) mine site facilities, 2) a 315-mi (507-km) natural gas pipeline, 3) oceanic supply barging; and 4) river supply barging (Figure 1). All barging will occur in the ice-free months from May to September. The marine barging components of the project could encounter species listed under the Endangered Species Act of 1973 (ESA) at locations described in this Biological Assessment (BA).

Eight species under ESA jurisdiction of the National Marine Fisheries Service (NMFS) are evaluated in this BA on the potential and magnitude of effect of barging activities to each of the listed species. Activities of the proposed project that could affect the listed species include: noise from vessel propulsion, vessel strikes, accidental spill, incidental spill, and effects to prey. This BA also provides substantial detail on the listed species distribution, feeding, reproduction, natural mortality, and use of the proposed action area, all of which are necessary to conduct the detailed effects analysis.



- ☐ Place of Interest
- Major Rivers
- Barge Route
- Project Components

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

PROJECT COMPONENTS

SCALE:
0 25 50 100 Miles
0 37.5 75 150 Kilometers

Figure: 1

ORNRC: DGP0026.mxd, 4/06/17, R01

2. ACTION AREA AND LOGISTICS

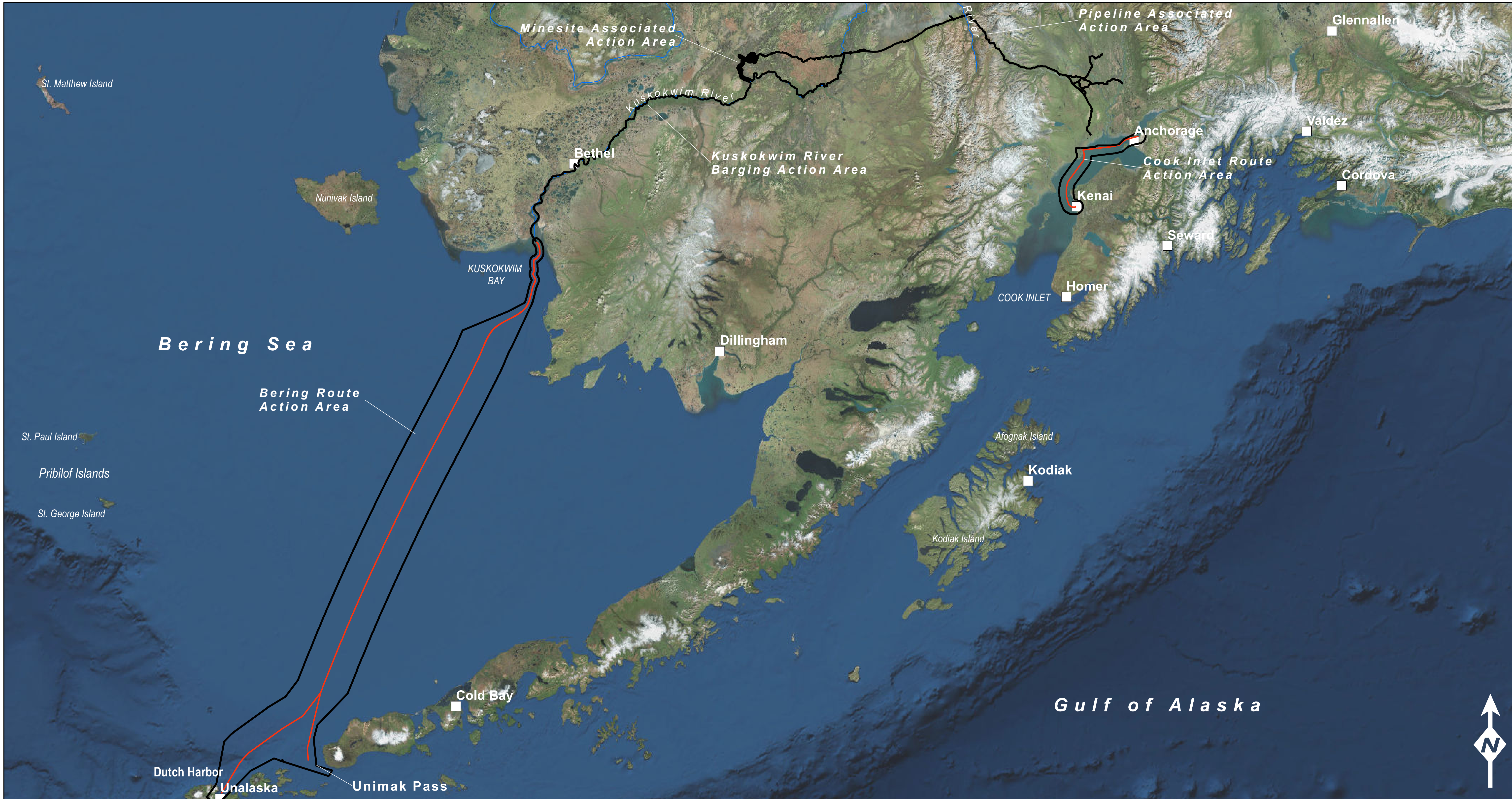
2.1. Action Area

The Donlin Gold Project action area includes the following proposed project components: mine site; natural gas pipeline; access road; Jungjuk Port; river transportation route; and the marine barging routes within the Bering Sea and Cook Inlet (Figure 2). Only the marine barging routes are addressed in this BA as they are the only project component intersecting habitat used by species under the ESA. The Bering Sea marine barging routes extend from Unimak Pass to Bethel (supply), and Dutch Harbor to Bethel (fuel). The Cook Inlet marine barging route runs between Beluga and Anchorage and/or Beluga and Nikiski. The action area, established by USACE in consultation with NMFS, is shown in Figure 2.

Donlin Gold's proposed oceanic barging program consists of two marine barging routes as described:

1. **Bering Sea Route**: the 458-mi (737-km) marine waters portion of the route between Dutch Harbor and Bethel that includes the 410-mi (660-km) marine route between Unimak Pass and Bethel (Figure 3).
2. **Cook Inlet Route**: a 40-mi (64-km) supply barge route between Anchorage and a barge landing south of Beluga (Figure 4). Fuel may come from Nikiski, which is considered in the analysis.

The Bering Route includes the harbor waters of Dutch Harbor, and Bristol and Kuskokwim bays within the Bering Sea. Route lines in the figures are the best approximation of the routes to be followed. Actual routes may vary from those depicted in the figures, but not appreciably enough to alter the effects analysis results presented in this BA.



□ Place of Interest

Marine Barge Route

Proposed Action Area

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

PROPOSED ACTION AREA

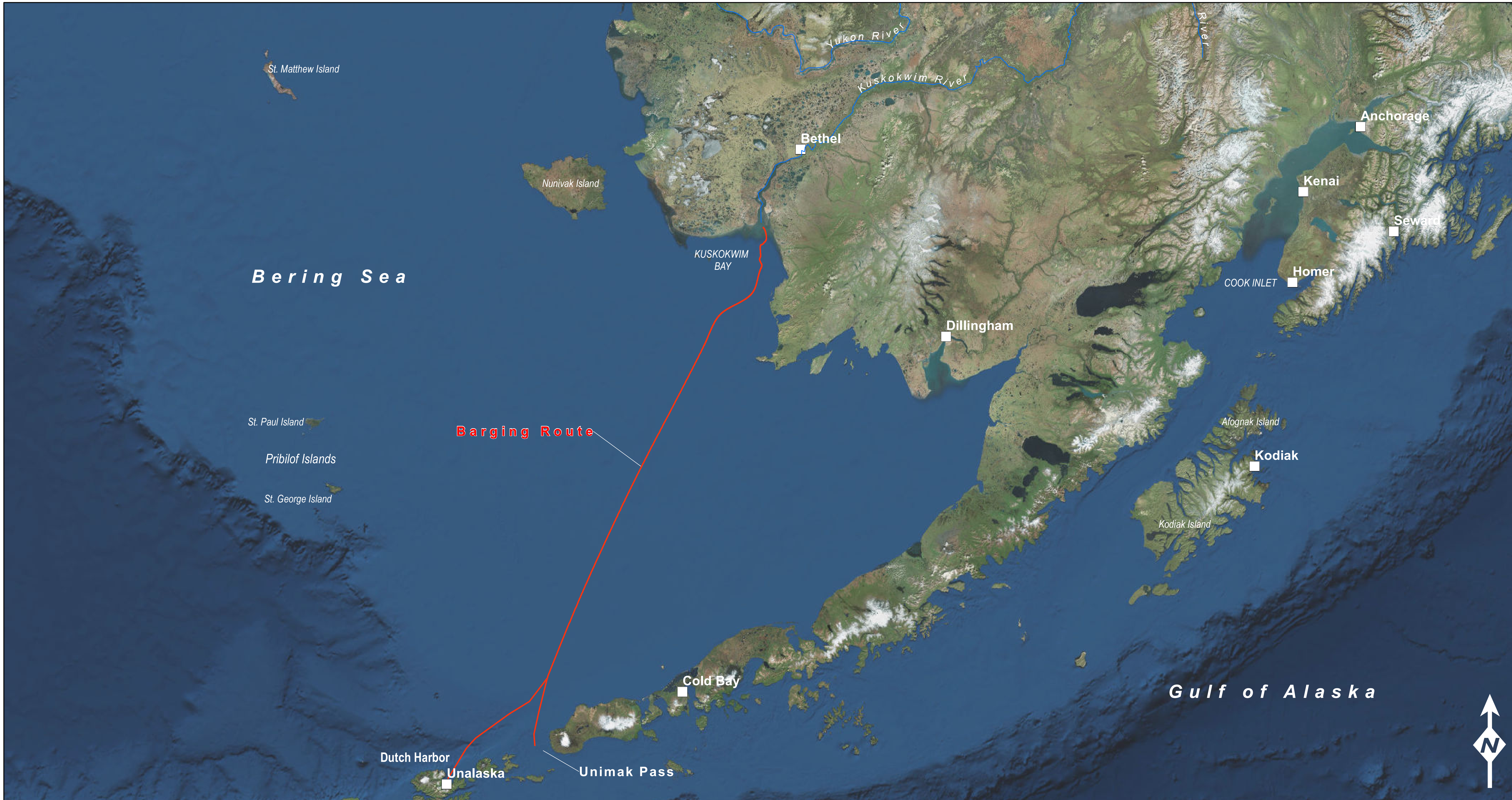
SCALE:

0 25 50 100 Miles

0 37.5 75 150 Kilometers

Figure: 2

ORNRC: DGP0025.mxd, 4/13/17, R02



Place of Interest

Barge Route

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

BERING SEA ROUTE

SCALE: 0 25 50 100 Miles; 0 37.5 75 150 Kilometers

Figure: 3

ORNRC: DGP0027.mxd, 4/06/17, R00

Place of Interest

Barge Route

VICINITY MAP

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

COOK INLET ROUTE

SCALE: 0 3 6 12 Miles; 0 4.25 8.5 17 Kilometers

Figure: 4

ORNRC: DGP0030.mxd, 4/06/17, R00

2.2. Cargo Logistics

Barging of cargo from the west coast ports will occur between May and September when all waters are clear of ice, and seasonal storms have abated. Barging will take place over the estimated 4 years of mine construction and the 27.5 years of operation. During operations, three sets of cargo barges launching from Seattle or Vancouver, will make approximately 12 trips (24 transits) annually, each round-trip taking about 32 days. Each barge will have a deadweight capacity of 11,500 tons (10,433 tonnes) and a net cargo capacity of 9,480 tons (8,600 tonnes), and will be hawser-towed by a 4,200-horsepower oceanic tugboat. Cargo will include annual consumables and general cargo consolidated as bulk in containers, bulk in Super Sacks ®, loose or palletized break-bulk, small packages, and liquid in small tanks. Included in this cargo are a number of chemicals required in gold ore processing. The list of chemicals and the annual amounts that will be transported to and from the mine are provided in Table 1.

TABLE 1: KEY CHEMICALS TRANSPORTED ANNUALLY DURING MINE OPERATION PHASE

Chemicals[1]	Est. Annual Transport (Short Tons)
Ammonium Nitrate (bulk)	33,000
Potassium Amyl Xanthate	4,189
Methyl Isobutyl Carbinol and F-549	1,984
Nitric Acid	661
Sodium Cyanide	2,535
Lime	21,027
Activated Carbon	220
Caustic soda (Sodium hydroxide)	358
Mercury Suppressant (UNR 829)	44
Flocculants	3,527
Sulfur	1,414
Copper sulfate	2,425
Fluxes (borax, sodium nitrate, and silica sand)	165
Water Softening and Anti-Scalant Agents	1,081
Ferric Sulphate	440
Sulphuric Acid	18
Sodium hydroxide	13
Polymer	2
Potassium Permangenate	13
Sodium Metabisulfite	7
Cleaning-In-Place (HCl, NaOH)	Less than 1 (~ 250 pounds [lb])
Microsand	8
Liquid Elemental Mercury	11
Spent Activated Carbon (Mercury)	5.5

[1]-The estimates are based on the current level of engineering design, and are applicable only to the mine operations phase. These chemicals would not be required during construction or the reclamation and closure phase of the project. The list of chemical amounts is subject to change along with future engineering design. Additional chemicals could/would be added, substituted, or amounts increased or decreased.

During operations, fuel will be transported from Dutch Harbor to Bethel using a single double-hulled barge holding up to 2.9 million U.S. gallons (gal) of fuel, towed by a 3,000-horsepower tug. Fuel demand varies over the mine life, but the peak of operations will require a maximum of about 14 annual barge roundtrips per year across Kuskokwim Bay. Fuel demands during construction are significantly lower and would require between 3 and 6 trips over the three- to four-year construction period.

Up to 20 construction barge trips (40 transits) will run from Anchorage to Beluga, all trips will occur within one construction season and gas line pipe will be the primary cargo, but Donlin is also considering transport of 1 million gal of diesel fuel across Cook Inlet needed to support the pipeline construction. This fuel could come from either Anchorage or Kenai. Donlin is examining several options for fuel transport, but transporting the fuel in mobile tank trailers on a deck barge is the mostly likely option. The beach landing site is 3.8 mi (6.1 km) south of the Beluga Airport and 7.3 mi (11.7 km) south of the mouth of the Beluga River.

3. SPECIES POTENTIALLY AFFECTED

The Cook Inlet Route bisects both summer and winter habitat for the endangered Cook Inlet beluga whale, a high-profile species, but no other listed species are found in the vicinity of this route. In contrast, the Bering Sea routes intersect marine habitat used year-round, seasonally, or occasionally by at least seven species, stocks, or distinct population segments (DPS) of listed marine mammals. The Bering Route includes habitat used by large whales and Steller sea lions, and seasonally by two listed ice seals. A complete list of these species and their status is provided in Table 2. For several of these species presence within the immediate vicinity of a moving barge is remote either because of rarity in the action area (*e.g.*, Western North Pacific [WNP] stock gray whale), or because of seasonal timing (*e.g.*, ringed seal and bearded seal). Other marine mammals are likely to be encountered at some point during operations, especially along the Pacific Inshore Route. None of these species are found in the vicinity of the other project components including the mine site, pipeline route, access roads, and river barging route; thus, this assessment focuses on only the marine barging routes.

TABLE 2: NMFS-LISTED MARINE MAMMALS POTENTIALLY OCCURRING ALONG DONLIN GOLD'S PROPOSED BARGING ROUTES

			Route	
Species	**Latin Name**	**ESA Status**	**Bering Sea**	**Cook Inlet**
North Pacific Right Whale	*Eubalaena japonica*	Endangered	x	
Fin Whale	*Balaenoptera physalus*	Endangered	x	
Humpback Whale	*Megaptera novaeangliae*	Endangered	x	
Gray Whale WNP Stock	*Eschrichtius robustus*	Endangered	x	
Beluga Whale CI Stock	*Delphinapterus leucas*	Endangered		x
Steller Sea Lion Western DPS	*Eumetopias jubatus*	Endangered	x	
Ringed Seal	*Pusa hispida*	Threatened	x	
Bearded Seal	*Erignathus barbatus*	Threatened	x	

CI = Cook Inlet
WNP = Western North Pacific

4. STATUS OF LISTED SPECIES

Eight ESA-listed species or DPS under the jurisdiction of the NMFS have been identified that could potentially occur along the marine barging routes proposed for the Donlin Gold project (Table 2). The ESA status, biological status, and use of the action area of each are addressed below.

4.1. North Pacific Right Whale (*Eubalaena japonica*)

4.1.1. ESA Status

A primary target of the 19th Century whaling industry, worldwide right whale populations, including those in the North Pacific, were reduced to critically low levels by the early 20th Century. As many as 37,000 North Pacific right whales were taken between 1839 and 1909, with 80 percent (%) of these taken in the 1840s alone (Scarff 2001). They were first protected under an international agreement in 1935, although Japan and the Soviet Union did not sign the original agreement and continued hunting these whales well into the 1960s, either illegally or as "scientific" research. In 1970, North Pacific right whales were afforded additional protection under the Endangered Species Conservation Act, the precursor to the ESA. They are currently listed as endangered under the ESA.

Critical habitat was designated for this species in 2006. At that time, the whale was classified as the North Pacific population of the northern right whale (*Eubalaena glacialis*). In 2008, it was reclassified as the North Pacific right whale (*E. japonica*). Two areas were designated, the 35,780-square-mile (mi^2) (92,670-square-kilometer [km^2]) Bering Sea Critical Habitat Area located north of the Alaska Peninsula (Figure 5) and the smaller Gulf of Alaska Critical Habitat Area found south of Kodiak Island. A final Recovery Plan was published in June 2013.

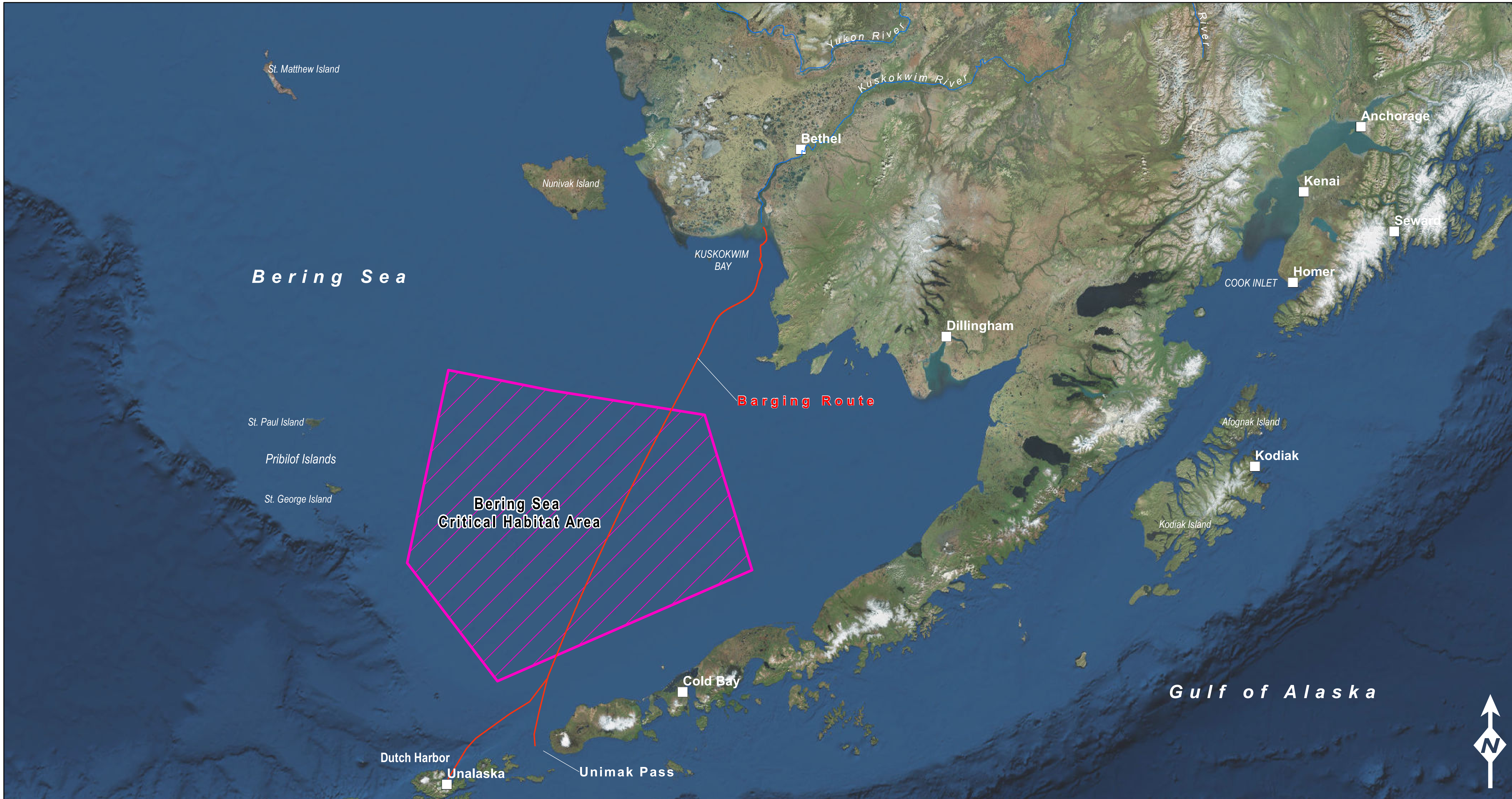
4.1.2. Biological Status

4.1.2.1. Abundance and Trends

Two separate populations of North Pacific right whales have been identified: a western population of about 400 whales that summers in the Sea of Okhotsk and winters off the coasts of China and Japan, and an eastern population of about 30 whales (Wade *et al.* 2016a) that summers in the Bering Sea and migrates along the western coast of the United States (U.S.) to Baja, California. Although neither of the aforementioned population estimates have been validated, they still represent a fraction of the tens of thousands of whales that once inhabited the North Pacific (Scarff 2001). The limited data on population abundance is insufficient to determine trends.

4.1.2.2. Distribution and Habitat Use

The potential historic range of the North Pacific right whale included the entire North Pacific with greater use in the eastern and western North Pacific and less use in the central North Pacific (Clapham *et al.* 2004). Nineteenth Century whaling efforts concentrated on the Gulf of Alaska, Bering Sea, and the Sea of Okhotsk. The several hundred whales that were illegally or "scientifically" killed by Russian and Japanese whalers in the 1960s were also taken in these areas (Omura *et al.* 1969, Ivashchenko and Clapham 2012). Winter



Place of Interest

Barge Route

North Pacific Right Whale Critical Habitat

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

NORTH PACIFIC RIGHT WHALE CRITICAL HABITAT

SCALE: 0 25 50 100 Miles; 0 37.5 75 150 Kilometers

Figure: 5

ORNRC: DGP0028.mxd, 4/06/17, R00

calving grounds or migration routes (Waite *et al*. 2003) are largely unknown based on the paucity of sightings, although the waters offshore of Southern California and northwest of the Hawaiian Islands have been identified as candidate wintering grounds based on winter habitat preferences of North Atlantic right whales (Good and Johnston 2009). Based on recent sightings, the Sea of Okhotsk, nearby Kamchatka Peninsula, the Bering Sea north of the Alaskan Peninsula, and Albatross Bank in the Gulf of Alaska south of Kodiak Island are the only known summer feeding grounds (Scarff 2001; Tynan *et al.* 2001; Brownell *et al*. 2001; Clapham *et al*. 2004; Wade *et al*. 2011a, b).

4.1.2.3. Feeding and Prey Selection

The preferred prey of North Pacific right whales is calanoid copepods. Diet studies from whales harvested in the 1960s by the Japanese revealed that whales in the Gulf of Alaska fed primarily on *Neocalanus cristatus*, while whales from the eastern Aleutian Islands contained mostly *N. plumchrus* (Omura 1958, 1986; Omura *et al*. 1969). A single net tow conducted in the vicinity of whales feeding on surface zooplankton over Albatross Bank found a mix of euphausiids and copepods that included *N. cristatus*, *N. plumchrus*, *N. flemingeri*, and *Calanus marshallae* (NMFS 2013, Wade *et al*. 2011b). Repeated sightings (3 consecutive years) of right whales presumably feeding at Albatross Bank suggest that the bank supports significant densities of zooplankton, leading to the designation of the bank as critical habitat (Gulf of Alaska Critical Habitat Area).

4.1.2.4. Reproduction

Little is known about reproduction in North Pacific right whales. The sighting of a possible calf in the Bering Sea in 1996 (Goddard and Rugh 1998), and the observations of a few subadults (Wade *et al*. 2011b), indicate that at least limited breeding has occurred since cessation of Soviet whaling in the 1960s. However, the number of breeding females in the eastern North Pacific population is small, which combined with the low population, limits the ability for these whales to find viable mates (NMFS 2013). Based on Kraus *et al.* (2007), for North Atlantic right whales, the average age at first calving is 9 to 10 years and the calving interval is 3 to 5 years.

4.1.2.5. Natural Mortality

Natural mortality rate for North Pacific right whales is likely to be similar to that for North Atlantic right whales: 17% in yearlings and 3% in subadults based on photo-identification data (Kraus 1990), although specific causes are not fully known. Mortality from anthropogenic sources is likely lower for the North Pacific whales because fishing and shipping traffic is less intense than in the Atlantic habitats (NMFS 2013). Still, any anthropogenic mortality is serious, given there may only be 30 whales in the eastern North Pacific population.

4.1.3. Species Use of the Action Area

A direct barging route between Unimak Pass or Dutch Harbor and Kuskokwim Bay would bisect the Bering Sea right whale critical habitat area (Figure 5), possibly leading to a barge encounter with individual summering right whales. If the entire North Pacific population of 30 right whales is present during barging across the 35,780-mi^2 (92,670-km^2) critical habitat area (1 whale per 1,200 mi^2 [3,108 km^2]), the expected encounter rate is low.

4.2. Fin Whale (*Balaenoptera physalus*)

4.2.1. ESA Status

North Pacific fin whales were listed as endangered under the Endangered Species Conservation Act in 1970 and the ESA in 1973, and received full protection from commercial whaling in 1976 under the International Whaling Commission. Between 1925 and 1975, nearly 48,000 fin whales were harvested in the North Pacific (Chapman 1976). No critical habitat has been designated for the North Pacific fin whale, although a recovery plan was developed in 1998.

4.2.2. Biological Status

4.2.2.1. Abundance and Trends

Prior to commercial whaling, an estimated 25,000 to 27,000 fin whales seasonally inhabited the eastern North Pacific (Ohsuma and Wada 1974). By 1974, this stock was thought to have been reduced to between 38% and 50% of the original population (Rice 1974, Chapman 1976), although the methods used to estimate the decline may not be reliable (Barlow *et al*. 1994). Because this species occurs both in shelf edge and pelagic waters of the North Pacific, much of the population occurs outside nearshore marine mammal survey areas. Survey results from Moore *et al*. (2002) and Zerbini *et al*. (2006) were combined by Muto *et al*. (2016) to produce the current population estimate of 5,700 animals for western Alaskan waters. Zerbini *et al*. (2006) also estimated that this stock has increased at an annual rate of 4.8% since 1987. The California/Oregon/Washington stock has been estimated at 3,051 (Carretta *et al*. 2016) based on the combined surveys by Forney (2007) and Barlow (2010). This stock is also thought to be increasing (Barlow *et al*. 1994, Barlow 1997).

4.2.2.2. Distribution and Habitat Use

Fin whales are cosmopolitan in their distribution in that they are found in all the oceans of the world, including polar regions, although they are rare in the tropics and the Arctic Ocean. They are found in both pelagic and shelf waters, and especially use shelf edge upwelling and mixing zones. The migratory pattern of eastern North Pacific fin whales is not fully understood, although they are found in Alaska during summer (Mizroch *et al*. 2009) and off California all year (Clapham *et al*. 1997).

4.2.2.3. Feeding and Prey Selection

Fin whales feed primarily on krill and schooling fish such as anchovies, Pacific herring (*Clupea pallasii*), and walleye pollock (*Theragra chalcogramma*) (Rice 1963, Clapham 1997). Euphausiids dominated the prey of fin whales taken from British Columbia whaling stations in the 1960s (Flinn *et al*. 2002).

4.2.2.4. Reproduction

It is assumed that North Pacific fin whales become sexually mature at about 10 years of age, although there is evidence that those in heavily exploited populations can mature in as little as 6 years (Gambell 1985, Ohsumi 1986). The calving interval may also vary depending on exploitation, with heavily hunted populations having intervals closer to 2 years (Christensen *et al*. 1992) and unhunted populations closer to 3 years (Agler *et al*. 1993).

4.2.2.5. Natural Mortality

There is little information on natural mortality. It is assumed that they are occasionally attacked by killer whales (*Orcinus orca*), but there is little evidence to confirm this.

4.2.3. Species Use of the Action Area

Fin whales have recently been observed summer feeding in the waters of the northern Bering Sea and southern Chukchi Sea. Presumably some of these whales seasonally pass through Unimak Pass to reach these feeding grounds where they might be encountered by barging operations.

4.3. Humpback Whale (*Megaptera novaeangliae*)

4.3.1. ESA Status

The humpback whale, as with most great whales, was protected under international convention in 1966, although illegal whaling continued to occur well into the 1970s and possibly 1980s. They were listed as endangered under the Endangered Species Conservation Act in 1969, and again under the ESA in 1973. On September 8, 2016, NMFS publish a rule, effective October 11, 2016, stating that ESA protection for the Hawaii DPS is no longer warranted, while the Mexico DPS was down-listed to threatened status. The small Western North Pacific DPS remains endangered. There is no designated critical habitat, but a recovery plan was finalized in 1991.

4.3.2. Biological Status

4.3.2.1. Abundance and Trends

There are numerous population estimates for North Pacific humpback whales depending on the survey and modeling techniques. An intensive 3-year (2004-2006) photo-identification study (Structures of Population, Levels of Abundance and Status of Humpback Whales [SPLASH]) was conducted in an attempt to determine the population structure and abundance of North Pacific humpback whale populations (Calambokidis *et al*. 2008). The results of the study provided a best estimate overall abundance of 18,302 for the entire North Pacific, or an estimate higher than the pre-exploitation population estimated by Rice (1974). The SPLASH data (Calambokidis *et al*. 2008, Barlow *et al*. 2011) provided estimates for the three North Pacific humpback whale stocks occurring in the action area (see *Distribution and Habitat Use* below): California/Oregon/Washington stock - 2,034; Central North Pacific stock - 10,103; and Western North Pacific stock - 1,107. Combined, these three stocks represent 72% of the current North Pacific population. Since protection in 1966, the North Pacific population has grown at an annual rate of about 6% to 7% (Caretta *et al*. 2012).

4.3.2.2. Distribution and Habitat Use

Humpback whales are coastal in their habitat use and generally are found in shelf edge, shelf, and inland waters. Three stocks of humpback whales inhabit the action area. The California/Oregon/Washington stock winters in the nearshore waters off Mexico and Central America, and summers off California, Oregon, and Washington. The Central North Pacific stock winters in Hawaiian waters and migrates to summer feeding areas in the coastal waters of British Columbia, Southeast Alaska, the Gulf of Alaska, the eastern Bering Sea, and the Aleutian Islands. The California/Oregon/Washington and Central North Pacific stocks overlap in southern British Columbia. The Western North Pacific stock winters off the coast of Asia and primarily summers in Russian waters, although it overlaps with the summer distribution of the Central North Pacific stock in the Bering Sea and along the Aleutians. Based on genetic analysis and movements of known animals, there appears to be some annual interchange between these three stocks, and all three stocks can be found in the Bering Sea (Wade *et al.* 2016b). On September 8, 2016, NMFS provided humpback whale guidance indicating that individuals from all three of the above stocks, identified by Wade *et al.* (2016b) as the Mexico, Hawaii, and Western North Pacific DPS, can occur in the Bering Sea summer feeding grounds. The majority (86.5%) of whales photo-identified were from the Hawaii DPS and 11.3% from the Mexico DPS (Wade *et al.* 2016b). Only 2.2% were from the Western North Pacific DPS. The Mexico and Western North Pacific DPS remain listed.

Humpback whales also occur in lower Cook Inlet (Owl Ridge Natural Resource Consultants 2014), and on occasion have wandered into upper Cook Inlet, but their presence near the barging routes to Beluga from either Anchorage or Kenai is not expected.

More than 5,000 humpback whales were taken by shore-based whalers off Vancouver Island between 1908 and 1967, and this region, plus Queen Charlotte Sound, remains an important humpback whale feeding ground (Nichol *et al.* 2002). Calambokidis *et al.* (2008) suggested that the whales using northern Washington and southern British Columbia waters might be a distinct stock.

4.3.2.3. Feeding and Prey Selection

For the most part, humpback whales prey on krill and schooling fish with the composition dependent on the feeding location. The most important prey off California are anchovies and the krill species *E. pacifica* (Rice 1963). This and other species of krill are important in Alaska along with Pacific herring (Frost and Lowry 1981, Krieger and Wing 1984). Nemoto (1957) found stomachs of humpbacks taken during Japanese whaling in the North Pacific to contain almost entirely euphausiids.

4.3.2.4. Reproduction

Humpback whale calving and breeding occurs on the warmer-watered wintering grounds. The high population growth rate (average annual rate of 6% to 7%) since the 1960s is partially explained by a higher reproduction rate compared to other large whales. Females sexually mature at 4 to 6 years of age and gestation periods are less than 12 months (NMFS 1991). The calving interval is generally 2 to 3 years, but some whales have calved in consecutive years (NMFS 1991).

4.3.2.5. Natural Mortality

Identified natural mortality in the North Pacific has been limited to occasional killer whale predation, although red tide events and possibly parasite overload has been implicated in deaths of North Atlantic humpback whales (NMFS 1991). Killer whales have been observed killing humpbacks in Southeast Alaska (Dolphin 1987), and the rake marks on whale flukes have been attributed to killer whale attacks, although there is speculation that some marks are due to attacks on juveniles by false killer whales (*Pseudorca crassidens*) on Hawaiian wintering grounds (NMFS 1991).

4.3.3. Species Use of the Action Area

Surveys conducted by Zerbini *et al*. (2006) show that Unimak Pass and the surrounding islands are commonly used by humpback whales. Humpback whales also concentrate in the waters surrounding Unalaska Island (Dutch Harbor), which includes a portion of the Bering Sea fuel barging route.

4.4. Gray Whale – Western North Pacific Stock (*Eschrichtius robustus*)

4.4.1. ESA Status

The Eastern North Pacific stock of the gray whale was removed from the Endangered Species List (NMFS 1994) and is not addressed in this assessment. In contrast, the Western North Pacific stock includes only about 200 individuals (Weller *et al*. 2002), and is listed as endangered under the ESA.

4.4.2. Biological Status

Bradford *et al*. (2003) modeled the population parameters of the Western North Pacific stock of gray whale and estimated that the current population is only 8% to 9% of the original population, but does appear to be growing at or near its biologically maximum rate. This stock winters off Korea and southern Japan and summers in the Sea of Okhotsk or vicinity (Weller *et al*. 2002).

4.4.3. Species Use of the Action Area

While the unlisted Eastern North Pacific stock of gray whale inhabits portions of the proposed barging routes, including Kuskokwim Bay, the occurrence of the Western North Pacific stock in Alaska is putative. Weller *et al*. (2012) confirmed a few individuals of the Western North Pacific stock (photographed in the Sakhalin Islands on multiple occasions) were occasionally found wintering with the Eastern North Pacific stock in Mexico (Laguna San Ignacio). Presumably, this interchange included passage through Alaskan waters. However, there is no evidence that the distribution of these few listed individuals would overlap with the proposed Donlin Gold barging activities, especially because gray whale migration occurs outside the summer barging season. Thus, this species will not be discussed further in this assessment.

4.5. Beluga – Cook Inlet Stock (*Delphinapterus leucas*)

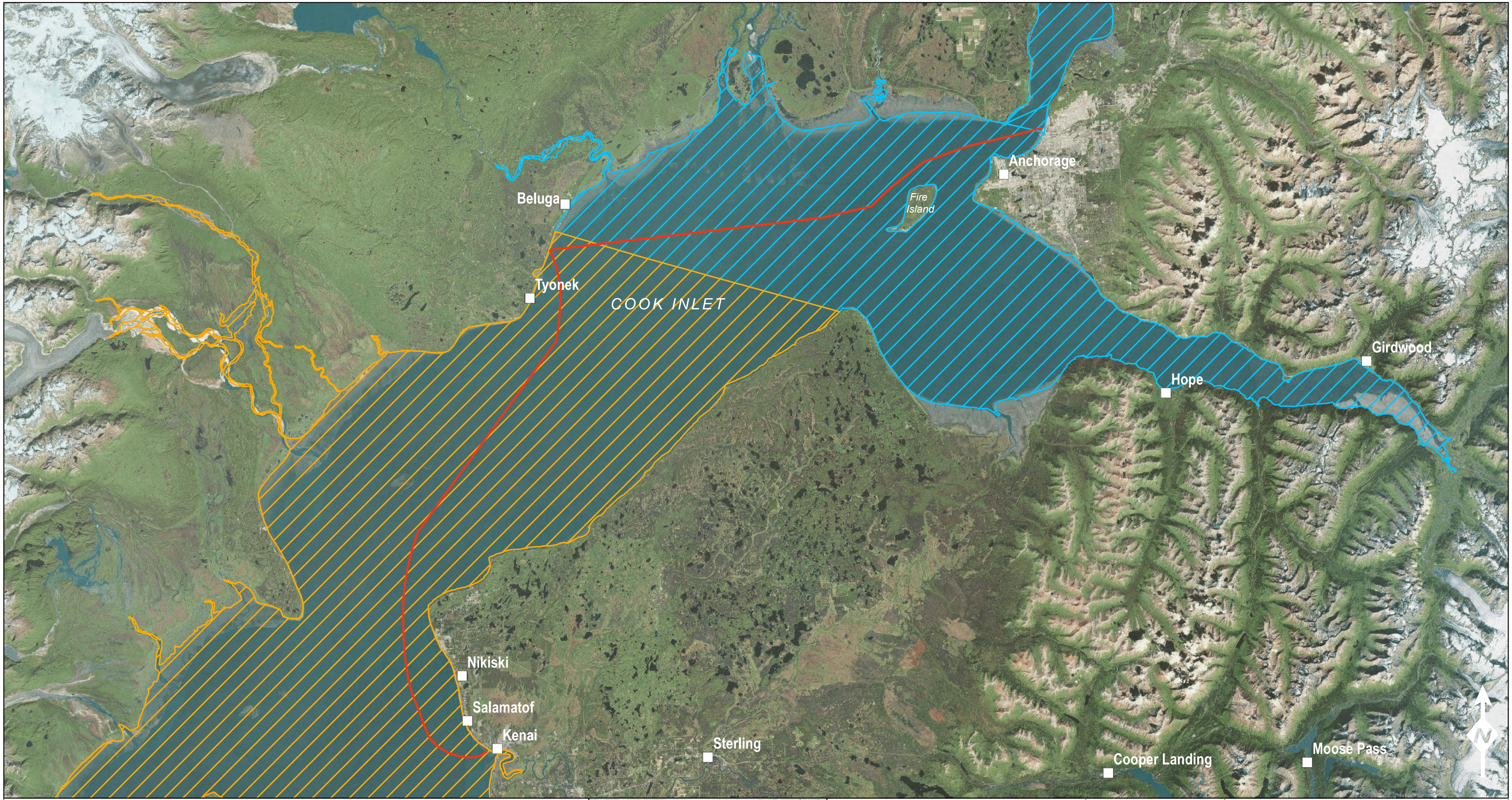
4.5.1. ESA Status

The isolated Cook Inlet stock of the beluga whale was listed under the ESA as endangered in 2008 after declining from about 1,300 animals in 1979 (Calkins 1989) to an estimated 278 animals in 2005 (Muto *et al*. 2016). Subsistence harvest best explains the observed decline as approximately 10% to 15% of the stock was removed annually between 1994 and 1998. A conservation plan was finalized in 2008 and critical habitat was designated in 2011 (Figure 6).

4.5.2. Biological Status

4.5.2.1. Abundance and Trends

The current abundance estimate for the Cook Inlet stock of beluga whale is 312 individuals. Since 2002, the population has continued to decline at a rate of about 0.6% annually (Muto *et al*. 2016).



Place of Interest

Barge Route

Beluga Critical Habitat

Area 1

Area 2

VICINITY MAP

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

COOK INLET BELUGA CRITICAL HABITAT

SCALE:

0 3 6 12 Miles

0 4.25 8.5 17 Kilometers

Figure: 6

ORNRC: DGP0031.mxd, 4/06/17, R00

4.5.2.2. Distribution and Habitat Use

Prior to the decline, this DPS was believed to range throughout Cook Inlet and occasionally into Prince William Sound and Yakutat (Nemeth *et al*. 2007). However, the range has contracted coincident with the population reduction (Speckman and Piatt 2000). During summer and fall, beluga whales are concentrated near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay (Nemeth *et al*. 2007). Critical Habitat Area 1 (Figure 6) reflects this summer distribution. During winter, beluga whales concentrate in deeper waters in the mid-inlet to Kalgin Island, and in shallow water along the west shore of Cook Inlet to Kamishak Bay (Critical Habitat Area 2; Figure 6). Some whales may also winter in and near Kachemak Bay.

4.5.2.3. Feeding and Prey Selection

In the late spring and summer, Cook Inlet belugas concentrate in river mouths of upper Cook Inlet where they feed upon seasonal runs of eulachon (Hobbs *et al*. 2006) and salmon (Moore *et al*. 2000). During the remaining part of the year they feed more on cod, sculpins, and flounders (NMFS 2008b).

4.5.2.4. Reproduction

Belugas become sexually mature at between 8 and 13 years of age (Burns and Seaman 1986). Gestation is 14 to 14.5 months (NMFS 2008b), and calving interval is 2 to 3 years (Sergeant 1973). Pregnancy rates are highest for the 12 to 21 age class (Burns and Seaman 1986). Published annual reproductive rates have ranged between 0.08 and 0.14 (NMFS 2008b). In Cook Inlet, most calving is thought to occur from mid-May to July (Calkins 1983).

4.5.2.5. Natural Mortality

Natural mortality includes stranding due to entrapment in shallow water from receding tides, and killer whale predation. However, most tidal strandings do not involve mortalities (Muto *et al*. 2016), and only four killer whale predation events were recorded between 1999 and 2008 (Shelden *et al*. 2003, Vos and Shelden 2005, Hobbs and Shelden 2008), and not all attacks were fatal.

4.5.3. Species Use of the Action Area

Cook Inlet belugas are largely confined to Cook Inlet proper and would not occur along any barging route outside the inlet. The Cook Inlet construction barging route between Anchorage and Beluga would intersect designated critical habitat Area 1 (Figure 6), including during the season of highest use of that habitat.

4.6. Steller Sea Lion (*Eumetopias jubatus*)

4.6.1. ESA Status

Due to substantial population declines in the western portion of its range, the Steller sea lion was first listed as threatened under the ESA in 1990, with critical habitat designated in 1993 (NMFS 2008c). In 1997, NMFS identified two DPSs, a Western and an Eastern, and reclassified the Western DPS as endangered based on persisting decline (NMFS 2008c). The Western DPS declined more than 80% between the late 1960s and 2000 at consistently monitored rookeries and haulout sites. Critical habitat includes a 20-

nautical-mi buffer around all major haulouts and rookeries, and three large offshore foraging areas, within the area used by the Western DPS (Figure 7). A recovery plan was developed in 2008.

4.6.2. Biological Status

4.6.2.1. Abundance and Trends

The minimum abundance estimate for the Western DPS of Steller sea lion, including Russian populations, is 45,916 animals based on pup and other count data collected between 2008 and 2011 (DeMaster 2011). This is down from a 1950s' population estimated for Alaska alone at 140,000 (Merrick *et al*. 1987). This DPS has grown at a slight 1.5% per year since 2000.

In contrast, the Eastern DPS has increased at a 3% annual rate between the 1970s and 2002. Declines in the small number of Steller sea lions that inhabit central California have been offset by modest increases in northern California and Oregon, and more dramatic increases in Southeast Alaska and British Columbia. The current minimum population estimate is 52,847 (Caretta *et al*. 2012).

4.6.2.2. Distribution and Habitat Use

Steller sea lions are found in all continental shelf waters from central California, north to Alaska, through the Aleutian Islands to Kamchatka Peninsula, then south to northern Japan. Major haul out sites relative to the proposed Donlin Gold barging activities occur from northern Vancouver Island (the Scotts Islands rookery supporting about 10,000 sea lions) almost continuously to the eastern Aleutian Islands in the vicinity of Unimak Pass and Unalaska (Dutch Harbor). In addition, about 1,000 Steller sea lions haul out along the outer coast of Washington with many seasonally occurring within inland waters of Washington where they regularly haul out on log booms and channel markers.

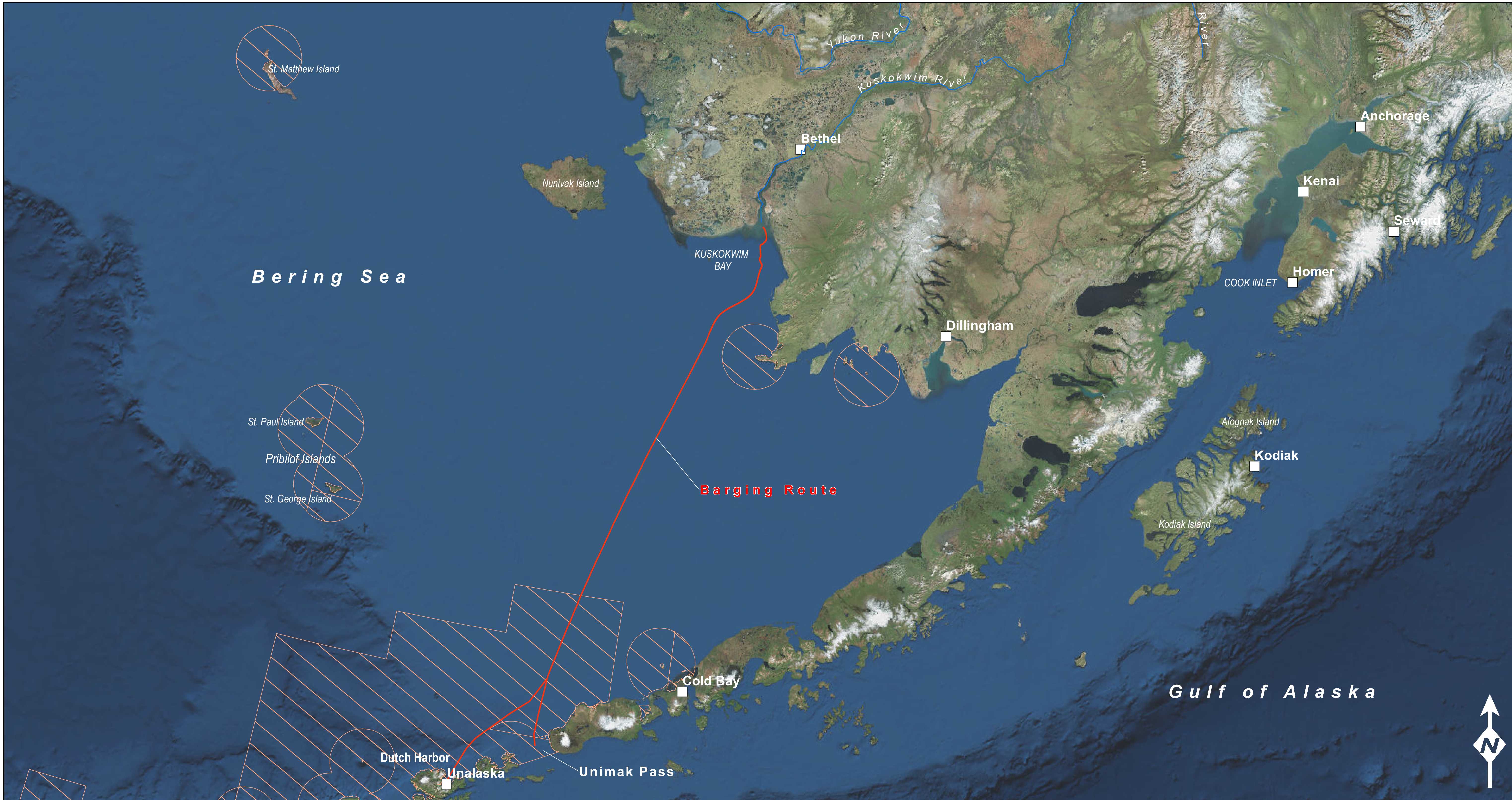
During summer Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nautical mi of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites. During winter, some of these sea lions may venture far out to sea in pursuit of prey (NMFS 2008c).

4.6.2.3. Feeding and Prey Selection

Steller sea lions are generalists, feeding on a wide variety of fish and cephalopods (Calkins and Goodwin 1988). In Alaska and British Columbia, schooling fish such as Pacific cod (*Gadus macrocephalus*), Pacific hake (*Merluccius productus*), walleye pollock, Pacific herring, Pacific sand lance (*Ammodytes hexapterus*), squid, and salmon are of great importance, although rockfish are also important (Calkins and Goodwin 1988, Calkins 1998). Small schooling fish and salmon are eaten almost exclusively during summer, cod during winter, and pollock year-round (Merrick and Calkins 1996, NMFS 2008c).

4.6.2.4. Reproduction

Female Steller sea lions reach sexual maturity at 3 to 6 years of age and can continue to breed into their early 20s (Mathisen *et al*. 1962, Pitcher and Calkins 1981). Males are sexually mature at 3 to 7 years of age, but are not physically mature enough to challenge for breeding rights until about 10 years of age



Place of Interest

Barge Route

Steller Sea Lion Critical Habitat Area

VICINITY MAP

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

STELLER SEA LION CRITICAL HABITAT

SCALE:

0 25 50 100 Miles

0 37.5 75 150 Kilometers

Figure: 7

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(Thorsteinson and Lensink 1962, Pitcher and Calkins 1981, Raum-Suryan *et al.* 2002). Sexually mature females are capable of pupping annually, and studies in the 1970s and 1980s found early gestation pregnancy rates of 97% (NMFS 2008c). However, during periods consistent with nutritional stress, pregnancy will be terminated early (intrauterine mortality or premature birthing) (Calkins and Goodwin 1988). During the decline of the Western DPS population in the 1970s and 1980s, pregnancy rates during late-term gestation dropped to between 55% to 67% (NMFS 2008c), and for lactating females, the late-term pregnancy rate was even lower suggesting that nursing compounds the energetic stress of reproduction during periods of low food availability. Females with better body condition were more likely to maintain pregnancy (NMFS 2008c).

4.6.2.5. Natural Mortality

About 20% of a stable Steller sea lion population dies annually from natural mortality including trampling, disease, senescence, and killer whale predation (NMFS 2008a). Killer whales have been implicated as a possible factor for the observed sea lion decline, or at least as a limit preventing recovery. Williams *et al.* (2004) explained that the foraging demands of even a relatively few killer whales could account for high sea lion losses. However, other studies have shown that sea lions are a relatively small component of the diet of mammal-eating killer whales for the Western DPS (6% to 22%; Wade *et al.* 2007), and that killer whales using Kenai Fjords annually ate from 3% to 7% of the local sea lion population, or only about a quarter of the annual natural mortality (Maniscalco *et al.* 2007). A decline in the carrying capacity resulting in nutritional stress and lower reproduction rates remains the most viable explanation for the dramatic decline of the Western DPS of Steller sea lions from the 1970s to the 2000s (NMFS 2008c).

4.6.3. Species Use of the Action Area

The Bering Sea action area, which includes all the potential variations in the barging route (due to weather, current, etc.), occurs within 20 nautical mi (critical habitat) of three Steller sea lion rookeries and six haulout sites (Table 3), plus portions of the Bogoslof feeding area critical habitat. None of the action area falls within 1 nautical mi of any rookery, and there is no Steller sea lion critical habitat in upper Cook Inlet.

TABLE 3: DISTANCES OF STELLER SEA LION ROOKERIES AND HAULOUT SITES TO THE ACTION AREA

Rookery/Haulout	Distance (nm)
Akutan Island	8.1
Akun Island	2.3
Ugamak Island	3.6
Tigalda Island	10.0
Tanginak Island	7.3
Akutan Reef-Lava	2.0
Old Man Rocks	11.9
Cape Sedanka	13.9
Cape Newenham	10.6

4.7. Ice Seals

Two species of ice seals – ringed seals (*Pusa hispida*) and bearded seals (*Erignathus barbatus*) – seasonally occur in the Bering Sea. Both were listed under the ESA as threatened in December 2012 because of the impact of declining sea ice on their long-term survival. Both species can be found in the southeastern Bering Sea, including Kuskokwim Bay, during winter periods when sea ice extends that far south (Cameron *et al.* 2010, Kelly *et al.* 2010). However, while their winter distribution spatially overlaps with a portion of the proposed Bering barging route, they do not temporally overlap. The oceanic barges proposed to be used for the Donlin Gold project do not have the capability to travel in sea ice, and as a result their operation will be limited to the mid-May to September open-water period when ice seals are not present. Other than the possible lingering effects from a major oil spill (see *Consequences of Proposed Action*), there is no pathway for effects because the species and proposed actions occur at different times. Therefore, neither are addressed further in this document. More information on these species can be found in the status reviews prepared by Kelly *et al.* (2010) for ringed seals and Cameron *et al.* (2010) for bearded seals during the ESA review process.

5. CONSEQUENCES OF PROPOSED ACTION

Three activities proposed by the Donlin Gold Project's construction and operation have the potential to impact wildlife species under the jurisdiction of NMFS: Supply barging between Unimak Pass and Bethel, fuel barging between Dutch Harbor and Bethel, and construction barging between Anchorage and Beluga. Pathways of potential effects include excessive noise generated by the tug propellers, ship strike, contamination from incidental spill of hazardous material, and contamination from an accidental oil spill due to rupture of a fuel tank or during fuel transfer. Each activity is considered in discussions below.

5.1. Disturbance

Relative to marine mammals, man-made noise introduced into the marine environment can result in impaired hearing, disturbance of normal behaviors (*e.g.*, feeding, resting, social interactions), masking calls from conspecifics, disruption of echolocation capabilities, and masking sounds generated by approaching predators. Behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen *et al*. 2006). Behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, interruption of vocal activity, and modification of vocal patterns (Watkins and Schevill 1975, Malme *et al*. 1984, Bowles *et al*. 1994, Mate *et al*. 1994). Long-term exposure can lead to fitness-reducing stress levels, and in some cases, physical damage leading to death can occur (*e.g.*, Balcomb and Claridge 2001).

The hearing of baleen whales remains unmeasured, but anatomical analyses suggest they are low-frequency specialists with good sensitivity at less than 2 kilohertz (kHz) (Wartzok and Ketten, 1999). Odontocetes (toothed whales), however, are high-frequency specialists. For example, beluga have their best hearing sensitivity between 30 and 80 kHz (Finneran *et al*. 2005). Most pinnipeds have peak sensitivities between 1 and 20 kHz (NRC 2003), with phocids such as ringed and harbor seals peaking at over 10 kHz and showing good sensitivity to approximately 30 kHz (Wartzok and Ketten 1999). Also, pinniped sensitivity to underwater noise relates to their evolutionary adaptation to the underwater environment. Kastak and Schusterman (1998) found that northern elephant seals, which forage at great depths and spend prolonged periods underwater, have better underwater hearing sensitivity than in-air, while sea lions, which spend considerably more time at the surface or hauled out, exhibited the reverse.

5.1.1. Threshold Shift

When exposed to intense sounds, the mammalian ear will protect itself by decreasing its level of sensitivity (shifting the threshold) to these sounds. Stereocilia are the sound sensing organelles of the middle and inner ear. They are the "hairs" of the hair cells that convert sound wave energy to electrical signals. When sound intensity is low, the hairs will bend towards the incoming waves, thereby increasing sensitivity. If the sound intensity is high, the hairs will bend away in an effort to reduce wave energy damage to the sensitive organelles, which includes a reduction in sensitivity. If the sound levels are loud enough to damage the hairs, the reduction in sensitivity will remain, resulting in a shift in hearing threshold. These threshold shifts can be temporary (temporary threshold shift [TTS]) or permanent (permanent threshold shift [PTS]) (Weilgart 2007) depending on the recovery ability of the stereocilia and connecting hair cells. Over-activation of hair cells can lead to fatigue or damage that remains until cells are repaired or replaced.

Exposure to intense impulsive noises can disrupt and damage hearing mechanisms, leading to a threshold shift. However, these threshold shifts are generally temporary (TTS), as the hair cells have some ability to recover between and after the intermittent sound pulses. Long-term exposure to continuous (non-impulsive) noise, even noise of moderate intensity, can lead to a PTS. This is because the continuous wave energy does not allow hair cells to recover. If the exposure is long enough, the ability to replace damaged hair cells after the exposure has ceased is also reduced, and the threshold shift becomes permanent.

Anthropogenic sources of underwater impulsive noises that could lead to TTS include seismic surveys, pile driving, and blasting. However, Donlin Gold's barging operations will not produce impulsive noises, so these TTS concerns do not apply. The primary underwater noise associated with the proposed barging operations is the continuous cavitation noise produced from the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the firing rate of the main engine, but both are subordinate to the blade rate harmonics (Gray and Greeley 1980). These continuous sounds for small ships have been measured at up to 171 decibels (dB) referenced at 1 micropascal in meters (μPa-m) root mean square (rms)) at 1-m source (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles *et al.* 1987, Richardson *et al.* 1995, Simmonds *et al.* 2004). Measured cavitation noise from modern cargo ships have peak energies less than 100 Hertz (Hz) (Areveson and Vendittis 2000, McKenna *et al.* 2012), resulting from both the blade rate harmonics and the chaotic collapse of cavities (cavitation), with a rapid drop off of about 6 dB per octave on a constant-bandwidth plot (Areveson and Vendittis 2000). Cavitation noise is a potential source for PTS depending on the received noise level (a function of the distance the animal is from the vessel) and duration (dependent on the period animal and vessel are in proximity). Because underwater hearing sensitivity in pinnipeds and odontocetes (*e.g.*, sperm, killer, and beluga whales) is greatest beyond 10 kHz, their effectiveness at hearing cavitation noise is already poor, and the potential for PTS is reduced. However, the cavitation noise does fall within the effective hearing range of baleen whales (*e.g.*, right, blue, sei, fin, humpback, and gray whales), and PTS could occur if exposure duration was long enough. However, as the tugboat is continually moving at about 9 knots (kt) (17 km/hour [hr]), there is no long-term exposure of a given whale to continuous cavitation noise leading to PTS. Thus, hearing loss in marine mammals is not of concern from the proposed oceanic barging operations. The maximum exposure time to noise exceeding 120 dB would be about 20 minutes (based on a conservative 15 Log r practical spreading model).

5.1.2. Masking

Masking occurs when louder noises interfere with marine mammal vocalizations or their ability to hear natural sounds in the environment (Richardson *et al.* 1995), which limit their ability to communicate, detect prey, or avoid predation or other natural hazards. Masking is of particular concern with baleen whales because low-frequency anthropogenic noises overlap with their communication frequencies. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, McDonald *et al.* (2009) found that California blue whales have shifted their call frequencies downward by 31% since the 1960s, possibly in an attempt to communicate at frequencies below masking shipping noise frequencies. Melcon *et al.* (2012) found blue whales to increase their call rates in the presence of shipping noise, while Watkins (1986) found fin whales to reduce their calling rate in response to boat noise. Both killer whales (Holt *et al.* 2009) and beluga whales (Scheifele *et al.* 2005) were found to increase the amplitude of their calls (known as the Lombard effect) in response to loud vessel noise levels.

Donlin Gold's planned barging will have some limited, additive effect to the overall anthropogenic noise budget. Donlin Gold plans 12 cargo barging round-trips (24 transits) annually from Unimak Pass to Bethel. These transits represent 0.5% of the 4,500 commercial vessels that annually pass through Unimak Pass (TRB 2008).

Most auditory studies on pinnipeds to date indicate that pinnipeds can hear underwater sound signals (such as higher frequency calls) in noisy (low frequency) environments, a possible adaption to the noisy nearshore environment (due to wind, waves, and biologics) they inhabit (Southall *et al.* 2000). Southall *et al.* (2000) found northern elephant seals, harbor seals, and California sea lions lack specializations for detecting low-frequency tonal sounds in noise, but rather were more specialized for hearing broadband noises associated with schooling prey.

The extent of masking associated with Donlin Gold's barging program is a function of the duration a barge is within hearing proximity of a marine mammal, and the additive noise from Donlin Gold's barging to overall shipping traffic. Working with killer whales, Crystal *et al.* (2011) found masking effects from vessels are eliminated at speeds less than 10 kt (18.5 km/hr). Whether this would apply also to other odontocetes such as beluga whales is unknown. However, odontocetes compensate for masking effects from vessel noise by increasing call intensity (Lombard effect), although the fitness implications of doing so is unknown. Given the ability for pinnipeds to hear well in noisy backgrounds (Southall *et al.* 2000), combined with the short duration of exposure from the moving vessel, masking concerns are not particularly significant for these marine mammals.

Masking is of greater concern with large baleen whales. Although masking might increase the risk of large baleen whales to killer whale predation, the increased risk is probably slight and minimal given the overall low predation risk. Communication masking is the primary issue, given the rate at which large baleen whales normally communicate. Communication masking is a function of the loss of communication space as a result of noise relative to the available communication space during quiet conditions (Clark *et al.* 2009). The size of communication space for a given species, in turn, is a function of call frequency range and call intensity. Clark *et al.* (2009) studied potential communication space loss from vessel traffic for singing fin and humpback whales and calling North Atlantic right whales. They found that for the source band (18 to 28 Hz) in which fin whales sing, source levels from a passing ship (181 dB) were essentially the same as the source level from the whale (180 dB), while for humpback source bands (224 to 708 Hz), ship source levels (167 dB) were much lower than whale source levels (170 dB). Thus, for both species there was little loss of communication space from the passing ship. However, because right whale call frequencies (71 to 224 dB) are well within the stronger frequency components from the ship, and right whale calls are relatively soft (160 dB), the source level from the ship (172 dB) is 12 dB higher than from the whale, resulting in nearly full masking of the communication space at the ships closest point. Consequently, the primary noise concern from Donlin Gold's barging is the potential effects on feeding right whales when traversing the Bering Sea right whale critical habitat area.

5.1.3. Chronic Disturbance

Apart from any potential for damaging marine mammal hearing, loud vessels can disrupt normal behaviors of marine mammals either through auditory or visual harassment. Disturbed animals may quit feeding, move away from feeding areas, display overt reactions, or display other behaviors that expend undue energy potentially culminating in lowered fitness. Continued disturbance can lead to chronic stress exposure, further leading to stress-related responses such as immune system suppression, reproductive failure, and slowed growth, and an overall decline in fitness. Chronic stress is exposure to stressors that last for days or longer, and does not apply to a single passing barge. However, disturbance noise from a passing barge (acute stress) can add to the overall stress budget (known as the allostatic load; Romero *et al*. 2009) of an individual marine mammal contributing to general distress and deleterious effects. Additional barging (multiple passes) would, of course, contribute further to the stress load.

In general, baleen whales seem less tolerant of continuous noise (Richardson and Malme 1993) and, for example, often detour around stationary drilling activity when received levels are as low as 119 dB re 1 μPa (rms) (Malme *et al*. 1983, Richardson *et al*. 1985, 1990). These studies are the basis for the threshold for harassment take from continuous noise defined at 120 dB re 1 μPa (rms). Humpback whales have been especially responsive to fast moving vessels (Richardson *et al*. 1995), and often react with aerial behaviors such as breaching or tail/flipper slapping (Jurasz and Jurasz 1979). Humpback whales have also shown a general avoidance reaction at distances from 1.2 to 2.5 mi (2 to 4 km) of cruise ships and tankers (Baker *et al*. 1982, 1983), although they have displayed no reactions at distances to 0.5 mi (800 m) when feeding (Watkins *et al*. 1981, Krieger and Wing 1986), and temporarily disturbed whales often remain in the area despite the presence of vessels (Baker *et al*. 1988, 1992). Odontocetes are probably less sensitive to acoustical disturbance from vessels because of their lower sensitivity to the low frequency noise generated by cavitating propellers. However, the presence of oceanic tug/barges could be disturbing to odontocetes when in close proximity, such as the coincidence of Southern Resident killer whales and barging through the narrow Admiralty Inlet, or beluga whales and barging in confined nearshore summer breeding or feeding habitat in Cook Inlet. Williams *et al*. (2009) found that Southern Resident killer whales travel greater distances in the presence of vessels, presumably to avoid these vessels, leading to increased energy expenditure and reduced fitness.

Most information on the reaction of seals and sea lions to boats relate to disturbance of hauled out animals. None of the proposed barging routes will come within disturbance distance to pinniped haulouts, or cross the 3-nautical-mi buffer surrounding any of the 35 listed rookeries in Alaska. There is little information on the reaction of these pinnipeds to ships while in the water other than some anecdotal information that sea lions are often attracted to boats (Richardson *et al*. 1995).

5.1.4. Relevance to Donlin Gold Barging

Donlin Gold's proposed oceanic barging program will contribute to existing vessel traffic noise along all barging routes. At times, the tugboat/barge may temporarily disturb marine mammals, especially baleen whales, resulting in acute stress levels and adding to the animal's overall stress budget. However, the overall effect is probably minimal given that the Donlin Gold's barging traffic would be well less than 1% of the total vessel traffic in the region, and the normal vessel speed is less than 10 kt (18.5 km/hr), and the individual noise source contribution is relatively less than other commercial vessels. Further, the propellers on ocean tugboats are generally recessed under the vessel hull to reduce cavitation and protect the nozzled propellers from damage during a grounding event. As a result, much of the noise emanating from the propellers is blocked (acoustical shadow) by the tugboat's hull, especially forward of the tug. Moreover, the nozzles themselves reduce cavitation, thereby further reducing noise levels to some degree. Overall, Donlin Gold's barging program is unlikely to result in chronic disturbance and stress in local marine mammals.

5.2. Vessel Strike

Collisions with marine vessels have been implicated in the deaths of marine mammals (Goldstein *et al.* 1999, Laist *et al.* 2001, Jensen and Silber 2004, Panigada *et al.* 2006, Van Waerebeek *et al.* 2007, Berman-Kowalewski *et al.* 2010). Whale mortality from ship strike is usually a result of blunt force injury from striking the ship bow (blunt trauma), or lethal wounding from propeller cuts (sharp trauma) (Moore *et al.* 2013). Worldwide (Laist *et al.* 2001, Jensen and Silber 2004) and off Washington (Douglas *et al.* 2008), fin whales are the most common cetacean killed by vessels. This may be a function of a greater population size or higher density in shipping lanes as opposed to a greater biological vulnerability (Douglas *et al.* 2008). Douglas *et al.* (2008) also noted that fin whales were more susceptible to blunt trauma from a bow strike, while gray whales were more likely to be injured by sharp trauma from a propeller strike. Neilson *et al.* (2012) documented 108 ship strikes in Alaska from 1978 to 2011 and found the vast majority to involve humpback whales in Southeast Alaska. All these records indicate that baleen whales are more susceptible to vessel strike than toothed whales. Of the 292 large whale ship strikes recorded by NMFS between 1975 and 2002 (Jensen and Silber 2004), only 17 (6%) involved sperm whales and only one a killer whale. Also, there are no records of lethal vessel strikes involving Cook Inlet beluga whales, although Kaplan *et al.* (2009) did record what appeared to be marks from a small propeller on at least two whales during photo-identification studies conducted from 2005 to 2008.

Vessel speed is the primary factor in the probability of a vessel strike occurring as well as the probability of the strike actually being lethal (Jensen and Silber 2004, Vanderlaan and Taggart 2007). The large whale ship strike database (Jensen and Silber 2004) indicates that the number of vessel strikes by vessels traveling at less than 10 kt (18.5 km/hr) is very low relative to the number of vessels normally traveling at those speeds. Vanderlaan and Taggart (2007) analyzed the ship strike database (Jensen and Silber 2004) and found that the probability of a strike actually being lethal (as opposed to survivable) was also low (<20%) for strikes at speeds less than 8 kt (15 km/hr), but high (>50%) at speeds greater than 12 kt (22 km/hr)). This and additional information was used to develop the 10-kt (18.5-km/hr) restriction now enforced in North Atlantic right whale (NMFS 2008d) habitat off New England. Conn and Silber (2013) estimated that implementation of this vessel speed rule reduced the risk of vessel collisions with right whales by 80% to 90%. Laist *et al.* (2014) evaluated the effectiveness of the restriction 5 years after it was implemented and concluded that it was statistically significant in reducing whale deaths. The number of whale deaths attributed to ship strike within the restricted area reduced from 0.72 whales killed per year during the 18 years prior to the rule to zero during the 5 years after the restriction was implemented.

Pinnipeds are far less susceptible to vessel strike, probably because of their visual awareness both above and below water, and their quick maneuverability. Of 6,197 strandings of six species of pinnipeds in central California between 1986 and 1998, only five exhibited vessel strike damage.

5.2.1. Relevance to Donlin Gold Barging

Vessel strikes are most likely to occur where large whale concentration areas overlap with shipping traffic. For example, Neilson *et al.* (2012) identified six collision hotspots in Southeast Alaska based on overlap of shipping traffic and humpback whale use. The Bering Sea route passes through Unimak Pass, where not only humpback whales concentrate (Zerbini *et al*. 2006), but the pass is also used by other whales entering the Bering Sea, including fin and right whales. The barging route between Dutch Harbor and Bethel passes through a humpback whale feeding area off Unalaska and Umnak islands identified by Zerbini *et al*. (2006) and both Bering routes (fuel and supply) pass through right whale critical habitat.

Oceanic tugboats and barges offer very little risk of collision to marine mammals. First, oceanic barges travel at less than 10 kt (18.5 km/hr), the threshold above which vessel collision is of greatest concern. Further, many of the tugboats used in the towing operations will have their propellers recessed into the vessel hull to prevent bottom-strike in shallow waters and inside protective nozzles. These configurations reduce or eliminate the risk of sharp trauma from contact with the moving propeller blades. The remaining risk, albeit low, is from a potential collision with the bow of a towing (pulling) vessel passing through marine mammal concentration areas. However, ocean tugs are also designed to push up against other vessels and do not generally have sharp, bulbous bows. They may push aside a marine animal rather than strike it with full blunt force, depending on strike angle (Silber *et al*. 2010).

The barging poses little risk to pinnipeds, as they appear maneuverable and aware enough to easily avoid vessel contact (Lawson and Lesage 2013). Collision risk from barging is also low for North Pacific right whales, fin whales, humpback whales, and Cook Inlet beluga whales, but not nonexistent. The proposed cargo and construction barging routes will pass through designated critical habitat for North Pacific right whales and Cook Inlet beluga whales. Any mortality for these extremely small populations poses a population level risk. As mentioned above, the proposed barging routes also pass through feeding areas of concentrated use by fin and humpback whales. However, Allen *et al.* (2014) estimated that the annual ship strike serious injury/mortality rate for humpback whales in Alaska waters is 1.8 whales. Similarly, Allen *et al*. (2014) estimated the annual mortality rate for Alaskan fin whales at 0.4 whales per year. The collision risk is further lowered given the low (<10 kt [<18.5 km/hr]) vessel speed of the tow operation, especially when compared to faster (>20 kt [37 km/hr]) cargo ships moving to and from Alaska. Neilson *et al*. (2012) reported on 89 cases of ship collisions with marine mammals in Alaska where the vessel type was known. None of the involved vessels was a barge.

5.3. Accidental Spill

A barge-related spill would be a large spill involving the rupture of a vessel or transported fuel tank, usually as a result of a collision, sinking, fire, or running aground. Oil effects to marine mammals that could result include skin contact with the oil, ingestion of oil, respiratory distress from hydrocarbon vapors, contaminated food sources, fouled baleen, and displacement from feeding areas (Geraci 1990). Actual impacts would depend on the extent and duration of contact, and the characteristics (age) of the oil. Most likely, the effects of oil would be irritation to the respiratory membranes and absorption of hydrocarbons into the bloodstream (Geraci 1990). If a marine mammal was present in the immediate area of fresh oil, it is possible that it could inhale enough vapors to affect its health. Inhalation of petroleum vapors can cause pneumonia in humans and animals due to large amounts of foreign material (vapors) entering the lungs (Lipscomb *et al*. 1994). Contaminated food sources, an inability to sieve krill due to oil-fouling of baleen, and displacement from feeding areas also may occur as a result of an oil spill. Long-term ingestion of pollutants, including oil residues, could affect reproductive success, but data is lacking to determine how oil may fit into this scheme for marine mammals. Oil can reduce the thermal effects of hair on sea lions resulting in death if significantly oiled, especially for pups. However, following the *Exxon Valdez* oil spill, Loughlin (1994) found no evidence of oil toxicity damage to Steller sea lions stranded or live-sampled, and the ultra-low sulfur diesel (ULSD) fuel that Donlin Gold would be transporting quickly evaporates and dissipates relative to heavier oils (NRC 2014).

Further, the remoteness of the barging routes may make it difficult for a quick oil spill response. The longer the oil remains in the marine environment the harder it becomes to collect it.

The risk and effects of a potential chemical spill has not been previously assessed. Information on the chemicals to be transported and the risk of a chemical spill are provided in Section 6.1.2.

5.3.1. Relevance to Donlin Gold Barging

Each fuel barge launching from Dutch Harbor has the capacity to carry nearly 2.9 million gal of ULSD fuel. Part of the barging route will cross the Great Circle route shipping lanes entering and exiting Unimak Pass. About 6,000 fishing and commercial vessels annually pass through Unimak Pass (TRB 2008), which is nearly double that of all Alaskan ports combined. Given traffic volume, currents (up to 7 kt [13 km/hr]), weather conditions (*e.g.*, fog), mixture of vessel speeds (*e.g.*, slow tug/barges vs. much faster container ships), and remoteness, Unimak Pass has a high risk for collision (Ports and Waterways Safety Assessment 2006), potentially resulting in an oil spill. Unimak Pass traffic also poses a collision risk for Donlin Gold barges coming from Seattle, although the potential oil spill volume is limited to what fuel remains in the tugboat tanks. Unimak Pass is also lined with rocky hazards, which could result in a grounding due to engine failure or other accidental reasons. Groundings in remote and rocky areas of Alaska waters often result in oil release.

However, in Alaska, operations relative to marine fuel transport and transfer are regulated by both federal and state agencies, more specifically, the U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC). The USCG requires Vessel Response Plans (VRP) that comply with 33 Code of Federal Regulation (CFR 155 subparts D, F, G, and I.

The fuel barges from Dutch Harbor would be double-hulled, specifically designed to reduce the risk of oil release in the event of a collision. Based on worldwide oil spills analyzed between 1991 and 2003, of 53 accidents with double-hulled tankers, only four resulted in an oil spill, totaling 115,000 gal (DeCola 2009). This compares to 105 accidents involving single-hulled tankers (without segregated ballast tanks), where 14 involved spills totaling over 70 million gal.

Donlin Gold is considering transporting 1 million gal of diesel fuel from Anchorage or Kenai to Beluga in support of the pipeline construction. While Donlin is considering several options, transport will most likely involve transporting the fuel in mobile tank trailers secured aboard a cargo deck barge. These tank trailers would hold about 10,000 gal each, and would be driven on and off the barge. Other options include using a small double-hulled tank barge with a tank capacity of 130,000 gal. The fuel would be loaded and offloaded using a hose system and onshore holding tanks.

A chemical spill could also occur during a collision or allision event, including during a grounding while traveling up and down the Kuskokwim River. However, the safety measures addressed above regarding reducing oil spill risk, also apply to a chemical spill risk.

5.4. Incidental Spill

Incidental spills are chemicals spills which can be safely controlled at the time of release by shipboard personnel, do not have the potential to become an emergency within a short time, and are of limited quantity, exposure and potential toxicity. Incidental spills also include normal vessel operational discharges such as release of bilge water that might contain oils or oily detergents from deck washdown operations. They also include accidental releases of small volumes of hydraulic fluids, motor fuels and oils, and other fluids used in normal ship operation, usually as a result of overfilling tanks. Incidental spills can also occur during vessel- and transportation tank fueling at Dutch Harbor docks. The accumulation of a number of small spills can lead to impaired marine waters.

5.4.1. Relevance to Donlin Gold Barging

Incidental spills associated with Donlin Gold's barging program are most likely to occur in port (Dutch Harbor, Bethel, Anchorage, or Beluga) during fuel and supply transfer, with the greatest risk during fuel barge filling operations at Dutch Harbor and offloading at Bethel. However, given Bethel is located nearly 70 mi (113 km) upstream from the mouth of Kuskokwim River, incidentally spilled diesel fuel will most likely have dispersed or evaporated long before reaching marine waters used by listed marine mammals. If Donlin Gold uses a small tank barge to transport fuel across Cook Inlet, then there is a small spill risk during loading and offloading fuel. However, if Donlin Gold uses mobile tank trailers, then fueling and draining tanks would occur on land.

Facility Response Plans (FRP) are also required by the USCG for transfer of fuel from marine tank vessels to shore-based fuel storage facilities. These FRP requirements are described in 33 CFR 154 subparts F, H, and I and typically regulate fuel transfer operations from the vessel to the marine header at the fuel storage terminal.

The EPA requires both Spill Prevention Control and Countermeasure (SPCC) Plans and FRPs for shore-based fuel storage facilities where over-water fuel transfers occur. These requirements are described in 40 CFR part 112.

ADEC regulates marine tank vessels in state waters, transfer of fuel across the water, and fuel storage and distribution through the requirements of 18 Alaska Administrative Code (AAC) 75. All of these various regulations stem from and are integrated through the Oil Pollution Act of 1990 (OPA 90), promulgated following the *Exxon Valdez* oil spill which occurred in 1989. They focus on spill prevention by specifying construction standards, use of established procedures (for example fuel transfer procedures), conduct of regular equipment inspections, and personnel training. They also focus on spill response by requiring pre-staged spill response equipment, pre-identification of sensitive areas, personnel training, and regular spill drills. Agency inspections are also important elements of assuring spill response prevention, preparation and readiness. In Alaska, both dock and vessel operations relative to fuel transfer are required to develop Oil Discharge Prevention and Contingency Plan (ODPCPs) as regulated under 18 AAC 75. The plans must include a response action plan in the event of a spill, a prevention plan detailing the Best Management Practices (BMPs) that will be implemented to avoid a spill occurrence, and a review of the best available technology for detecting and recovering oil discharges.

Spill response crisis management systems that conform to the National Incident Management System are also required. This assures seamless integration with state and federal response resources in the event that they are needed.

Both Dutch and Iliuliuk harbors were listed as impaired waters for settleable solids, dissolved oxygen, and petroleum hydrocarbons. In 1995 a Total Maximum Discharge Load was established related to waste discharges from Seafood Processors. Further sampling from 2006 to 2008 indicated that while the water column met State of Alaska Water Quality Standards (WQS), sediments did not. Focus since that time has been on BMPs to minimize further petroleum hydrocarbon and other contaminant inputs.

North Pacific Fuel is regulated through an Alaska Pollutant Discharge Elimination System Multi-sector General Permit (MSGP) number AKR05DB55. These MSGPs are designed to assure that all discharges from regulated facilities meet WQS. Sediment contamination is thought to be a result of historic spills, perhaps occurring as long ago as World War II when more than a million gal of fuel was released during a Japanese bombing attack, as well as stormwater discharges from upland contaminated sites. Small spills at or near docks continue to contribute to impairment with an average of 1,000 gal of petroleum products spilled annually into the waters or onto adjacent shorelines of Dutch and Iliuliuk harbors (ADEC 2010).

ADEC (2010) has evaluated the three bulk-fuel storage and transfer facilities (Delta Western and two North Pacific Fuel facilities) and written "The three facilities appear to have implemented BMPs [Best Management Practices], developed the appropriate plans for spill scenarios, and properly managed their operations. There is no indication that these facilities are chronic sources of petroleum pollutants for the study area". But they did recognize that the almost 20 million gal of fuel stored does pose a potential high risk to water quality.

Given the required fuel BMPs and containment capabilities located at Dutch Harbor, it is unlikely that an incidental fuel spill would result in the escape and travel of enough fuel to result in any consequential exposure to a listed marine mammal under NMFS jurisdiction. Incidental spills are not addressed further as potential risk.

5.5. Effects to Prey

For the listed species addressed in this assessment, nearly all feed on small schooling fish, shrimp, squid, and zooplankton. All these prey species could become contaminated from spills leading to bioaccumulation or biomagnification of toxins in listed species (Eisler 1987, Almeda *et al.* 2013a, b), although diesel has a low specific gravity and does not sink; thus, rarely reaches the seafloor. Plankton appears to be particularly sensitive to oil (ITOPF 2014a); however, small schooling fish generally do not live long enough to bioaccumulate large amounts of toxins, and fish are able to metabolize polycyclic aromatic hydrocarbons, the oil contaminant of greatest concern (Eisler 1987). Further, because of its high viscosity, fuel oil is less readily incorporated into live tissue and, thus, is less bioavailable than, for example, crude oil (ITOPF 2014b).

Barging activity can directly affect plankton, fish eggs, fish larvae, and small fish through hull shear, entrainment through the propulsion system, exposure to turbulence in the propeller wash, and wake stranding (Odom *et al.* 1992). However, studies have found it difficult to detect barge-related mortality (Holland 1986, Odom *et al.* 1992), and have found fish larvae to be relatively resilient. Wake stranding, the depositing of fish onto shore by vessel-induced waves, is a function of wave amplitude, which further is a result of vessel size, vessel draft, vessel speed, and distance of vessel from shore (Bauersfeld 1977). Ackerman (2002) studied salmonid stranding in the lower Columbia River and found that shallow-draft tugs pulling barges produced much smaller wake amplitudes (average of 0.52 feet [ft] [0.15 meters [m]) than larger, deep-draft ships (1.7 ft [0.52 m]), and all but one of the observed salmonid strandings were associated with deep-draft ships. The distances to shore during this study ranged from 780 to 1,630 ft (238 to 497 m), or much closer to shore than the proposed travel routes for the Donlin barging. Thus, the Donlin barges probably do not produce large enough wakes and are not close enough to shore to cause any significant wave mortality stranding of prey fish.

Acoustical effects to prey resources are also limited. Christian *et al.* (2004) studied seismic energy impacts on male snow crabs (*Chionoecetes* sp.) and found no significant increases in physiological stress due to exposure. No acoustical impact studies have been conducted to date on Alaskan fish species, but studies have been conducted on Atlantic cod (*Gadus morhua*) and sardine (*Clupea* sp.). Davis *et al.* (1998) cited various studies and found no effects to Atlantic cod eggs, larvae, and fry when received levels were 222 dB. Effects found were to larval fish within about 16.4 ft (5 m), and from air guns with volumes between 3,000 and 4,000 cubic inches. Similarly, effects to sardines were greatest on eggs and 2-day larvae, but these effects were also confined to 16.4 ft (5 m). Further, Greenlaw *et al.* (1988) found no evidence of gross histological damage to eggs and larvae of northern anchovy (*Engraulis mordax*) exposed to seismic air guns, and concluded that noticeable effects would result only from multiple, close exposures. All these studies involved impulsive noise of very high energy, much higher than the continuous noise associated with tug propeller cavitation. Given the little response of potential prey to impulsive noise, the noise associated with barging activity is not likely to affect benthic or fish prey.

6. DIRECT EFFECTS

6.1. Insignificant and Discountable Effects

The Endangered Species Consultation Handbook describes insignificant effects as those that are so small that they "should never reach the scale where take occurs", and discountable effects "are those extremely unlikely to occur". A Donlin Gold barging accident resulting in an oil or chemical spill represents a low likelihood, high impact event. The impacts of a spill could range from negligible to high depending on the nature and amount of material spilled, environmental factors, and response. Neither spill event, should it occur, could be considered insignificant if listed species were present in the affected area. However, if the risk of such a spill were low enough, the effects would be discountable. The following sections address the oil and chemical spill risk associated with Donlin Gold's proposed barging relative to spill risk and presence of listed species.

6.1.1. Risk of Oil Spill

Donlin Gold contracted ERM (2016) to prepare an oil spill risk assessment for the proposed fuel barging between Dutch Harbor and Bethel. They used available data to assess the risk of a fuel spill during oceanic transit and fuel transfer activities associated with diesel fuel transport from Dutch Harbor. The results are presented in subsections 6.1.1.1 and 6.1.1.2 below.

6.1.1.1. Risk during Barge Transit

Donlin Gold plans to annually contract 14 fuel barge roundtrips between Dutch Harbor and Bethel, equating to 6,418 mi (10,329 km) of ocean transit each year. Based on this exposure and available data, ERM (2016) calculated an annual spill rate of 0.03, or one spill approximately every 31 years. Half the expected spills would be less than 5 gal and 17% greater than 1,000 gal (they found no data for spills greater than 10,000 gal). The rate for a spill of 1,000 to 10,000 gal was calculated as 0.005 spills annually, or one every 188 years.

6.1.1.2. Fate and Transport of a Transit Spill

The potential impact of a transit spill on listed wildlife species is not only a function of the spill risk, but also the location of the spill relative to the location of where species of concern occur. A spill occurring within North Pacific right whale critical habitat would pose a higher risk to the whale than one outside the critical habitat. To determine the fate and transport of a spill, Owl Ridge contracted Owens Coastal Consultants Ltd. (OCC) to develop fate and transport scenarios for a hypothetical 10,000-gal spill in Kuskokwim Bay. This was considered a worst-case scenario for a number of listed species.

To determine oil fate, OCC used the National Oceanic and Atmospheric Administration ADIOS oil weathering model for an instantaneous 10,000-gal spill of diesel (with no assumed containment or cleanup) in summer water conditions expected in Kuskokwim Bay (water temperature 50°F, salinity 32 parts per thousand, sediment load 5 grams per cubic meter, and current 2 kt). The model output for six different wind speed scenarios is provided in Table 4 and shows that in winds over 10 kt, the diesel has nearly all evaporated in 24 hr. The oil is predicted by the model to persist for a longer period, but OCC considered this persistence to be unrealistic given the evaporative properties of diesel and should be viewed as worst-case only.

TABLE 4: PERSISTENCE OF DIESEL RELATIVE TO WIND SPEED

Wind Speed (kt)	Percentage of Product Remaining after:				
	24 hr	48 hr	72 hr	96 hr	120 hr
2	47	39	36	33	31
5	39	33	29	26	23
6	36	28	23	19	16
7	21	10	5	2	1
10	3	0	0	0	0
15	2	0	0	0	0

OCC also modeled transportation fate based on local currents and tides relative to five wind speed scenarios (Table 5). There are no values in the gray boxes as the diesel fuel would have evaporated under these higher wind conditions (Table 4). This information provides a worst-case scenario for how far a large spill might travel before evaporation.

TABLE 5: DISTANCE OF DIESEL TRAVEL BEFORE EVAPORATION. NEGATIVE VALUES INDICATE MOVEMENT TO THE SOUTH (CURRENT) AND POSITIVE VALUES MOVEMENT TO THE NORTH (WIND)

Time (hr)	Transportation relative to release point (mi)				
	0 kt wind	5 kt S wind	7 kt S wind	10 kt S wind	15 kt S wind
0	0.0	0.0	0.0	0.0	0.0
6.5	-2.3	-1.2	-0.7	-0.1	1.1
13	-1.2	1.1	2.0	3.3	5.6
19.5	-3.5	-0.1	1.3	3.3	6.6
26	-2.3	2.2	4.0	6.7	11.2
32.5	-4.6	1.0	3.3	6.6	
39	-3.5	3.3	6.0	10.0	
45.5	-5.8	2.1	5.2	10.0	
52	-4.6	4.4	8.0		
58.5	-6.9	3.2	7.2		
65	-5.8	5.5	10.0		
71.5	-8.1	4.3	9.2		
78	-6.9	6.6	11.9		
84.5	-9.2	5.4	11.2		
91	-8.1	7.7	13.9		
97.5	-10.4	6.5	13.2		
104	-9.2	8.7	15.9		
110.5	-11.5	7.6	15.2		
117	-10.4	9.8	17.9		
123.5	-12.7	8.7	17.2		

6.1.1.3. Risk during Fuel Transfer

Loading or offloading a barge from Dutch Harbor would result in a transfer of about 2.9 million gal of diesel fuel. At a transfer rate of 85,000 gal per hr, the process would take about 36 hours to complete. A spill can occur during the transfer process due to equipment malfunction (*e.g.*, a faulty shutoff valve or hose leak) or human error (*e.g.*, misconnecting a hose or overtopping a tank). Typically, these incidental fuel transfer spills are small. ERM (2016) found that 95% of transfer spills are less than 50 gal, and only 0.2% of the spills were greater than 1,000 gal (and none greater than 10,000 gal). Based on 28 transfers per year, ERM estimated that a spill of any size could occur on average every 6 years, but a spill greater than 1,000 gal would occur approximately every 3,022 years.

It is possible that during infrequent periods of low water in the river, the deeper-draft ocean fuel barge may need to transfer fuel to a river barge in Kuskokwim Bay. Further, if a small tank barge is used to transport fuel across Cook Inlet, fuel would be transferred at both Anchorage and the barge landing near Beluga. But in both cases, the fuel transfer spill risk modeled by ERM (2016) would still apply.

6.1.1.4. Cook Inlet Fuel Transport

As mentioned in subsection 5.3.1, Donlin Gold is considering transporting 1 million gal of diesel fuel from Anchorage to Beluga in support of the pipeline construction. Options considered include transporting the diesel in 10,000-gal tank trailers secured aboard a cargo deck barge, using a small double-hulled tank barge with a tank capacity of 130,000 gal, or a combination of both. While this Cook Inlet activity was not specially assessed for spill risk, associated risks for the tank barge option are probably similar as or less than barging diesel from Dutch Harbor to Bethel. Because the Cook Inlet route is much shorter, there is less likelihood of a weather associated event occurring mid-travel, and there are few, if any, rocky areas along the travel route that could rupture a hull. Under the tank trailer option, the diesel would be compartmentalized in separate trailers, and there would be no fuel transfer risk as the tanks would be loaded and unloaded inland. Finally, the upper Cook Inlet location of the route limits the risk to a single listed species (Cook Inlet beluga whale).

6.1.2. Risk of Chemical Spill

The risk of a chemical spill during barging that would result in a spill, coupled with a release of a volume that could adversely affect a listed species or critical habitat, is extremely low. The pathway for a chemical spill to affect a listed species or critical habitat would start with a barging accident that affected the particular chemical container. That container would need to be breached and the contents come into contact with the environment. Finally, there would need to be receptors (listed species) present to be exposed the contaminated water. The details regarding spill risk and controls can be found in Section 3.24 of the Donlin Gold Project Draft Environmental Impact Statement (DEIS).

A chemical spill into water would likely be the result of a major or catastrophic barge incident. Saricks and Tompkins (1999) estimated the risk of a barge accident (allisions, collisions, breakaways, fires, explosions, groundings, structural failures, flooding, capsizing, and sinking) that occurred within 100 mi (160 km) of the coastline. The risk is 5.29×10^{-7} accident per 500 short ton (st)/km. Over the life of the mine operations

(27.5 years) this translates to 0.00014[1] accidents. It is important note that a barge accident, may or may not result in a chemical spill to water. Therefore, the risk of chemical spill would be less than 0.00014 over the life of the mine. Similarly, the DEIS stated that the risk of a cyanide spill would be very low (defined as a probability approaching zero).

This is an extremely low accident risk and, based on precedent, is discountable for the purposes of the ESA.

6.2. North Pacific Right Whale

6.2.1. Disturbance

Donlin Gold's barging operations, including both supply and fuel barges, will traverse Bering Sea designated critical habitat for the North Pacific right whale during the period these whales would actively be using the area. Depending on where the barge crosses the critical habitat unit within the action area depicted in Figure 2, the intersect length could vary from 177 mi (285 km) to 207 mi (333 km). Because the eastern Pacific population of this species is critically low (approximately 30 animals), any undue effect on the population can have great consequences on long-term survival. A primary concern is the effects barging noise might have on displacement of feeding right whales and/or masking communication.

Noise risk was evaluated by assuming noise effects occur when noise levels from the barge/tug exceed 120 dB re 1 μPa (rms). Using a conservative practical spreading model (15 Log r) and assuming a source level of 171 dB re 1 μPa (rms), the radius to the 120-dB isopleth would be 1.56 mi (2.5 km). Considering both sides of the vessel, the tug/barge would ensonify a swath 3.12 mi (5 km) wide over a maximum 207-mi (333-km) portion of the route that transits right whale critical habitat, or ensonify 646 mi^2 (1,673 km^2) of critical habitat, which represents only 1.8% of the 35,780-mi^2 (92,670-km^2) Bering Sea critical habitat. In using another metric, if it is assumed that 30 right whales inhabit the Bering Sea critical habitat during the barging period, the whale density would be 1 animal for approximately 1,193 mi^2 (3,089 km^2), or 0.54 animals per the area (barge route) ensonified. Further, given a <10-kt (<18.5-km/hr) vessel travel speed, the maximum exposure time for a stationary whale on the vessel path would only be 21 minutes, or far too short a period to elicit PTS concerns. If the barging route does intersect North Pacific right whale critical habitat, the determination is ***May Affect, Not Likely to Adversely Affect.***

6.2.2. Vessel Strike

Given the slow speed of the barge/tug (less than 10 kt [18.5 km/hr]), and the very low density of right whales within the designated critical habitat, vessel strike is not a concern. Donlin Gold met with representatives with NMFS (September 14, 2016) to discuss barging plans and mitigation measures to reduce risk of vessel strike. NMFS asked that barges: 1) maintain a speed less than 10 kt (18.5 km/hr); 2) reduce speed to 5 kt (9.3 km/hr) when within 900 ft (274 m) of a cetacean or pinniped; 3) avoid crossing designated critical habitat or cross along the western boundary; 4) avoid crossing between April and August; and 5) utilize protected species observers (PSOs) when crossing critical habitat. Barges will maintain speeds less than 10 kt (18.5 km/hr) and reduce speeds to 5 kt (9.3 km/hr) when approaching marine mammals. The 10-kt rule is similar to that imposed for North Atlantic right whales at Stellwagen Bank. Donlin Gold believes that this rule sufficiently reduces risk to below levels of concern. Donlin Gold will

[1] $(\text{Accident Rate}) \times \frac{Total\ distance\ traveled\ with\ Cargo\ (km)}{Total\ Cargo\ \ (st)}$ therefore $5.29\ \cdot 10^{-7} \cdot \frac{500\ st}{1\ km} \cdot \frac{1{,}973{,}277.6\ km}{3{,}612{,}000\ st} = 0.00014$

consider shifting of the route to avoid whale high concentration areas within the critical habitat, but only after consulting with the eventual barging contractor(s). For the fuel barging out of Dutch Harbor, avoiding critical habitat altogether would add an additional 2,000 mi (3,219 km) of additional travel annually (and barging from Unimak Pass would result in similar increases in cost and time). For practical and safety reasons, the barges must operate during the summer months when the Kuskokwim River is not frozen and the weather (and seas) is calmer. Using PSOs is also impractical. Fuel barges typically do not have berthing or other space for supernumeraries such as PSOs (and may possibly violate U.S. Coast Guard rules regarding passengers on such vessels). Donlin Gold does not propose using PSOs at this time.

The determination is ***May Affect, Not Likely to Adversely Affect*** based on the slow operating speeds the barges will maintain.

6.2.3. Accidental Spill

Barges from both Seattle and Dutch Harbor would follow or cross the Great Circle Route shipping lane as it enters and exits Unimak Pass. The number of vessels that annually pass through Unimak Pass is double that calling on all other ports in Alaska with approximately 4,500 large vessel transits annually (TRB 2008). These vessels are bottle-necked by a 4-mi (6.4-km) safety fairway within the 10-mi (16-km) wide pass. Coupled with frequent severe weather conditions, especially fog, Unimak Pass is one of the highest large-vessel collision risk locations in the world. Further, entrances to Unimak Pass are lined with rocky hazards, winds can be exceedingly strong, and USCG rescue services are 500 mi (804 km) away (Kodiak), greatly increasing the risk of oil-release in a grounding due to power loss, tow line separation, collision, or grounding. Moreover, oil spill response capabilities near Unimak Pass are minimal.

Oceanographic studies indicate that both Alaska Stream and Alaska Coastal Current (ACC) waters pass north through Unimak Pass, with the ACC becoming the Bering Coastal Current running along the north side of the Alaska Peninsula into Bristol Bay. Drifter trajectory studies (TRB 2008) confirm that significant current drift from Unimak Pass moves on to the Bering Shelf and into Bristol Bay. Consequently, it is possible that a significant oil spill in or near Unimak Pass could reach the Bering Sea right whale critical habitat.

The Donlin Gold fuel barging program will reduce oil spill risk because: 1) they cannot operate in winter months when weather conditions are extreme; 2) they will be using barges with double-hull tanks to reduce the potential for tank rupture; and 3) by using updated radar equipment to avoid other vessels traveling in the proximity. Furthermore, except for the first few hours of a diesel spill where there is a concentration of toxic vapors at the sea surface, cetaceans are little affected by oil (Geraci 1990).

While the risk of an oil spill associated with Donlin Gold's barging operations is highest while traveling in the vicinity of Unimak Pass, the overall risk is discountable based on the risk assessment and safety measures mentioned in Section 6.1.1 (but see Section 6.2.5 below). The determination for accidental oil spill is ***May Affect, Not Likely to Adversely Affect.***

6.2.4. Incidental Spill

North Pacific right whales do not inhabit harbor waters where the risk of an incidental spill during fuel or cargo transfer is more likely to occur. Also, safety measures in place would prevent spills from reaching habitat used by this species. Thus, the determination for incidental spill is ***No Effect***.

6.2.5. Effects on Critical Habitat

Both the offshore and inshore barging routes completely avoid the Gulf of Alaska critical habitat area. However, the Bering Sea fuel barging route would intersect the Bering Sea critical habitat area. ERM conducted spill risk modeling and determined that the annual risk of a large 1,000- to 10,000-gal diesel spill during fuel barging was only 0.005 (one every 188 years). OCC modeled both the fate and transportation of a hypothetical 10,000-gal diesel spill in Kuskokwim Bay and concluded that such a spill could travel between 9 and 18 mi (14 and 29 km) before evaporating, depending on wind speeds at the time of spill. Given the fuel barging route crosses a maximum 207 mi (333 km) of right whale critical habitat, and the maximum fuel spill transport is 18 mi (29 km), then approximately 243 mi (391 km; 53.1%) of the 458-mi (737-km) route is within a 10,000-gal spill distance of critical habitat. Thus, the maximum annual risk of a spill occurring where it could potentially reach right whale critical habitat is a discountable 0.0027 (53.1% x 0.005) or one every 354 years (188 years/53.1%). In addition, there is little potential for a major collision or allision in the center Bristol Bay because of a lack of rocks, shorelines, and boat traffic. The determination for North Pacific right whale critical habitat is ***May Affect, Not Likely to Adversely Affect***.

6.3. Fin Whale

6.3.1. Disturbance

Fin whales may seasonally occur in Unimak Pass as they travel to northern feeding grounds. Thus, there is the potential for propeller noise and vessel presence to disturb fin whales. However, any disturbance would be limited to exposure to low levels of continuous noise that would last for only a few minutes (~20 minutes), and is probably insignificant at a population level. The determination is ***May Affect, Not Likely to Adversely Affect*** for disturbance.

6.3.2. Vessel Strike

Fin whales are also the most common large whale struck by vessels worldwide, and they can be found in waters along the proposed Bering Sea barging routes. However, because the barge will be traveling at speeds less than 10 kt (18.5 km/hr), the risk of ship strike is low to the point of discountable. Thus, the determination is ***May Affect, Not Likely to Adversely Affect*** for vessel strike.

6.3.3. Accidental Spill

The barging route through Unimak Pass includes hazardous rocks and other obstacles where collision and allision risks are greatest, some of which occur in the vicinity of fin whale travel areas. However, as shown in Section 6.1.1, the safety measures to be implemented will reduce the risk of an oil spill to discountable levels resulting in a determination of ***May Affect, Not Likely to Adversely Affect*** for accidental spills.

6.3.4. Incidental Spill

Fin whales are not found in harbors where incidental spills are most likely. The determination is ***No Effect***.

6.3.5. Effects on Critical Habitat

There is no designated critical habitat for fin whales.

6.4. Humpback Whale

6.4.1. Disturbance

The Bering Sea routes will pass through humpback whale concentration areas near Dutch Harbor and Unimak Pass (Zerbini *et al*. 2006). Thus, there is the potential for propeller noise and vessel presence to disturb humpback whales. However, any disturbance would be limited to exposure to low levels of continuous noise that would last for only a few minutes (~20 minutes), and is probably insignificant at a population level. The determination is ***May Affect, Not Likely to Adversely Affect*** for disturbance.

6.4.2. Vessel Strike

Similar to fin whales mentioned above, the Bering Sea barging routes pass through or near Unimak Pass where vessel traffic is concentrated. It is also important to note that humpback whales comprise the vast majority of vessel strike records in Alaska (Nielson *et al*. 2012). However, because of the low (<10 kt [18.6 km/hr) vessel speed, the risk of a vessel strike is essentially discountable and, therefore, results in a ***May Affect, Not Likely to Adversely Affect*** determination.

6.4.3. Accidental Spill

Unimak Pass is lined with rocky hazards posing both collision and allision risks that might lead to an oil spill. However, as shown in Section 6.1.1, the risk of an oil spill is discountable resulting in a determination of ***May Affect, Not Likely to Adversely Affect*** for accidental spills.

6.4.4. Incidental Spill

Humpback whales are not found in harbors where incidental spills are most likely. The determination is ***No Effect***.

6.4.5. Effects on Critical Habitat

There is no designated critical habitat for humpback whales.

6.5. Beluga Whale – Cook Inlet Stock

6.5.1. Disturbance

The Cook Inlet construction barging route will run from Anchorage to near the town of Beluga, with about 20 round trips (40 transits) in a single year. Nearly the entire route will run through Cook Inlet Beluga designated critical habitat Area 1, at a time of year when beluga whales actively use this summer habitat. The proposed barge landing location at Beluga is situated only 7.3 mi (11.7 km) south of the mouth of the Beluga River, a known summer concentration area. Beluga whales occurring within approximately 1.5 mi (2.4 km) of active barges are likely to be exposed to noise exceeding 120 dB (Level B harassment criterion). As a result, NMFS asked (September 14, 2016, meeting in Anchorage) that Donlin Gold barging keep further than 1.5 miles from the mean lower low water line of the Susitna Delta. Figure 8 provides the planning travel route between Anchorage and Beluga relative to this restriction. Possible barging from Kenai would also remain south of this line. Thus, by meeting the NMFS request, the determination is ***May Affect, Not Likely to Adversely Affect*** for disturbance.

Place of Interest

1.5-mile Travel Restriction Line

Mean Lower Low Water Line

Barge Route

VICINITY MAP

Projection: NAD83 Alaska Albers

REV:	NOTES:

DONLIN GOLD

DONLIN GOLD

ANCHORAGE TO BELUGA BARGING ROUTE RELATIVE TO THE SUSITNA DELTA

SCALE: 0 3 6 12 Miles; 0 4.25 8.5 17 Kilometers

Figure: 8

ORNRC: DGP0032.mxd, 4/06/17, R00

6.5.2. Vessel Strike

Vessel strike risk from the slow moving (less than 10 kt [18.5 km/hr]) tug/barge is low. As mentioned earlier, there are no records of lethal vessel strikes involving Cook Inlet beluga whales, (although Kaplan *et al*. (2009) did record what appeared to be marks from a small propeller on at least two whales during photo-identification studies conducted from 2005 to 2008). Beluga whales, a maneuverable toothed whale, may be somewhat susceptible to strike by a fast-moving small fishing boat as the known strike marks suggest, but they are not likely to be struck by a tug/barge moving at less than 10 kt (18.5 km/hr). Therefore, the determination is ***May Affect, Not Likely to Adversely Affect*** for vessel strike.

6.5.3. Accidental Spill

There are few collision or allision hazards along the short 40-mi (64-km) Anchorage to Beluga route, or the longer 48-mi (77-km) Kenai to Beluga route, to elevate spill risks. The primary cargo on the Anchorage route will be pipe for the gas line, and the fuel in the tug's fuel tanks represent the only spill hazard. Donlin Gold is considering transporting 1 million gals of diesel across Cook Inlet, either from Anchorage or Kenai. As mentioned in Section 6.1.1, the risk of such a spill is discountable leading to a spill determination of ***May Affect, Not Likely to Adversely Affect***.

6.5.4. Incidental Spill

The Port of Anchorage loading docks lay at the mouth of Knik Arm, an important seasonal feeding area for beluga whales. Whales moving in and out of Knik Arm are often observed in the vicinity of the docks and, therefore, could be exposed to contaminants resulting from an incidental petroleum spill at the docks. The greatest spill risk would likely be during tug fueling operations. It is unclear at this time where the tug operators would fuel, but it likely to occur either at the loading docks or their home berth near Anchorage.

However, given the low likelihood of a fuel spill, the safety and response measures that would be in place, the small size of any spill that would occur, and the very short period beluga whales would be expected to remain within the vicinity of these docks, the potential effects to beluga whales is insignificant. Thus, the determination is ***May Affect, Not Likely to Adversely Affect*** for incidental spill.

6.5.5. Effects on Critical Habitat

Nearly all the Cook Inlet barging activity would occur within beluga whale critical habitat Area 1, the region where beluga whales concentrate during the summer to feed on migrating fish, breed, and molt, although barging activity would not occur over the Susitna Delta where most of this whale activity is found. (A portion of the Cook Inlet route also crosses beluga whale critical habitat Area 2 where belugas forage during the winter months, but not so much during the barging season.) The proposed barging activity could affect critical habitat via noise pollution or contamination from a fuel spill. However, underwater noise emanating from the tug would not extend to Susitna Delta (and mouth of the Beluga River, Figure 8) where whales actually concentrate, and the risk of a fuel spill is discountable (see Section 6.1.1). The project determination is ***May Affect, Not Likely to Adversely Affect*** for Cook Inlet beluga whale critical habitat.

6.6. Steller Sea Lion – Western DPSs

6.6.1. Disturbance

Because the effective hearing of Steller sea lions is largely above the major noise frequencies of cavitating propellers and they appear adapted to hear important sounds in noisy backgrounds, Steller sea lions are likely not susceptible to continuous noise disturbance in open water. Also, there are no PTS concerns because Steller sea lions remain underwater for only short periods of time and, thus, there are no long-duration exposures to underwater noise. The determination for disturbance of Steller sea lions from barging activity is ***May Affect, Not Likely to Adversely Affect***.

6.6.2. Vessel Strike

Sea lions are highly maneuverable and, thus, not very susceptible to vessel strike, especially with a vessel traveling at less than 10 kt (18.5 km/hr). From 1978 to 2014, there have been only four confirmed sea lion mortalities in Alaska resulting from ship collisions (NMFS, unpublished data). Collision with a tug/barge is highly unlikely to the point of discountable. The determination is ***May Affect, Not Likely to Adversely Affect*** for vessel strike.

6.6.3. Accidental Spill

The Bering Sea barging routes do pass near Steller sea lion rookeries or haulouts. The rocky areas these sea lions inhabit near Dutch Harbor and Unimak Pass also pose navigation hazards, and the risk of a collision with another vessel while traversing Unimak Pass remains possible. However, the risk of an accidental oil or chemical spill is low to the point of discountable (see Sections 6.1.1 and 6.1.2). Thus, the determination is ***May Affect, Not Likely to Adversely Affect*** for accidental spill risk.

6.6.4. Incidental Spill

Incidental spills are most likely to occur during cargo- and fuel transfer at loading and unloading docks. Steller sea lions essentially are not found near Anchorage, Beluga, or Bethel. They are commonly found around the docks at Dutch Harbor where they seek handouts and feed on fish waste during harvest offloading. At this time, they could be exposed to a petroleum spill if it occurred during fuel transfer. However, the SPCC plans and FRPs required by EPA and USCG for shore-based fuel storage facilities where over-water fuel transfers occur, would require that measures be implemented to prevent and control any fuel spill that might occur. Therefore, with these measures in place, the determination for incidental spill is ***May Affect, Not Likely to Adversely Affect***.

6.6.5. Effects on Critical Habitat

The proposed barging activity could affect Steller sea lion critical habitat via noise pollution or contamination from a fuel spill. However, Steller sea lions are accustomed to vessel traffic and accidental spill risks are discountable. The determination is the Donlin Gold barging project ***May Affect, Not Likely to Adversely Affect*** Steller sea lion critical habitat.

7. INDIRECT EFFECTS

The Donlin Gold barging program will be implemented to supply fuel and cargo for a planned gold mine project located more than 250 mi (402 km) up the Kuskokwim River. Other than the barging activity addressed in this BA, there are no direct or ancillary mine features that involve marine waters, other than additional fuel transport to Dutch Harbor to supply Donlin Gold's fuel vendors located at Dutch Harbor. This fuel transport is not specifically addressed as it is presently unknown from where this additional fuel will be purchased, and is a part of normal business operation with Dutch Harbor fuel vendors. However, fuel purchase by Donlin Gold represents additional sales that would not have occurred but for the project, and will require additional fuel transport to and storage at Dutch Harbor.

The risk of an oil spill has already been determined to be a discountable direct effect. However, should a spill occur, there are potential indirect effects associated with cleanup. The type of synthetic materials used to disperse or clean up fuel can influence the magnitude of effect on listed wildlife (Ober 2013). While dispersants can increase the rate of oil degradation and thereby reduce the effects from surface toxicity or degradation of shoreline habitats, they also are surfactants that can reduce the insulation abilities of bird feathers and cause floating oil particles to sink down to benthic habitats. Dispersants are rarely used for diesel spills because the fuel evaporates and dissipates quickly. In addition, cleanup involves a large amount of human activity with associated additional disturbance risk to wildlife.

No other indirect effects have been identified.

8. CUMULATIVE EFFECTS ANALYSIS

For purposes of consultation under the ESA, cumulative effects are future state or private activities not involving federal activities that are reasonably certain to occur within the action area of an action subject to consultation. Relative to barging, the action areas are the barging routes between Unimak Pass and Bethel, Dutch Harbor and Bethel, and Anchorage and Beluga (there are no listed species occurring along the Kuskokwim River barging route between Bethel and the proposed project port near Crooked Creek). Actions similar to Donlin Gold's barging program are the existing shipping traffic along these routes that also contribute to noise, strike, and spill hazard. Donlin Gold's operation will add to the shipping traffic Unimak Pass, but by no more than 0.5% over existing traffic. However, with the expected increase in shipping traffic, volume through Unimak Pass over the estimated 35-year barging program, especially with increase in tanker ship traffic carrying Canadian crude oil to China over the Great Circle route, Donlin Gold cargo barges will be traversing more crowded shipping lanes leading to an increase in collision risk. Further, Unimak Pass is a conduit to oil and gas exploration and increased cargo traffic to and through the Alaskan Arctic. Donlin Gold barging can expect to be part of the expected increase in Alaskan shipping traffic congestion. Several projects are planned for Cook Inlet that would also contribute noise and strike risk to local marine mammals including the Alaska Liquefied Natural Gas pipeline project and several oil and gas seismic and drilling programs planned in both upper and lower Cook Inlet. All these projects will have associated mitigation and monitoring plans designed to limit impacts to Cook Inlet marine mammals.

9. DETERMINATION OF EFFECTS SUMMARY

A determination of effects for each species for the five evaluated risk categories is provided in Table 6.

TABLE 6: DETERMINATION OF EFFECTS FOR EACH ESA LISTED SPECIES POTENTIALLY OCCURRING ALONG DONLIN GOLD'S PROPOSED BARGING ROUTES

Species	Noise	Vessel Strike	Accidental Oil Spill	Incidental Spill	Critical Habitat	Overall
North Pacific Right Whale	NLAA	NLAA	NLAA	NE	NLAA	NLAA
Fin Whale	NLAA	NLAA	NLAA	NE	N/A	NLAA
Humpback Whale	NLAA	NLAA	NLAA	NE	N/A	NLAA
Beluga Whale – Cook Inlet	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Steller Sea Lion – Western DPS	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA

NE = No Effect
NLAA = May Affect, Not Likely to Adversely Affect
N/A = Not Applicable

10.LITERATURE CITED

Ackerman, N.K. 2002. Effects of vessel wake stranding of juvenile salmonids in the lower Columbia River, 2002 – a pilot study. S.P. Cramer & Associates report to USACOE, Portland. 47 pp.

Agler, B.A., R.L. Schooley, S.E. Frohock, S.K. Katona, and I.E. Seipt. 1993. Reproduction of photographically identified fin whales, *Balaenoptera physalus*, from the Gulf of Maine. J. Mamm. 74:577-587.

Alaska Department of Environmental Conservation (ADEC). 2010. Total Maximum Daily Loads (TMDLs) for Petroleum Hydrocarbons in the Waters of Dutch Harbor and Iliuliuk Harbor in Unalaska, Alaska. Alaska Department of Environmental Conservation, 555 Cordova Street, Anchorage, Alaska 99501. 75 pp.

Allen, B.M., V.T. Helker, and L.A. Jemison. 2014. Human-caused injury and mortality of NMFS-managed Alaska marine mammals stocks, 2007-2011. NOAA Technical Memorandum NMFS- AFSC-274, Alaska Fisheries Science Center, Seattle, WA. 84 pp.

Almeda R, Wambaugh Z, Chai C, Wang Z, Liu Z, Buskey EJ. 2013a. Effects of Crude Oil Exposure on Bioaccumulation of Polycyclic Aromatic Hydrocarbons and Survival of Adult and Larval Stages of Gelatinous Zooplankton. PLoS ONE 8(10): e74476. doi:10.1371/journal.pone.0074476

Almeda R, Wambaugh Z, Wang Z, Hyatt C, Liu Z, Buskey EJ. 2013b. Interactions between Zooplankton and Crude Oil: Toxic Effects and Bioaccumulation of Polycyclic Aromatic Hydrocarbons. PLoS ONE 8(6): e67212. doi:10.1371/journal.pone.0067212

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of occurrence rates for offshore oil spills. OCS Report BOEM 2012-069. 76 pp.

Arveson, P.T. and D.J. Vendittis. 2000. Radiated noise characteristics of a modern cargo ship. Journal of the Acoustical Society of America 107:118–129.

Baker, C.S., L.M. Herman, B.G. Bays, and W.F. Stifel. 1982. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska Contract 81-ABE00114, NMFS, National Marine Mammal Laboratory, Seattle, WA. 78 pp.

Baker, C.S., L.M. Herman, B.G. Bays, and G.B. Bauer. 1983. The impact of vessel traffic on the behavior of humpback whales in Southeast Alaska: 1982 season. Report submitted to the National Marine Mammal Laboratory, NMFS, Seattle, WA. May 17, 1983. 3 pp.

Baker, S. 1988. Behavioral responses of humpback whales to vessels in Glacier Bay. Proceedings of the Workshop to Review and Evaluate Whale Watching Programs and Management Needs, November 1988. Center for Marine Conservation, Washington DC. 16 pp.

Baker, C.S., J.M. Straley, and A. Perry. 1992. Population characteristics of individually identified humpback whales in southeastern Alaska: Summer and fall 1986. Fishery Bulletin, U.S. 90:429-437.

Balcomb, K. C., and D. E. Claridge. 2001. Mass whale mortality: U.S. Navy exercises cause strandings. Bahamian Journal of Science 8:1-12.

Barlow, J., R.W. Baird, J.E. Heyning, K. Wynne, A.M. Manville, II, L.F. Lowry, D. Hanan, J. Sease, and V.N. Burkanov. 1994. A review of cetacean and pinniped mortality in coastal fisheries along the west coast of the USA and Canada and the east coast of the Russian Federation. Rep. int. Whal. Commn (Special Issue 15):405-425.

Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon, and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rept. LJ-97-11.

Barlow, J. 2010. Cetacean abundance in the California Current estimated from a 2008 ship-based line-transect survey. NOAA Technical Memorandum NMFS-SWFSC-456. National Oceanic and Atmospheric Administration.

Barlow, J., J. Calambokidis, C. S. Baker, A. M. Burdin, P. J. Clapham, J. K. B. Ford, C. M. Gabriele, R. LeDuc, D. K. Mattila, T. J. I. Quinn, L. Rojas-Bracho, J. M. Straley, B. L. Taylor, J. Urban-Ramirez, P. Wade, D. Weller, B. H. Witteveen, and M. Yamaguchi. 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science 27:793-818.

Bauersfeld, K. 1977. Effects of peaking (stranding) of Columbia River Dams on juvenile anadromous fishes below The Dalles Dam, 1974 and 1975. State of Washington Department of Fisheries report to the U.S. Army Corps of Engineers, Contract DACW 57-74-C-0094, 32 pp.

Berman-Kowalewski, M., Gulland, F. M. D., Wilkin, S., Calambokidis, J., Mate, B., Cordaro, J., Rotstein, D., Leger, J. S., Collins, P., Fahy, K., and Dover, S. 2010. Association between blue whale (*Balaenoptera musculus*) mortality and ship strikes along the California coast. Aquatic Mammals 36:59-66.

Bowles, A.E., M. Smultea, B. Wursig, D.P. DeMaster, D. Palka. 1994. Abundance of marine mammals exposed to transmissions from the Heard Island Feasibility Test. Journal of the Acoustical Society of America 96:2469-2482.

Bradford, A.L., Wade, P.R., Burdin, A.M., Ivashchenko, Y.V., Tsidulko, G.A., VanBlaricom, G.R., Brownell, R.L., Jr. and Weller, D.W. 2003. Survival estimates of western North Pacific gray whales (*Eschrichtius robustus*). Paper SC/54/BRG14 presented to the International Whaling Commission Scientific Committee (unpublished). 34 pp.

Brownell, R.L., P.J. Clapham, T. Miyashita, and T. Kasuya. 2001. Conservation status of North Pacific right whales. Journal of Cetacean Research and Management. (Special Issue 2):269-286.

Brueggeman, J.J., G.A. Green, R.A. Grotefendt, D.G. Chapman. 1987. Aerial surveys of endangered cetaceans and other marine mammals in the northwestern Gulf of Alaska and southeastern Bering Sea. Outer Continental Shelf Environmental Assessment program. Final Reports of Principal Investigators OCS/MMS-89/0026. 61:1-24.

Brueggeman, J.J., Green, G.A., Tressler, R.W., Chapman, D.G., 1988. Shipboard surveys of endangered cetaceans in the northwestern Gulf of Alaska, US Department of Commerce, NOAA, OCSEAP Final Report 61, pg 125–188.

Burns, J.J. and Seaman, G.A. 1986. Investigations of belukha whales in coastal waters of western and northern Alaska. Part II. Biology and ecology. Final report submitted to NOAA Outer Continental Shelf Environmental Assessment Program. 129 pp.

Calambokidis, J., E.A. Falcone, , T.J. Quinn, A.M. Burdin, P.J. Clapham, J.K.B. Ford, C.M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-Bracho, J.M. Straley, B.L. Taylor, J. Urbán R., D. Weller, B.H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn , A. Havron, J. Huggins, N. Maloney, J. Barlow, and P.R. Wade. 2008. SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific. Final report for Contract AB133F-03-RP-00078 prepared by Cascadia Research for U.S. Dept of Commerce. May 2008.

Calkins, D.G. 1983. Susitna hydroelectric project phase II annual report: big game studies. Vol. IX, belukha whale. ADFG, Anchorage, Alaska. 15 pp.

Calkins DG, Goodwin EA. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK 99518. 76 pp.

Calkins D.G. 1989. Status of belukha whales in Cook Inlet. In: Jarvela LE, Thorsteinson LK (eds) Gulf of Alaska, Cook Inlet, and North Aleutian Basin information update meeting. Anchorage, AK, Feb. 7 – 8, 1989, USDOC, NOAA, OCSEAP, Anchorage, AK, pp. 109–112.

Calkins, D.G. 1998. Prey of Steller sea lions in the Bering Sea. Biosphere Conservation 1:33-44.

Cameron, M.F., J. L. Bengston, P.L. Boveng, J.K. Jansen, B.P. Kelly, S.P. Dahle, E.A. Logerwell, J.E. Overland, C.L. Sabine, G.T. Waring, and J.M. Wilder. 2010. Status review of the bearded seal (*Erignathus barbatus*). U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-211, 246 pp.

Carretta, J. V., E. Oleson, J. Baker, D. W. Weller, A. R. Lang, K. A. Forney, M. M. Muto, B. Hanson, A. J. Orr, H. Huber, M. S. Lowry, J. Barlow, J. E. Moore, D. Lynch, L. Carswell, R. L. Brownell, Jr. 2016. U.S. Pacific marine mammal stock assessments: 2015. NOAA Technical Memorandum NMFS-SWFSC-504, Southwest Fisheries Science Center, San Diego, California.

Chapman, D.G. 1976. Estimates of stocks (original, current, MSY level and MSY) (in thousands) as revised at Scientific Committee meeting 1975. Rep. int. Whal. Commn 26:44-47.

Christensen, I., T. Haug, and N. Øien. 1992. A review of feeding and reproduction in large baleen whales (Mysticeti) and sperm whales *Physeter macrocephalus* in Norwegian and adjacent waters. Fauna norvegica Series A 13:39-48.

Christian, J.R., A. Mathieu, and R.A. Buchanan. 2004. Chronic effects of seismic energy on snow crab (*Chionoecetes opilio*). Environmental Studies Research Funds Report No. 158, Calgary, AB.

Clapham, P., C. Good, S. Quinn, R.R. Reeves, J.E. Scarff, and R.L. Brownell, Jr. 2004. Distribution of North Pacific right whales (*Eubalaena japonica*) as shown by 19th and 20th century whaling catch and sighting records. J. Cetacean Res. Manage. 6:1-6.

Clark C.W., W.T. Ellison, B.L. Southall, L. Hatch, S.M. van Parijs, A. Frankel, and D. Ponikaris. 2009. Acoustic masking in marine ecosystems: intuitions, analyses and implication. Mar Ecol Prog Ser. 395:201–222

Conn, P.B. and G.K. Silber. 2013. Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. Ecosphere 4: Article 43.

Davis, R.A., D. Thomson, and C.I. Malme. 1998. Environmental assessment of seismic exploration of the Scotian Shelf. Unpublished Report by LGL Ltd., environmental research associates, King City, ON and Charles I. Malme, Engineering and Science Services, Hingham, MA for Mobil Oil Canada Properties Ltd, Shell Canada Ltd., and Imperial Oil Ltd.

DeCola, E. 2009. A Review of Double Hull Tanker Oil Spill Prevention Considerations, Report to Prince William Sound RCAC. Nuka Research & Planning Group, LLC. P.O. Box 175 Seldovia, Alaska 99663.

DeMaster, D. P. 2011. Results of Steller sea lion surveys in Alaska, June-July 2011. Memorandum to J. Balsiger, K. Brix, L. Rotterman, and D. Seagars, December 5, 2011. Available AFSC, National Marine Mammal Laboratory, NOAA, NMFS 7600 Sand Point Way NE, Seattle WA 98115.

Dolphin, William F. 1987. Observations of Humpback Whale, *Megaptera novaeangliae*, Killer Whale, *Orcinus orca*, Interactions in Alaska: Comparison with Terrestrial Perdator-Prey Relationships. Canadian Field-Naturalist 101:70-75.

Eisler, R. 1987. Polycyclic aromatic hydrocarbon hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85(1.11).

Finneran, J.J., D.A. Carder, C.E. Schlundt, and S.H. Ridgeway. 2005. Temporary threshold shift in bottlenose dolphins (*Tursiops truncates*) exposed to mid-frequency tones. J. Acoust. Soc. Am. 118:2696–2705.

Flinn, R.D., Trites, A.W., Gregr, E.J. and Perry, R.I. 2002. Diets of fin, sei and sperm whales in British Columbia: An analysis of commercial whaling records, 1963-1967. Mar. Mamm. Sci. 18:663-679.

Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the U.S. west coast and within four National Marine Sanctuaries during 2005. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-406. 27 pp.

Frost, K. J., and L. F. Lowry. 1981, Foods and trophic relationships of cetaceans in the Bering Sea. In D. W. Hood and J. A. Calder (eds.), The Eastern Bering Sea shelf oceanography and resources, Vol. 2. Univ. Washington Press, Seattle, WA, pp. 825-836.

Gambell, R. 1985. Fin Whale, *Balaenoptera physalus*. In S Ridgway, R Harrison, eds. Handbook of Marine Mammals, Vol. 3, first Edition. San Diego, CA: Academic Press Inc. Pp. 171-192.

Geraci, J.R. 1990. Physiologic and Toxic Effects on Cetaceans. Chapter 6: J.R. Geraci and D.J. St. Aubin (eds.), Sea Mammals and Oil: Confronting the Risks. San Diego, California: Academic Press, Inc., pp. 167-197.

Gray, L.M. and D.S. Greeley. 1980. Source level model for propeller blade rate radiation for the world's merchant fleet. Journal of the Acoustical Society of America 67:516–522.

Greenlaw, C.F., D.V. Holliday, R.E. Pieper, and M.E. Clark. 1988. Effects of airgun energy releases on the northern anchovy. Journal of the Acoustical Society of America 84:S165.

Goddard, P. D., and D. J. Rugh. 1998. A group of right whales seen in the Bering Sea in July 1996. Marine Mammal Science. 14:344-349.

Goldstein, T., S.P. Johnson, A.V. Phillips, K.D. Hanni, D.A. Fauquier, and F.M.D. Gulland. 1999. Human-related injuries observed in live stranded pinnipeds along the central California coast 1986-1998. Aquatic Mammals 25:43-51.

Good, C., and D. Johnston. 2009. Spatial modeling of optimal North Pacific right whale (*Eubalaena japonica*) calving habitats. North Pacific Research Board Project Final Report 718.

Hobbs, R. C., K. E. W. Shelden, D. J. Vos, K. T. Goetz, and D. J. Rugh. 2006. Status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*). AFSC Processed Rep. 2006-16. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle, WA. 74 pp.

Hobbs, R. C., and K. E. W. Shelden. 2008. Supplemental status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*). AFSC Processed Rep. 2008- 08, 76 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Hobbs, R. C., K. E. W. Shelden, D. J. Rugh, and S. A. Norman. 2008. 2008 status review and extinction risk assessment of Cook Inlet belugas (*Delphinapterus leucas*). AFSC Processed Rep. 2008-02, 116 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Holland, L.E. 1986. Effects of barge traffic on distribution and survival of ichthyoplankton and small fishes in the upper Mississippi River. Trans. Am. Fish. Soc. 115:162-165.

International Tanker Owners Pollution Federation Limited (ITOPF). 2014a. Effects of Oil Pollution on Fisheries and Mariculture. Technical Information Paper 11. 11 pp. Accessed at http://www.itopf.com/knowledge-resources/documents-guides/document/tip-13-effects-of-oil-pollution-on-the-marine-environment/

International Tanker Owners Pollution Federation Limited (ITOPF). 2014b. Effects of Oil Pollution on the Marine Environment. Technical Information Paper 13. 11 pp. Accessed at http://www.itopf.com/knowledge-resources/documents-guides/document/tip-11-effects-of-oil-pollution-on-fisheries-and-mariculture/

Ivashchenko, Y.V. and P.J. Clapham. 2012. Soviet catches of right whales *Eubalaena japonica* and bowhead whales *Balaena mysticetus* in the North Pacific Ocean and the Okhotsk Sea. End Species Res 18:201-217.

Jensen, A.S. and G.K. Silber. 2004. Large whale ship strike database. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-OPR-25.

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

Jurasz, C.M., and V.P. Jurasz. 1979. Feeding modes of the humpback whale, *Megaptera novaeangliae*, in southeast Alaska. Scientific Reports of the Whales Research Institute, 31:69-83.

Kaplan, C.C., T.L. McGuire, M.K. Blees, and S.W. Raborn. 2009. Longevity and causes of marks seen on Cook Inlet Beluga Whales. Chapter 1 In: Photo-identification of beluga whales in Upper Cook

Inlet, Alaska: Mark analysis, mark-resight estimates, and color analysis from photographs taken in 2008. Report prepared by LGL Alaska Research Associates, Inc., Anchorage, AK, for National Fish and Wildlife Foundation, Chevron, and ConocoPhillips Alaska, Inc. 32 pp.

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

Kelly B.P., O.H. Badajos, M. Kunnasranta, J.R. Moran, M. Martinez-Bakker, D. Wartzok, and P. Boveng. 2010. Seasonal home ranges and fidelity to breeding sites among ringed seals. Polar Biol 33:1095–1109.

Kraus, S. D. 1990. Rates and potential causes of mortality in North Atlantic right whales. Marine Mammal Science. 6:278-291.

Kraus, S. D., R. M. Pace III, and T. R. Frasier. 2007. High investment, low return: the strange case of reproduction in *Eubalaena glacialis*. Pages 172-199 in S. D. Kraus, and R. Rolland, editors. The Urban Whale: North Atlantic Right Whales at the Crossroads. Harvard University Press, Cambridge, Massachusetts.

Kreiger, K. and B.L. Wing. 1984. Hydroacoustic surveys and identification of humpback whale forage in Glacier Bay, Stephens Passage, and Frederick Sound, southeastern Alaska, Summer 1983. NOAA Tech. Memo. NMFSINWC-66. 60pp.

Kreiger, K. and Wing, B.L 1986. Hydroacoustic monitoring of prey to determine humpback whale movements. NOAA Tech. Memo. NMFSNWC-98.62 pp.

Lawson, J.W. and Lesage, V. 2013. A draft framework to quantify and cumulate risks of impacts from large development projects for marine mammal populations: A case study using shipping associated with the Mary River Iron Mine project. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/154 iv + 22 p

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science, 17:35-75.

Laist, D.W., A.R. Knowlton, and D. Pendleton. 2014. Effectiveness of mandatory vessel speed limits for protecting North Atlantic right whales. Endangered Species Research 23:133-147.

Lipscomb T.K., R.K. Harris, A.H. Rebar, B.E. Bellachey, R.J. Haebler. 1994. Pathology of sea otters. In: Loughlin TR (ed) Marine mammals and the ‘Exxon Valdez’. Academic Press, San Diego, CA, p 265–280.

Loughlin T.R. (ed.) 1994. Marine mammals and the ‘Exxon Valdez’. Academic Press, San Diego, CA.

Madsen, P.T., Wahlberg, M., Tougaard, J., Lucke, K. and Tyack, P. (2006). Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. Mar. Ecol. Progr. Ser. 309, 279-295.

Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird. 1983. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior (BBN Report No. 5366; NTIS PB86-174174). Report from Bolt Beranek and Newman Inc. for U.S. Minerals Management Service, Anchorage, AK.

Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird. 1984. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior/Phase II: January 1984 migration. BBN Rep. 586. Rep. from Bolt, Beranek, & Newman, Inc. Cambridge, Massachusetts, for U.S. Minerals Management Service, Anchorage, Alaska.

Maniscalco, J. M., C. O. Matkin, D. Maldini, D. G. Calkins, and S. Atkinson. 2007. Assessing killer whale predation on Steller sea lions from field observations in Kenai Fjords, Alaska. Mar. Mamm. Sci. 23:306–321.

Mathisen, O. A., R. T. Baade, and R. J. Loff. 1962. Breeding habits, growth and stomach contents of the Steller sea lion in Alaska. Journal of Mammalogy 43(4):469-477.

Mate, B.R., K.M. Stafford and D.K. Ljungblad. 1994. A change in sperm whale (*Physeter macrocephalus*) distribution correlated to seismic surveys in the Gulf of Mexico. Journal of the Acoustical Society of America 96(2):3268-3269.

McDonald, M., J. Hildebrand, and S. Mesnick. 2009. Worldwide decline in tonal frequencies of blue whale songs. Endangered Species Research 9:13–21.

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131:92-103.

Melcón M.L., A.J. Cummins, S.M. Kerosky, L.K. Roche, S.M. Wiggins, and J.A. Hildebrand. 2012. Blue whales respond to anthropogenic noise. PLoS ONE 7(2):e32681.

Merrick, R. L., & Calkins, D. G. (1996). Importance of juvenile walleye pollock, *Theragra chalcogramma*, in the diet of Gulf of Alaska Steller sea lions, *Eumetopias jubatus*. In R. D. Brodeur, P. A. Livingston, T. R. Loughlin, & A. B. Hollowed (Eds.), Ecology of juvenile walleye pollock (*Theragra chalcogramma*) (NOAA Technical Report 126) (pp. 153-166). Washington, DC: U.S. Department of Commerce. 200 pp.

Merrick, R. L., T. R. Loughlin, and D. G. Calkins. 1987. Decline in abundance of the northern sea lion, *Eumetopias jubatus*, in 1956-86. Fish. Bull., U.S. 85:351-365.

Merrick, R. L., and T. R. Loughlin. 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. Can. J. Zool. 75:776–786.

Miles, P.R., C.I. Malme, and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. Report prepared by BBN Laboratories Inc., Cambridge, MA and LGL Ltd., King City, ON for the U.S. Department of the Interior Minerals Management Service, Alaska OCS Office, Anchorage, AK.

Mizroch, S. A., D. Rice, D. Zwiefelhofer, J. Waite, and W. Perryman. 2009. Distribution and movements of fin whales in the North Pacific Ocean. Mammal Rev. 39:193-227.

Moore, S.E., K.W. Shelden, D.J. Rugh, B.A. Mahoney, and L.K. Litzky. 2000. Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. Mar. Fish. Rev. 62:60-80.

Moore, S. E., J. M. Waite, N. A. Friday and T. Honkalehto. 2002. Distribution and comparative estimates of cetacean abundance on the central and south-eastern Bering Sea shelf with observations on bathymetric and prey associations. Progr. Oceanogr. 55:249-262.

Moore M.J., J. der Hoop, S.G. Barco, A.M. Costidis, F.M. Gulland, P.D. Jepson, K.T. Moore, S. Raverty, and W.A. McLellan. 2013. Criteria and case definitions for serious injury and death of pinnipeds and cetaceans caused by anthropogenic trauma. Dis Aquat Organ. 103:229-64.

Muto, M.M., V.T. Helker, R.P. Angliss, B.A. Allen, P.L. Boveng, J.M. Breiwick, *et al.* 2016. Alaska Marine Mammal Stock Assessments, 2015. NOAA Tech. Memo. NMFS-AFSC-323. 300 pp.

National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.

National Marine Fisheries Service. 1994. Final Rule to Remove the Eastern North Pacific Population of the Gray Whale from the List of Endangered Wildlife. Fed. Regist. 59:31094-31095.

National Marine Fisheries Service. 2008a. Conservation Plan for the Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Seattle, Washington.

National Marine Fisheries Service. 2008b. Conservation Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*). National Marine Fisheries Service, Juneau, Alaska.

National Marine Fisheries Service. 2008c. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Revision. National Marine Fisheries Service, Silver Spring, MD. 325 pp.

National Marine Fisheries Service. 2008d. Final rule to implement speed restrictions to reduce the threat of ship collisions with North Atlantic Right Whales. Fed Regist. 73: 60173−60191.

National Marine Fisheries Service. 2011. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. 108 pp.

National Marine Fisheries Service. 2013. Final Recovery Plan for the North Pacific Right Whale (*Eubalaena japonica*). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD.

National Research Council (NRC). 2003. Ocean Noise and Marine Mammals. National Academies Press, Washington, D.C. 192 pp.

National Research Council (NRC). 2014. Responding to Oil Spills in the U.S. Arctic Marine Environment. National Academies Press, Washington, D.C. 183 pp.

Neilson, J.L., C.M. Gabriele, A.S. Jensen, K. Jackson, and J.M. Straley. 2012. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology 2012:1-18.

Nemeth, M. J., C. C. Kaplan, A. M. Prevel-Ramos, G. D. Wade, D. M. Savarese, and C. D. Lyons. 2007. Baseline studies of marine fish and mammals in Upper Cook Inlet, April through October 2006. Final report prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska for DRven Corporation, Anchorage, Alaska.

Nemoto, T. 1957. Foods of baleen whales in the northern Pacific. Sci. Rep. Whales Res. Inst. Tokyo: 1233-89.

Odom, M.C., D.J. Orth, and L.A. Nielsen. 1992. Investigation of barge-associated mortality of larval fishes in the Kanawha River. Virginia Journal of Science 43:41-45.

Ohsumi, S., and S. Wada. 1972. Stock assessment of blue whales in the North Pacific. Unpublished working paper for the 24th meeting of the Scientific Committee of the International Whaling Commission, 20 pp.

Ohsumi, S. 1986. Yearly change in age and body length at sexual maturity of a fin whale stock in the eastern North Pacific. Sci. Rep. Whales Res. Inst. 37:1-16.

Olesiuk, P. F., G. M. Ellis, and J. K. Ford. 2005. Life history and population dynamics of northern resident killer whales (*Orcinus orca*) in British Columbia. DFO Canadian Science Advisory Secretariat Research Document 2005/045.

Omura, H. 1958. North Pacific right whale. Scientific Reports of the Whales Research Institute, Tokyo. 13:1-52.

Omura, H. 1986. History of right whale catches in the waters around Japan. Reports of the International Whaling Commission Special Issue. 10:35-41.

Omura, H., S. Ohsumi, K.N. Nemoto, K. Nasu, and T. Kasuya. 1969. Black right whales in the North Pacific. Scientific Reports of the Whales Research Institute, Tokyo. 21:1-78.

Owl Ridge NRC. 2014. Cosmopolitan State 2013 Drilling Program Marine Mammal Monitoring and Mitigation 90-day Report. Prepared for BlueCrest Alaska Operating LLC. 74 pp.

Panigada, S., Pesante, G., Zanardelli, M., Capoulade, F., Gannier, A., and Weinrich, M. T. 2006. Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin 52:1287-1298.

Papanikolaou, A., E. Eleftheria, A. Aimilia, A, Seref, T. Cantekin, D. Severine, and M. Nikos. 2006. Impact of Hull Design on Tanker Pollution. Proceedings of the Ninth International Marine Design Conference, Ann Arbor, MI.

PAWSA (Ports and Waterways Safety Assessment) Workshop Report Aleutian Islands. July 24-25, 2006.

Pitcher, K.W. and D.G. Calkins. 1981. Reproductive biology of Steller sea lions in the Gulf of Alaska. Journal of Mammalogy 62:599-605.

Rankin, S., J. Barlow, and K.M. Stafford. 2006. Blue whale (*Balaenoptera musculus*) sightings and recordings south of the Aleutian Islands. Marine Mammal Science 22:708-713.

Raum-Suryan, K. L., K. Pitcher, D. G. Calkins, J. L. Sease and T. R. Loughlin. 2002. Dispersal, rookery fidelity, and metapopulation structure of Steller sea lions (*Eumetopias jubatus*) in an increasing and a decreasing population in Alaska. Marine Mammal Science 18:746–764.

Rice, D.W. 1963. Progress report on biological studies of the larger Cetacea in the waters off California. Norsk Hvalfangst-tid. 52:181-187.

Rice, D. W. 1998. Marine mammals of the world: Systematics and distribution. Special Publication Number 4. The Society for Marine Mammology, Lawrence, KS. 231 pp.

Richardson, W.J., M.A. Fraker, B. Würsig, and R.S. Wells. 1985. Behaviour of bowhead whales, *Balaena mysticetus*, summering in the Beaufort Sea: Reactions to industrial activities. Biological Conservation 32:195-230.

Richardson, W.J., B. Würsig, and C.R. Greene Jr. 1990. Reactions of bowhead whales, *Balaena mysticetus*, to drilling and dredging noise in the Canadian Beaufort Sea. Marine Environmental Research, 29:135-160.

Richardson, W.J. and C.I. Malme. 1993. Man-made noise and behavioral responses. In J. J. Burns, J. J. Montague, & C. J. Cowles (Eds.), The bowhead whale (Special Publication 2) (pp. 631-700). Lawrence, KS: Society for Marine Mammalogy. 787 pp.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thompson. 1995. Marine Mammals and Noise. Academic Press, San Diego, CA. 576 pp.

Romero L.M., M.J. Dickens, and N.E. Cyr. 2009. The reactive scope model – a new model integrating homeostasis, allostasis and stress. Horm. Behav. 55:375–389.

Saricks, C.L. and M.M. Tompkins. 1999. State-Level Accident Rates of Surface Freight Transportation: A Reexamination. Argonne National Laboratory publication ANL/ESD/TM-150. 62 pp.

Scarff J.E. 2001. Preliminary estimates of whaling-induced mortality in the 19th century North Pacific right whale (*Eubalaena japonicas*) fishery, adjusting for struck-but-lost whales and non-American whaling. Journal of Cetacean Research Management (Special Issue) 2:261-268.

Scheifele, P.M., S. Andrew, R.A. Cooper, M. Darre, F.E. Musiek, and L. Max. 2005. Indication of a Lombard vocal response in the St. Lawrence River beluga. Journal of Acoustics Society of America 117:1486-1492.

Sergeant, D.E. 1973. Biology of white whales (*Delphinapterus leucas*) in western Hudson Bay. J Fish Res Bd Can 30:1065-90.

Shelden, K.E.W., D.J. Rugh, B.A. Mahoney, and M.E. Dahlheim. 2003. Killer whale predation on beluga whale in Cook Inlet, Alaska: Implications for a depleted population. Marine Mammal Science: 19:529–544.

Silber, G. K. and S. Bettridge. 2012. An assessment of the final rule to implement vessel speed restrictions to reduce the threat of vessel collisions with North Atlantic Right Whales. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-48.

Silber, G. K., J. Slutsky, and S. Bettridge. 2010. Hydrodynamics of a ship/whale collision. Journal of Experimental Marine Biology and Ecology 36:10-19.

Simmonds, M., S. Dolman, and L. Weilgart. 2004. Ocean of noise – A WDCS Science report. Whale and Dolphin Conservation Society. 164 pp.

Southall, B.L., R.J. Schusterman, and D. Kastak. 2000. Masking in three pinnipeds: Underwater, low-frequency critical ratios. J. Acoust. Soc. Am. 108, 1322–1326.

Speckman, S.G., and Piatt, J.F. 2000. Historic and current use of lower Cook Inlet, Alaska, belugas, *Delphinapterus leucas*. Marine Fisheries Review 62:22-26.

Thorsteinson, F.V. and C.J. Lensink. 1962. Biological observations of Steller sea lions taken during an experimental harvest. Journal of Wildlife Management 26:353-359.

Tynan, C.T., D.P. Demaster, and W.T. Peterson. 2001. Endangered right whales on the southeastern Bering Sea shelf. Science. 294:1894.

Tønnessen JN, Johnsen AO. 1982. The History of Modern Whaling. University of California Press: Berkeley, CA.

Transportation Research Board (TRB). 2008. Risk of Vessel Accidents and Spills in the Aleutian Islands. TRB Special Report 293, National Academy of Sciences, Washington, D.C. 225 pp.

Van Waerebeek, K., Baker, A. N., Felix, F., Gedamke, J., Inigues, M., Sanino, G. P., Secchi, E., Sutaria, D., van Helden, A., Wang, Y. 2007. Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, and initial assessment. Latin American Journal of Aquatic Mammals 6:43-69.

Vanderlaan, A.S.M., and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science, 23:144-156.

Vos, D.J. and K.E.W. Shelden. 2005. Unusual mortality in the depleted Cook Inlet beluga population. Northwest. Nat. 86:59-65.

Wade P. R., V. N. Burkanov, M. E. Dahlheim, N. A. Friday, L. W. Fritz, T. R. Loughlin, S. A. Mizroch, M. M. Muto, D. W. Rice, L. G. Barrett-Lennard, N. A. Black, A. M. Burdin, J. Calambokidis, S. Cerchio, J. K. B. Ford, J. K. Jacobsen, C. O. Matkin, D. R. Matkin, A. V. Mehta, R. J. Small, J. M. Straley, S. M. McCluskey, and G. R.VanBlaricom. 2007. Killer whales and marine mammal trends in the North Pacific—a re-examination of evidence for sequential megafauna collapse and the prey-switching hypothesis. Mar. Mamm. Sci. 23:766–802.

Wade, P. R., A. Kennedy, R. LeDuc, J. Barlow, J. Carretta, K. Shelden, W. Perryman, R. Pitman, K. Robertson, B. Rone, J. C. Salinas, A. Zerbini, R. L. Brownell, and P. J. Clapham. 2011a. The world's smallest whale population? (*Eubalaena japonica*). Biology Letters. 7(1):83-85.

Wade, P. R., A. D. Robertis, K. R. Hough, R. Booth, A. Kennedy, R. G. LeDuc, L. Munger, J. Napp, K. E. W. Shelden, S. Rankin, O. Vasquez, and C. Wilson. 2011b. Rare detections of North Pacific right whales in the Gulf of Alaska, with observations of their potential prey. Endangered Species Research. 13:99-109.

Wade P.R., A. Kennedy, R. LeDuc, J. Barlow, J. Carretta, K. Shelden, *et al.* 2016a. The world's smallest whale population? Biology Letters 7:83–5.

Wade, P.R., T.J. Quinn II, J. Barlow, C.S. Baker, A.M. Burdin, J. Calambokidis, P.J. Clapham, E. Falcone, J.K.B. Ford, C.M. Gabriele, R. Leduc, D.K. Mattila, L. Rojas-Bracho, J. Straley, B.L. Taylor, J. Urbán, R.D. Weller, B.H. Witteveen, and M. Yamaguchi. 2016b. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA21 submitted to the Scientific Committee of the International Whaling Commission, June 2016, Bled, Slovenia.

Waite, J.M., K. Wynne, and D.K. Mellinger. 2003. Documented sighting of a North Pacific right whale in the Gulf of Alaska and post-sighting acoustic monitoring. Northwestern Naturalist. 84:38-43.

Wartzok, D. and D.R. Ketten. 1999. Marine Mammal Sensory Systems. In: J.E. Reynolds III & S.A. Rommel (eds) Biology of Marine Mammals. Smithsonian Institution Press, Herndon, Virginia. Pp. 117–175.

Watkins, W.A. and W.E. Schevill. 1975. Sperm whales (*Physeter catodon*) react to pingers. Deep-Sea Research 22: 123-129.

Watkins, W.A, K.E. Moore, D. Wartzok, and J.H. Johnson. 1981. Radio tracking of finback (*Balaenoptera physalus*) and humpback (*Megaptera novaeangliae*) in Prince William Sound, Alaska. Deep-Sea Res. 28:577-588.

Watkins, W.A. 1986. Whale reactions to human activities in Cape Cod waters. Marine Mammal Science 2:251-262.

Weilgart, L. 2007. The impacts of anthropogenic ocean noise on cetaceans and implications for management. Can J Zool 85:1091–1116.

Weller, D.W., A.M. Burdin, B. Würsig, B.L. Taylor, and R.L. Jr. Brownell. 2002. The western Pacific gray whale: a review of past exploitation, current status and potential threats. J Cetacean Res Manag 4:7−12.

Weller, D.W., A. Klimek, A.L. Bradford, J. Calambokidis, A.R. Lang, B. Gisborne, A.M. Burdin, W. Szaniszlo, J. Urban, A. Gomez-Gallardo Unzueta, S. Swartz, and R.L. Jr Brownell. 2012. Movements of gray whales between the western and eastern North Pacific. Endangered Species Research 18:193-199.

Williams TM, Fuiman LA, Horning M, and Davis RW. 2004. The cost of foraging by a marine predator, the Weddell seal *Leptonychotes weddellii*: pricing by the stroke. J Exp Biol 207:973 – 982.

Williams R., D.E. Bain, J.C. Smith, and D. Lusseau. 2009. Effects of vessels on behaviour patterns of individual southern resident killer whales *Orcinus orca*. Endangered Species Research 6:199-209.

Zerbini, A. N., J. M. Waite, J. L. Laake, and P. R. Wade. 2006. Abundance, trends and distribution of baleen whales off western Alaska and the central Aleutian Islands. Deep-Sea Res. Part I:1772-1790.