Request for Incidental Harassment Authorization
Lutak Dock Project
Haines, Alaska

Submitted to:

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

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On Behalf of:

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ACRONYMS AND ABBREVIATIONS

ADF&G .... Alaska Department of Fish and Game
AKR................. Alaska Regional Office
AML .... Alaska Marine Lines
BMP................. Best Management Practice
CFR.................. Code of Federal Regulations
cm .... centimeter
dB .... decibels
DPS.................. Distinct Population Segment
DTH .... down the hole+
EEZ .... Exclusive Economic Zone
ESA.................. Endangered Species Act
ft....................... feet
GPS.................. Global Positioning System
HFC .... High Frequency Cetaceans
IHA .... Incidental Harassment Authorization
in .... inch
ITA................... incidental take authorization
km .... kilometers
km^2.................. square kilometers
LFC.................. Low Frequency Cetaceans
LOA .... Letter of Authorization
m .... meters
MFC................. Mid Frequency Cetaceans
mi .... miles
mi^2................... square miles
MMPA .... Marine Mammal Protection Act
NMFS .... National Marine Fisheries Service
NMML............. National Marine Mammal Laboratory
OPR .... Office of Protected Resources
PBF .... Primary Biological Feature
PBR.................. Potential Biological Removal
PK .... peak
PSO .... Protect Species Observer
PTS .... Permanent Threshold Shift
RoRo................ roll-on-roll-off
Secretary .... US Secretary of Commerce
SL..................... Source Level
TL .... Transmission Loss
TTS .... Temporary Threshold Shift
U.S. .... United States
WNP .... Western North Pacific

1. DESCRIPTION OF SPECIFIED ACTIVITY

1.1. Nature of the Request

Alaska Marine Lines (AML) proposes to replace the degraded roll-on-roll off (RoRo) ramp located on the west side of the existing Lutak Dock near Haines, Alaska; these activities are referred to as the Project (Figure 1-1). A Department of the Army permit is required to authorize this Project because of its location in waters of the Unites States (U.S). The Public Notice for the Department of the Army permit application was published on March 7, 2019 (Reference Number POA-209-00108). The replacement of the RoRo ramp would be completed within a 12-month period.

The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals; take is defined as to "harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill," except under certain situations. Section 101 (a)(5)(D) of the MMPA allows for the issuance of an Incidental Harassment Authorization (IHA), provided an activity results in negligible impacts on marine mammals and would not adversely affect subsistence use of the animals.

The removal of the existing RoRo ramp and construction of a new ramp may result in the incidental taking by acoustical harassment of marine mammals protected under the MMPA. Incidental take is unintentional but not unexpected based on the Project activities, the area where proposed activities have the potential to impact marine mammals (i.e., Action Area see Section 1.4.1) and marine mammals that may occur there. The Project is not expected to result in serious injury or mortality of any marine mammals.

Therefore, AML is requesting an IHA from the National Marine Fisheries Service (NMFS) for potential incidental take of marine mammal species that may occur in the vicinity of the Project, including harbor seal, Steller sea lion, humpback whale, minke whale, killer whale, harbor porpoise and Dall's porpoise. The IHA, which would be effective approximately April 2020, would allow non-lethal taking of small numbers of marine mammals by harassment incidental to the proposed activities. This request is submitted pursuant to Section 101 (a) (5) (D) of the MMPA, 16 USC 1371.101 (a) (5), and 50 Code of Federal Regulations (CFR) 216, Subpart I. In addition, some species are listed under the Endangered Species Act (ESA) which will also require consultation under Section 7 of the ESA.

1.2. Project Location

The Project site is located at Lutak Dock near the mouth of Lutak Inlet, approximately 4 miles (mi) north (6.4 kilometers [km]) of Haines in northern southeastern Alaska at 59.282958º N., 135.467892ºW (Figure 1-1). AML uses the Lutak Dock for tugs and loading and unloading of barges. The multipurpose facility is also used by Alaska Marine Highway System ferries and Delta Western tugs and barges.

1.3. Project Purpose and Need

The existing RoRo ramp located off the west end of Lutak Dock has degraded and must be replaced. The current orientation of the ramp and dock provides for barge-end loading. The new dock would be oriented to allow for barge-side loading and unloading (Figure 1-2), which would improve the efficiency and safety of AMLs operations.

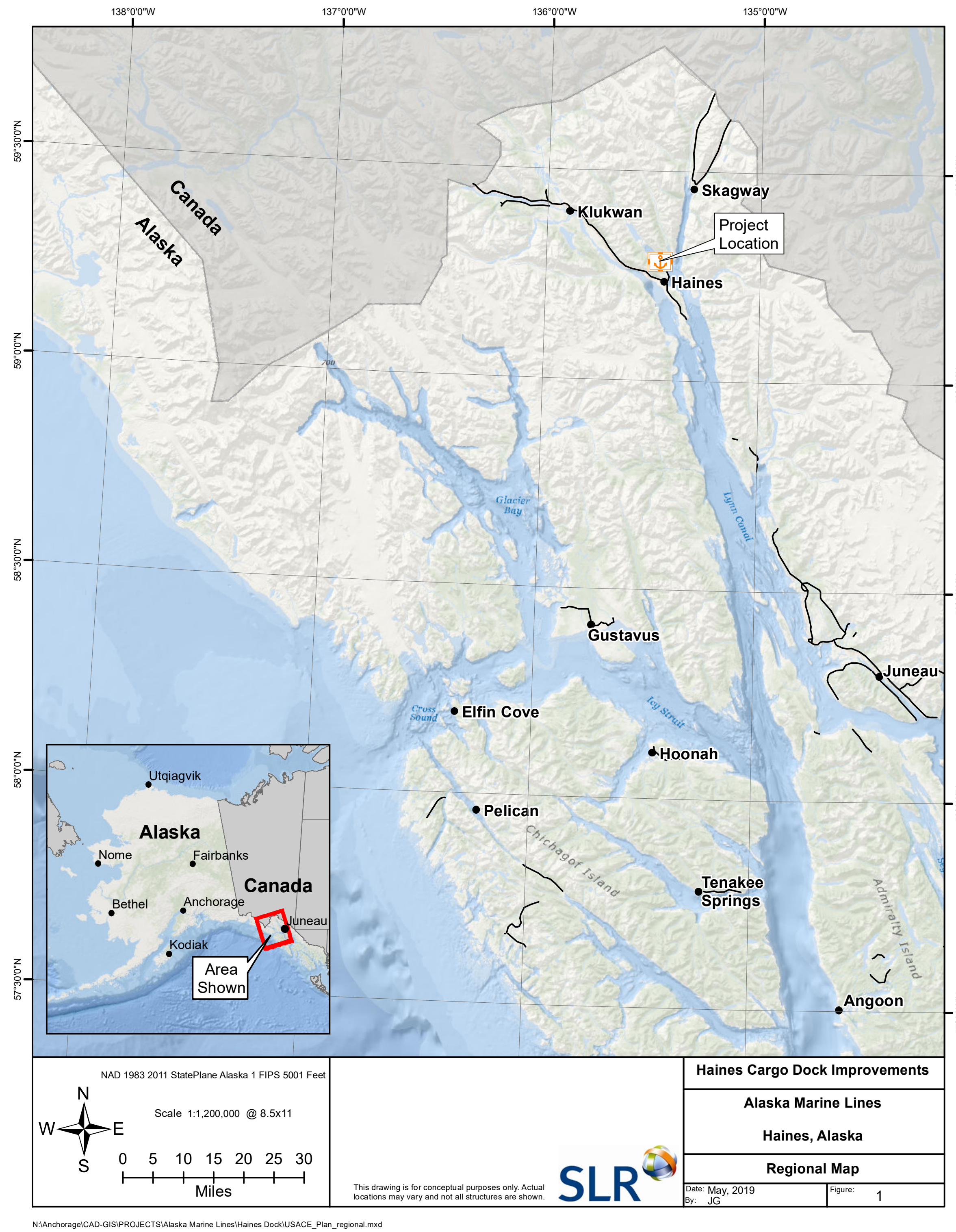

FIGURE 1-1. REGIONAL MAP

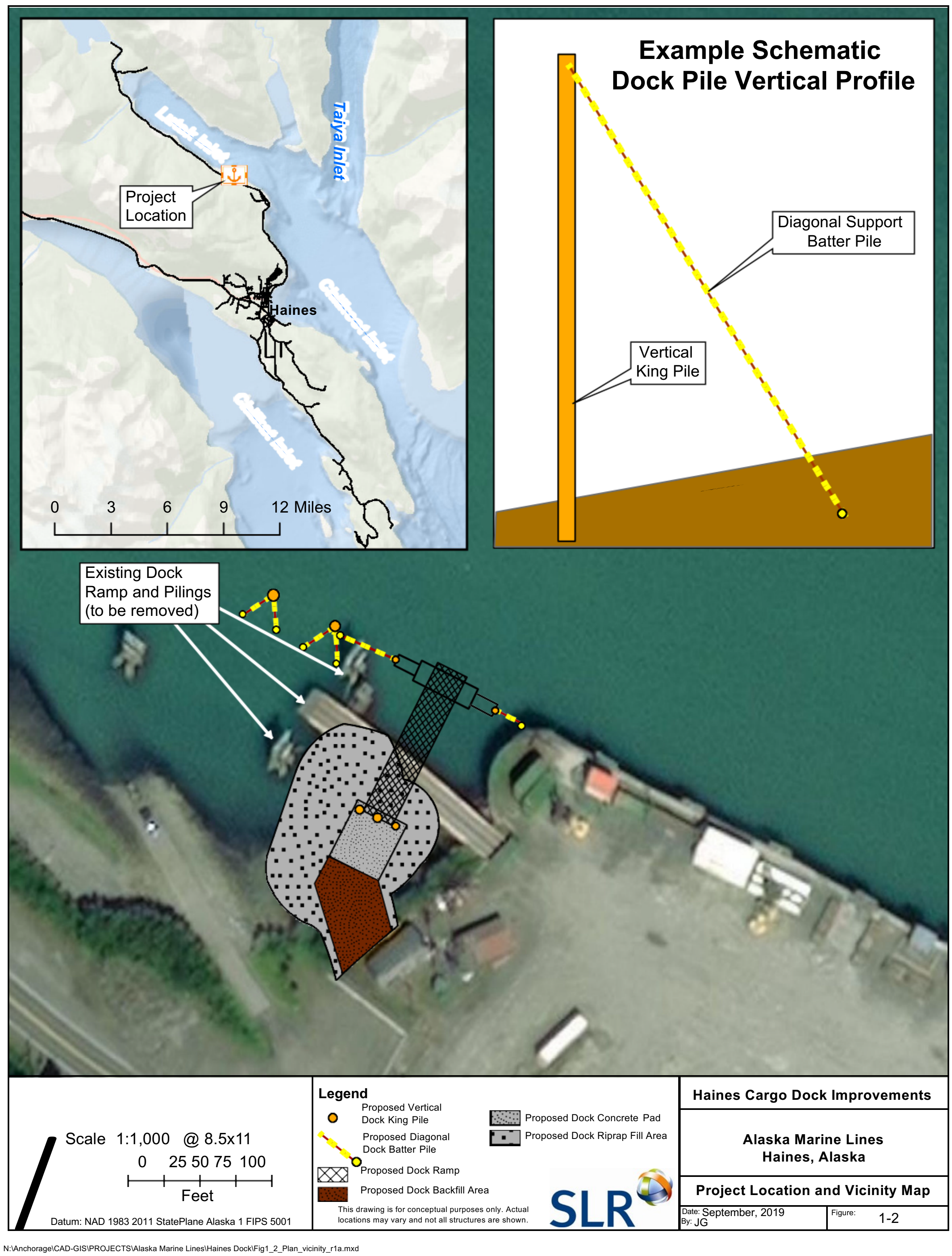

FIGURE 1-2. PROJECT LOCATION AND VICINITY MAP

1.4. Proposed Action

1.4.1. Action Area

The Action Area for this Project is distinct from and larger than the dock footprint because some elements of construction may affect marine mammal species at a distance from the activity due to underwater sounds. The Action Area extends from the dock to the point where marine mammals would no longer be affected by the underwater sounds produced by the Project (see Section 6) and is based on thresholds for potential disturbance to marine mammals as defined in the 2018 Revisions to Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (NMFS 2018)[1]. These thresholds are described in more detail in Section 6 of this application.

1.4.2. Project Description

Project elements include placement of steel pipe piles for dolphins and RoRo ramp supports, and placement of fill for construction of the access causeway (see Figure 1-2). Prior to the construction of the new facility, the existing steel cargo bridge (RoRo ramp) and the float facility currently used for barge cargo operations would be removed. Twelve existing 16-inch (in.) steel piling dolphins associated with the current RoRo ramp would be removed or left in place. Dredging is not proposed. Thirteen piles ranging in size from 24 to 36 in. in diameter would be installed using methods described below.

1.4.2.1. Removal of Existing Infrastructure and Piles

An existing steel cargo bridge with steel floats currently used for cargo barge operations and associated berthing dolphins would be removed. The structure is currently supported by 12, 16-in. diameter piles. Unless permitted to remain in place, these 12 piles would be removed utilizing a crane-mounted vibratory hammer located on a barge or on land. If piles cannot be removed using vibratory methods, they would be cut at the mudline or left in place. An underwater shielded metal-arc[2] would be used to cut the piles if this option is chosen.

1.4.2.2. Installation of New Piles and Infrastructure

To support the new 120 foot (ft) by 24 ft (36.6 meters [m] by 7.3 m) long steel bridge (RoRo ramp) and associated dolphins, four 24-in. diameter and six 36-in. diameter steel pipes would be driven into the marine sand and gravel at the Project location. Three additional 30-in. diameter steel pipes would be installed to support concrete abutment (see Figure 1-2).

The pipe piles would be installed to a depth of 40 ft (12.2 m) or more below the surface using a crane-mounted vibratory and/or impact hammer located on a barge which may take up to about 60 minutes per pile of vibratory driving to set each pile. If impact hammering is used, about 700 strikes would be needed to drive each of the piles to a sufficient depth which may require about 15 minutes of hammering. It is estimated that about 3 hours (maximum) would be required to drive each pile and they would be proofed the same day (see Section 6.3 for additional detail on noise sources).

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[1] The NMFS acoustic injury guidelines are located at (file:///Users/annesoutham/Downloads/TECH%20MEMO%20Acoustic%20Guidance%20(2.0)%20(PDF)%20508.pdf)
[2] Shielded metal-arc cutting is a process in which the metal is cut by the intense heat of the arc. The arc creates intense heat, 7,000°F to 11,000°F, concentrated in a very small area (US Navy 2002).

Bedrock may be encountered before the full required pile depth is achieved. If this condition is encountered, piles would be socketed into the bedrock using concrete. If the bedrock is within 40 ft of the surface, tension anchors may be installed in the vertical for additional support. Alternatively, a longer reinforced concrete socket could be used in lieu of tension anchors.

Where bedrock is present, piles would be installed using both vibratory and either down-the-hole (DTH) hammer/drilling or traditional auger drilling methods. Initially a vibratory hammer would be used to drive the sediment until bedrock is reached (~60 minutes). A DTH hammer (e.g., Numa) would be used to drill and socket the pile into bedrock. This could take up to an additional 180 minutes. The DTH hammer uses a drill that operates below the pile and advances it along with the drilling action. Another option would be to use a traditional auger drill to create the socket hole in bedrock and then install the pile into the hole with an impact hammer. A pneumatic percussion hammer chips away rock and other material in DTH drilling while auger drilling employs a rotating bit to drill away material. Sound from drilling is generally continuous, though DTH drilling may produce short pulses in addition to continuous sound (Denes et al. 2016). The time required to install piles using either method (DTH versus traditional auger) would be about the same.

If tension anchors are required, a small rotary drill would be used to complete an approximately 5-in. diameter hole extending about 30 to 40 ft (1 to12 m) into bedrock below the tip of the pile. A steel bar would be grouted into this hole. Once the grout sets, a jack would be applied to the top of the bar and the tensioned rod would be locked off to plates at the top of the pile.

1.4.3. Elements of the Project that May Impact Marine Mammals

Elements of the Project that generate noise that may disturb marine mammals include vibratory pile driving, impact pile driving, and DTH hammer driving. Each of these elements generates underwater and in-air noise.

Vibratory pile driving and DTH drilling/hammering are considered to be continuous or non-pulsed sound sources, while impact pile-driving produces impulse sound. The two sound types are differentiated because they have different potential to cause physical effects, particularly with regard to marine mammal hearing (Southall, Bowles et al. 2007).

Non-pulsed sounds may be either continuous or non-continuous. Non-pulsed sounds can be transient signals of short duration, but without the essential properties of pulses (e.g., rapid rise time). The duration of these sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Pulsed sound sources produce signals that are brief, typically less than one second, and occur either as isolated events or repeated in succession. Pulsed sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating pressures; they generally have an increased capacity to induce physical injury as compared with sounds lacking these features.

1.4.3.1. Impact Hammer

Source: WSDOT 2016

FIGURE 1-3. IMPACT HAMMER

Impact hammers (Figure 1-3) are used to install plastic/steel core, wood, concrete, or steel piles. An impact hammer is a steel device that works like a piston. The pile is first moved into position and set in the proper location using a choker cable or vibratory hammer. The impact hammer is held in place by a guide (lead) that aligns the hammer with the pile. A heavy piston moves up and down, striking the top of the pile and driving it into the substrate. Once the pile is set in place, pile installation with an impact hammer can take less than 15 minutes under good substrate conditions. However, under poor conditions, such as glacial till and bedrock or exceptionally loose material, piles can take longer to set.

1.4.3.2. Vibratory Hammer

Vibratory hammers (Figure 1-4) are commonly used in steel pile driving or removal where sediments allow. Generally, the pile is placed into position using a choker and crane, and then vibrated between 1,200 and 2,400 vibrations per minute. The vibrations liquefy the sediment surrounding the pile allowing it to penetrate to the required seating depth or to be removed.

1.4.3.3. DTH Drill/Hammer

The DTH drill/hammer acts on a shoe at the bottom of the pile and uses a pulsing mechanism to break up rock below the pile while simultaneously installing the pile through the rock formation. Rotating bit wings extend below the pile and remove the broken rock fragments as the pile advances. The pulsing sounds produced by the DTH method reduces sound attenuation because the noise is primarily contained within the steel pile and below ground rather than impact hammer driving methods which occur at the top of the pile. Therefore, the pulsing sounds produced by this method are considered less harmful than those produced by impact hammer driving.

Source: WSDOT 2016

FIGURE 1-4. VIBRATORY HAMMER

2. DATES, DURATION, AND SPECIFIED GEOGRAPHIC REGION

2.1. Dates and Duration of Activities

The IHA for incidental take of marine mammals described in this application would be issued no later than April 2020 and effective by June 15, 2020 for in-water construction. The duration of the pile driving would be from approximately mid- to late June through October 2020. Specifically:

- The daily construction window for pile removal and driving would begin no sooner than 30 minutes after sunrise and would end 30 minutes prior to sunset to allow for marine mammal monitoring;
- Demolishing and removing the existing steel cargo bridge with steel float, associated berthing dolphins and the 12, 16-in. diameter supporting piles would take approximately one day by vibratory methods. Depending on conditions and approvals, the piles may either be left in place or cut off at the mudline. If the option to cut the piles using an underwater shielded metal-arc is chosen, the activity would also take approximately one day;
- Vibratory and impact driving of four 24-in. and six 36-in. diameter steel piles to support the new RoRo ramp, and three 30-in. piles to support the concrete abutment, would take up to three hours each. Under the best-case scenario, five piles would be set in a day. If DTH drilling is needed, it would be used the same day following vibratory driving and approximately four piles would be set, with two drilled into bedrock per day;
- If conditions are challenging, only two piles could be set and drilled (if needed) in one day. Therefore, the duration of drilling activity for piles could be as long as seven days. To be precautionary, this IHA assumes all types of pile driving may occur for up to seven days (Section 6).

2.2. Geographic Setting

2.2.1. Physical Environment

The Chilkat, Chilkoot, Lutak, and Taiya inlets compose the northern part of Lynn Canal (see Figure 1-1). The Project area is situated on the shore of Lutak Inlet between the Chilkoot and Chilkat rivers. Lutak Inlet is a glacial scoured fjord. The surrounding glacial valley is shaped with exposed bare rock ridges in many areas. Where not exposed, the bedrock is covered in a thick layer of colluvium. Lutak Inlet sediment is homogeneous, consisting of dark gray, silty gravel material, as well as cobbles and boulders (ADOT&PF 2005). Lutak Inlet estuary is five miles long and one mile wide from Tanani Point and Taiya Point to its confluence with the Chilkoot River. The Inlet has depths generally less than 275 feet, with depths at the mouth of about 400 feet (Haines 2007).

Several seasonally available prey species are abundant and densely aggregated within the Action Area. In Southeast Alaska, spawning of eulachon (*Thaleichtys pacificus*) (Marston et al. 2002; Sigler et al. 2004) and herring (*Clupea pallasii*) (Womble et al. 2005) play an important role in the seasonal foraging ecology of sea lions in the area (Marston et al. 2020; Sigler et al. 2004; Womble et al. 2005; Womble and Sigler 2006). Eulachon are anadromous smelt that spawn primarily from March to May (Marston et al. 2002; Womble 2003). The largest eulachon run in northern Lynn Canal occurs in Lutak Inlet/Chilkoot River approximately two weeks after the April pre-spawning/spawning peak in Berners Bay.

Other seasonal prey species provide high-energy nutrition at different times of year, and the presence of these species influences the distribution of marine mammals in the area, particularly sea lions (Womble et al. 2005) and harbor seals. Five species of salmon spawn in rivers and nearby streams and tributaries near Haines. The salmon runs begin in late summer and continue through late fall or early winter. Salmon increase in importance as prey for sea lions and other predators from late October and December in the Chilkat River, coinciding with the fall run of spawning pink salmon (*Oncorhynchus gorbuscha*),and late season runs of coho salmon (*O. kisutch*) and chum salmon (*O. keta*) as they return to rivers in northern Lynn Canal to spawn.

2.2.2. Acoustic Environment

The underwater acoustic environment in the Action Area is dominated by ambient noise from day-to-day ferry terminal, port, and vessel activities. Haines Borough operates two harbor facilities (Portage Cove, Letnikof Cove) has a float moored at Swanson Harbor in Couverden, two docks (Lutak Dock, Port Chilkoot Dock), and three boat launch ramps (at Lutak Dock, Portage Cove and Letnikof Cove) (Haines Borough Comprehensive Plan (2012). Lutak Dock is the second busiest port for the Alaska Marine Highway System (AMHS) system. Delta Western (tug and barge) also operates out of this area. The AMHS provides the primary transportation link for Alaska residents and businesses as well as for recreational vessels by residents and non-Alaska residents. The facilities at the Lutak Dock are currently capable of handling containerized cargo (break and bulk), manual loading and unloading operations, petroleum products transshipment and passenger operations. This dock is used commercially year-round and is operated by the Haines Borough on a fee basis. Current leases include Alaska Marine Lines for weekly barge service and general container loading, staging and storage as well as Delta Western for fuel transfer and storage (Haines Borough Comprehensive Plan 2012).

There are no current measurements of ambient noise levels at Lutak Dock but ambient underwater noise levels in the immediate area are expected to be variable and intermittently high as vessel traffic enters and leaves the area. The dock is a multi-use facility and is the second busiest AMHS port of call, with up to four ferry arrivals and departures alone during any given day in summer. Additional use of the dock by barges and cargo vessels adds to ambient noise levels.

3. SPECIES AND NUMBERS OF MARINE MAMMALS IN THE ACTION AREA

3.1. Marine Mammal Species Potentially Found in the Action Area

Eight marine mammal species or distinct population segments (DPSs[3]) under NMFS jurisdiction have been observed at least seasonally in Upper Lynn Canal and Lutak Inlet (Table 3-1) and may occur within the Action Area at some time throughout the duration of the project. These species may be observed in waters directly adjacent to the Project site on at least a seasonal basis (Womble 2003, Womble, Willson et al. 2005, Womble and Sigler 2006, NMFS 2008, Dahlheim, White et al. 2009, Womble, Sigler et al. 2009, NMFS 2013, Allen and Angliss 2015, Hastings 2016, Muto, Helker et al. 2016, Womble 2016, Muto, Helker et al. 2018).

- Harbor seals (*Phoca vitulina*) are common in Lutak Inlet and in Chilkat Inlet where there is a small haulout at Pyramid Island. They are abundant in the Chilkat and Chilkoot rivers in late fall and winter during spawning runs of salmon (*Onchorhynchus spp.)* and in the spring when eulachon (*Thaleichtys pacificus*) are present.
- Steller sea lions (*Eumetopias jubatus*) have been observed throughout the year in Chilkoot Inlet; they seasonally occupy Lutak Inlet. Steller sea lions follow spring foraging runs of eulachon into Lutak Inlet up to the mouth of the Chilkoot River, then move farther south to forage on herring in late-summer and fall. Salmon increase in importance as prey for sea lions from late-October and December in the Chilkat River.
- Humpback whales (*Megaptera novaeangliae*) occur in Chilkoot Inlet, Upper Lynn Canal, and have been observed infrequently near the mouth of Lutak Inlet during the spring eulachon and herring runs; they vacate the area by July to feed on aggregations of herring in lower Lynn Canal.
- Minke whales (*Balaenopera acutorostrata*) are considered to be rare in northern parts of Lynn Canal (Dahlheim, White et al. 2009). However, minke whales forage on schooling fish and may rarely enter the Action Area in Upper Lynn Canal. In 2015, one minke whale was sighted in Taiya Inlet, northeast of the Project Area (K. Gross, Never Monday Charters, personal communication, as cited in 84 FR 4777).
- Killer whales (*Orca orcinus*) are sporadically and seasonally attracted to the inlet during the spring to feed on the large aggregations of fish and pinnipeds.
- Harbor porpoise (*Phocoena phocoena*) have been observed as far north as Haines during the summer months (Dahlheim, White et al. 2009, Dahlheim, Zerbini et al. 2015).
- Dall's porpoise (*Phocoenoides dalli*) are widely distributed throughout the region and have been observed in Lynn Canal (Dahlheim, White et al. 2009). They may occur within the Action Area of extended noise exposure threshold zones and are included in the take calculations to be precautionary.

[3] A DPS or "distinct population segment" is the smallest division of a taxonomic species permitted to be protected under the ESA recognized as a taxonomic species or subspecies of plant or animal, or in the case of vertebrate species (61 FR 4722: February 7, 1996).

Additionally, the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) and the eastern stock of gray whale (*Eschrichtius robustus*) have been infrequently observed during aerial surveys in Lynn Canal. Gray whale sightings in this northern portion of southeastern Alaska are very rare. The range of Pacific white-sided dolphin is also suggested to overlap with Lynn Canal (Allen and Angliss 2015), but no sightings have been documented in the Project area (Dahlheim, White et al. 2009). While several California sea lions (*Zalophus californianus*) were observed at Gran Point in May 2005 (K. Hastings, Alaska Department of Fish and Game (ADF&G), from aerial data provided to this project), they have not been observed since that date. Sperm whales (*Physeter macrocephalus*) are considered extralimital in the Action Area. However, on March 20, 2019, a dead sperm whale was found washed up in Lynn Canal. Based on NOAA's Whale Alert system (NOAA 2019), the Alaska State Ferry reported seeing four sperm whales in December 2018 off False Point Retreat, and two near Point Howard in lower Lynn Canal early in March 2019. Despite these recent sightings, sperm whales are very rare in the Action Area. Due to the low probability of these species occurring in the Action Area, exposure of these cetaceans and pinnipeds to Project impacts is considered unlikely and take is not requested for these species.

3.2. Abundance and Distribution Data Sources

NMFS prepares Stock Assessment Reports (SARs) for all marine mammal stocks at least once every three years or as new information becomes available. Appendices 1 and 2 of Muto, Helker et al. (2018), and Muto, Heckler et al. (2019), provide the most recent SARs for the species potentially found in the Action Area and shown in Table 3-1. Abundance estimates are presented at the stock, DPS or population level, and may exceed the numbers of animals found in Upper Lynn Canal, and especially the Project site, at any time of the year.

In addition to NMFS survey data and information incorporated into the stock assessment reports, the seasonal distribution and abundance estimates, trends and occurrences of marine mammals potentially encountered in the Action Area have been established from scientific studies and literature including, but not limited to:

- Data from almost two decades of surveys and research on distribution, abundance and seasonal foraging behavior of Steller sea lions from the Gran Point haul out. These data with sightings through 2018 have been provided through personal communication with key marine mammal researchers in the region (K. Hastings ADF&G; Tom Gelatt, NMFS AKFSC, National Marine Mammal Laboratory). Available information from this database through 2018 is included in this IHA application. The average monthly densities for Steller sea lions at Gran Point were estimated using this database and are considered a proxy for the monthly abundance of sea lions within the Action Area (see Section 4.2.1.4).
- Estimates of humpback whale abundance and density were calculated from data provided by K. Hastings (ADF&G). Hastings reported humpback whales at Gran Point in 2015 and 2018.
- A multi-year marine mammal survey was conducted by Dahlheim, White et al. (2009) in the inland waters of southeastern Alaska over the period 1991-2007. Surveys were conducted in Taiya Inlet during each season. Although no cetaceans were reported in Taiya Inlet during the studies, humpback whales and harbor porpoises were consistently and frequently sighted and were documented in Lynn Canal as far north as Haines. Resident and killer whales were also observed less frequently in Lynn Canal but occurred throughout all seasons.

- NMFS issued an IHA to the White Pass and Yukon Railroad on February 19, 2019 (NMFS 2019) as part of a railway dock project to take marine mammals incidental to impact and vibratory pile driving, and DTH pile driving activities for the Railroad Dock Installation Project, Skagway, Alaska. Information in the Final IHA (NMFS 2019) was used for this species review.
- Site-specific data from Protected Species Observers (PSOs) on the previous Haines ferry projects[4].
- Killer whales have been reported in the Action Area and observations of this species during the Steller sea lion surveys were noted in Lynn Canal during all seasons (K. Hastings, ADF&G, pers. comm.); Hastings reported observations of killer whales at Gran Point in 2012.
- The NMFS Marine Mammal Laboratory (MML), maintains a multi-year database of Steller sea lion and harbor seal counts (Fritz, Sweeney et al. 2015). These databases contain annual survey data for pups, juveniles, and adults, and the movements of branded animals.

Accordingly, marine mammal density numbers used to calculate exposures and estimate takes were based on the best available data from literature, and personal communication with ADF&G, National Park Service (NPS), and individual researchers working in the Project area (see Section 6).

[4] Only two sightings of marine mammals were reported from the previous project, one of which was a “pod” of porpoise.

TABLE 3-1 ABUNDANCE AND STATUS OF MARINE MAMMAL SPECIES POTENTIALLY PRESENT IN THE ACTION AREA

Common Name	Scientific Name	Stock Abundance Estimate[1]	ESA Status	MMPA Status	Frequency of Occurrence in Project Area[2]
Harbor Seal	*Phoca vitulina*	9,478	Not listed	Protected	Likely
Steller Sea Lion	*Eumetopias jubatus*	54,267 (Western DPS)	Endangered	Protected	Infrequent
		41,638 (Eastern DPS)	Not listed	Strategic, Depleted	Likely
Humpback Whale (Central North Pacific Stock)	*Megaptera novaeangliae*	10,103 (Hawaii DPS)	Not Listed	Protected	Likely
		3,264 (Mexico DPS)	Threatened	Strategic, Depleted	Rare
Minke Whale	*Balaenoptera acutorostrata*	unknown	Not listed	Protected	Infrequent to Rare
Killer Whale[3]	*Orcinus orca*	2,347 (Alaska resident)	Not listed	Strategic	Infrequent (all stocks)
		261 (Northern resident)			
		243 (West Coast transient)			
Harbor Porpoise	*Phocoena phocoena*	975 (Southeast Alaska stock)	Not listed	Strategic	Infrequent
Dall's Porpoise	*Phocoenoides dalli*	Unknown (Alaska stock)	Not listed	Protected	Rare

[1] NMFS marine mammal stock assessment reports (Allen and Angliss 2014, Allen and Angliss 2015, Muto, Helker et al. 2016, Muto, Helker et al. 2018; Muto et al. 2019) and http://www.nmfs.noaa.gov/pr/sars/species.htm.

[2] Rare: Few confirmed sightings, or the distribution of the species is near enough to the area that the species could occur there; Infrequent: Confirmed, but irregular sightings; Likely: Confirmed and regular sightings of the species in the area at least seasonally.

[3] "NMFS has preliminary genetic information on killer whales in Alaska which indicates that the current stock structure of killer whales in Alaska needs to be reassessed. NMFS is evaluating the new genetic information. A complete revision of the killer whale stock assessments will be postponed until the stock structure evaluation is completed and any new stocks are identified" (Muto, Helker et al. 2018). For the purposes of this IHA application, the existing stocks are used to estimate potential takes.

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

4.1. Harbor Seals

Harbor seals inhabit coastal and estuarine waters off Alaska. They haul out on rocks, reefs, beaches, and drifting glacial ice. They are considered opportunistic feeders and often adjust their distribution to take advantage of locally and seasonally abundant prey (Womble, Sigler et al. 2009, Allen and Angliss 2014, Allen and Angliss 2015). Harbor seals do not migrate; their movements can be attributed to factors such as prey availability, weather, and reproduction. In 2010, based on genetic structure NMFS identified 12 stocks of harbor seals in Alaska (Allen and Angliss 2014).

Harbor seals are not considered depleted under the MMPA, and they are not listed under the ESA. Harbor seals occurring in the Project area belong to the Lynn Canal/Stephens Passage (LC/SP) stock (Allen and Angliss 2015). The LC/SP stock of harbor seals is not classified as a strategic stock (Muto, Helker et al. 2016).

The LC/SP stock is genetically distinct and believed to consist of year-round residents; therefore, estimates of abundance are considered reliable for this species and densities within this geographical area can be determined. The current abundance estimate for the LC/SP stock is 9,478 (Muto et al. 2019) based on aerial survey data (see Table 3-1). The minimum population estimate is 8,605. Muto, Helker et al. (2016) reported a decreasing trend in this stock in recent years. That stock assessment analysis indicated that there was a 71% probability that the stock declined by 1.8% during the period 2011-2015.

The seasonal spawning runs of eulachon and salmon in Lutak Inlet and the Chilkat River are a very important prey resource for harbor seals. During the pre-spawning and spawning aggregations of eulachon and herring that occur from mid-March through mid-May, harbor seals are most abundant immediately adjacent to the Project site. The seals tend to congregate in the lower portion of the Chilkoot River; as many as about 100 individual animals have been observed actively feeding in Lutak Inlet near the mouth of the Chilkoot River, and at up-river locations during these fish runs (K. Hastings ADF&G, 2016 and J. Womble, 2016 pers. comm.). Both prior to and after the spawning run, fewer harbor seals are present in these waters, but individuals may stay further south in the Chilkat River area to forage on salmon that run from late October through winter. During these late season runs, local observations have noted very few, if any, harbor seals present in waters immediately adjacent to the Project site during the winter.

4.2. Steller Sea Lion

Steller sea lions range along the North Pacific Rim from northern Japan to California, with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands. This species has been studied throughout its range for the past several decades. Large numbers of individuals widely disperse when not breeding (late May to early July) to access seasonally important prey resources (Muto, Helker et al. 2016, Muto, Helker et al. 2018).

In 1997 NMFS identified two DPSs of Steller sea lions under the ESA: a Western DPS and an Eastern DPS[5]. During the past several decades most of the Steller sea lions in southeastern Alaska have been

[5] 62 *FR* 24,345 May 5, 1997

determined to be part of the Eastern DPS (Jemison, Pendleton et al. 2013). However, in recent years there has been an increasing trend of the Western DPS animals occurring and breeding in southeastern Alaska (NMFS 2013, Fritz, Sweeney et al. 2015, Jemison, Pendleton et al. 2018, Muto, Helker et al. 2018).

During the 1980s the Western DPS declined approximately 15% per year (NMFS 2008) and was listed as threatened under the ESA throughout the range of the species[6]. After continued declines documented in the 1990's the Western DPS was listed as endangered in 1997[7] (NMFS 2008). Survey data collected since 2002 suggest the overall decline ended sometime between 2000 and 2002 (Sease and Gudmundson 2002). Population trend data collected through 2014 provides strong evidence that the population has increased; however, there are also robust regional differences across the range of the Western DPS in Alaska (Muto, Helker et al. 2016, Muto, Helker et al. 2018). Currently, the Western DPS is still endangered under the ESA, and strategic under the MMPA. However, the Eastern DPS was removed from the list of threatened wildlife in 2013[8] based on information that the Eastern DPS increased at a rate of 4.18% per year between 1979 and 2010 (Allen and Angliss 2014). The Eastern DPS is still considered a strategic stock under the MMPA (Muto, Helker et al. 2018).

The total count estimate of pups and non-pups for the entire Eastern DPS of Steller sea lions in 2015 was 71,562 (52,139 non-pups plus 19,423 pups (Muto et al. 2019). The current estimated total count of the Eastern DPS in U.S. waters is 41,638 (30,917 non-pups plus 10,721 pups). These estimates are considered minimum estimates of population size because they have not been corrected for animals that are at sea during the surveys.

The current population of Western DPS sea lions in Alaska is estimated at 54,267 (Muto et al. 2019). This represents an increase from the previous estimate of 53,303 reported in Muto, Helker et al. 2018. For this estimate pups were counted during the breeding season, and the birth numbers were estimated from the pup count. Because of uncertainties regarding the use of pup data, this estimate is also considered to be the minimum population estimate.

4.2.1. Overlap between the Western DPS and Eastern DPS in the Action Area

Exchange between the Western DPS and Eastern DPS does occur, and numbers of individuals from the Western DPS have been increasing in Southeast Alaska. Samples of skin tissue collected from pups in 2002 at Graves Rock (located on the outer coast of Glacier Bay past Cape Spencer) showed that approximately 70% of the pups had DNA haplotypes that were consistent with those found in the Western DPS (Gelatt, Trites et al. 2007). Available data on movements and interchange between the two DPSs of Steller sea lions in Southeast Alaska were reviewed by Jemison, Pendleton et al. (2018), who determined that sea lions from the Western DPS have been re-distributing throughout inland waters of Southeast Alaska since 2002.

The first Western DPS Steller sea lion documented in Lynn Canal was observed in 2003 at Benjamin Island in southern Lynn Canal (approximately 60 mi (97 km) south from the Project site and 25 mi (40 km) north of Juneau, Alaska (NMFS 2013)). This animal was observed again in 2003 and 2004, and two additional animals were seen at Benjamin Island in 2005 and 2006. The ADF&G has documented a

6 55 *FR* 49204, November 26, 1980
7 62 *FR* 24345, May 5, 1997
8 78 *FR* 66139, November 4, 2013

minimum 88 Western DPS Steller sea lions in the eastern region. Most of these sighting locations are haulouts and rookeries on the outer islands of Southeast Alaska, outside of the Action Area. Forty percent of the observed animals were female, and nine of them gave birth at rookeries in the eastern region.

Branded individuals from the Western DPS have been observed at the Gran Point haulout located about 14 mi (22.5 km) southeast of the Project area[9]. Three individual Western DPS sea lions were observed repeatedly at Gran Point from 2003 through 2012 (NMFS 2013). The most recent assessment of branded or marked Western DPS sea lions at the Gran Point haul out was provided by K. Hastings, ADF&G[10]. Sightings of marked animals from the Western DPS at Gran Point were also provided by K. Hastings[11]. Between 2001 - 2009, three out of 213 marked individuals (1.4%) were from the Western DPS. Between 2010 - 2018, two out of 97 animals (2.0%) were from the Western DPS. The percentage of Western DPS animals over the entire time period was 1.7% (Jemison, Pendleton et al. 2018). Therefore, conservatively it is estimated that 2% of the sea lions at Gran Point are from the Western DPS. These animals could enter the Action Area to forage during the spring eulachon runs.

4.2.2. Haulouts in Lynn Canal

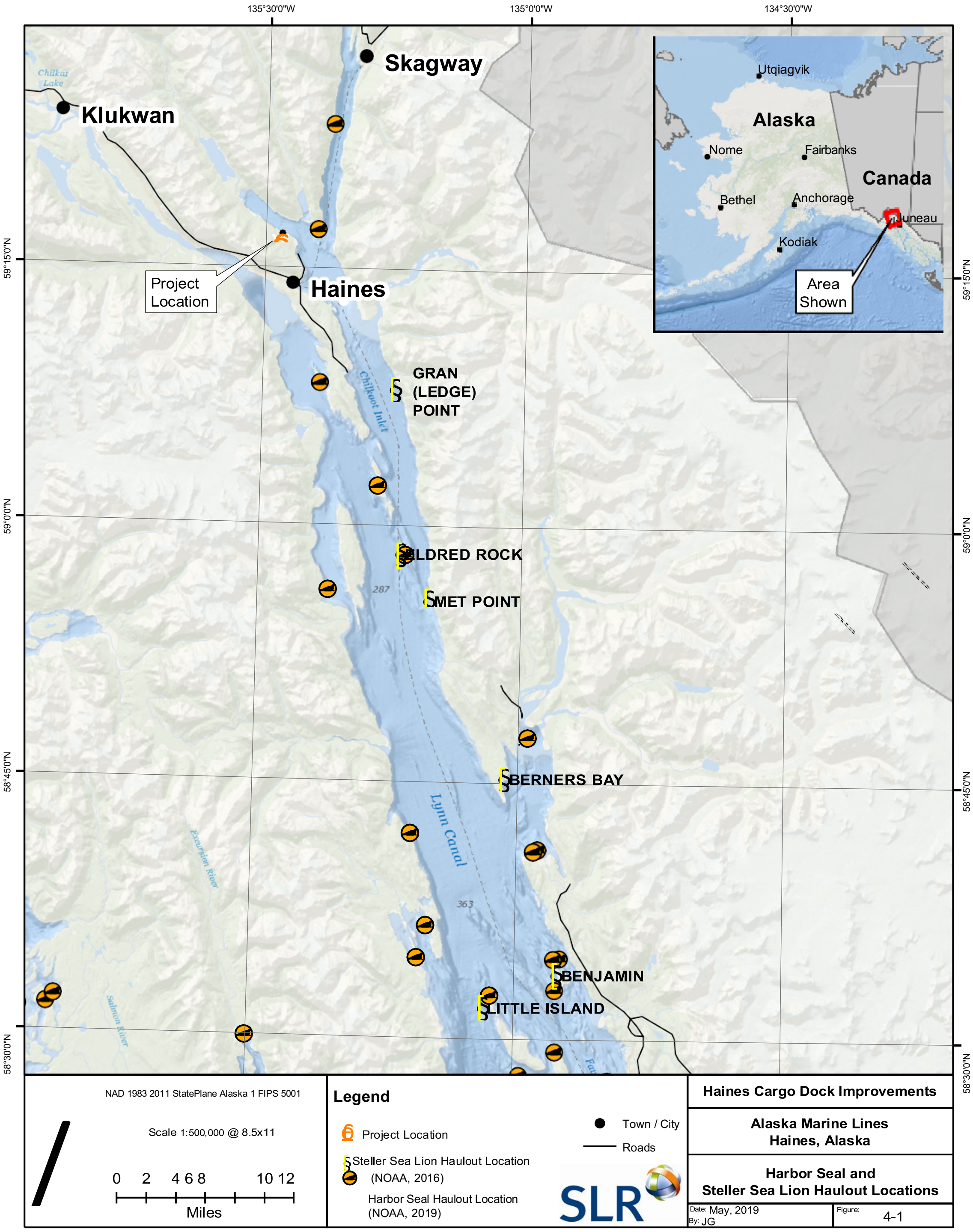
There are several long-term Steller sea lion haul outs in Lynn Canal (Figure 4-1). The haul out at Gran Point in Upper Lynn Canal is located closest to the Project site. As many as 1,000 Steller sea lions have been observed at this haulout prior to and during the spring eulachon runs. Other year-round haulouts in Lynn Canal are present at Met Point, Benjamin Island, and Little Island, closer to Juneau (Fritz, Sweeney et al. 2015).

Pre-spawning and spawning aggregations of many forage fish species occur between March and May in Southeast Alaska just prior to the breeding season of sea lions (Pitcher, Burkanov et al. 2001, Womble and Sigler 2006, Womble, Sigler et al. 2009). Aggregations of eulachon in Lutak Inlet persist for about three to four weeks during that period. Due to their high lipid content they are extremely important as forage for Steller sea lions (Womble, Sigler et al. 2009). During the spring eulachon run, a temporary seasonal haulout site is also located on Taiya Point at the southern tip of Taiya Inlet (approximately 3.1 mi [5 km] from the Project Site) (NMFS 2019). The spawning aggregations of forage fish provide densely aggregated, high-energy prey for Steller sea lions (and harbor seals) for brief time periods and influence haulout use (Sigler, Womble et al. 2004, Womble, Willson et al. 2005, Womble and Sigler 2006, Womble, Sigler et al. 2009) and foraging patterns at Gran Point, Taiya Point and in Lutak Inlet.

[9]As part of the ESA consultations on the effects of a highway expansion project north of Juneau, DOT&PF agreed to monitor the use of the Gran Point haulout throughout the year. DOT&PF installed a remote video camera system in late 2002 to determine periods of Steller sea lion use.

[10] K. Hastings (ADF&G) pers. comm., email dated May 10, 2019

[11] Personal Communication, in an email dated May 10, 2019



N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Figure 4_1_Haines_SSL_r1.mxd

FIGURE 4-1. HARBOR SEAL AND STELLER SEA LION HAULOUT LOCATIONS

Data from the monitoring location at Gran Point and from aerial surveys conducted between 2002 -2018 (unpublished data provided by K. Hastings, ADF&G and J. Womble; and (Womble, Sigler et al. 2009) demonstrate a nearly year-round residency pattern for Steller sea lions at that haulout. Gran Point is used most heavily in the spring (mid-April through mid-June, see Figures 4-2 and 4-3, and Table 4-1); however, on average more than a hundred Steller sea lions can be present during most of the year. Generally, the average count significantly decreased from mid-July throughout mid-October and there were periods of time ranging from one to five weeks in mid-late summer when Steller sea lions were absent (Table 4-1). In recent years use of the haulout by Steller sea lions has increased by the early fall months, with more than a hundred animals present at each site by mid-October. Generally, fewer animals are observed at Gran Point over the period December through March when individuals move further south in Lynn Canal to Berners Bay or Benjamin Island to forage on over-wintering adult herring (Womble and Sigler 2006, Womble, Sigler et al. 2009). Aerial surveys are rarely conducted after the peak abundance periods; video monitoring during winter months was discontinued in 2008, primarily due to the well-established and consistent pattern of haulout use during winter, and the difficulty in maintaining the system throughout winter.

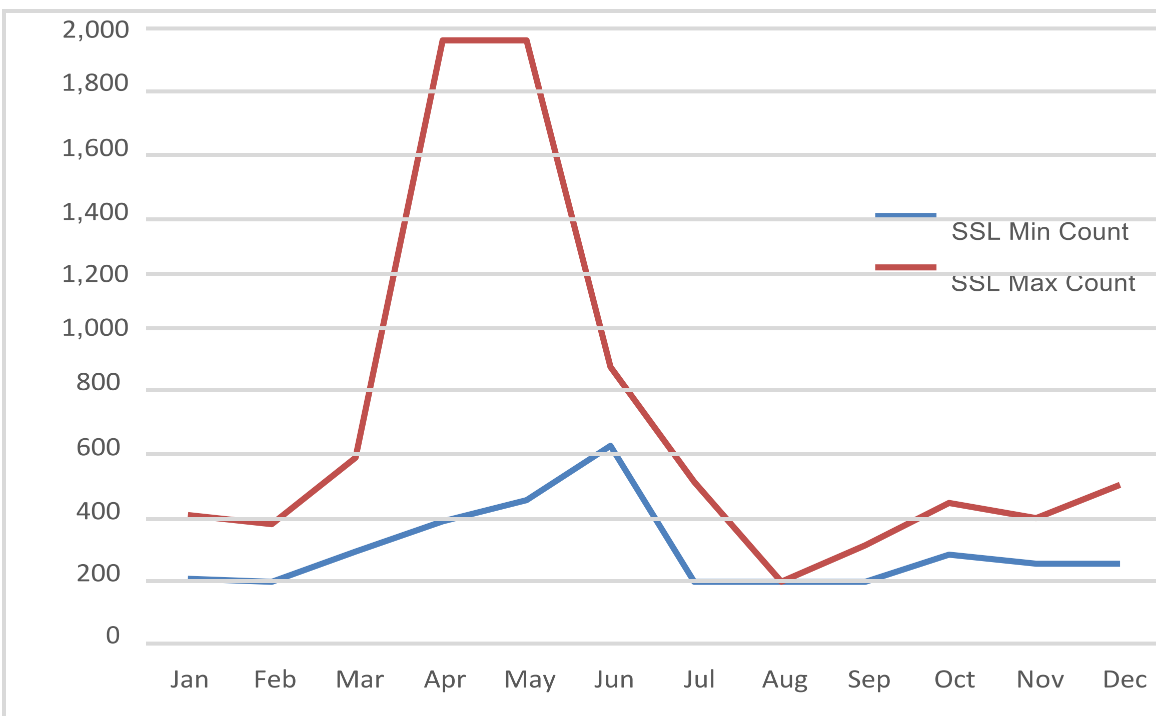


FIGURE 4-2. MINIMUM AND MAXIMUM STELLER SEA LION COUNTS AT GRAN POINT 2002-2018

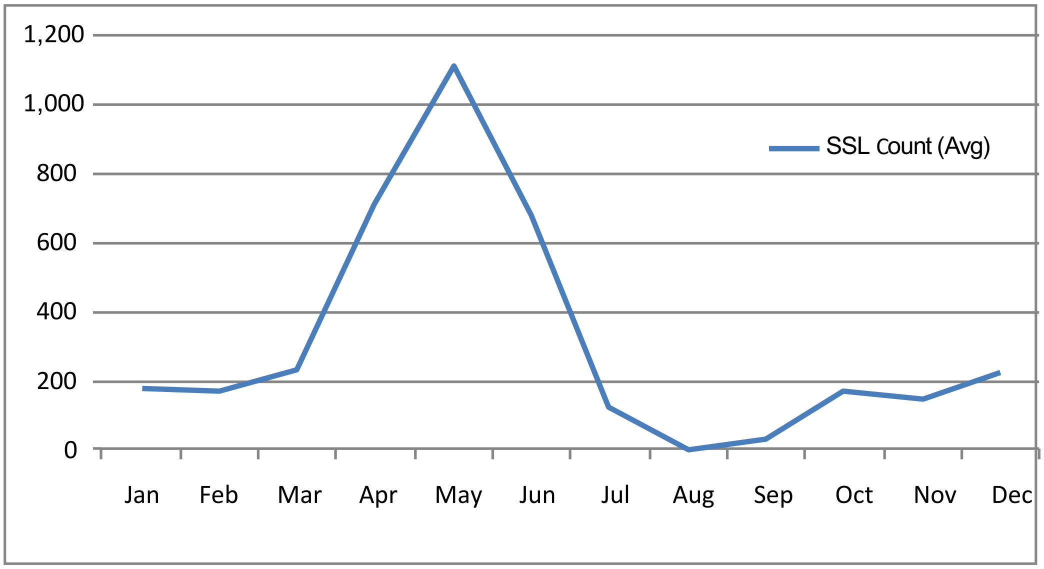


FIGURE 4-3. AVERAGE MONTHLY STELLER SEA LION COUNTS AT GRAN POINT 2002-2018

TABLE 4-1. AVERAGE NUMBER OF STELLER SEA LIONS PER MONTH AT GRAN POINT 2002-2018

Month	Average Count	N	Month	Average count	N
Jan	179.6	10	July	123.7	3
Feb	171.1	9	Aug	0	3
March	230.3	16	Sept	33.0	4
April	707.7	67	Oct	168.5	6
May	1,105.6	59	Nov	145.3	3
June	674.4	5	Dec	222.1	13

Source: Womble and Hastings (unpubl. data)

Steller sea lions have also been observed to haulout in the spring on small, offshore rocks near Cove Point in Berners Bay located on east side of southern Lynn Canal, approximately 50 mi (80 km) south of Lutak Inlet. There is minimal information on the use of this haulout site, although juveniles and adults have been observed during the peak of eulachon and herring spawning from mid-March through May.

4.2.3. Presence in the Action Area

Individuals from the Eastern DPS dominate the population of Steller sea lions found in Lynn Canal. As described in Section 4.2.2, while Steller sea lions that inhabit Lynn Canal are generally considered part of the Eastern DPS, some interchange between the Eastern and Western DPSs has occurred since at least 1998 (Gelatt, Trites et al. 2007, NMFS 2013, Fritz, Sweeney et al. 2015, Muto, Helker et al. 2016, Jemison, Pendleton et al. 2018, Muto, Helker et al. 2018).

Aerial survey data demonstrate a clear annual cycle, with a peak of abundance of Steller sea lions at Gran Point from March to May followed by a steep decline in numbers through the summer into fall (Figure 4-3). In addition to the seasonal trends, there has been a consistent, annual increase of Steller sea lions at Gran Point from approximately 500 animals in 2002 to nearly 2,000 in 2015 (Womble, Willson et al. 2005) K. Hastings, ADF&G, unpubl. aerial survey data). This can serve as a good estimate of the maximum number of animals that move back-and-forth from the haulout into the Action Area to forage from March through May. Over a decade of research on seasonal foraging behavior of Steller sea lions shows that they move into the Action Area, and the immediate Project site, to forage during the spring fish runs, resulting in local seasonal increases in abundance (Womble, Willson et al. 2005, Womble and Sigler 2006, Womble, Sigler et al. 2009). This information was used to calculate monthly density estimates for this species in the Action Area.

Sea lions are rarely observed in Lutak Inlet during the winter (K. Hastings, ADF&G, pers. comm.). In winter, large numbers of adult female, dependent young, juveniles, and sub-adult Steller sea lions move away from the Action Area. They occupy Benjamin Island (southern Lynn Canal) during the non-breeding season from October to April-May (Sigler, Womble et al. 2004, Womble and Sigler 2006) and forage on overwintering adult herring in that area. Salmon increase in importance as prey for sea lions and other predators from late-October and December in the Chilkat River, coinciding with the fall run of spawning pink salmon (*Oncorhynchus gorbuscha*), and late season runs of coho salmon (*O. kisutch*) and chum salmon (*O. keta*) as they return to rivers in northern Lynn Canal to spawn. At this time they become available to sea lions and harbor seals as a source of high-energy prey.

In summary, Steller sea lions seasonally follow dense aggregations of pre-spawning and spawning prey species throughout Lynn Canal. The largest aggregations of sea lions in winter target herring in the lower portions of the canal, followed by a gradual but predictable movement north towards and into Lutak Inlet and the mouths of the Chilkat and Chilkoot rivers during spring (mid-April through mid-June) as they follow dense aggregations of eulachon. In early summer through fall, Steller sea lions disperse southward from the northern portions of Lynn Canal including the Action Area as they follow multiple runs of salmon throughout the canal, prior to the return of adult herring aggregations in late fall through winter.

4.2.4. Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993[12]. At the time of designation, Steller sea lions were listed as a single species (not two DPSs). Critical habitat that had been designated for the entire population before the two DPS units were recognized remains unchanged. In 2013, the Eastern DPS of Steller sea lions was de-listed. Therefore, only the Western DPS is considered endangered

[12] At Federal Register 58 FR 45269.

under the ESA. In 2014, NMFS began undertaking a review of critical habitat designation to take into account new information available since the original 1993 designation. Although the Eastern DPS is no longer protected under the ESA, it remains protected under the MMPA.

NMFS designated critical habitat that includes marine waters within 20 nautical miles of rookeries and haulouts within the breeding range of the Western DPS and within three special aquatic foraging areas in Alaska (50 CFR 226.202, a and c, respectively). Critical habitat also includes an aquatic zone that extends 3,000 ft (914 m) seaward from the baseline or basepoint of each major rookery and major haulout in Alaska that is east of 144° W. longitude (the range of the Eastern DPS) in state and federally-managed waters. The closest haulout to the Project site that has been designated as Steller sea lion critical habitat is located at Gran Point (50 CFR 226.202).

4.3. Humpback Whales

Humpback whales from the Central North Pacific stock are the most commonly observed baleen whale in Lynn Canal particularly when foraging during the spring and summer months. In the North Pacific, humpback whales migrate from low-latitude breeding and calving grounds to form geographically distinct aggregations on higher-latitude feeding grounds. The aggregations of feeding humpbacks are generally isolated from each other; however, a very small degree of interchange has been documented (Calambokidis, Steiger et al. 1996).

In 1970, following substantial declines due to commercial whaling, the humpback whale was listed as endangered under the ESA. In 2015, NMFS completed a review of the humpback whale DPS designation and ESA listings and drafted a status report (NMFS 2015). Based on information presented in the status report, NMFS proposed revisions to the species-wide listing of the humpback whale[13], and a revision to the status of humpback whale DPSs was finalized by NMFS on September 8, 2016[14], effective October 11, 2016.

NMFS recognizes 14 DPSs and has classified four of those as endangered and one as threatened. The remaining nine DPSs do not warrant protection under the ESA. NMFS is in the process of reviewing humpback whale stock structure under the MMPA in light of the 14 DPS established under the ESA (81 FR 62259, 8 September 2016). Until this review is complete, current stocks as listed under the MMPA remain the same. Three DPSs of humpback whales occur in waters off the coast of Alaska: the Western North Pacific (WNP) DPS, which is an endangered species under the ESA; the Mexico DPS, which is a threatened species; and Hawaii DPS, which is not protected under the ESA. Humpback whales from the endangered WNP DPS are uncommon in waters off Alaska and are only likely to be encountered in the Aleutian Islands and Bering Sea region (Wade, Quin et al. 2016). NMFS considers humpback whales in Southeast Alaska to be 94% comprised of the Hawaii DPS (not listed) and 6% of the Mexico DPS (threatened; (Wade, Quin et al. 2016)). Therefore, humpback whales in Southeast Alaska, especially in the extreme northern waters of Lynn Canal, are most likely to be from the Hawaii DPS; this application assumes that 6% observed humpbacks in the Action Area could be from the Mexico DPS. While the range of the Mexico DPS extends up to Southeast Alaska, this DPS has never been reported as far north as Sitka. The likelihood that an individual from the Mexico DPS is part of the relatively few humpback whales that move to extreme northern Lynn Canal in July is extremely low.

[13] At 80 FR 22304, 21 April 2015
[14] At 81 FR 62259

The abundance of humpback whales in southeast Alaska has been steadily increasing in recent decades. The southeast Alaska-specific rate of increase is approximately 5.6% annually (Calambokidis, Falcone et al. 2008, Muto, Helker et al. 2018). The latest abundance estimate for southeast Alaska/northern British Columbia is 2,251 (Muto, Helker et al. 2018). Humpback whales listed as threatened or endangered would retain depleted status under the MMPA, while non-listed whales would lose depleted status under the MMPA (Muto, Helker et al. 2018). However, until such time as the MMPA stock delineations are reviewed, NMFS treats MMPA stocks that fully or partially coincide with a listed DPS as depleted and stocks that do not fully or partially coincide with a listed DPS as 'not depleted' for management purposes (Muto, Helker et al. 2018). The current status of each DPS is shown in Table 3-1.

4.3.1. Critical Habitat

On October 9, 2019, NMFS published a proposed rule to designate critical habitat for the humpback whale (84 CFR 54354). Areas proposed as critical habitat include specific marine areas off the coasts of California, Oregon, Washington and Alaska. A final determination on critical habitat will be forthcoming in the final rule. Therefore, for the purposes of this application, critical habitat for humpback whales is not considered further.

4.3.2. Presence in Action Area

Humpback whales have been observed in southeastern Alaska waters during in all months of the year. The majority of these whales winter in low latitudes, but some individuals have been documented as over-wintering south of the Action Area near Sitka and Juneau (Liddle 2015). The pattern of over-wintering in Sitka Sound from late fall through April correlates with foraging activity on large densities of herring (Liddle 2015). The whales feed on large schools of adult, over-wintering herring throughout winter, and on pre-spawning and spawning aggregations of herring in spring (Liddle 2015).

Humpback whales generally are found in Lynn Canal only during mid- to late spring (mid-May through June) and vacate the area by July to follow the large aggregations of forage fish in lower Lynn Canal. In recent years a few whales have been observed at the entrance to Taiya Inlet throughout the fall months (NMFS 2019) and at the mouth of Lutak Inlet (K. Hastings, ADF&G, person. comm.). Hastings observed from one to three humpback whales at Gran Point in May of 2015 and 2018. Individual animals have been observed in the same area intermittently throughout the summer months (NMFS 2017), but most whales move further south and are absent from the Action Area during summer.

4.4. Minke Whale

There are three stocks of minke whales recognized in U.S. waters of the Pacific Ocean: the Alaska; Hawaii; and California/Oregon/ Washington stocks (Muto, Helker et al. 2016, Muto, Helker et al. 2018). Only members of the Alaska stock could potentially occur within the Action Area. There are no current abundance estimates for the Alaska stock of minke whales (Muto, Helker et al. 2016). This stock is not designated as depleted under the MMPA nor is it listed as threatened or endangered under the ESA. Minke whales are considered common in the waters off Alaska and the number of human-related removals is currently thought to be minimal. Minke whales are occasionally seen in Southeast Alaska around Glacier Bay, in central Icy Strait, and northern Stephen's passage, all well south of the Action Area. Based on aerial surveys, these whales are considered to be rare in the northern parts of Lynn Canal (Dahlheim, White et al. 2009). One whale was reported in 2015 in upper Lynn Canal (NMFS 2019). One minke whale was also observed during in-water construction in June 2018 (84 FR 17805). Based on the available information the likelihood that minke whales will be present near the Project site and Action Area during construction are considered low. However, because they forage on schooling fish such as eulachon and herring, and could possibly venture into the Action Area, to be precautionary this species is included in the request for takes.

4.5. Killer Whales

NMFS recognizes eight killer whale stocks throughout the Pacific Ocean. However, only four of these stocks can be found in Southeast Alaska: 1) the Alaska Resident stock ranges from southeastern Alaska to the Aleutian Islands and Bering Sea; 2) the Northern Resident stock occurs from Washington State through part of southeastern Alaska; 3) the Southern Resident stock, found mainly within the inland waters of Washington State and southern British Columbia; and 4) the West Coast transient stock ranges from California through southeastern Alaska (Muto, Helker et al. 2018). Of these four stocks, it is not expected that the range of the ESA-listed Southern Resident stock would overlap with the Action Area. A killer whale from the listed population has not been reported as far north as Lynn Canal, and it is unlikely that they would be found in northern Lynn Canal. Since 1970 most killer whales in the project area have been from a resident stock. Therefore, individuals from this endangered stock are not likely to be present in the Action Area and the Southern Resident stock is not discussed further.

All killer whale stocks are protected under the MMPA. However, the three stocks that could be found in the Action Area are not designated as depleted under the MMPA, nor are they listed as threatened or endangered under the ESA (Muto, Helker et al. 2018). In addition, none of these three stocks are classified as a strategic stock.

Resident and transient killer whales have been documented in the middle to lower reaches of Lynn Canal (Dahlheim, White et al. 2009), and in Upper Lynn Canal and Lutak Inlet (K. Hastings, ADF&G pers. comm.).

Killer whale abundance estimates are determined by a direct count of individually identifiable animals. While killer whales occurring in Lynn Canal can belong to one of several different stocks, photo-identification studies since 1970 have catalogued most individuals observed in this area as belonging to the Northern Resident Stock. The photo-identification catalogue was updated in 2011 summarizing individual identifications made between 1974 and 2010. The population was composed of three clans representing a total of 261 whales (Muto, Helker et al. 2018). Because this population has been studied for such a long time, the estimated population size of 261 animals can serve as a minimum count of the population. The minimum population estimate for the Alaska Resident stock of killer whales based on photo-identification studies conducted between 2005-2009 is 2,084 animals (Muto, Helker et al. 2018).

Transient killer whales prey on marine mammals and have been found in all major waterways of southeastern Alaska, including Lynn Canal especially around Steller sea lion haulout sites (Dahlheim, White et al. 2009). Most of the transient whales photographed in the inland waters of southeastern Alaska share the west coast transient haplotype (Muto, Helker et al. 2018). From 1991 to 2007, an increasing population trend of 5.2% annually has been documented for transient killer whales in southeastern Alaska (Dahlheim, White et al. 2009). Over the time period from 1975 to 2012, 521 individual transient killer whales have been identified (Muto, Helker et al. 2018). Of these, 217 are considered part of the poorly known “outer coast” subpopulation and it is highly unlikely that this ‘subpopulation’ would be found in the Action Area.

The occurrence of transient killer whales in Upper Lynn Canal increases in summer, with lower numbers observed in spring and fall. Data from Lutak Inlet suggests that a small number of killer whales infrequently enter the Lutak Inlet, generally during spring fish runs when large aggregations of pinnipeds are also present (K. Hastings, ADF&G pers. comm.). Transient killer whales have also been observed in Lutak Inlet in front of the dock when sea lions are present (K. Hastings, ADF&G pers. comm.), presumably following their preferred food source. Dahlheim, White et al. (2009) documented a mean group size of four to six animals in southeastern Alaska.

4.6. Harbor Porpoise

Harbor porpoise are common in coastal waters of Alaska. There are three harbor porpoise stocks in Alaska: the Bering Sea Stock, the Southeast Alaska Stock, and the Gulf of Alaska Stock (Allen and Angliss 2015). Only the Southeast Alaska stock occurs in the Action Area (Muto, Helker et al. 2016). There was new information presented for the abundance estimate of harbor porpoise in southeastern Alaska in the most recent SAR (Muto, Helker et al. 2018) that substantially affected the abundance estimate for this stock.

Although harbor porpoise in the northern and southern regions of the inland waters of southeastern Alaska have not been determined to be subpopulations of the Southeast Alaska Stock, NMFS calculated a population estimate and PBR for the two different regions in southeastern Alaska for management purposes, and then pooled them to calculate a regional abundance estimate (Muto, Helker et al. 2018). The pooled abundance estimate is 975 (e.g., 398 for the northern region of southeastern Alaska and 577 for the southern region (Dahlheim, Zerbini et al. 2015). The minimum estimate is 359 and 513, respectively (Muto, Helker et al. 2018). Harbor porpoise are neither designated as depleted under the MMPA nor listed as threatened or endangered under the ESA.

Individuals from the Southeast Alaska Stock of harbor porpoise are infrequently observed in Upper Lynn Canal. Most sightings of harbor porpoise occur further south in lower Lynn Canal near Juneau. This may be simply due to observer bias as more people are on the water closer to Juneau. This species is considered to be more common than is documented from aerial data and is often observed by people who encounter small groups of two or three animals. Local observations occur throughout the year in Upper Lynn Canal between Haines and the Gran Point haulout site (J. Womble, pers. comm.). The species has been observed as far north as Haines during the summer surveys (Dahlheim, White et al. 2009). PSOs at the Haines Ferry Terminal observed one small pod of harbor porpoise on September 22, 2015[15]. This data is consistent with data from multiple observations of small groups of two to three individuals (two adults and a calf in summer) throughout the Action Area (J. Womble, pers. comm.). Dahlheim, White et al. (2009) also estimated the mean group size of harbor porpoise in southeastern Alaska at two individuals consistent with local observations

4.7. Dall's Porpoise

Dahlheim, White et al. (2009) observed Dall's porpoise throughout lower and outer southeastern Alaska, with concentrations of animals consistently found in Lynn Canal, Stephens Passage, Icy Strait, upper Chatham Strait, Frederick Sound, and Clarence Strait. While all of these locations are well south of the

[15]Haines Ferry Terminal Improvements, Marine Mammal Observation Form, Sept. 22, 2015.

Action Area for this project, individuals were observed as far north as Haines. The mean group size of the sightings was three individuals (Dahlheim, White et al. 2009), and they were observed more frequently in the spring, tapering off in summer and fall.

The Alaska Stock is the only Dall's porpoise stock found in Alaska waters. There are no reliable abundance data for this stock (Muto, Helker et al. 2016, Muto, Helker et al. 2018, Muto et al. 2019) as surveys for this stock are more than 21 years old (Allen and Angliss 2014). A population estimate determined from observations over the period 1987 to 1991 was 83,400. Since the abundance estimate is based on data older than eight years, the current minimum population number is considered unknown. Dall's porpoise are not designated as depleted under the MMPA or listed as threatened or endangered under the ESA. The Alaska stock of Dall's porpoise is not classified as a strategic stock

The mean group size of historical sightings was three individuals (Dahlheim, White et al. 2009). Observations were not predictable and were occasional to sporadic. No animals have been observed during the summer or winter (Dahlheim, White et al. 2009). Using this limited information, it is estimated that three animals could be present in the Action Area during the fall (between September and October). Sighting data from 2002, 2008 and 2010 indicated greater densities in waters deeper than 328 ft (100 m) than in shallower waters found in the Action Area (Friday et al. 2013 as cited in (Muto, Helker et al. 2018)). Since observations have been occasional, presence in the Inlet is assumed to be infrequent to unlikely. Dall's porpoise have not been observed in the waters of Lutak Inlet immediately adjacent to the Project site but may be present offshore in deeper waters of northern Lynn Canal. However, based on personal communication with S. Teerlink (June 2019) and Guide to Marine Mammals of N. Pacific, an average group size of 10 animals has been used for the purposes of this application.

5. TYPE OF INCIDENTAL TAKING AUTHORIZATION REQUESTED

Under Section 101(a)(5)(D) of the MMPA, AML requests an IHA for Level A and B takes during certain operations associated with the construction of the proposed Project at Lutak Dock in Haines, Alaska. In-water work could commence as early as June 15, 2020 and continue until October 2020. In order to ensure all required permits (including one from the U.S. Army Corp of Engineers) can be finalized and so as not to cause project delays, AML is requesting an IHA for one year be issued in April 2020 with an effective date of June 15, 2020. Once the major permits are in hand, a minimum of 30 days is required for AML to commit to mobilizing equipment and personnel to the Project site; more time would be preferred to complete contracting and mobilize equipment, material, and personnel. If work is not completed at the end of the 12-month IHA period, AML would request an IHA renewal.

5.1. Method of Incidental Taking

This authorization request considers noise from vibratory and impact pile installation and DTH drilling as outlined in Section 2. Underwater noise created during these activities has the potential to exceed NMFS' regulatory thresholds described in the revised 2018 Marine Mammal Acoustic Technical Guidance (NMFS 2018a). Project activities have the potential to result in Level A (i.e., permanent [hearing] threshold shift (PTS) or other types of non-serious injury) or Level B (i.e., temporary threshold shift [TTS] or behavioral disturbance) harassment of marine mammals that may occur within the Action Area during the proposed activities (see Section 4). Specifically, take is requested for the following activities:

- Vibratory removal of 12 existing 16-in. steel piles as needed[16]; and
- Vibratory and impact pile driving and/or DTH drilling to install a total of 13 steel piles ranging in size from 24 to 36 in.

No serious injury or mortality is expected as a result of Project activities. Section 6 provides specific details on the number of estimated takes by species and by type of taking (e.g., Level A or Level B harassment). Mitigation and monitoring measures described in detail in Sections 11 and 13 will be implemented to minimize the potential for unauthorized injury or harassment. The request includes a small number of takes for species that are uncommon or rarely occur in the Project Area. Although takes for these species are unlikely, this approach reduces the risk of the Project being shut down if one of these species enters the Level B harassment zone during pile installation or removal.

5.2. Compliance with 'Small Numbers' and 'Negligible Impact' Requirements

Section 101(a) (5)(d) of the MMPA allows, upon request, the incidental, but not intentional taking of small numbers of marine mammals if certain findings are made (16 U.S.C. 1361 et seq.). An authorization shall be granted if NMFS finds that the specified activity results in the taking of small numbers and would have a negligible impact on the species or stock(s), and would have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses, and if the permissible methods of taking, mitigation, monitoring and reporting of such takings are set forth. Section 7 provides an analysis of the requested takes relative to these requirements.

[16] If piles cannot be removed using vibratory methods, they would be cut at the mudline or left in place. An underwater shielded metal-arc would be used to cut the piles if this option is chosen. Cutting the piles would not result in incidental harassment.

6. TAKE ESTIMATES FOR MARINE MAMMALS

6.1. Threshold Criteria for Injury (Level A) and Behavioral (Level B) Disturbance

In 2019, Southall, Finneran et al. (2019) published an update to the 2007 Marine Mammal Noise Exposure Criteria, proposing eight discrete hearing groups including: 1) low frequency cetaceans; 2) high frequency cetaceans; 3) very high frequency cetaceans; 4) sirenians; 5) phocid carnivores in water; 6) phocid carnivores in air; 7) other marine carnivores in water; and 8) other marine carnivores in air (Southall, Finneran et al. 2019). While the 2019 publication considers more recent studies conducted since 2007 to better understand marine mammal hearing, the 2018 revised NMFS Technical guidance continues to be used for defining regulatory thresholds for calculating incidental takes of marine mammals under the MMPA. For this reason, the thresholds used in this application are based on the 2018 revised NMFS guidance (NMFS 2018a).

The *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (NMFS 2018a) uses marine mammal hearing groups defined by Southall, Bowles et al. (2007) with some modifications. These groups and their generalized hearing ranges are shown in Table 6-1. Of the seven marine mammal species (five cetaceans and two pinnipeds) that may occur in the Action Area, humpback and minke whales are classified as low frequency cetaceans (LFC), killer whales are mid-frequency cetaceans (MFC), and harbor and Dall's porpoise are classified as high-frequency cetaceans (HFC) (Southall, Bowles et al. 2007). Harbor seals are members of the phocid group, while Steller sea lions are otariid pinnipeds. NMFS (2018a) considered acoustic thresholds by hearing group to acknowledge that not all marine mammals have identical hearing ability or identical susceptibility to noise or noise-induced PTS. NMFS (2018a) also used the hearing groups to establish marine mammal auditory weighting functions (Table 6-2). These functions are considered in the determination of Level A threshold criteria as discussed in Section 6.1.1.

TABLE 6-1. GENERALIZED HEARING RANGES FOR MARINE MAMMAL HEARING GROUPS IN WATER

Hearing Group	Hearing Range
Low-frequency cetaceans[1]	7 Hz to 35kHz
Mid-frequency cetaceans[2]	150 Hz to 160 kHz
High-frequency cetaceans[3]	275 Hz to 160 kHz
Phocids[4]	50 Hz to 86 kHz
Otariids[5] and other non-phocid marine carnivores	60 Hz to 39kHz

Source: NMFS (2018a).
[1] Humpback and minke whales.
[2]Killer whales.
[3]Harbor and Dall's porpoise.
[4]Harbor seals.
[5]Steller sea lions.

TABLE 6-2. SUMMARY OF WEIGHTING AND EXPOSURE FUNCTION PARAMETERS

Hearing Group	*a*	*b*	*f₁* *(kHz)*	*f₂* *(kHz)*	*K* *(dB)*
Low-frequency cetaceans	1.0	2	0.20	19	0.13
Mid-frequency cetaceans	1.6	2	8.8	110	1.20
High-frequency cetaceans	1.8	2	12	140	1.36
Phocids in water	1.0	2	1.9	30	0.75
Otariids in water	2.0	2	0.94	25	0.64

Source: NMFS (2018a).

6.1.1. *Auditory Injury (Level A) Threshold Criteria for Marine Mammals*

Acoustic thresholds for generating PTS effects in marine mammals are provided in NMFS (2018a). A dual metric approach considering both cumulative sound exposure and peak sound levels was used to determine the PTS thresholds for impulsive sounds. For non-impulsive sounds, unless the impulsive peak level threshold was exceeded, only the cumulative sound exposure level was used. As defined in the Technical Acoustic Guidance (NMFS 2018a), different thresholds and auditory weighting functions are provided for different marine mammal hearing groups. The PTS thresholds corresponding to each hearing group are shown in Table 6-3.

TABLE 6-3. ACOUSTIC THRESHOLDS FOR LEVEL A INJURY

	PTS Onset Acoustic Thresholds (Received Level)		
	Impulsive Sources		**Non-impulsive Sources**
Hearing Group	**Peak, L_{pk}, flat** *(dB re 1 µPa)*	**Cumulative weighted SEL_{24h}** *(dB re 1 µPa²·s)*	**Cumulative weighted SEL_{24h}** *(dB re 1 µPa²·s)*
Low-frequency cetaceans[1]	219	183	199
Mid-frequency cetaceans[2]	230	185	198
High-frequency cetaceans[3]	202	155	173
Phocid pinnipeds in water[4]	218	185	201
Otariid pinnipeds in water[5]	232	203	219

Source: NMFS (2018a).
Notes: Peak sound pressure is "flat" or unweighted. Cumulative sound exposure level has a reference value of 1µPa2s. Cumulative levels should be appropriately weighted for the hearing group for assessment to the threshold
[1] Humpback and minke whales.
[2]Killer whales.
[3]Harbor and Dall's porpoise.
[4]Harbor seals.
[5]Steller sea lions.

6.1.2. Level B (Behavioral Disturbance) Threshold Criteria for Marine Mammals

Animals exposed to natural or anthropogenic sound may experience physical and behavioral effects, ranging in magnitude from none to severe (Southall, Bowles et al. 2007). NMFS currently uses a behavioral threshold of 120 dB RMS for continuous noise sources (i.e., vibratory driving, down-the-hole drilling) and 160 dB RMS for impulsive noise sources (i.e., impact driving). These interim behavioral effect thresholds as applied by NMFS do not account for differences between species in hearing ranges and sensitivity to noise at different frequencies and are based on broadband unweighted sound levels. These thresholds are conservative considering that many natural and anthropogenic noise sources can cause noise levels above these thresholds but not necessarily result in adverse behavioral effects to marine mammals. TTS is by definition recoverable rather than permanent and is treated as ‘‘Level B harassment’’ under the MMPA.

6.2. Marine Mammal Densities

The abundance of the seven marine mammal species (by month) in the Action Area (Table 6-4) was estimated using available survey data, literature, sightings from PSOs from other projects, personal communication from researchers, state and federal biologists, average group size (i.e., killer whales, Dall’s porpoise) and the IHA issued by NMFS for the ADOT&PF Haines Ferry Terminal Project (NMFS 2018b). Density estimates were calculated by dividing the estimated monthly abundance for each species (see Section 4) by the area (km^2) that best encompasses all marine mammals potentially taken during Project activities described in Section 2. The Action Area is approximately 91.3 km^2 and extends from Lutak Inlet/Chilkat River south down Lynn Canal to the Gran Point haulout (see Figure 1-1). This area includes the seasonal peak occurrences of marine mammal species considered in this IHA application and the greatest densities of foraging sea lions and harbor seals in northern Lynn Canal at any time of the year. Although pile driving could occur at any period during the four-month window, for purposes of requesting takes, Steller sea lion densities from June and the highest densities during the 4-month period for all other species have been used (see Section 6.4).

As shown in Table 6-4, the abundance of marine mammals in the Action Area fluctuates seasonally. For example, prey aggregations strongly influence the occurrence of Steller sea lions in the Action Area as shown in Table 6-4. Based on abundance surveys conducted at Gran Point (K. Hastings, ADF&G, pers. comm), monthly Steller sea lion densities were calculated to demonstrate this variation. Humpback whales are present in the Action Area from mid-April through June at a rate of five whales per month and given that a few whales have typically remained in the area through the fall months, this application assumes two whales may remain in the Action Area from August through October (NMFS 2018b). Minke whales are infrequent in the Action Area. One whale was reported in 2015 in upper Lynn Canal (NMFS 2019). However, because minke whales forage on eulachon and herring that occur in the Action Area, to be precautionary, density estimates were based on an assumption that two minke whales may occur in the Action Area. Killer whale densities were estimated based on the assumption that an average group of five animals may occur in the Action Area from April through November. These animals may be from either the resident or transient stocks (see Section 4).

TABLE 6-4. MARINE MAMMAL DENSITY ESTIMATES/DAY (ANIMALS/KM^2) DURING MONTHS WHEN PROPOSED PROJECT ACTIVITIES MAY OCCUR

Species	Jun	Jul	Aug	Sep	Oct
Humpback Whales	0.055	0.055	0.022	0.022	0.022
Minke Whales	0	0.22	0.22	0.22	0
Killer Whales	0.055	0.055	0.055	0.055	0.055
Harbor Porpoise	0.055	0.055	0.055	0.055	0.055
Dall's Porpoise	0.110	0.110	0.110	0.110	0.110
Harbor Seals	1.095	0.1095	0.1095	0.1095	0.1095
Steller Sea Lions	7.382	1.38	0.00	0.36	1.85

Harbor porpoise may occur in low numbers and while Dall's porpoise are infrequent in the area, they may occur in larger groups during the months with Project construction is occurring. For this reason, the take estimate for Dall's porpoise considers that a single average group of ten animals may occur in the Action Area (NMFS 2018b). Harbor seals, while generally present all year, are abundant in Lutak Inlet between mid- March through mid-June when prey abundance is high. An average of 100 seals per day in the Inlet is considered a conservative estimate during this period. For all other months, an estimate of 10 seals per month was incorporated into the density equation (NMFS 2018b).

The months when all species have the greatest probability of occurring is mid-April through July. The seasonal fish runs of eulachon and salmon in Lutak Inlet and the Chilkat River are a very important forage resource for marine mammals in the area. From mid-March through mid-May during these pre-spawning and spawning aggregations of eulachon and herring, there are generally higher densities of marine mammals. Beginning in late June, marine mammal densities significantly decrease (see Table 6-4). Although Project activities are proposed to occur from mid-June through October, as a precautionary approach, the highest marine mammal densities (see Table 6-5) have been used for all species to estimate takes (see Section 6.4). Densities for Steller sea lions are based on sighting data from Gran Point which are higher than would occur at the Project site.

TABLE 6-5 MARINE MAMMAL DENSITY ESTIMATES/DAY (ANIMALS/KM^2) USED FOR ESTIMATING POTENTIAL TAKES

Species	Time Period	Average Species Sighting Rates or Group Size[1]	Action Area (km^2)	Species Density
Humpback Whale	Apr - Jul	5	91.3	0.055
Minke Whale	Jul - Sept	2		0.022
Killer Whale	Apr - Nov	5		0.055
Harbor Porpoise	All	5		0.055
Dall's Porpoise[2]	Jul - Aug	10		0.110
Harbor seal	May - Jun	100		1.095
Steller sea lion	Jun	674		7.382

[1]Based on available survey data, literature, sightings from observers for other projects (i.e., NMFS 2019), personal communication from researchers and state and federal biologists, and the Incidental Harassment Authorization for ADOT&PF 2018 (NMFS 2018b). See Section 4 for supporting information.
[2]Dall's porpoise density estimates are based on average group size of 10 animals (per S. Teerlink personal communication June 2019 and Guide to Marine Mammals of N. Pacific).

6.3. Description of Acoustic Sources and Assessment Methodology

A detailed Noise Report for the proposed Project is included as Appendix A. As described in Section 5, vibratory and impact pile driving and DTH drilling may cause disturbance of marine mammals due to the underwater noise produced during construction. Removing the existing piles by cutting them off at the mudline rather than vibratory removal would be completed using hand tools (i.e., metal-arc) and would not result in underwater noise exceeding NMFS thresholds. Therefore, this application considered potential marine mammal takes associated with vibratory removal of piles if that method is necessary.

Table 6-6 provides the source specific information used to calculate the distances to impact thresholds for the three activities proposed during construction. Source levels for vibratory and impact pile driving were obtained from Caltrans (2015), with DTH drilling source levels from Denes, Warner et al. (2016). To be conservative, this application considers source levels assuming 36-inch piles are installed. For DTH drilling, while some analysts have used the median source level (166.2 dB) reported by Denes et al. (2016), this application is using the maximum reported level as a conservative measure. Noise levels during installation of the 24- and 30-in. piles are expected to be slightly less than the assumed source levels.

TABLE 6-6. NOISE SOURCE LEVELS

	PTS Onset Acoustic Thresholds (Received Level)		
	Vibratory Pile Driving or Removal	**DTH Drilling/Driving**	**Impact Pile Driving**
Source Level	175 dB (RMS SPL)	171 dB (RMS SPL)	210 dB (PK SPL) 183 dB (single strike SEL) 193 dB (RMS SPL)
Source Level Reference	Caltrans (2015)	Denes, Warner et al. (2016)	Caltrans (2015)
Number of Piles Within 24-Hr Period	5	2	5
Duration/ Number of Strikes to Drive a Single Pile	60 minutes	180 minutes	700 strikes

Source: (SLR 2019).

As described in Appendix A (SLR 2019), the NMFS User Spreadsheet tool (NMFS 2018a) was used to calculate practical spreading losses for this assessment. The sound transmission loss between a noise source and the receiver can be predicted using an underwater noise propagation model. When the source level (SL) of the noise source is known, the predicted transmission loss (TL) is used to predict the received level (RL) at the receiver location as:

$$RL = SL - TL$$

Transmission loss between two distances D1 and D2 may be described by a logarithmic relationship with an attenuation factor x:

$$TL = x \cdot \log (D_1 / D_2)$$

Transmission loss would be wholly due to spherical (in deep water) or cylindrical (shallow water) spreading if all losses due to factors other than geometric spreading are neglected. Spherical spreading means underwater noise would attenuate by 6 dB with each doubling of distance, or x = 20. Cylindrical spreading means an attenuation of 3 dB with each doubling of distance, or x = 10.

Caltrans (2015) indicates that in cases where practical spreading occurs, the attenuation factor can range from 5 to 30. A "practical spreading loss model" based on an attenuation factor of 15 for sound transmission in the nearshore environment is commonly used (NMFS 2012). Relevant pages of NMFS' User Spreadsheet used for this application are provided in Appendix A. A description of assumptions applied for estimating underwater noise propagation are provided in detail in the Noise Report (App. A).

6.3.1. Distances to PTS (Level A) Thresholds

The distances to the weighted PTS thresholds for continuous noise sources (vibratory pile driving (5 piles at 60 min/pile) and DTH (2 piles at 180min/pile)) and impulsive impact pile driving for marine mammals are shown in Tables 6-7 and 6-8, respectively. Also shown in Table 6-7 is a combined scenario for vibratory pile driving (4 piles, 4 hours active noise) and DTH (2 piles, 6 additional hours active noise) on the same day (10 hours active noise as worst-case). The 3-hour timeframe required to install a single pile (see Section 1) may include any combination of vibratory driving, impact driving, DTH drilling. If a combination of vibratory driving and DTH drilling is needed, the assessment described herein assumes that 4 piles would be installed using the vibratory method and 2 piles installed using DTH drilling for a total of 10 hours of active noise. See Appendix A, Figures 1 through 6 for additional detail.

TABLE 6-7. DISTANCES TO WEIGHTED PTS THRESHOLDS (LEVEL A) FOR CONTINUOUS NOISE SOURCES

Hearing Group	$SEL_{cum\ (24h)}$ Threshold	Distance to SEL_{cum} Threshold		
		Vibratory Pile Driving or Removal	DTH Drilling	Combined Vibratory + DTH[1]
LFC[2]	199 dB re 1μPa^2 ·s	171 m (560 ft)	105 m (345 ft)	200 m (656 ft)
MFC[3]	198 dB re 1μPa^2 ·s	15 m (50 ft)	6 m (20 ft)	18 m (59 ft)
HFC[4]	173 dB re 1μPa^2 ·s	253 m (830 ft)	92 m (302 ft)	296 m (971 ft)
Phocid Pinnipeds[5]	201 dB re 1μPa^2 ·s	104 m (340 ft)	56 m (184 ft)	122 m (400 ft)
Otariid Pinnipeds[6]	219 dB re 1μPa^2 ·s	7 m (25 ft)	4 m (13 ft)	9 m (30 ft)

Source: SLR (2019).
[1] Vibratory installation of 4 piles combined with 2 piles installed using DTH; [2]Humpback and minke whales; [3]Killer whales; [4]Harbor and Dall's porpoise; [5]Harbor seals; [6]Steller sea lions.

TABLE 6-8. DISTANCES TO WEIGHTED PTS THRESHOLDS FOR IMPULSIVE NOISE SOURCES

	Threshold		Distance to Threshold during Impact Pile Driving	
Hearing Group	**$SEL_{cum\ (24h)}$**	**PK (Peak)**	**$SEL_{cum\ (24h)}$**	**PK (Peak)**
LFC[1]	183dB re1µPa2·s	219 dB re1µPa	2.3 km (1.4 mi)	3 m (8 ft)
MFC[2]	185 dB re1µPa^2·s	230 dB re1µPa	82 m (270 ft)	n/a
HFC[3]	155 dB re1µPa^2·s	202 dB re1µPa	2.7 km (1.7 mi)	34 m (112 ft)
Phocid Pinnipeds[4]	185 dB re1µPa^2·s	218 dB re1µPa	1.2 km (0.8 mi)	3 m (8 ft)
Otariid Pinnipeds[5]	203 dB re1µPa^2·s	232 dB re1µPa	80 m (262 ft)	n/a

Source: SLR 2019.
[1] Humpback and minke whales; [2]Killer whales; [3]Harbor and Dall's porpoise; [4]Harbor seals; [5]Steller sea lions

6.3.2. *Potential for Cumulative PTS*

There is no potential for PTS to Stellar sea lions or killer whales as a result of peak noise levels from individual strikes during impact piling as shown in Table 6-8. Harbor seals, humpbacks and minke whales would need to be unfeasibly close (within 3 m of the pile) for potential PTS due to peak noise. A harbor porpoise or Dall's porpoise would need to be within 34 m of the source for potential PTS due to peak noise. Therefore, it is a reasonable assumption that driving a single pile using impact driving has very low potential for PTS due to peak noise levels.

The potential for PTS due to cumulative noise exposure from continuous noise sources (i.e., vibratory and DTH) has been calculated for all noise sources over 24 hours. As described in Appendix A and the recent Technical Guidance (NMFS 2018), for PTS to occur due to cumulative noise exposure an individual animal would need to remain in proximity to the noise source for a sufficiently long time. The shorter the distance to the PTS threshold, the smaller the volume of water an individual animal would need to remain in for the full duration of the workday (i.e., all impact strikes or continuous sound production as modelled in Appendix B). With reference to the project geometry in Figure 1 in Appendix A, ranges of 1-100 m from the source would be very unlikely to cause PTS. Ranges from 100 to 500 m are possible for PTS, but unlikely as animals would normally be expected to move around over larger distances in the time frame necessary to cause PTS. Beyond 500 m, PTS is possible and the presence of species in each relevant hearing group should be monitored (see Appendix A). Considering these factors, the realistic potential for PTS from vibratory pile driving and DTH driving/drilling is low for all species. In the worst-case scenario for PTS due to vibratory driving, animals would need to remain within about 253 m (830 ft) of the noise source for a full workday.

6.3.3. Distances to Level B Behavioral Thresholds

The enclosed nature of Lutak Inlet (see Figure 1-1) restricts the propagation of noise in all directions because of encountering land before noise levels reduce below the 120 dB RMS threshold for "continuous" source types (i.e., vibratory pile driving, DTH). Therefore, the distance in Table 6-9 for vibratory driving (46.4 km) would be truncated by land in all directions as shown in Figure 1 of Appendix A. Noise from impact driving is impulsive and in nature and the threshold of 160 dB RMS is used to establish what areas may be ensonified that could result in disturbance to marine mammals. Noise levels during impact pile driving (i.e., for piles ranging in size 24-36 in.) may exceed Level B thresholds (160 dB RMS) at about 1.8 km (1.1 miles) as shown in Table 6-9 (SLR 2019). Note that thresholds for behavioral disturbance are unweighted with respect to marine mammal hearing and therefore the thresholds apply to all species.

TABLE 6-9. AREA ENSONIFIED (KM^2) (LEVEL B) BASED ON PROJECT ACTIVITY

Disturbance Threshold (dB RMS)	Activity	Source (dB re 1µPa @10m)	Source Type	Distance to Threshold
120	Vibratory Driving	175	Continuous	46.4 km (28.8 miles)
160	Impact Driving	194	Impulsive	1.8 km (1.1 miles)
120	DTH Drilling	171	Continuous	25.1 km (15.6 miles)

Source: SLR (2019).

6.3.4. Estimating the Ensonified Area

The estimated area that will be ensonified above behavioral thresholds by source is calculated based on the distance from the Project (i.e., Lutak Dock) to the edge of the NMFS thresholds for each species for Level A and to the edge of the current Level B threshold which is applicable to all species (Table 6-10). Cross references to Figures 1 through 6 from Appendix A that depict these ensonified zones are also provided in Table 6-10.

TABLE 6-10. AREA ENSONIFIED (KM^2) BASED ON PROJECT ACTIVITY

Corresponding Figure # in Appendix A	Figure Title	Activity	km^2
LEVEL A			
2	Potential PTS Areas – Low Frequency Cetaceans	DTH	0.025
2	Potential PTS Areas – Low Frequency Cetaceans	Vibratory driving	0.056
2	Potential PTS Areas – Low Frequency Cetaceans	Vibratory + DTH	0.074
2	Potential PTS Areas – Low Frequency Cetaceans	Impact piling	6.899
3	Potential PTS Areas – Otariid Pinnipeds	DTH	0.000
3	Potential PTS Areas – Otariid Pinnipeds	Vibratory driving	0.000
3	Potential PTS Areas – Otariid Pinnipeds	Vibratory + DTH	0.000
3	Potential PTS Areas – Otariid Pinnipeds	Impact piling	0.020
4	Potential PTS Areas – Mid Frequency Cetaceans	DTH	0.000
4	Potential PTS Areas – Mid Frequency Cetaceans	Vibratory driving	0.001
4	Potential PTS Areas – Mid Frequency Cetaceans	Vibratory + DTH	0.001
4	Potential PTS Areas – Mid Frequency Cetaceans	Impact piling	0.017
5	Potential PTS Areas – High Frequency Cetaceans	DTH	0.020
5	Potential PTS Areas – High Frequency Cetaceans	Vibratory driving	0.113
5	Potential PTS Areas – High Frequency Cetaceans	Vibratory + DTH	0.151
5	Potential PTS Areas – High Frequency Cetaceans	Impact piling	8.736
6	Potential PTS Areas – Phocid Pinnipeds	DTH	0.010
6	Potential PTS Areas – Phocid Pinnipeds	Vibratory driving	0.025
6	Potential PTS Areas – Phocid Pinnipeds	Vibratory + DTH	0.032
6	Potential PTS Areas – Phocid Pinnipeds	Impact piling	2.369
LEVEL B			
1	Behavioral Disturbance Zones	Impact Piling	5.179
1	Behavioral Disturbance Zones	Vibratory Driving and DTH	22.164

Source: SLR (2019)

6.4. Estimated Incidental Take

For all marine mammals, takes are estimated by considering the density of marine mammals per km^2. Density is then multiplied by the ensonified area (km^2) and the number of days the noise source could occur. For example:

Species Density x Area Ensonified x Days = Exposure Estimate

For killer whales and Dall's porpoise, it is important to consider the average group size that could occur within the Action Area and therefore, average group size based on recent sighting data is used to estimate potential takes for those species. The following subsections describe the process for each step and conclude with the estimated number of takes anticipated for the Project that is used to develop the final take request numbers. Table 6-11 shows the results of calculations for Level A exposures and Table 6-12 provides the Level B exposures for vibratory pile driving.

TABLE 6-11. LEVEL A EXPOSURE ESTIMATE WITHOUT MITIGATION

Species	Level A Impact Area (km^2)	Density (animal per km^2)	# Pile Removal/ Driving Days	Level A Exposures (density*area*days)
Humpback Whale	6.899	0.055	8	3.02
Minke Whale	6.899	0.022	8	1.21
Killer Whale[1]	0.017	0.055	8	0.01
Harbor Porpoise	8.736	0.055	8	3.83
Dall's Porpoise [1]	8.736	0.110	8	7.65
Harbor seal	2.369	1.095	8	20.76
Steller sea lion	0.020	7.382	8	1.18

[1]Based on average group size.

TABLE 6-12. LEVEL B EXPOSURE ESTIMATE WITHOUT MITIGATION

Species	Level B Impact Area (km^2)	Density (animal per km^2)	# Pile Driving Days	Level B Exposures (density*area*days)
Humpback Whale (HI DPS)	22.164	0.055	8	9.13
Humpback Whale (Mexico DPS)				0.58
Minke Whale	22.164	0.022	8	3.88
Killer Whale[1]	22.164	0.055	8	9.71
Harbor Porpoise	22.164	0.055	8	9.71
Dall's Porpoise[1]	22.164	0.110	8	19.42
Harbor seal	22.164	1.095	8	194.21
Steller sea lion (EDPS)	22.164	7.382	8	1282.78
Steller sea lion (WDPS)				26.18

[1]Based on average group size.

The exposure estimates assume:

- Animals occurring within the Level A ensonified zone have already been exposed to Level B and counted as takes. Therefore, Level A takes have been subtracted from the total number of Level B takes so as not to double count takes;
- Exposures are based on total number of days that pile removal or driving could occur (i.e., one day for vibratory removal of piles and seven days for vibratory or impact pile driving or DTH drilling).
- As shown in Table 6-10, impact pile driving results in the largest ensonified areas that could result in PTS while vibratory driving results in the largest ensonified areas for behavioral disturbance. These two scenarios have been used to estimate potential takes as described in Section 6;
- One day equates to any length of time that piles are driven whether it is a partial day or a 24-hour period;
- An individual animal can only be taken once during a 24-hour period;
- Exposures to sound levels at or above the relevant thresholds equate to take, as defined by the MMPA. Therefore, all pinnipeds and cetaceans covered in this application that come within harassment zones for pile removal/driving or drilling activities would be recorded as a take. If a non-permitted marine mammal (i.e., a species not covered in this application) is observed approaching a harassment zone then pile removal/driving or drilling would shut down;
- Takes by acoustic harassment would only occur during those days when pile removal/driving or drilling occurs. Tables 6-11 (Level A) and 6-12 (Level B) provide an estimate of exposures for each species;
- To minimize exposure of marine mammals to Level A harassment, a 200 m shutdown zone is proposed for all species. The shutdown zone is designed to minimize the potential for injury as described in more detail below. For mid-frequency cetaceans (i.e., killer whales) and otariid pinnipeds (i.e., sea lions), shutdown would prevent Level A take. Therefore, Level A takes are not requested for these species; and
- If Level A take numbers are approaching authorized levels, shutdown will be implemented before individuals reach the Level A zones.

Potential take estimates may overestimate the actual number of individuals taken, assuming that available population data and modeled threshold areas or zones are accurate. For example, it is assumed that the output of the calculation represents the number of individuals that may be taken by the specified activity. In fact, in the context of stationary activities such as pile driving in areas where resident animals may be present, this number represents the number of instances of take that may occur to a small number of individuals, with a notably smaller number of animals actually being exposed more than once per individual. While pile driving can occur any day throughout the in-water work window, and the analysis is conducted on a per day basis, only a fraction of that time (typically a matter of hours on any given day) is actually spent pile driving. Take estimates are conservative and worst-case.

The probability of PTS from vibratory driving and DTH drilling is low for all species. In the worst-case scenario for PTS due to vibratory driving plus DTH, animals would need to remain within about 296 m of the noise source for a full workday or 24-hour period. Therefore, shutdown during continuous noise would only occur after an animal has been within their respective zone for a total of 1 hour. Similarly, during impact driving, an animal must be within their respective Level A harassment zone (see Table 6-8) for a total of 15 minutes for PTS to occur. To be precautionary, a minimum shutdown zone at 200 m will be implemented for all species to avoid exposing them to noise levels that may exceed PTS thresholds. The implementation of the 200 m shutdown zone, combined with the fact that animals would need to remain within their respective Level A zones for a period of time, the potential for PTS is reduced.

Considering the 200 m shutdown zone, the potential for MFCs (killer whales) or otariid pinnipeds (Steller sea lions) to experience PTS due to vibratory/impact driving or removal, or from DTH drilling is avoided considering the distances presented in Table 6-7. Therefore, Level A takes for MFC and otariids are not requested. Tables 6-13 and 6-14 summarize the number of requested Level A and B takes for each species.

TABLE 6-13. LEVEL A TAKE REQUEST WITH SHUTDOWN

Species	Estimated Level A Exposures	Requested Level A Take
Humpback Whale[1]	**2.14**	**3**
Minke Whale	**1.21**	**2**
Killer Whale[2]	**0.01**	**0**
Harbor Porpoise	**3.83**	**4**
Dall's Porpoise	**7.65**	**8**
Harbor seal	**20.76**	**21**
Steller sea lion[2,3]	**1.18**	**0**

[1]Assumed all Hawaii DPS.
[2] The potential for MFCs (killer whales) or otariid pinnipeds (Steller sea lions) to experience PTS due to vibratory/impact driving or removal, or from DTH drilling is very low considering the distances presented in Table 6-7. Shutdown for all species is proposed at 200 m which would avoid Level A takes for these species (see Section 11). Therefore, Level A takes for MFC and otariids are not requested.
[3] Assumed all Eastern DPS.

TABLE 6-14. LEVEL B TAKE REQUEST[1]

Species	Estimated Level B Exposures	Level B Take Request (Minus Level A To Avoid Double Counting)
Humpback Whale (Hawaii DPS)[2]	**9.13**	**6**
Humpback Whale (Mexico DPS)[3]	**0.58**	**1**
Minke Whale	**3.88**	**2**
Killer Whale	**9.71**	**10**
Harbor Porpoise	**9.71**	**6**
Dall's Porpoise	**19.42**	**12**
Harbor seal	**194.21**	**174**
Steller sea lion[4] (Eastern DPS)	**1282.78**	**1,283**
Steller sea lion (Western DPS)	**26.18**	**26**

[1]Level A takes were removed from total Level B to avoid double counting considering animals potentially exposed to Level A would have already been exposed to Level B.
[2]94% Hawaii DPS
[3]6% Mexico DPS. Note the total Level B shown in the far-right column does not apportion takes but counts total Level B combined for both DPS.
[4]1.6% of branded population from WDPS so propose 2% of takes to WDPS.

Level A takes requested for humpback whales assume they are from the Hawaii DPS given the ratio of whales in the Action Area from that DPS. The potential for MFCs or otariids to experience PTS due to vibratory/impact driving or removal, or from DTH drilling is very low considering the distances presented in Table 6-7. Shutdown for all species is proposed at 200 m which would avoid Level A takes for both MFC and otariids (see Section 11). Therefore, Level A takes for MFC (killer whales) or otariids (Steller sea lions) are not requested. The MMPA and its implementing regulations have never had a clear operational definition of Level B “take by harassment”. There is general recognition that minor and brief changes in behavior generally do not have biologically significant consequences for marine mammals and do not “rise to the level of taking” (NRC 2005). Based on available data, it is unlikely that the potential behavioral effects from this Project would result in anything more than minor, biologically insignificant consequences for any individual animals or for the population.

7. ANTICIPATED IMPACT OF THE ACTIVITY ON SPECIES AND STOCKS

AML is requesting authorization for Level A and Level B takes by acoustical harassment of marine mammals as listed in Tables 6-13 and 6-14. Incidental takes would be expected to be multiple takes of individuals, rather than single takes of unique individuals. This is especially valid for the requested number of Level B takes. For example, killer whales in the Action Area travel in small groups up to five animals; the same small group can be observed multiple times over a one- to two-week period. The take calculations by stock and DPS described in Section 6 assume takes of individual animals, rather than repeated takes of the same individuals. Therefore, the take/stock percentage calculations are very conservative. Table 7-1 provides the total requested Level A and B takes as a percentage of each stock or DPS.

TABLE 7-1. COMBINED LEVEL A AND B TAKE REQUESTED AS A PERCENTAGE OF EACH STOCK OR DPS

Species	Total Takes	% of Stock/DPS
Humpback Whale (HI DPS)	9	0.08
Humpback Whale (Mexico DPS)	1	0.02
Minke Whale	4	N/A
Killer Whale	10	0.35
Harbor Porpoise	10	1.03
Dall's Porpoise	20	N/A
Harbor seal	195	2.06
Steller sea lion (EDPS)	1,283	3.08
Steller sea lion (WDPS)	26	0.05

7.1. Hearing Impairment and Non-auditory Injury

Permanent or temporary hearing impairment or threshold shifts (PTS or TTS) could occur when marine mammals are in close proximity to the sound source and are exposed to very loud sounds of a short duration or to quieter sounds over a prolonged time period. Whether the threshold shifts are temporary or permanent depends on the intensity of the sound and length of time exposure. Typically, TTS occurs due to impacts to middle-ear muscular activity, increased blood flow, and general auditory fatigue (Southall, Bowles et al. 2007). At the TTS level, the animals do not experience a permanent change in hearing sensitivity and exhibit no signs of physical injury.

Hearing impairment and non-auditory physical effects (e.g., stress) might occur in marine mammals exposed to strong, pulsed underwater sounds. However, only limited data is available from studies using captive marine mammals, and there is no evidence that these effects occur even for marine mammals in close proximity to sound sources.

The proposed Project would have the potential to result in Level B harassment of pinnipeds and cetaceans due to increased underwater noise associated with pile removal and installation. The potential impacts from Level B harassment would be temporary. Mitigation measures discussed in Section 11, would be incorporated into the Project to prevent Level A harassment, or PTS. Given the brief duration of exposure of any marine mammal in combination with the proposed monitoring and mitigation measures, auditory impairment or other non-auditory physical effects are unlikely to occur during the proposed Project.

7.2. Masking

Natural and artificial sounds can disrupt behavior by masking. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (Clark, Suydam et al. 2009). It is important to consider the frequency range of the potentially masking sound to determine behavioral impacts. For example, because sound generated from in-water pile driving is of low frequency, it may have less effect on high frequency sounds made by porpoises. Impact pile driving produces the most intense underwater sounds that would be generated by construction of the proposed Project. Because the energy distribution of noise from pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the Action Area.

The duration of impact pile driving for this Project would be relatively short-term. The probability that underwater noise generated from impact pile driving would mask acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term, with rapid oscillations occurring throughout driving. It is possible that noise resulting from vibratory pile driving during Project construction may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

7.3. Disturbance Reactions

Marine mammal responses to continuous sound such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. The onset of either impact or vibratory pile driving could result in temporary, short term changes in typical animal behavior or avoidance of the affected area (Richardson, Greene Jr. et al. 1995). The biological significance of behavioral disturbances is difficult to predict, especially if the detected disturbances appear to be minor. Behavioral modification would only be considered biologically significant if the growth, survival, or reproduction are affected.

7.4. Small Numbers Consideration

Table 7-1 demonstrates that the number of animals potentially exposed to elevated noise levels from the Project that could result in a Level A or Level B take by harassment are very small percentages of stock size. It shows that less than about 3% of total abundance for any stock, species or DPS would be potentially affected by Level A acoustic harassment due to Project construction. For most species, less than 1% of the stock would be affected. These percentages in Table 7-1 would be further reduced when considering that multiple takes of individuals would likely be taking place rather than each estimated take occurring to a unique individual. In all cases, the take request is less than 3.1% of the estimated size of the stock and is considered to be a “small” number pursuant to NMFS guidance. Potential take at these levels would not be expected to have any effect on populations, population recruitment, or survival.

Based on this analysis of the likely effects of the specified activity on marine mammals and taking into consideration the implementation of the mitigation and monitoring measures (see Section 11), only small numbers of marine mammals are likely to be taken relative to the populations of the affected species or stocks.

7.5. Negligible Impact Consideration

Negligible impact is “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival”[17]. A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). In all cases the requested number of Level A and B takes together are less than about 3% of the estimated abundance for the stock or DPS (Table 7-1). Level B takes are neither considered serious or injurious and would not result in mortality. Therefore, the requested levels of both Level A and Level B takes would not adversely affect recruitment or survival of a species or stock.

However, an estimate of the number of Level A or Level B harassment takes alone generally does not provide sufficient information to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through behavioral harassment, other factors were considered such as the nature of any responses (their intensity, duration), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

Pile driving activities associated with the proposed Project have the potential to temporarily disturb or displace marine mammals. Specifically, underwater sound generated from pile driving during construction activities may result in Level A or Level B harassment (behavioral disturbance) for all species authorized for take. Potential takes could occur if individuals of these species are present in the ensonified zones described in Section 6 when pile driving is underway.

While Level A takes have been requested for this project, the occurrence of PTS, serious injury, or death would be extremely unlikely for all authorized species. The request for Level A takes is considered precautionary and helps to determine the appropriate level of mitigation and monitoring, which would further ensure that Level A takes are avoided. Level A exposure would also have to occur for up to one hour (continuous) or 15 minutes (impact driving) for PTS to occur.

Soft start techniques would be employed during pile-driving operations to allow marine mammals to vacate the area prior to commencement of full power driving (see Section 11 Mitigation). AML proposes

[17] Definition at 50 CFR 216.103

a 200 m shutdown zone for all species, which would prevent or significantly reduce the likelihood of injury. Considering the Level A distances for MFC and otariids (see Section 6), PTS is avoided for these species. AML would record all occurrences of marine mammals and any behavior or behavioral reactions observed, any observed incidents of behavioral harassment, and any required shutdowns, and would submit a report upon completion of the project.

Based on current literature as well as monitoring from other similar activities, effects on individuals that are taken by either Level A or Level B harassment would be considered insignificant to minor. Most individuals would simply move through, or away from, the sound source and be temporarily displaced from the areas of pile driving. This reaction has been observed primarily only in association with impact pile driving. In response to vibratory driving, pinnipeds (which may become somewhat habituated to human activity in industrial or urban waterways) have been observed to orient towards and sometimes even move towards the sound. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in hearing impairment or to significantly disrupt foraging behavior. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness for the affected individuals and would not result in any adverse impact to individuals or the stock.

In summary, the takes requested for this activity would result in no more than a negligible impact to any of the marine mammal species that may be taken during this Project. This is based on: (1) the overall effectiveness of proposed mitigation measures at minimizing the effects of pile driving and associated construction activities; (2) the low probability of serious injury or mortality to species; and (3) the anticipated incidents of Level B harassment likely consisting of temporary modifications in behavior. The specified activity is not expected to impact rates of recruitment or survival and would therefore not result in population-level impacts.

8. ANTICIPATED IMPACTS ON SUBSISTENCE USES

Subsistence harvest of harbor seals and Steller sea lions by Alaska Natives is authorized under the MMPA. Of the marine mammals considered in this IHA application, only harbor seals and Steller sea lions are used for subsistence. No records exist of subsistence harvests of whales and porpoises in Lynn Canal (Haines 2007).

The ADF&G has regularly conducted surveys of harbor seal and Steller sea lion subsistence harvest in Alaska and the number of animals taken for subsistence in this immediate area is low when compared to other areas in Southeast Alaska (Wolfe, Bryant et al. 2013). Marine mammals comprise less than 1 pound per capita of all resources harvested by Haines residents (Household Survey of Wildfoods Resources Harvest in Haines, as cited in Haines 2007). Construction activities at the Project site would be expected to cause only short term, non-lethal disturbance of marine mammals. Impacts on the abundance or availability of either species to subsistence hunters in the region are not anticipated; therefore, measures to reduce impacts to subsistence are not proposed.

AML will notify local Alaska Native tribes that may hunt marine mammals for subsistence in the larger Upper Lynn Canal region of the Project.

9. ANTICIPATED IMPACTS ON HABITAT

9.1. Underwater Noise Disturbance

Construction activities at the Lutak Dock could cause temporary impacts on marine mammal habitat due to elevated underwater noise levels, which could cause animals to leave or avoid the area during pile installation activities. However, elevated underwater noise from pile driving would be localized and short-term, and would last only as long as the construction phase of the Project; therefore, any impacts on individual cetaceans and pinnipeds would be limited. Most species in the vicinity of the dock would be expected to be tolerant of noise levels associated with an active marine harbor. For example, despite background noise levels and dock activities, seals have been seen near the Lutak Dock. These facilities often attract pinnipeds due to the availability of prey in the form of discards from commercial and sport fishermen. In addition, Russell, Hastie et al. (2016) found that noise from pile driving can cause harbor seals to be displaced from an ensonified zone but their distribution returned to normal two hours after cessation of pile driving activity. So, while it is possible that pinnipeds may avoid the project area during pile driving, they are not likely to abandon the site altogether. Best Management Practices (BMPs) and minimization practices would be followed to minimize potential environmental effects from Project activities would be used throughout this Project and are outlined in Section 11 Mitigation Measures.

9.2. Water and Sediment Quality

In water pile driving and pile removal activities would cause short-term effects on water quality due to increased turbidity. The physical resuspension of sediments could produce localized turbidity plumes that could last from a few minutes to several hours. Fish and marine mammals in the Lutak Inlet/Lynn Canal region are routinely exposed to substantial levels of suspended sediment from glacial sources. Turbidity associated with pile installation is expected to be localized to about a 25 ft (7.6 m) radius around the pile (Everitt, Fiscus et al. 1980). Because of local currents and tidal action, any potential water quality exceedances would be expected to be temporary and highly localized. The local currents would disperse suspended sediments at a moderate to rapid rate depending on tidal stage.

While contaminated sediments are not expected at the Project site, any contaminants associated with the re-suspended sediments would be tightly bound to the sediment matrix. Cetaceans are not expected to come close enough to the Project site to encounter temporary turbidity plumes from construction activities. Any pinnipeds in the immediate vicinity would be expected to avoid the short-term, localized areas of turbidity. There is little potential for them to be directly exposed to increased turbidity during construction operations, but these short-term increases in water turbidity levels could temporarily affect the distribution and availability of their prey species (see Section 9.4). Overall, any impacts on marine mammals from increased turbidity levels would be short term and negligible.

9.3. Passage Obstructions

Pile removal and installation at the Project site would occur adjacent to the existing shoreline. Construction activities at the Lutak Dock would not obstruct movements of marine mammals or fish over the long term.

9.4. Construction Effects on Potential Prey and Foraging Habitat

The proposed Project occurs in an area critically important for foraging pinnipeds during several seasonal runs of anadromous fish. The relationship between sea lions and these ephemeral fish runs is so strong the seasonal abundance and distribution of Steller sea lions throughout Lynn Canal reflects the distribution of spawning herring and pre-spawning/spawning aggregations of eulachon in northern Southeast Alaska, particularly in Lynn Canal (Womble, Willson et al. 2005). Dense concentrations of quality prey in low-velocity shallow waters make them an easy target for predators such as sea lions and seals (Marston, Willson et al. 2002). All marine mammals under consideration in this application depend either directly or indirectly upon the seasonal influx of prey in upper Lynn Canal. For example, transient killer whales move into these waters to hunt pinnipeds that are in turn aggregated to forage on anadromous fish.

Construction activities would produce continuous (i.e., vibratory pile driving) sounds and pulsed (i.e. impact-driving) sounds. Fish react to sounds that are especially strong or intermittent and low frequency. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Popper, Fay et al. (2003) determined that the process of hearing across fishes is quite variable - some species can only perceive sounds in the range up to 100 or 200 kHz and others are able to hear at well over 180 kHz. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear construction projects (Scholik and Yan 2001, Scholik and Yan 2002, Popper and Hastings 2009).

Also, increased turbidity from construction activities has the potential to adversely affect forage fish and juvenile salmonid out of migratory routes in the Project area. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle. Given the limited area affected and high tidal dilution rates in the inlet, any effects on forage fish and salmon from increased turbidity are expected to be short term and minor or negligible.

Generally, the most likely impact to fish from pile-driving activities in the Project area would be temporary behavioral avoidance of the area. However, this is unlikely during the pre-spawning movements into the Action Area by eulachon and herring. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

Given the area is recognized as being an important foraging area to marine mammals (see Section 7.4), By scheduling work to occur mid-June through October, AML would avoid months when the highest density of fishes run in the inlet, thereby avoiding the greatest densities of fish [and marine mammals] in the Action Area, and specifically in the immediate area adjacent to the Lutak Dock. Therefore, to the greatest extent practicable, impacts from short-term elevated noise levels and temporary increased turbidity on available prey would be avoided during this period.

10. ANTICIPATED EFFECTS OF HABITAT IMPACTS ON MARINE MAMMALS

The proposed activities are not likely to result in a significant adverse or permanent loss or modification of habitat for marine mammals or their prey. The most likely effects on marine mammal habitat due to the proposed Project are temporary, short duration elevated in-water noise, temporary prey (fish) disturbance, and localized, temporary water quality effects (see Section 9). Additionally, no physical damage to habitat other than an extremely minor loss of benthic habitat at the location of the piles is anticipated as a result of Project activities at the Lutak Dock. Therefore, the potential loss or long-term modification of marine mammal habitat is not expected.

11. MITIGATION MEASURES

AML activities are subject to federal, state, and local permit regulations. AML has based the proposed mitigation measures on the best guidance available to avoid and minimize (to the greatest extent possible) impacts on the environment, ESA species, designated critical habitats, and species protected under the MMPA.

Mitigation measures to reduce total takes (e.g. closures, shutdown periods) would be employed throughout all construction in-water work at the dock. General mitigation measures used for all construction practices are listed first (Section 11.1), followed by specific mitigation measures for pile installation activities (Section 11.2).

11.1. General Construction Activities

AML will perform construction in accordance with the best guidance available (e.g., BMPs and mitigation measures) to avoid and minimize (to the greatest extent possible) impacts on the environment, ESA species, designated critical habitats, and species protected under the MMPA. Mitigation measures include:

- The dock would be maintained in a manner that does not introduce any pollutants or debris into the harbor or cause a migration barrier for fish;
- Fuels, lubricants, and other hazardous substances would not be stored below the ordinary high-water mark;
- Properly sized equipment would be used to drive piles;
- Oil booms would be readily available for containment should any releases occur;
- The contractor would check for leaks regularly on any equipment, hoses, and fuel storage that occur at the project site;
- All chemicals and petroleum products would be properly stored to prevent spills; and
- No petroleum products, cement, chemicals, or other deleterious materials would be allowed to enter surface waters.
- Scheduled activities will not overlap with high densities of marine mammal prey that occur March 1 through May 31; therefore, marine mammal densities during the proposed construction (mid-June through October) are reduced.

11.2. Pile Installation Activities

The following subsections describe mitigation measures proposed by AML during pile removal/driving or drilling activities. These measures would reduce impacts on marine mammals to the lowest extent practicable during in-water construction. In addition to the mitigation measures listed here, AML also proposes specific monitoring measures including the use of PSOs as described in detail in Section 13.

11.2.1. Methods for Pile Removal and Pile Driving

If possible, piles would be removed by using a direct pull method or by cutting piles off at the mudline instead of using a vibratory hammer. To the extent practicable, AML would drive all piles with a vibratory hammer (*i.e.,* until a desired depth is achieved or to refusal) or use DTH drilling prior to using an impact hammer. In addition, the minimum hammer energy needed to safely install the piles would be used and sound attenuation devices (*e.g.,* pile caps/cushions) to reduce source levels.

11.2.2. Soft Start

To minimize disturbance and harm to marine mammals from pile driving noise, AML would implement a "soft-start" procedure to allow animals to leave the area prior to full sound exposure. Specifically, AML would use the soft-start technique at the beginning of impact pile driving each day, or if pile driving has ceased for more than 30 minutes. The requirements for soft start for impact driving are:

> *Initiating sound from impact driving with an initial set of three strikes from the impact hammer at reduced energy, followed by a 1-minute waiting period, then two subsequent three strike sets. Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of pile driving of 30 minutes or longer.*

11.2.3. Pile Driving Delay/Shutdown

For use of in-water heavy machinery/vessels (e.g., dredge), AML will implement a minimum shutdown zone of 10 m radius around the pile/vessel if a marine mammal is observed within that radius. For vessels, AMR must cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. AML would also implement a 200 m shutdown zone for all species to ensure that no injuries to marine mammal hearing occur (See Section 6.4). While the distance to Level A for impact pile driving as shown in Table 6-8 is slightly larger (2.7 km [1.7 miles]), the harassment zone is restricted by land (i.e., the Inlet is approximately 1km wide at this location). Therefore, AML proposes to position PSOs at the locations shown in Figure 11-1 which are accessible from Lutak Road.

PTS from vibratory driving and DTH drilling is low for all species. In the worst-case scenario for PTS due to vibratory driving plus DTH, animals would need to remain within about 296 m of the noise source for a full workday. Therefore, implementing shutdown at 200 m is conservative considering that animals would only experience PTS after spending one hour in the Level A zone during continuous noise or 15 minutes in their Level A zone for 15 minutes.

Pile driving activities would only be conducted during daylight hours when it is possible to visually monitor for marine mammals. If poor environmental conditions restrict visibility (e.g., from excessive wind or fog, high Beaufort state) of the shutdown zone, pile installation would be delayed. If a species for which authorization has not been granted or if a species for which authorization has been granted but the authorized takes are met, AML would delay or shut down pile driving if the marine mammal approaches or is observed within the Level A or B harassment zones. In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as serious injury or mortality, the PSO on watch would immediately call for the cessation of the specified activities

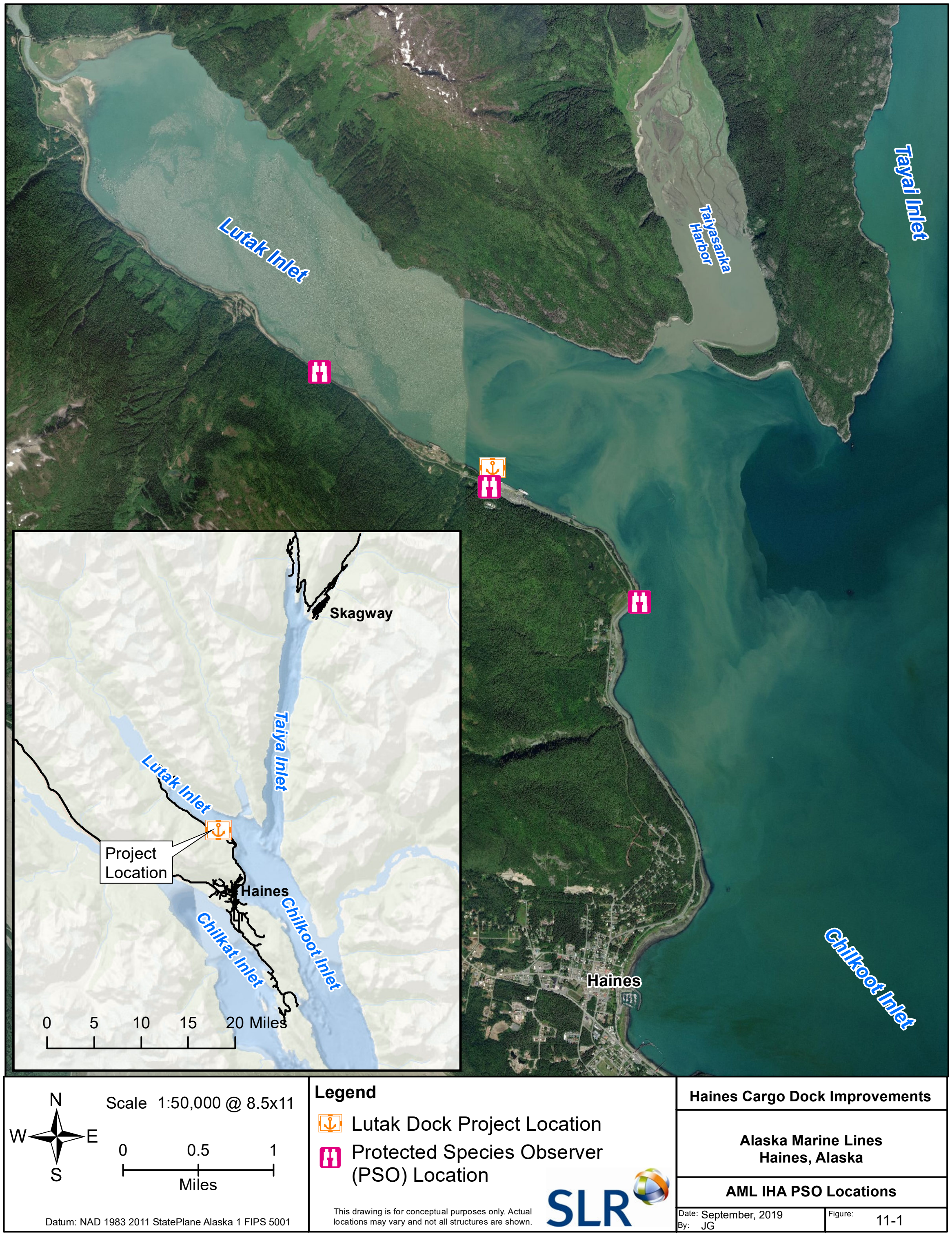


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FIGURE 11-1. PROPOSED PSO MONITORING LOCATIONS

and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and NMFS Alaska Regional Office (see Section 13 for contact information).

11.3. Mitigation Summary

AML has developed the proposed mitigation measures to ensure the least practicable impact on affected marine mammal species and stocks and their habitat. The potential measures include consideration of the following factors in relation to one another: (1) the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals; (2) the proven efficacy of the specific measure to minimize adverse impacts as planned based on monitoring plans from previous, similar IHA applications incorporating pile driving; and (3) the practicability of the measure for implementation. Based on these factors AML believes the mitigation measures being considered accomplish the required objectives:

- Avoidance of pile driving activities at biologically important times for marine mammals at the Project site to reduce the total number of marine mammals potentially exposed to harassment from pile driving;
- Avoidance of peak, biologically significant foraging periods for pinnipeds and cetaceans in the Action Area to reduce impacts to forage species as well as marine mammals, paying particular attention to the prey-base seasonal cycles, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during the biologically important foraging season in spring.

The proposed mitigation measures provided would ensure the least practicable impact on marine mammal species or stocks and their habitat. Section 13 provides specific information on proposed monitoring during construction activities as well as reporting requirements both during and after construction is complete.

12. MITIGATION MEASURES TO PROTECT SUBSISTENCE USES

The proposed activity would take place in Lutak Inlet, near Haines, in southeast Alaska. It is highly unlikely that there would be any impact to subsistence species or on the availability of marine mammals for subsistence purposes due to this Project. According to an Alaska Fish and Game study from 1996, marine mammals accounted for only 2% of total subsistence resources for Haines households (as cited in the Haines Coastal Management Plan 2007). Subsistence hunting of sea lions and harbor seals may occur in the larger Upper Lynn Canal area; however the significance of these species as subsistence resources when compared to terrestrial mammals and fish is very low (Haines Coastal Management Plan 2007). Considering the nature, location and short duration of the proposed activities at the Project site, no impacts on the abundance or availability of marine mammal species to subsistence hunters in the region are expected. Therefore, no further measures to reduce impacts to subsistence are being considered.

13. MONITORING AND REPORTING

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for incidental take authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that would result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed Action Area.

AML recognizes that monitoring requirements should be designed that improve the understanding of one or more of the following:

- Occurrence of marine mammal species in the Action Area (e.g., presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) Action or environment (e.g., source characterization, propagation, ambient noise); (2) Affected species (e.g., life history, dive patterns); (3) Co-occurrence of marine mammal species with the action; or (4) Biological or behavioral context of exposure (e.g., age, calving or feeding areas);
- Individual responses to acute stressors, or impacts of chronic exposures (behavioral or physiological);
- How anticipated responses to stressors impact either: (1) Long-term fitness and survival of an individual; or (2) population, species, or stock;
- Effects on marine mammal habitat and resultant impacts to marine mammals; and
- Mitigation and monitoring effectiveness.

13.1. Protected Species Observers

AML has requested the number of Level A takes (Table 6-13) determined to be necessary based on modeling calculations for this specific Project, taking into account PSO monitoring and shutdown measures as a primary source of mitigation for this project.

Marine mammal monitoring would be employed through PSOs during all pile removal/driving or drilling activities. Current NMFS guidelines recommend that noise-producing activities should be shut down prior to reaching the PTS threshold as discussed in Section 11. In addition, AML proposes to use PSOs to monitor a reasonable distance within the Level B zone to document marine mammals that could occur, recording them as takes as part of this authorization (see additional information below). AML would collect observation data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of activity. All PSOs would be trained in marine mammal identification and behaviors and are required to have no other Project-related tasks while conducting monitoring.

AML would implement the following monitoring procedures during pile driving:

- PSOs would be on site before, during and after all pile driving or drilling activities, and would monitor the Level A zones and a portion of the Level B zones as described herein.
- PSOs would scan the waters using binoculars, or spotting scopes, and would use a hand-held GPS or range-finder device to verify the distance to each sighting from the Project site.
- If poor environmental conditions restrict visibility (e.g. excessive wind or fog, high Beaufort state) of the monitoring zones, pile installation would cease.
- Pile driving or drilling activities would only be conducted during daylight hours when it is possible to visually monitor marine mammals.
- All PSO locations are accessible from Lutak Road. A central PSO would be placed at Lutak Dock to monitor the Level A shutdown zone (200 m) from the dock (see Figure 11-1).
- A second PSO would be placed at a vantage point near Tanani Point that allows monitoring of the area offshore from Lutak Dock and across the inlet, a width of about 0.6 mi (1 km). This location is near the edge of the Level A harassment zone for LFC during impact pile driving as shown in Figure 2 of Appendix A. A third PSO would be placed northwest of the dock near the edge of the Level A harassment zone for LFC as shown in Figure 11-1. Therefore, the outer edge of the largest Level A harassment zone and a majority of the Level B zone for all species (see Figure 1, Appendix A) could be visually monitored by the PSOs. These two PSOs would assess movement of animals within Level A zones including time spent at various distances from the sound source.
- Any marine mammal documented within the Level B harassment zone during pile driving would constitute a Level B take and would be recorded and reported. Given the large size of the Level B zone, it is not practicable to monitor the entire area. Therefore, Level B takes will be calculated by extrapolating based on the number of animals observed.
- As described in Section 11, the waters would be scanned 30 minutes prior to commencing pile driving at the beginning of each day, and prior to commencing pile driving after any stoppage of 30 minutes or greater. If marine mammals enter or are observed within the designated marine mammal shutdown zone during or 30 minutes prior to pile driving, the monitors would notify the on-site construction manager to not begin until the animal has moved outside the designated radius.
- A shutdown zone would be cleared when a marine mammal has not been observed within the zone for a 30-minute period. If a marine mammal is observed within the shutdown zone, a soft-start (described in Section 11) cannot proceed until the marine mammal has left the zone or has not been observed for 30 minutes.
- The waters would continue to be scanned for at least 30 minutes after pile driving has completed each day, and after each stoppage of 30 minutes or greater.
- If a marine mammal is observed within the Level B zone during pile driving, the animal would be carefully monitored. AML would shut down pile driving if an animal is observed within a 200m radius from the dock. The animal would be recorded as a Level A take and its behavior would be reported.

- If pile driving is stopped, pile installation would not commence or would be suspended temporarily if any marine mammals are observed anywhere within the Level A zone.
- Any marine mammal observed approaching their respective Level A zone would have already been exposed to Level B thresholds and would be recorded as a Level B take. PSOs will record animal behaviors for all marine mammals observed within the Level A and Level B zones shown in Tables 6-7 through 6-10.
- If the number of marine mammals exposed to Level B harassment approaches the number of takes allowed by the IHA, AML would notify NMFS and seek further consultation. Due to the size of the Level B harassment zones, the number of takes will be extrapolated based on the number of animals observed during monitoring and the marine mammal densities presented in Table 6-5.
- If any marine mammal species are encountered that are not authorized by the IHA and are likely to be exposed to sound pressure levels greater than or equal to the Level B harassment thresholds, then the AML would shut down in-water activity to avoid take of those species.
- In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as serious injury or mortality (e.g., ship-strike), the PSO would immediately cease the specified activities and immediately report the incident to the NMFS Office of Protected Resources, Chief of the Permits and Conservation Division.

13.2. Data Collection

AML would require that PSOs use approved data forms developed for this Project. Among other pieces of information, the PSOs would record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, the PSOs would attempt to distinguish between the number of individual animals taken and the number of incidents of take. At a minimum, the following information would be collected on the PSO forms:

1. Date and time that monitored activity begins or ends;
2. Construction activities occurring during each observation period;
3. Weather parameters (e.g., percent cover, visibility);
4. Water conditions (e.g., sea state, tide state);
5. Species, numbers, and, if possible, sex and age class of marine mammals;
6. Description of any marine mammal behavior patterns, including bearing and direction of travel, and distance from pile driving activity;

[18] As described in Section 6, PTS would not occur until an animal is exposed to impact pile driving for 15 minutes. Therefore, by shutting down at 10 minutes if the animal is still in the zone, PTS would be avoided.
[19] PTS would only occur during vibratory pile driving if the animal remains in the zone for full workday. Therefore, shutdown at 1 hour is precautionary and avoids PTS.

7. Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
8. Description of implemented mitigation measures (e.g., shutdown or delay);
9. Locations of all marine mammal observations;
10. Estimated takes (note Level B takes will be extrapolated based on number of animals observed and the marine mammal densities shown in Table 6-5); and
11. Other human activity in the area.

13.3. Reporting

A draft report would be submitted to NMFS within 90 days of the completion of marine mammal monitoring, or 60 days prior to the requested date of issuance of any future IHAs for projects at the same location, whichever comes first. The report would include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days, and would also provide descriptions of any behavioral responses to construction activities by marine mammals. It would include a complete description of all work shutdowns and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within 30 days following resolution of comments on the draft report.

The report would include the following information at a minimum:

- General data:
    - Date and time of activity
    - Water conditions (e.g., sea-state)
    - Weather conditions (e.g., percent cover, percent glare, visibility)
- Specific pile driving data:
    - Description of the pile driving activity being conducted (pile locations, pile size, and type), and times (onset and completion) when pile driving occurs.
    - The construction contractor and/or marine mammal monitoring staff would coordinate to ensure that pile driving times and strike counts are accurately recorded. The duration of soft start procedures should be noted as separate from the full power driving duration.
    - Description of in-water construction activity not involving pile driving (location, type of activity, and onset and completion times).
- Pre-activity observational survey-specific data:
    - Date and time survey was initiated and terminated
    - Description of any observable marine mammals and their behavior in the immediate area during monitoring
    - Times when pile driving or other in-water construction was delayed due to presence of marine mammals within the shutdown zone.

- Unanticipated Event such as a Serious Injury or Mortality
- Time, date, and location of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with the PSOs to determine actions necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The PSOs would not be able to resume activities until notified by NMFS via letter, email, or telephone.

In the event that the PSO discovers an injured or dead marine mammal, and the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition), the PSO would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Stranding Coordinator, Juneau, Alaska.

The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with the observer to determine whether modifications in the activities are appropriate.

In the event that the PSO discovers an injured or dead marine mammal, and the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, or by email to the Alaska Stranding Coordinator, within 24 hours of the discovery. The PSO would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

14. SUGGESTED MEANS OF COORDINATION

Project activities would be conducted in accordance with all federal, state, and local regulations. This would minimize the likelihood that impacts could occur to the species, stocks, and subsistence use of marine mammals in Upper Lynn Canal. AML would cooperate with NMFS as well as other appropriate federal and state agencies throughout all phases of the Project.

AML would also cooperate with any other marine mammal monitoring and research programs that may take place in the Upper Lynn Canal area during construction at the Lutak Dock. If requested, AML would provide any marine mammals monitoring data and behavioral observations collected during construction activities to other researchers. Results of monitoring efforts would be provided to NMFS in a draft summary report within 90 calendar days of the conclusion of monitoring (See Section 13). This information could be made available to regional, state, and federal resource agencies, universities, and other interested private parties upon written request to NMFS.

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APPENDIX A

Marine Mammal Noise Impact Assessment

Alaska Marine Lines

Lutak Dock Project

global environmental solutions

Alaska Marine Lines
Lutak Dock Project

Marine Mammal Noise Impact Assessment

SLR International Corporation Ref. 105.02166.19001 Task 0003

September 2019
SLR Consulting (Canada) Ltd. Project No.: 201.19052.00000

ALASKA MARINE LINES

LUTAK DOCK PROJECT

MARINE MAMMAL NOISE IMPACT ASSESSMENT

SLR International Corporation Project No.: 105.02166.19001 Task 0003

SLR Consulting (Canada) Ltd. Project No.: 201.19052.00000

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EXECUTIVE SUMMARY

This report describes the potential underwater noise generated by the Lutak Dock Project in Haines, Alaska. Alaska Marine Lines (AML) proposes to replace the degraded roll-on-roll off (RoRo) ramp located on the west side of the existing Lutak Dock. Construction scenarios with the potential for noise generation have been identified and quantitatively assessed.

Guidance from the National Marine Fisheries Service (NMFS) on noise thresholds for behavioral effects has been applied. These interim behavioral effect thresholds as applied by NMFS are based on broadband unweighted sound levels, and do not account for differences between species in hearing ranges and sensitivity to noise at different frequencies. These thresholds are conservative – many natural and anthropogenic noise sources can cause noise levels above these thresholds, often with no adverse behavioral effects to marine mammals.

At higher exposure levels, noise can induce a permanent or temporary reduction in marine mammal hearing sensitivity, i.e. Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS). The potential for PTS has been assessed following guidance provided by the National Oceanic and Atmospheric Administration (NOAA), including consideration of species-specific hearing sensitivity through use of marine mammal frequency weighting functions (M-weighting).

Impact pile driving has the highest potential to cause PTS, and then only if marine mammals remain in proximity to the noise source for extended periods of time. In practice, the potential for PTS would depend on the likelihood of animals being present within the identified distances from the noise source. The behaviour of individual animals in response to noise is also a factor. PTS would not occur if an animal moved away from the noise source during a 24-hour work period, or if an animal did not remain underwater for the full duration of active noise generation.

The interpretation of these results to inform an Incidental Harassment Authorization (IHA) application for the AML Lutak Dock Project should acknowledge inherent uncertainties in prediction of underwater noise. While the thresholds used in this assessment follow guidance provided by the National Oceanic and Atmospheric Administration (NOAA), it is recognized that variation in the responses of different species and individual animals to noise will occur.

Summary of distances to noise thresholds

Activity	Behavioral Disturbance (Level B) All Species	PTS (Level A)				
		Humpback + Minke Whales	Killer Whales	Harbor + Dall's Porpoise	Harbor Seals	Stellar Sea Lions
Vibratory Driving	46.4 km (28.8 miles)*	171 m (560 ft)	15 m (50 ft)	253 m (830 ft)	104 m (340 ft)	7 m (25 ft)
DTH Driving	25.1 km (15.6 miles)*	105 m (345 ft)	6 m (20 feet)	92 m (302 ft)	56 m (184 ft)	4 m (13 ft)
Combination of Vibratory + DTH driving	46.4 km (28.8 miles)*	200 m (656 ft)	18 m (59 ft)	296 m (971 ft)	122 m (400 ft)	9 m (30 ft)
Impact Driving	1.8 km (1.1 miles)	2.3 km (1.4 miles)	82 m (270 ft)	2.7 km (1.7 miles)	1.2 km (0.8 miles)	80 m (300 ft)

*Lutak Inlet is smaller than this, therefore extent of actual impacts will be constrained by land.

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1.0 INTRODUCTION

1.1 Project description

Alaska Marine Lines (AML) proposes to replace the degraded roll-on-roll off (RoRo) ramp located on the west side of the existing Lutak Dock near Haines, Alaska; referred to as the Project (Figure 1).

Construction of the Project will include placement of steel pipe piles for dolphins and RoRo ramp support, and placement of fill for construction of the access causeway. Prior to the construction of the new facility the existing steel cargo bridge (RoRo ramp) and the float facility currently used for barge cargo operations would be removed. Twelve existing 16-inch (in) steel piling dolphins associated with the current RoRo ramp would either be removed with a vibratory pile driver or cut off at the mudline. Four 24-inch diameter and six 36-inch diameter piles would be driven into the sea floor.

The Action Area assessed for this Project is distinct from and larger than the dock footprint because some elements of construction may affect marine mammal species at relatively large distances from the activity due to underwater sound propagation away from the source. The Action Area extends from the dock to the point where marine mammals would no longer be affected by the underwater sounds produced by the Project and is based on thresholds for potential disturbance to marine mammals as defined in the NMFS Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS, 2018).

Elements of the Project that generate noise that may disturb marine mammals include vibratory pile driving, impact pile driving, and Down The Hole (DTH) hammer drilling/driving.

Vibratory pile driving and DTH drilling/hammering are considered continuous or non-pulsed sound sources, while impact pile-driving produces impulsive sound. The two sound types are differentiated because they have different potential to cause physical effects.

The marine mammal species of interest for this study with the potential to be affected by underwater noise are humpback whales, minke whales, Stellar sea lions, harbor porpoise, Dall's porpoise, harbor seals and killer whales.

A summary of acoustic acronyms and terminology used in this report is provided in Appendix A.

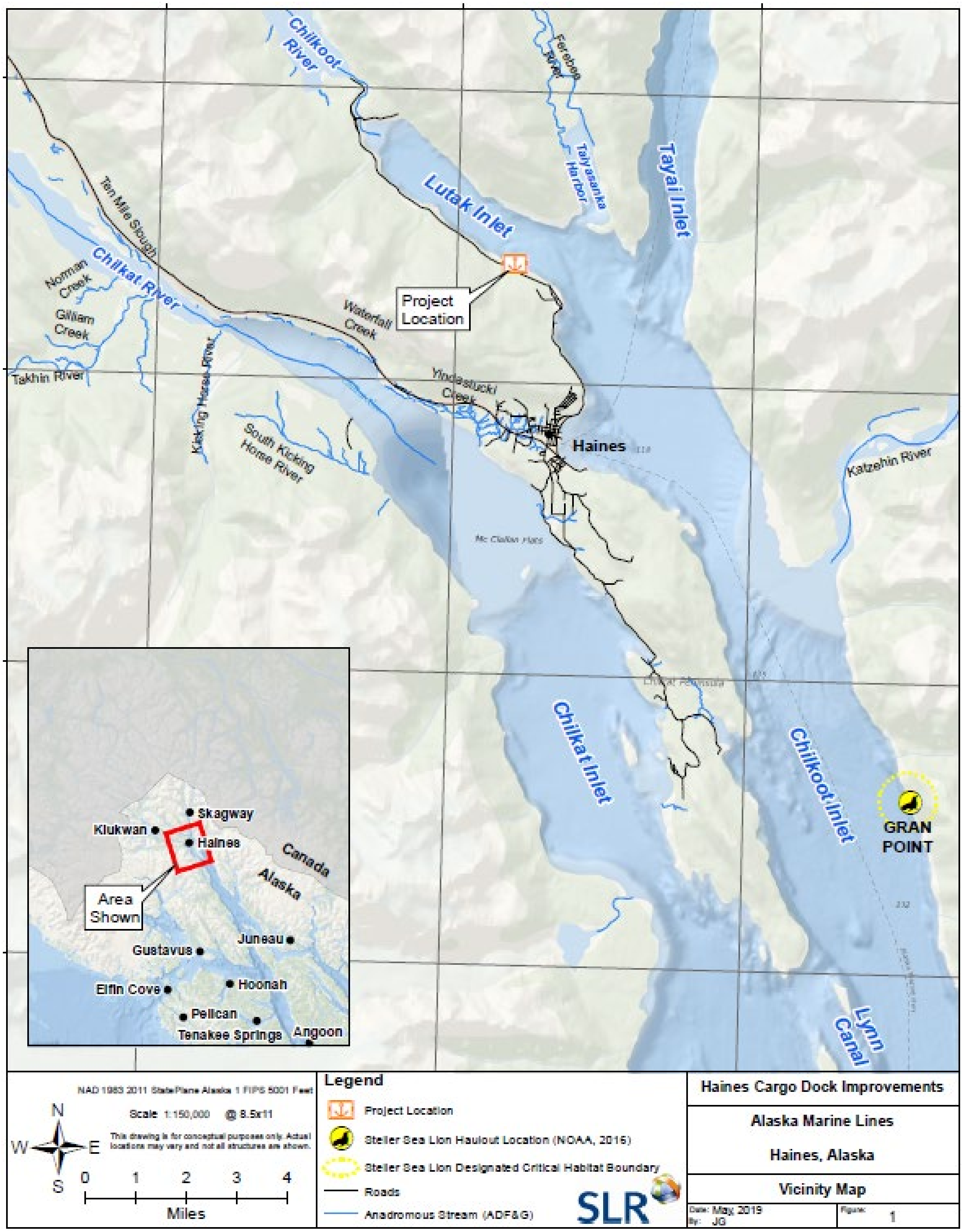

Figure 1: Lutak Inlet and the AML project site

1.2 Noise assessment overview and objectives

In order to provide an objective and quantitative assessment of project related noise levels, it is necessary to be able to estimate, measure or predict the following parameters:

- The source noise level and its temporal and spectral characteristics.
- The rate at which sound from the source is attenuated as it propagates underwater.
- The hearing bandwidth or sensitivity of the species in question.
- The noise threshold, that is, the level of sound at which a particular effect such as behavioural change, hearing damage or injury is experienced by a particular species.

The first two parameters define the sound level at all points in the water for the various construction activities. The hearing bandwidth and noise threshold are used to indicate the potential effects of noise on marine mammals and will differ for different species.

The potential effect of man-made noise on an animal depends on the level of noise exposure. At moderate exposure levels, noise may cause a change in animal behaviour. At higher exposure levels, noise can induce a temporary or permanent reduction in hearing sensitivity, i.e. temporary threshold shift (TTS) or permanent threshold shift (PTS). The effect of noise exposure generally depends on a number of factors relating to the physical and spectral characteristics of the sound (*e.g.*, the intensity, peak pressure, frequency, duration, duty cycle), and relating to the animal under consideration (*e.g.*, hearing sensitivity, age, gender, behavioural status, prior exposures). The type and level of the impact also depends on whether the noise consists of single-pulse, multiple-pulse or non-pulsed continuous sounds.

1.3 Existing noise environment

The underwater acoustic environment in the Action Area is expected to be dominated by ambient noise from day-to-day ferry terminal, port, and vessel activities. Ambient underwater noise levels in the immediate area are expected to be variable and intermittently high as vessel traffic enters and leaves the area. The dock is a multi-use facility and is the second busiest Alaska Marine Highway System (AMHS) port of call, with up to four ferry arrivals and departures alone during any given day in summer. Additional use of the dock by barges and cargo vessels adds to ambient noise levels.

1.4 Noise assessment guidance and assessment thresholds

The Lutak Dock Project has the potential to generate noise in areas occupied by marine mammals. For noise impact assessment purposes, all marine mammals are categorized into 5 hearing groups, Low, Mid and High-frequency Cetaceans as well as Phocid and Otariid Pinnipeds. Guidance on acoustic thresholds for marine mammal injury and disturbance are provided by the National Oceanic and Atmospheric Administration (NOAA) NMFS.

NMFS has released the 2018 Revision to: *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (Version 2.0)* NMFS-OPR-59. This Technical Guidance provides acoustic thresholds to help quantify potential for PTS and TTS, but does not represent the entirety of a comprehensive effects analysis. Other factors and thresholds such as behavioral impact thresholds should also be considered in attempting to understand the ultimate effects of any particular type of impact on individual animals and populations.

As it is a permanent auditory injury, the onset of PTS may be considered an example of ‘‘Level A harassment’’ as defined in the Marine Mammal Protection Act (MMPA). TTS is by definition recoverable rather than permanent and has historically been treated as ‘‘Level B harassment’’ under the MMPA. Behavioral effects may also constitute Level B harassment and are expected to occur at even lower noise levels than would generate TTS. For this reason, predicted noise levels are not assessed against TTS thresholds in this study.

The recent Technical Guidance (NMFS, 2018) contains thresholds that may be applied to identify the potential for PTS. A dual metric approach is used for impulsive sounds, considering both cumulative sound exposure level and peak sound level. For non-impulsive sounds, only the cumulative sound exposure level is used (unless the impulsive peak level threshold is exceeded). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS, 2018). The generalized hearing range of each hearing group is reproduced in Table 1. The PTS thresholds corresponding to each hearing group are shown in Table 2.

Table 1: Marine mammal hearing groups (NMFS, 2018)

Hearing Group	Generalized Hearing Range
Low-frequency cetaceans	7 Hz to 35 kHz
Mid-frequency cetaceans	150 Hz to 160 kHz
High-frequency cetaceans	275 Hz to 160 kHz
Phocid pinnipeds	50 Hz to 86 kHz
Otariid pinnipeds	60 Hz to 39 kHz

Humpback and minke whales are low-frequency cetaceans. Killer whales are mid-frequency cetaceans. Harbor porpoises and Dall’s porpoises are high frequency cetaceans. Harbor seals are Phocid pinnipeds and steller sea lions are Otariid pinnipeds.

Table 2: Underwater acoustic thresholds for PTS onset

Hearing Group	PTS Onset Acoustic Thresholds (Received Level)		
	Impulsive (Peak, L_{pk}, flat)	Impulsive (cumulative weighted, $L_{E, 24h}$)	Non-impulsive (cumulative weighted, $L_{E, 24h}$)
Low-frequency cetaceans	219 dB	183 dB	199 dB
Mid-frequency cetaceans	230 dB	185 dB	198 dB
High-frequency cetaceans	202 dB	155 dB	173 dB
Phocid pinnipeds	218 dB	185 dB	201 dB
Otariid pinnipeds	232 dB	203 dB	219 dB

Notes: Peak sound pressure (Lpk) has a reference value of 1 µPa and is “flat” or unweighted.
Cumulative sound exposure level (LE) has a reference value of 1µPa^{2}s.
LE received levels should be appropriately weighted for the hearing group for assessment to the thresholds.

The NMFS interim underwater thresholds for behavioral effects are shown in Table 3.

Table 3: Interim underwater acoustic thresholds for behavioral disruption

Criterion Definition	Threshold
Behavioral disruption for impulsive noise (e.g., impact pile driving)	160 dB_{rms}
Behavioral disruption for non-impulsive noise (e.g., vibratory pile driving, drilling)	120 dB_{rms}

Notes: dB referenced to 1 micro Pascal (re: 1μPa).
All thresholds are based off root mean square (rms) levels and are broadband (unweighted).
The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level.

The objective of this quantitative noise modelling assessment is to identify the areas with noise potentially above the interim underwater thresholds for marine mammal behavioral disruption, and above the PTS onset thresholds where applicable.

2.0 NOISE SOURCES AND ASSESSMENT METHODOLOGY

2.1 Noise sources and scenarios

The construction activities, equipment and scenarios with the potential for noise disturbance to wildlife are vibratory pile driving or extracting, impact pile driving and DTH drilling/driving. If the existing piles are cut off at the mudline rather than being removed by vibratory extraction, this would be completed using hand tools and it is assumed the noise impacts would be considerably less than if a vibratory rig is used to extract the piles.

Details of the maximum number of piles that may be installed in any one day have been provided by AML. Source levels for each noise source and scenario were determined by a review of the literature. At Lutak Dock, noise generated may be slightly different depending on the details of equipment used, substrate conditions, and propagation factors.

Table 4 gives the source specific information used to calculate the distances to the various noise impact thresholds for the three activities considered. Source levels for vibratory and impact pile driving were obtained from Caltrans (2015), with DTH drilling source levels from Denes *et al.* (2016). The source levels given are conservative assuming a 36-inch pile installation (noise levels during installation of smaller piles are expected to be slightly less than the assumed source levels).

Table 4: Noise source levels and scenarios

	Vibratory pile driving or extracting	DTH Drilling/Driving	Impact pile driving
Source Level	175 dB (RMS SPL)	171 dB (RMS SPL)	210 dB (PK SPL) 183 dB (Single Strike SEL) 193 dB (RMS SPL)
Source Level Reference	Caltrans (2015)	Denes et al (2016)	Caltrans (2015)
Maximum number of piles within 24-h period	5	2	5
Active noise duration/number of strikes to drive a single pile	60 minutes	180 minutes	700 strikes

2.2 Geometric spreading loss model

Underwater noise propagation models predict the sound transmission loss between the noise source and the receiver. When the source level (SL) of the noise source is known, the predicted transmission loss (TL) is then used to predict the received level (RL) at the receiver location as:

$$\mathrm{RL} = \mathrm{SL} - \mathrm{TL}$$

The transmission loss between two distances D1 and D2 may be described by a logarithmic relationship with an attenuation factor x:

$$\mathrm{TL} = x \cdot \log(D_1/D_2)$$

If all losses due to factors other than geometric spreading are neglected, then the transmission loss would be wholly due to spherical spreading (in deep water) or cylindrical spreading (in shallow water, bounded above and below). Spherical spreading means underwater noise would attenuate by 6 dB with each doubling of distance, or x = 20. Cylindrical spreading means an attenuation of 3 dB with each doubling of distance, or x = 10.

Guidance provided by the California Department of Transportation (Caltrans, 2015) indicates that in practical cases the attenuation factor can range from 5 up to 30. A "practical spreading loss model" based on an attenuation factor of 15 for sound transmission in the near shore is commonly assumed (NMFS, 2012).

The companion user spreadsheet to NMFS (2018) was used to calculate practical spreading losses for this assessment. The relevant spreadsheet pages are attached as Appendix B.

2.3 Summary of conservative assumptions in approach to this study

Underwater noise modelling inherently involves a simplified representation of a complex physical system. The practical spreading loss model used in this assessment is based on a series of assumptions. The interpretation of the effect of a particular noise level on a species also requires simplifications and assumptions. Since the objective of the study is a precautionary investigation into the potential effects of noise generated by the Lutak Dock Project, the model assumptions tend to be conservative. Table 5 provides a summary of the main conservative assumptions incorporated in the approach applied to this study.

Table 5: Conservative assumptions in approach to this study

Component	Assumption	Discussion
Behavioral noise effect thresholds	Broadband overall noise level thresholds	The NMFS interim thresholds are considered to be conservative. Natural noise sources can at times result in ambient noise levels above the thresholds. Marine mammals are grouped based on their respective sensitivity to noise levels across the frequency spectrum and appropriate weightings are applied to calculate specific isopleths. A noise level above the behavioral threshold indicates a potential for a behavioral response to noise – it does not necessarily equate to an adverse effect on an individual marine mammal or a population.
PTS noise effect thresholds	PTS onset thresholds	NMFS (2018) note that no direct measurements of marine mammal PTS have been published. The PTS onset acoustic thresholds recommended by NMFS have been extrapolated from marine mammal TTS measurements using a conservative assumed offset from TTS thresholds.
Representation of noise sources	Omni-directional noise sources and propagation	The model assumes each source generates noise propagating equally in all directions. In practice many sources are directional, and propagation can vary.
	Point source representation	Representing noise sources as points results in an overestimation of noise levels in the near field. This is particularly relevant to the assessment of PTS, where effects identified as potentially occurring close to the source are likely to be based on overestimates of the actual noise level.
Noise duration for behavioral effects	Duration of noise has no influence on behavioral response	Many noise sources including pile driving are transitory or relatively short-term. The noise from these activities may only affect a particular area for a relatively short time in any 24-hour period. This study identifies areas with potential for behavioral effects without any adjustment for reduced disturbance due to short duration activities.

3.0 UNDERWATER NOISE MODELLING RESULTS & DISCUSSION

3.1 Distances to behavioral disturbance interim thresholds

In Table 6, the distances to behavioural disturbance thresholds are shown for the construction activities associated with the Lutak Dock Project.

Table 6: Distance to Level B Behavioural Disturbance Threshold

Disturbance Threshold (dB RMS)	Activity	Scenario (pile diameter)	Source (dB re 1µPA) @ 10 m	Source Type	Distance to Threshold
120	Vibratory Driving	24-36 inch	175	Continuous	46.4 km (28.8 miles)
160	Impact Driving	24-36 inch	194	Impulsive	1.8 km (1.1 miles)
120	DTH Drilling	24-36 inch	171	Continuous	25.1 km (15.6 miles)

Due to enclosed nature of Lutak Inlet as shown in Figure 1 the propagation of noise in all directions will encounter land before noise levels reduce below the 120 dB RMS threshold for “continuous” source types.

Noise from impact pile driving is “impulsive” in nature and the threshold is 160 dB RMS (see Table 6). The noise levels from impact pile driving are predicted to exceed the behavioural disturbance thresholds distances beyond about 1.1 miles (1850 m). Note that the thresholds for behavioural disturbances are unweighted with respect to marine mammals hearing capabilities and as such are applicable to all marine mammal species.

3.2 Distances to PTS thresholds

Table 7 and Table 8 show the calculated distances to the weighted PTS thresholds for continuous noise sources (vibratory pile driving, DTH) and impulsive impact pile driving, for the marine mammal hearing groups of interest. Also shown in Table 7 is a “combined scenario” with a combination of vibratory pile driving (4 piles, 4 hours active noise) and DTH driving (2 piles, 6 additional hours active noise generation) on the same day.

Table 7: Distances to weighted PTS thresholds for continuous noise sources

Activity / Scenario	Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
	$SEL_{cum\ (24\ h)}$ Threshold	199 dB re 1µPa²·s	198 dB re 1µPa²·s	173 dB re 1µPa²·s	201 dB re 1µPa²·s	219 dB re 1µPa²·s
Vibratory Driving or Extracting	**Distance to SEL_{cum} Threshold**	171 m (560 feet)	15 m (50 feet)	253 m (830 feet)	104 m (340 feet)	7 m (25 feet)
DTH driving/drilling	**Distance to SEL_{cum} Threshold**	105 m (345 feet)	6 m (20 feet)	92 m (302 feet)	56 m (184 feet)	4 m (13 feet)
Combined Vibratory + DTH	**Distance to SEL_{cum} Threshold**	200 m (656 ft)	18 m (59 ft)	296 m (971 ft)	122 m (400 ft)	9 m (30 ft)

Table 7 shows that the potential zone of PTS for Stellar sea lions (Otariid Pinnipeds) and killer whales (mid-frequency cetaceans) is relatively small for both the continuous noise sources, 60 feet or less. For humpback and minke whales (low frequency cetaceans) the distance to the PTS threshold is 656 feet for the combined vibratory piling and DTH scenario. For harbor and Dall's porpoise (high frequency cetaceans) the distance to the PTS threshold is just under 1000 ft feet for the combined vibratory piling and DTH scenario. For harbor seals (phocid pinnipeds) the maximum distance to the PTS threshold is 400 feet.

Table 8: Distances to weighted PTS thresholds for impulsive noise sources

Activity / Scenario	Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
	$SEL_{cum\ (24\ h)}$ Threshold	183 dB re 1μPa²·s	185 dB re 1μPa²·s	155 dB re 1μPa²·s	185 dB re 1μPa²·s	203 dB re 1μPa²·s
	PK Threshold	219 dB re 1μPa	230 dB re 1μPa	202 dB re 1μPa	218 dB re 1μPa	232 dB re 1μPa
Impact Pile Driving or Extracting	Distance to SEL_{cum} Threshold	2.3 km (1.4 miles)	82 m (270 feet)	2.7 km (1.7 miles)	1.2 km (0.8 miles)	80 m (300 feet)
	Distance to PK Threshold	3 m (8 feet)	n/a	34 m (250 feet)	3 m (8 feet)	n/a

Table 8 shows that the potential zone of PTS for Stellar sea lions (Otariid Pinnipeds) and killer whales (mid-frequency cetaceans) is relatively small for impact piling, around 300 feet or less. For humpback and minke whales (low frequency cetaceans) the distance to the PTS threshold is around 1.4 miles (2.3 km). For harbor and Dall's porpoise (high frequency cetaceans) the distance to the PTS threshold is around 1.7 miles for impact piling. For harbor seals (Phocid pinnipeds) it is 0.8 miles. The zones of potential PTS for impact pile driving are controlled by the cumulative noise effects. There is no potential for PTS to Stellar sea lions or killer whales as a result of peak noise levels from individual strikes during impact piling. Harbor seals, humpbacks and minke whales would need to be unfeasibly close (within 8 feet of the pile) for potential PTS due to peak noise. A harbor porpoise or Dall's porpoise would need to be within 250 feet of the source for potential PTS due to peak noise.

3.3 Discussion of potential for Cumulative PTS

As described above, there is very low potential for PTS due to the peak noise level from single impact pile driving strikes. The potential for PTS due to cumulative noise exposure has been calculated for all noise sources including combinations of sources over 24 hours. As described in the recent Technical Guidance (NMFS, 2018), for PTS to occur due to cumulative noise exposure an individual animal would need to remain in proximity to the noise source for a sufficiently long time. The shorter the distance to the PTS threshold, the smaller the volume of water an individual animal would need to remain in for 24 hours or the full duration of the work day. With reference to the project geometry in Figure 1 we can consider ranges of 1-100 m from the source very unlikely for PTS onset. Ranges from 100 m to 500 m are possible for PTS, but unlikely as animals would normally be expected to move around over larger distances in the time frame. At identified PTS ranges beyond 500 m PTS is possible and the presence of species belonging to the relevant hearing group should be monitored.

Considering these factors, the realistic potential for PTS from vibratory pile driving and DTH driving/drilling is low for all species of interest as in the worst-case scenario they would need to remain within about 1000 feet (300 m) of the noise source for a full work day or 24-hour period. There is theoretical potential for PTS to humpback whales, minke whales, harbor porpoise, Dall's porpoise and harbor seals during impact pile driving if these remain within the identified distance from the noise source for a full work day or 24-hour period.

Figures showing the extent of the various zones of acoustic impact for each activity are attached as Appendix C.

4.0 SUMMARY AND CONCLUSIONS

This report documents the potential underwater noise levels during construction of the Lutak Dock Project by Alaska Marine Lines (AML). It includes details of the source noise characteristics of various noise-generating activities.

The assessment objectives and the various scenarios have prompted the analysis of three different scenarios: Vibratory pile driving/extracting, DTH pile driving and Impact pile driving.

The assessment indicates that vibratory and DTH pile driving will ensonify the Action Area (i.e. Lutak Inlet) above the 120 dB RMS behavioral disturbance threshold for continuous noise sources. For impact pile driving the corresponding 160 dB RMS behavioral disturbance threshold will be exceeded at distances out to 1.1 miles.

The only scenario with moderate potential for PTS onset is impact pile driving. In practice, the potential for PTS would depend on the likelihood of particular species being present within the identified distances from the noise source, and on the behaviour of the individual animal in response to noise. PTS would not occur if an animal moved more than 1.7 miles from the noise source during the work day, or if an animal did not remain underwater for the full duration of active noise generation.

This precautionary investigation is intended to identify the potential extent of noise generated by the project, to inform an Incidental Harassment Authorization (IHA) application for the AML Lutak Dock Project.

The interpretation of these results should acknowledge inherent uncertainties in prediction and measurement of underwater noise levels. In particular, the interpretation of underwater noise levels in terms of the resulting effects on marine mammals is a developing field of research. While the noise thresholds used in this assessment follow guidance provided by the National Oceanic and Atmospheric Administration (NOAA), it is recognized that variation in the responses of different species and individual animals to noise are likely.

5.0 REFERENCES

Caltrans [2015]. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish, California Department of Transportation.

Denes, S., A. MacGillivray, and G. Warner [2016]. Alaska DOT Hydroacoustic Pile Driving Noise Study: Auke Bay Monitoring Results. JASCO Document 01133, Version 2.0. Technical report by JASCO Applied Sciences for Alaska Department of Transportation and Public Facilities.

NMFS [2012]. Guidance Document: Sound propagation modeling to characterize pile driving sounds relevant to marine mammals. U.S. Dept. of Commerce, NOAA, NMFS Northwest Region and Northwest Fisheries Science Center. Memorandum.

NMFS [2018]. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing: Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts (Version 2.0). U.S. Dept. of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59.

6.0 STATEMENT OF LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by SLR Consulting (Canada) Ltd. (SLR) for Alaska Marine Lines, hereafter referred to as the “Client”. It is intended for the sole and exclusive use of the Client. The report has been prepared in accordance with the Scope of Work and agreement between SLR and the Client. Other than by the Client and as set out herein, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted unless payment for the work has been made in full and express written permission has been obtained from SLR.

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1. 201.19052.00000 Noise Modelling AML Rev1 2019-09-11.Docx

APPENDIX A
Acronyms and Terminology

Alaska Marine Lines
Lutak Dock Project
Marine Mammal Noise Impact Assessment
SLR International Corporation Project No.: 105.02166.19001 Task 0003
SLR Consulting (Canada) Ltd. Project No.: 201.19052.00000

APPENDIX A

ACRONYMS AND TERMINOLOGY

μPa	MicroPascal
μPa^2-s	MicroPascal squared second
dB	Decibel
dB re 1 μPA rms	Decibels relative to 1 microPascal root mean square
DTH	Down The Hole
HF	High-frequency
Hz	Hertz
IHA	Incidental Harassment Authorization
kHz	kilohertz
LE_{24h}	Cumulative sound exposure level
LF	Low-frequency
Lpk	Peak sound pressure
m	Meter(s)
MF	Mid-frequency
MMPA	Marine Mammal Protection Act
OW	Otariid pinnipeds
Pa	Pascals
PK	Peak sound level
PTS	Permanent Threshold Shift
PW	Phocid pinnipeds
RL	Received level
rms	Root mean square
rms SPL	Root-mean-square Sound Pressure Level

SEL	Sound exposure level
SEL_{cum}	Cumulative sound exposure level
SL	Source level
SPL	Sound pressure level
TL	Transmission loss
TS	Threshold Shift
TTS	Temporary Threshold Shifts
WFA	Weighting factor adjustments

APPENDIX B
NMFS Transmission Loss Calculations

Alaska Marine Lines
Lutak Dock Project
Marine Mammal Noise Impact Assessment
SLR International Corporation Project No.: 105.02166.19001 Task 0003
SLR Consulting (Canada) Ltd. Project No.: 201.19052.00000

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.0: 2018

KEY

(green)	**User Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AML Haines Dock - vib piling
PROJECT/SOURCE INFORMATION	Caltrans (2015), also similar to Denes (2016)

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	Default vib piling

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (RMS SPL)	175
Number of piles within 24-h period	5
Duration to drive a single pile (minutes)	60
Duration of Sound Production within 24-h period (seconds)	18000
10 Log (duration of sound production)	42.55
Propagation (xLogR)	15
Distance from source level measurement (meters)[+]	10

[+]Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**171.3**	**15.2**	**253.2**	**104.1**	**7.3**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.0: 2018

KEY

	User Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AML Haines Dock - Drilling
PROJECT/SOURCE INFORMATION	Denes et al (2016)

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2	Drilling default

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (RMS SPL)	171
Number of piles within 24-h period	2
Duration to drive a single pile (minutes)	180
Duration of Sound Production within 24-h period (seconds)	21600
10 Log (duration of sound production)	43.34
Propagation (xLogR)	15
Distance from source level measurement (meters)[+]	10

[+]Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**105.3**	**5.9**	**92.3**	**56.3**	**4.1**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.0: 2018

KEY

(green)	**User Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AML Haines Dock - vib piling+ DTH
PROJECT/SOURCE INFORMATION	Source here is log average of 4 hours of vib piling plus 6 hours of DTH, applied over 10 hours to assess combined activity

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2.5	Default vib piling

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (RMS SPL)	173
Number of piles within 24-h period	10
Duration to drive a single pile (minutes)	60
Duration of Sound Production within 24-h period (seconds)	36000
10 Log (duration of sound production)	45.56
Propagation (xLogR)	15
Distance from source level measurement (meters)⁺	10

⁺Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**200.0**	**17.7**	**295.7**	**121.6**	**8.5**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.0: 2018

KEY

	User Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AML Haines Dock - Impact piling
PROJECT/SOURCE INFORMATION	Caltrans (2015), also similar to Denes (2016)

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2	default - impact piling

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 75), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: Choose either E1-1 OR E.1-2 method to calculate isopleths (not required to fill in sage boxes for both)

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Source Level (RMS SPL)	n/a
Number of piles per day	
Strike Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Propagation (xLogR)	
Distance of source level measurement (meters)[+]	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

[+]Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	n/a
Distance of source level measurement (meters)[+]	
Source level at 1 meter	#VALUE!

[+]Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**

E.1-2: ALTERNATIVE METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	218.4

SEL_{cum}

Source Level (Single Strike SEL)	183
Number of strikes per pile	700
Number of piles per day	5
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)⁺	10

⁺Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	210
Distance of source level measurement (meters)⁺	10
Source level at 1 meter	225.0

⁺Unless otherwise specified, source levels are referenced 1 m from the source.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	2,302.1	81.9	2,742.1	1,232.0	89.7
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	2.5	NA	34.1	2.9	NA

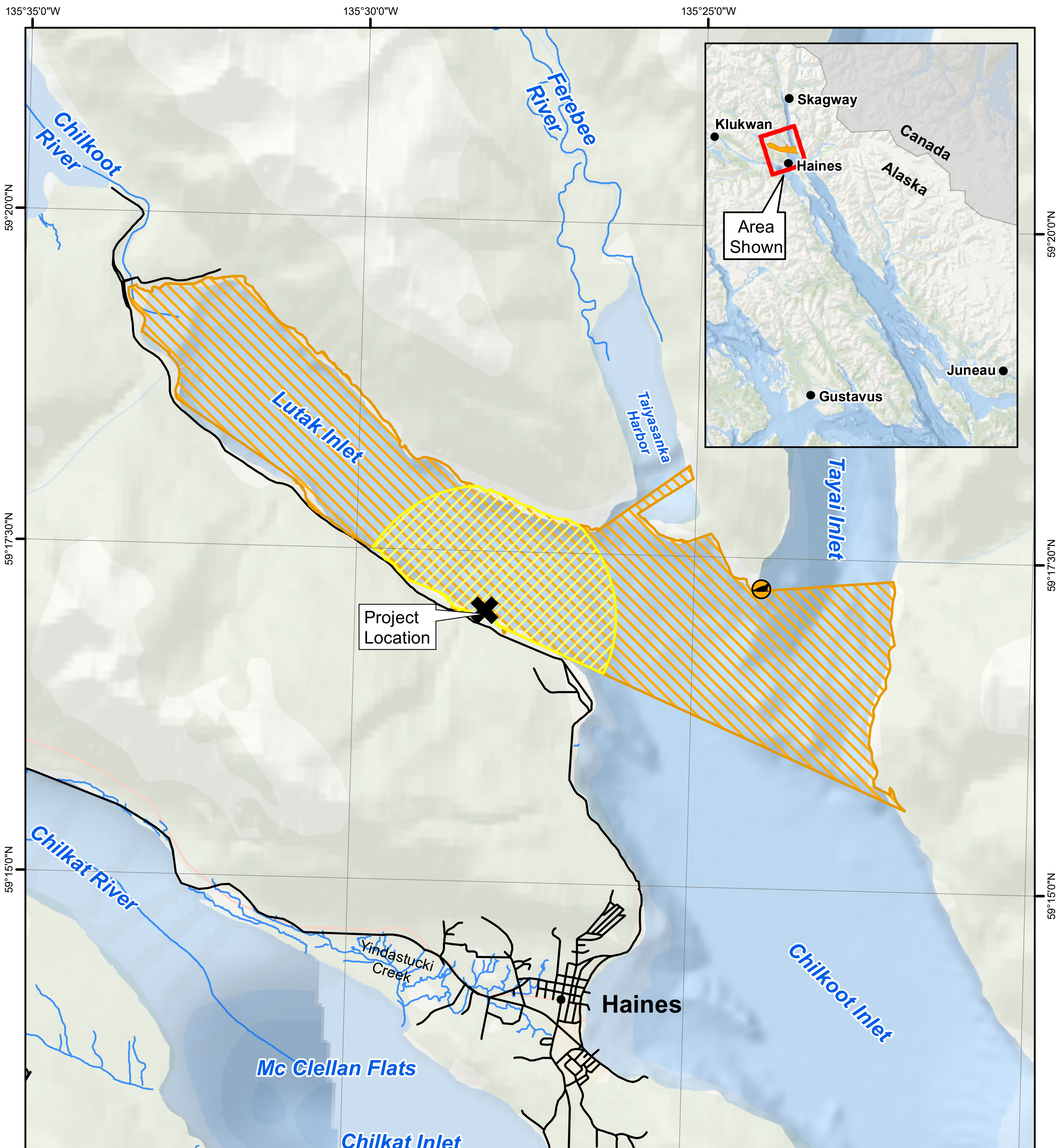
WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	-0.01	-19.74	-26.87	-2.08	-1.15

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a\,[1+(f/f_2)^2]^b}\right\}$$

APPENDIX C
Noise Exposure Extent Figures

Alaska Marine Lines
Lutak Dock Project
Marine Mammal Noise Impact Assessment
SLR International Corporation Project No.: 105.02166.19001 Task 0003
SLR Consulting (Canada) Ltd. Project No.: 201.19052.00000



NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

Scale 1:70,000 @ 8.5x11

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

N W E S

0 0.5 1 1.5 2 Miles

Legend

- Project Location - Noise Source
- Impact Pile Driving
- Vibratory Driving and DTH
- Roads
- Anadromous Stream (ADF&G)
- Harbour Seal Haulout Location (NOAA, 2019)

SLR

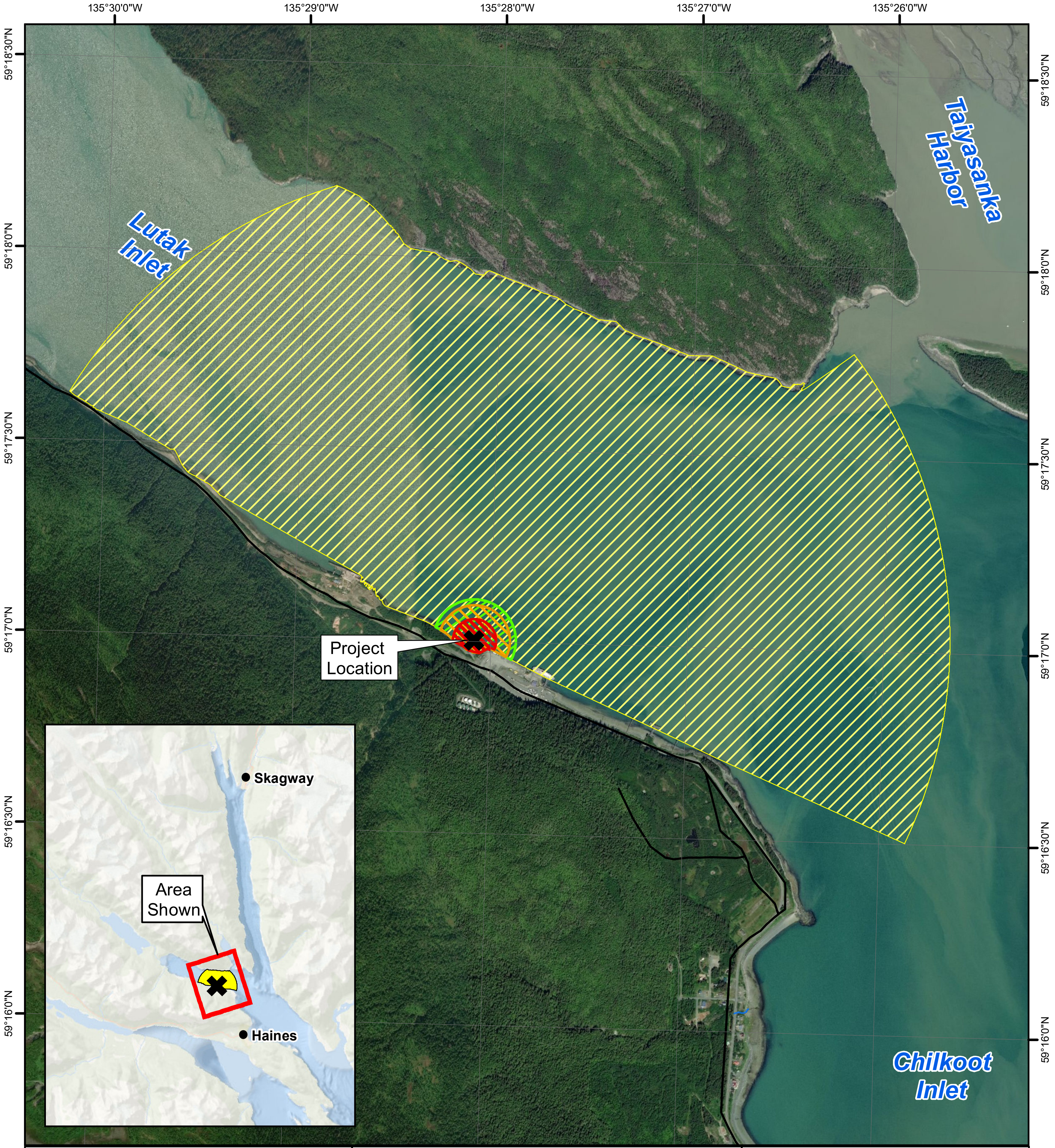
Haines Cargo Dock Improvements

Alaska Marine Lines
Haines, Alaska

Behavioral Disturbance Zones

Date: June, 2019
By: JG
Figure: 1

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig1_r1.mxd



NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

Scale 1:24,000 @ 8.5x11

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

N W E S

0 0.1 0.2 0.3 0.4 0.5

Miles

Legend

- Project Location - Noise Source
- DTH
- Vibratory driving
- Combined DTH + Vibratory Driving
- Impact piling

SLR

Haines Cargo Dock Improvements

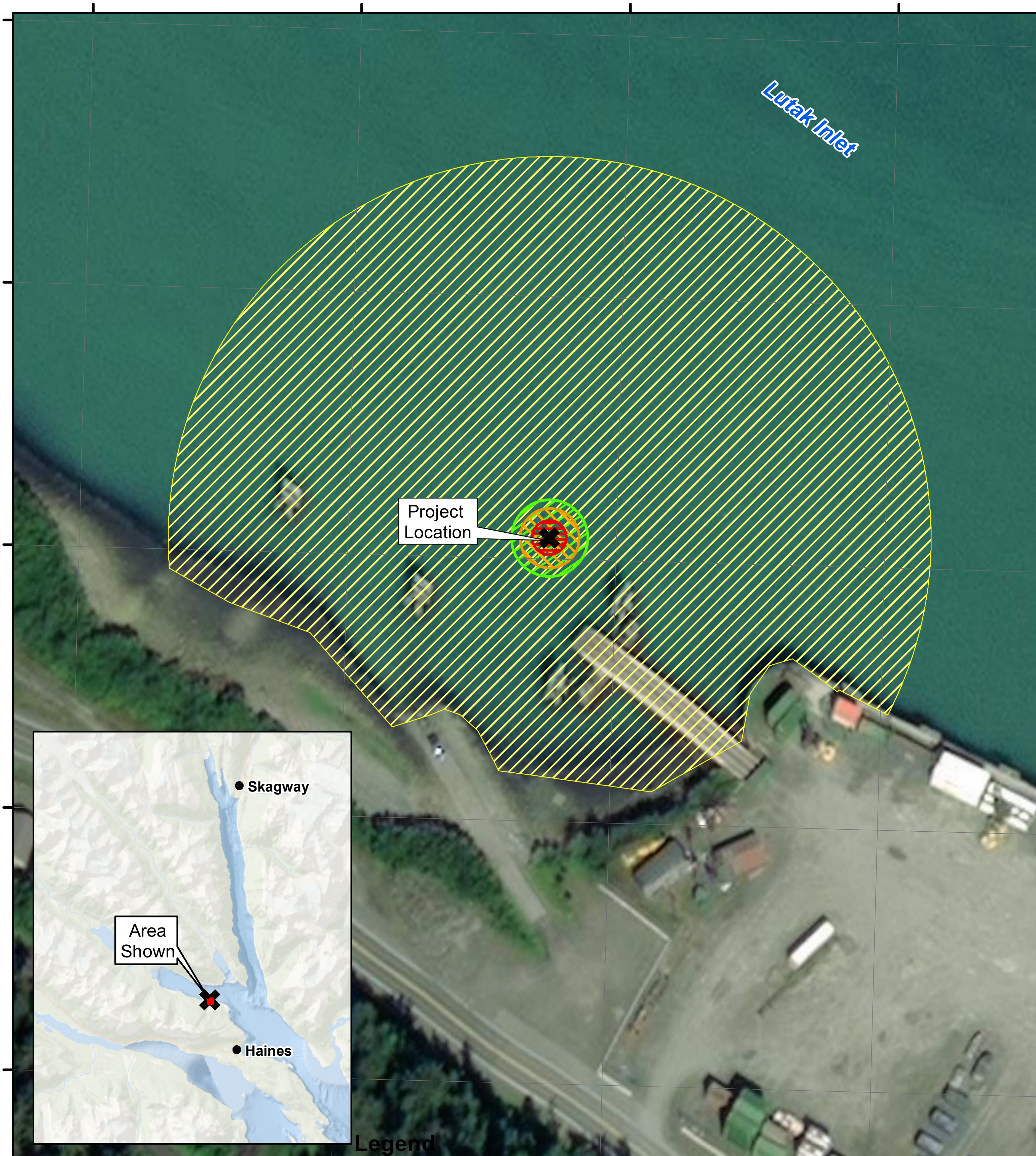
Alaska Marine Lines
Haines, Alaska

Potential PTS Areas – Low Frequency Cetaceans

Date: September, 2019
By: JG

Figure: 2

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig2_r2.mxd



NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

Scale 1:1,200 @ 8.5x11

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

N W E S

0 50 100 150 200
Feet

- Project Location - Noise Source
- DHT
- Vibratory Driving
- Combined DTH + Vibratory Driving
- Impact Piling

SLR

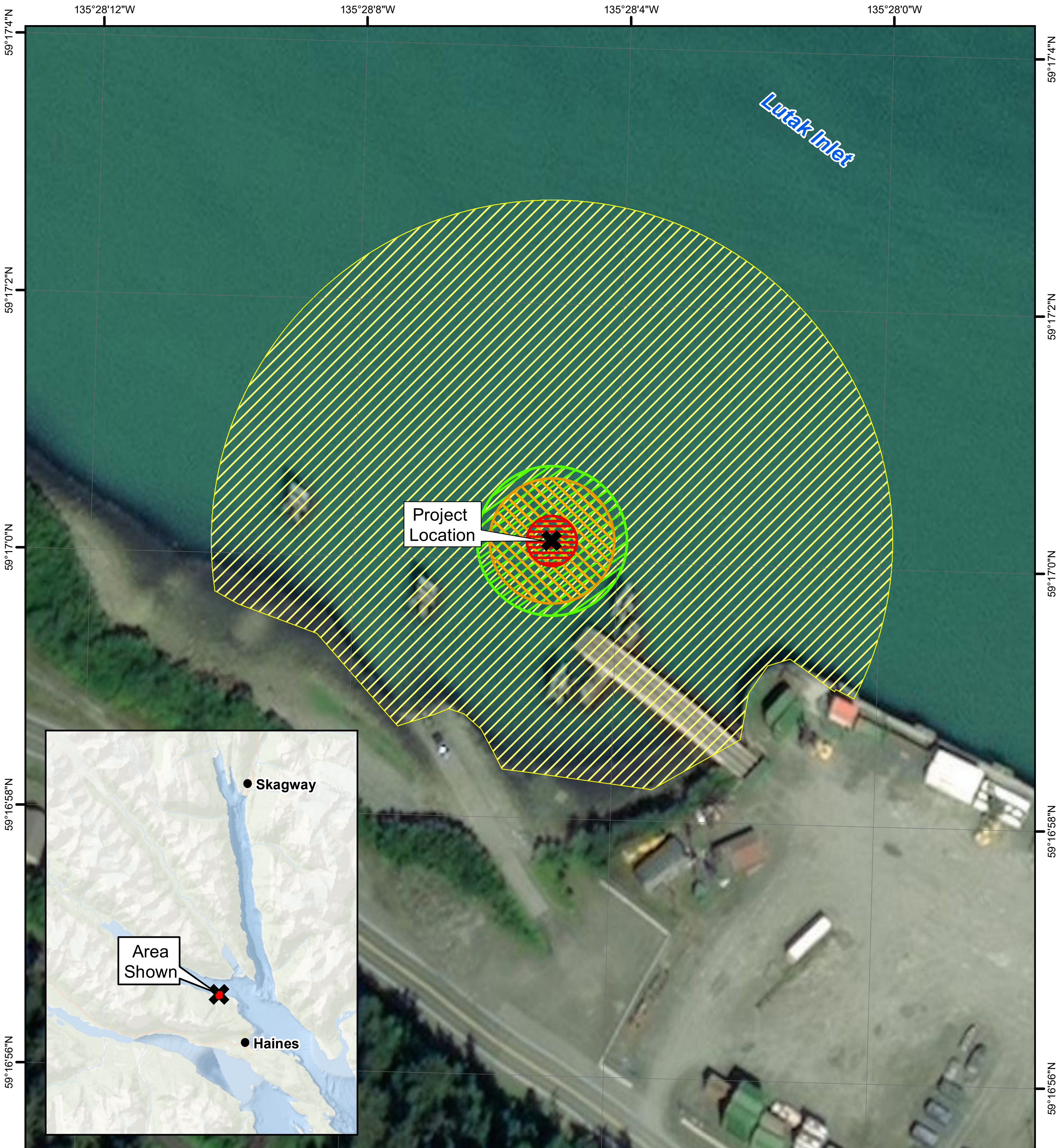
Haines Cargo Dock Improvements

Alaska Marine Lines
Haines, Alaska

Potential PTS Areas – Otariid Pinnipeds

Date: September, 2019
By: JG
Figure: 3

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig3_r2.mxd



NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

Scale 1:1,200 @ 8.5x11

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

N S W E

0 50 100 150 200

Feet

Legend

- ✖ Project Location - Noise Source
- DHT
- Vibratory Driving
- Combined DTH + Vibratory Driving
- Impact Piling

SLR

Haines Cargo Dock Improvements

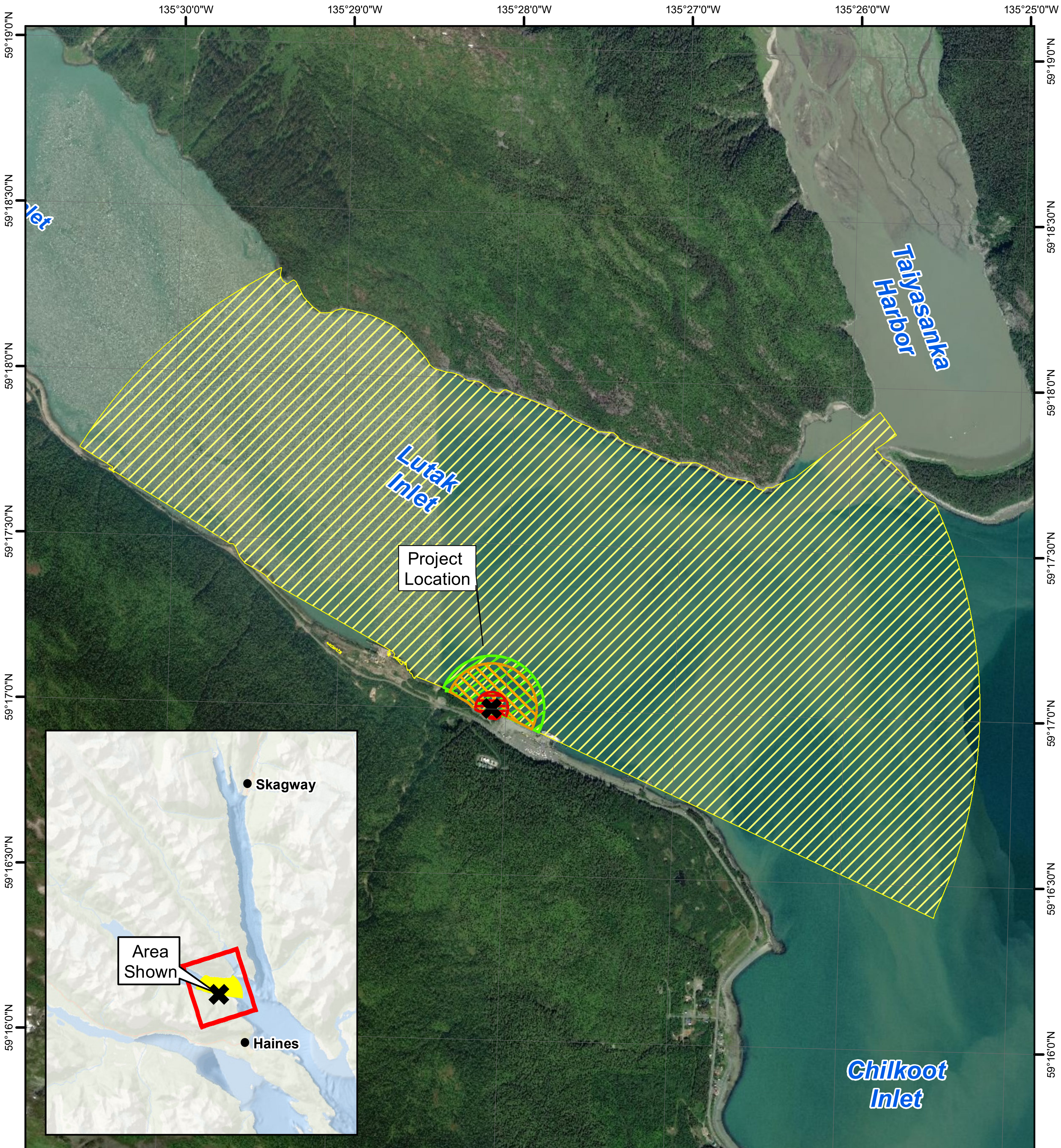
Alaska Marine Lines
Haines, Alaska

Potential PTS Areas –
Mid Frequency Cetaceans

Date: September, 2019
By: JG

Figure: 4

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig4_r2.mxd



NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

Scale 1:28,000 @ 8.5x11

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

N W E S

0 1,000 2,000 3,000 4,000 5,000

Feet

Legend

- ✖ Project Location - Noise Source
- DHT
- Vibratory Driving
- Combined DTH + Vibratory Driving
- Impact Piling

SLR

Haines Cargo Dock Improvements

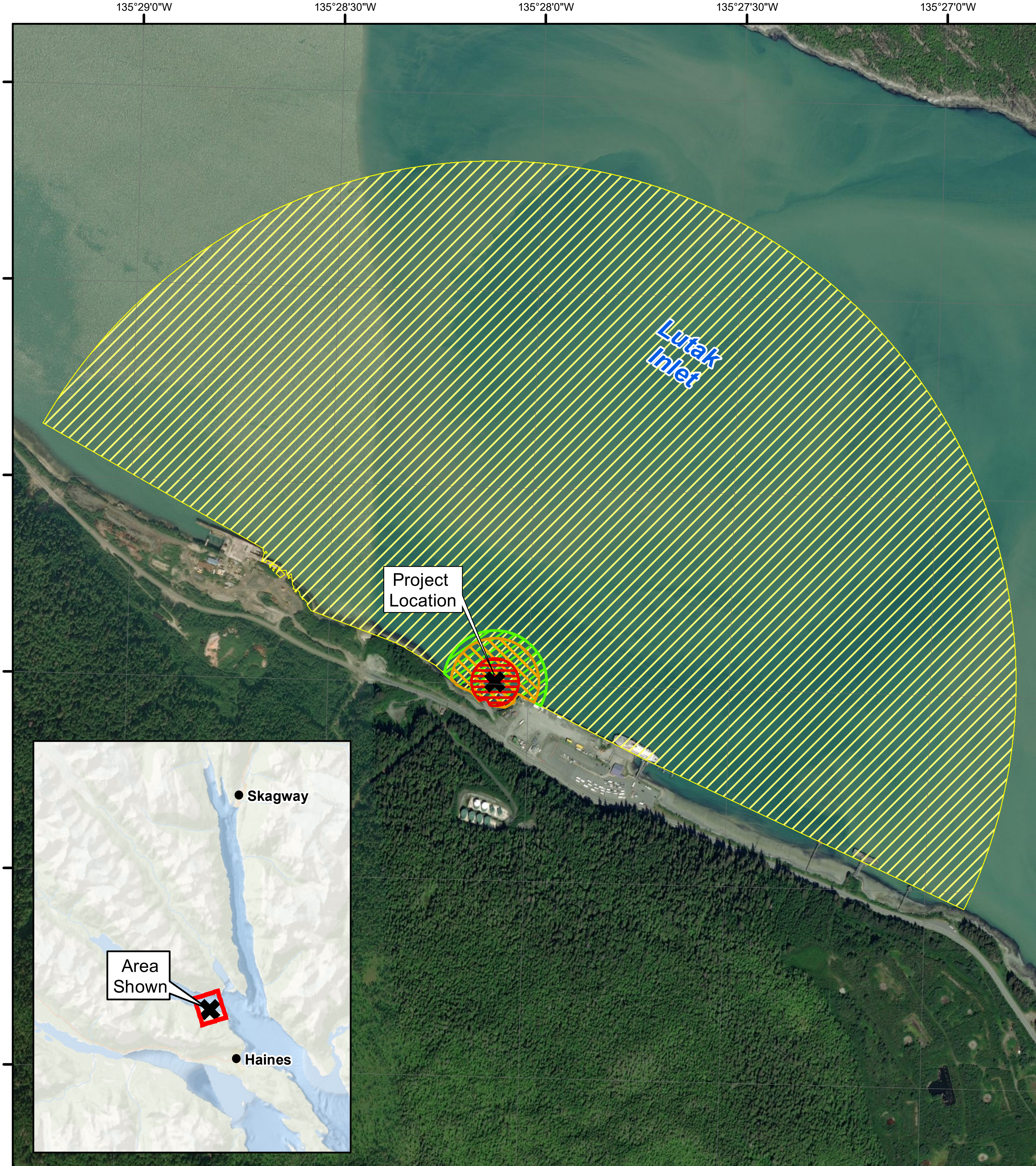
Alaska Marine Lines
Haines, Alaska

Potential PTS Areas –
High Frequency Cetaceans

Date: September, 2019
By: JG

Figure: 5

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig5_r2.mxd



Haines Cargo Dock Improvements

Alaska Marine Lines
Haines, Alaska

Potential PTS Areas – Phocid Pinnipeds

Date: September, 2019
By: JG
Figure: 6

N:\Anchorage\CAD-GIS\PROJECTS\Alaska Marine Lines\Haines Dock\Noise_Fig6_r2.mxd

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