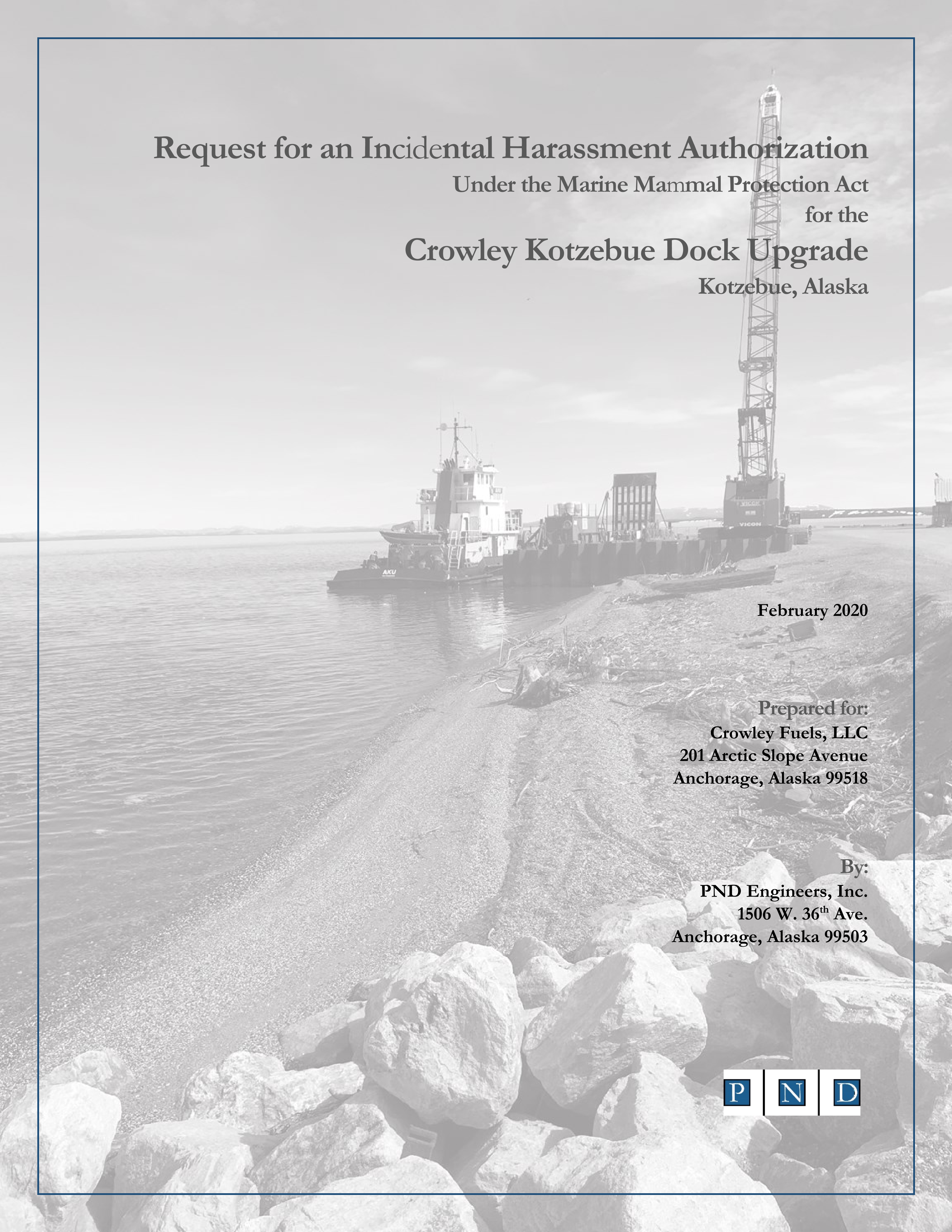

Request for an Incidental Harassment Authorization

Under the Marine Mammal Protection Act
for the

Crowley Kotzebue Dock Upgrade

Kotzebue, Alaska

February 2020

Prepared for:
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ACRONYMS AND ABBREVIATIONS

4MP	Marine Mammal Monitoring and Mitigation Plan
μPa	micropascal
ADF&G	Alaska Department of Fish and Game
BA	Biological Assessment
BMP	best management practice
CFR	Code of Federal Regulations
Crowley	Crowley Fuels, LLC
CY	cubic yards
dB	decibel
DPS	distinct population segment
EL	elevation
ENP	Eastern North Pacific
ESA	Endangered Species Act
FR	Federal Register
HF	high frequency (cetaceans)
HTL	high tide line
Hz	hertz
IHA	Incidental Harassment Authorization
LF	low-frequency (cetaceans)
MF	mid-frequency (cetaceans)
MHW	mean high water
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCSP	OPEN CELL SHEET PILE®
OW	otariid (pinnipeds)
PND	PND Engineers, Inc.
POC	plan of cooperation
PW	phocid (pinnipeds)
PTS	permanent threshold shift
RMS	root mean square
SEL	Sound Exposure Level
SEL_{CUM}	Cumulative Sound Exposure Level

RMS	root mean square
Sound	Kotzebue Sound
SEL	sound exposure level
SPL	sound pressure level
SPL_{PK}	peak sound pressure level
TTS	temporary threshold shift
TYP	typical
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WFA	Weighting Factor Adjustment

1 DESCRIPTION OF THE ACTIVITY

The project proponent, Crowley Fuels, LLC (Crowley), proposes to upgrade their existing sheet pile bulkhead dock for vessel-based fuel and cargo distribution in Kotzebue, Alaska. The action is needed because the existing bulkhead is corroding and has reached the end of its useful service life. Over the past fifteen years, the dock has been repaired multiple times. Several areas of localized erosion are also present along the length of the wall and pose risk to stability of the bulkhead. The bulkhead must be replaced to restore the dock serviceability and prevent further damage to the facility and impacts to operations.

The Crowley Kotzebue Fuel Dock provides berthing for Crowley's bulk fueling operations. The dock also provides essential access for community barges, cargo-loading, transloading, subsistence harvest, and other community events; all of which are necessary operations to the City of Kotzebue, its residents, and adjacent villages supported by Kotzebue's connections to marine-based transportation.

The proposed project will occur in marine waters that support several marine mammal species. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of all marine mammals, which is defined as to "harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill," except under certain situations. Section 101(a)(5)(D) of the MMPA allows for National Marine Fisheries Service (NMFS) to issue an Incidental Harassment Authorization (IHA), provided an activity results in negligible impacts to marine mammals and would not adversely affect subsistence use of these animals (MMPA 1972, as amended). The project may result in marine mammals protected under the MMPA being exposed to sound levels above allowable noise harassment or non-serious injury thresholds.

Figure 1. Existing conditions (prior to temporary repair)

1.1 PROPOSED ACTION

The new dock will be constructed with an OPEN CELL SHEET PILE® (OCSP) structure, a bulkhead utilizing flat-web sheet piles, fabricated connector wyes, and anchor piles. This type of bulkhead is a flexible steel sheet pile membrane supported by soil contact with the embedded steel pile tail walls. No demolition is planned for this project, so the new sheet pile bulkhead will provide additional protection for the existing fuel header system and associated piping. A new potable water service and 120/208-volt power service will be provided at the south end of the new dock.

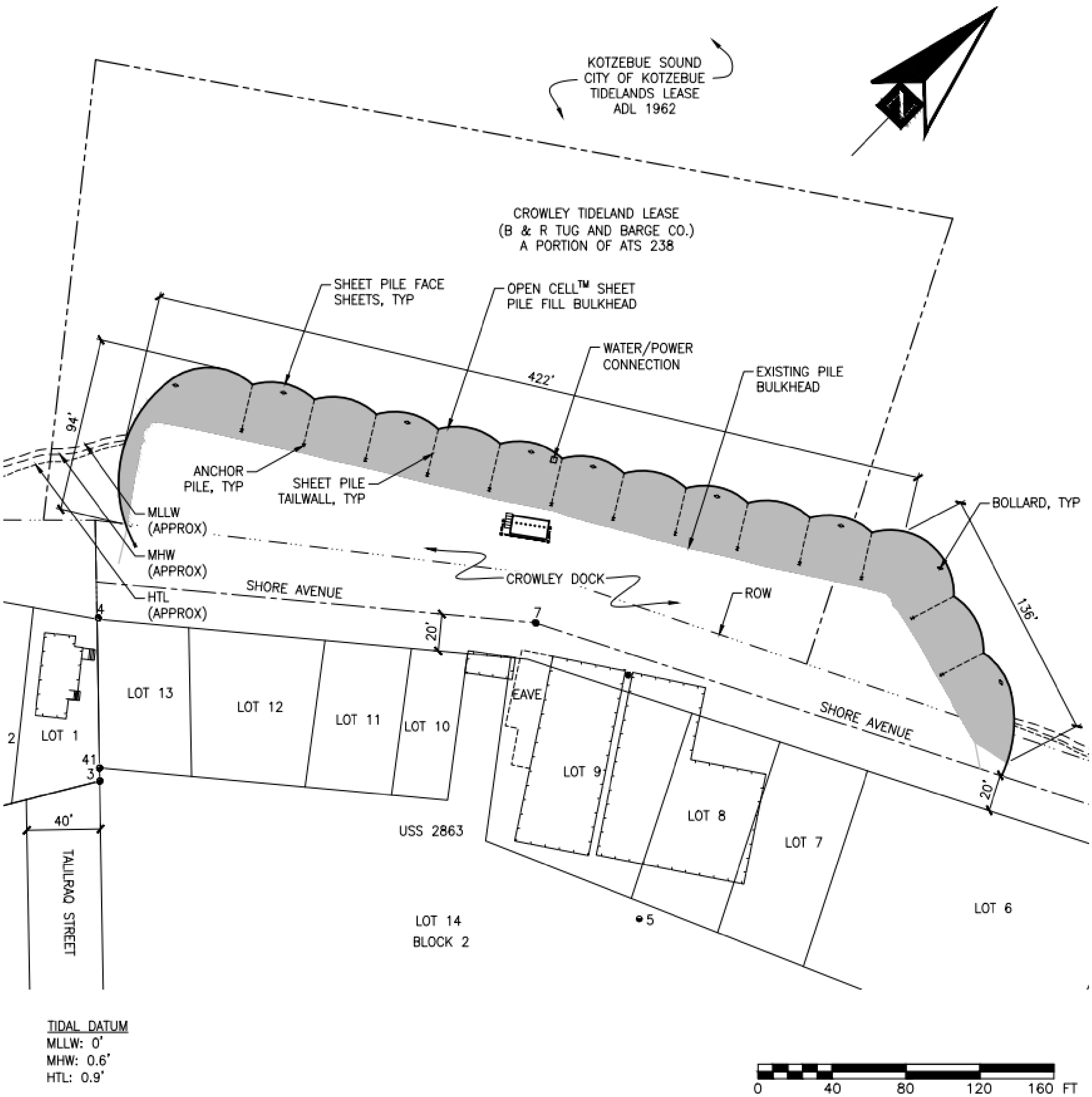

Figure 2. Project Overview

1.2 PROJECT MATERIALS

Table 1. Materials and impacts summary

	Construction Method	Project Total	Below HTL (EL =0.9)	Below MHW (EL=0.6)	Below MLLW (EL=0)	Hours Per Day	Days Effort
Footprint (acre)	(all)	0.66	0.60	0.60	0.60	N/A	N/A
Temporary template piles (Pipe piles 18")	Vibratory Installation	170	170	170	170	1.7	17
Temporary template piles (Pipe piles 18")	Vibratory Removal	170	170	170	170	1.7	17
***(Alternate)* temp. template piles (H-piles 14")**	Vibratory Installation	(170)	(170)	(170)	(170)	(1.7)	(17)
***(Alternate)* temp. template piles (H-piles 14")**	Vibratory Removal	(170)	(170)	(170)	(170)	(1.7)	(17)
Anchor piles (14" HP14x89 or similar)	Vibratory Installation	15	13	13	13	1.7	2
Sheet piles (20" PS31 or similar)	Vibratory Installation	650	645	645	645	1.7	44
Gravel Fill (CY)	Conventional Equipment	18,700	12,400	12,100	11,500	11	30
Bollard piles (Pipe piles 24")	Upland Vibratory Installation	9	9	9	9	1.5	1

1.3 DEMOLITION

New sheet pile cells will be installed seaward of the existing dock, so no demolition of existing dock face will be required.

1.4 TEMPORARY TEMPLATE PILES

Temporary piles for bulkhead template structures will be installed to aid with sheet pile cell construction and will be removed after the permanent sheet piles or support piles have been installed. Figure 3 shows temporary support piles and templates being used during pile installation. Temporary template piles will be either steel pipe piles (18-inch or smaller) or H-piles (14-inch or smaller). Up to 170 temporary template piles will be needed for this project. Quantities noted in Table 1 are for either pipe piles or H-piles, not cumulative.

Temporary template piles will be driven with a vibratory hammer. All piles are expected to be installed using land-based crane and a vibratory hammer. It is anticipated that the largest size vibratory hammer used for the project will be an APE 200-6 (eccentric moment of 6,600 inch-pounds) or comparable vibratory hammer from another manufacturer such as ICE or HPSI. It is estimated that not more than ten template piles will be installed per day.

Temporary piles will be removed following bulkhead construction using vibratory extraction methods. Means and methods for extraction will be similar to temporary pile installation.

1.5 SHEET PILES

The new sheet pile bulkhead dock consists of fourteen OCSP cells. The sheet piles will be installed in pairs using the vibratory hammer on land. After all the piles for a sheet pile cell have been installed, clean gravel fill will be placed within the cell. This process will continue sequentially until all of the sheet pile cells are installed and backfilled.

1.6 ANCHOR PILES

Fourteen-inch H-pile anchor piles with welded connectors to secure the structure will be installed at the end of each sheet pile tailwall using a vibratory hammer on land.

Figure 3. Installing sheet piles with a vibratory hammer.

1.7 FILL PLACEMENT

The bulkhead will be filled with clean gravel materials after each cell is closed. Fill will be transported from an off-site quarry to the project site using loaders, dump trucks, and dozers within the project footprint as needed. It will be placed within the cells from the shore (or occasionally a barge) using the same equipment and will be finished using roller compactors and graders.

1.8 BOLLARD PILES

Twenty-four-inch pipe piles will be installed at nine locations along the dock face to support mooring bollards. Bollard piles will be driven into completed, compacted cells using a vibratory hammer on land.

1.9 UTILITIES

A new potable water service and 120/208-volt power service will be provided near the south end of the new dock. The potable water service will consist of a buried two-inch diameter HDPE line. The power service will be routed in a buried conduit from the nearby Crowley Dock Office.

1.10 IMPACT AVOIDANCE AND MINIMIZATION MEASURES

Impacts to waters of the U.S. could not be entirely avoided, as the nature of this project is dependent on maritime access. The size of the construction area was minimized to the smallest footprint possible to provide a safe and functional dock while meeting the goal of sustaining the service life of the facility.

The following best management practices (BMPs) will be incorporated by the applicant in order to minimize impacts to waters of the U.S.:

- New sheet piles will be installed seaward of the existing dock, containing it and removing the need for demolition or disturbance of the existing dock. Enclosing the existing dock will also provide more dockside space for safe handling of bulk fuel deliveries. A silt curtain will be utilized during pile driving to reduce the potential for increased turbidity levels.
- A silt curtain will be deployed during pile driving operations to prevent turbidity and negative impacts to water quality. This measure will also prevent fish from entering the injury isopleth for fish during pile driving. Both results will reduce the potential for impacts to prey species.
- Fill placed in the tidelands will be clean gravel fill. Fill will contain relatively few fines to reduce impacts to turbidity and/or sedimentation. Fill will be placed in completed sheet pile cells, providing containment and removing the need for a silt curtain.
- The dock will 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 will not be stored below the ordinary high-water mark. All chemicals and petroleum products will be properly stored to prevent spills. Petroleum products, cement, chemicals, or other deleterious materials will not be allowed to enter surface waters.
- Oil booms will be readily available for containment should any releases occur.
- The contractor will check for leaks regularly on any equipment, hoses, and fuel storage that occur at the project site.
- Noise levels will be minimized by the use of appropriately sized piles. The use of vibratory pile driving methods will also reduce sound levels entering the water during construction and reduce the impacts to marine mammals, fish, and seabirds. Properly sized equipment will be used to drive piles.
- To minimize impacts from vessels interactions with marine mammals, the crews aboard project vessels will follow NMFS's marine mammal viewing guidelines and regulations as practicable. (https://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm).

In addition to these measures, Crowley will station observers as described in the Marine Mammal Monitoring and Mitigation Plan (4MP) accompanying the IHA Application. In-water work will stop if a protected species enters a shutdown zone, as described in the 4MP.

The project results in a minimal loss of tidelands and waters of the U.S. in an existing industrialized area. The project site is already in use as an industrial dock and the proposed expansion will support essential community services, including energy security. As such, no compensatory mitigation is proposed for this project.

The mitigation measures and BMPs that will be implemented are expected to reduce the project's impacts within the action area.

2 DATES, DURATION, AND REGION OF ACTIVITY

2.1 PROJECT TIMELINE

Construction is anticipated to begin June, 2020 with an expected duration of approximately three months resulting in construction completion by September, 2020. Approximately 100 days of active in-water work is expected. Additional contingencies for partial days or delays are built into take calculations later in this document. Work effort is expected to be 11-hour days, with one additional work hour reserved for safety briefings and other non-impactful tasks.

2.2 REGION OF ACTIVITY

The Crowley Kotzebue Dock Upgrade Project is located in Qikiqtaġruq (Kotzebue) on the northernmost shoreline of the Baldwin Peninsula between Kotzebue Sound and Hotham Inlet. The project site is located at 66.9038° N Latitude, 162.5841° W Longitude, within Section 3, Township 17N, Range 18W of the Kateel River Meridian. The typical sea level range at Kotzebue is exceptionally minimal, with the National Oceanic and Atmospheric Administration (NOAA) Kotzebue Tide Station 949-0424 reporting a mean high water (MHW) of 0.6 feet mean lower low water (MLLW). The high tide line (HTL) is at a mere 0.9 feet. Immediately adjacent to the dock, the City owns and maintains Shore Avenue, which separates the dock from the rest of the Crowley fuel facility.

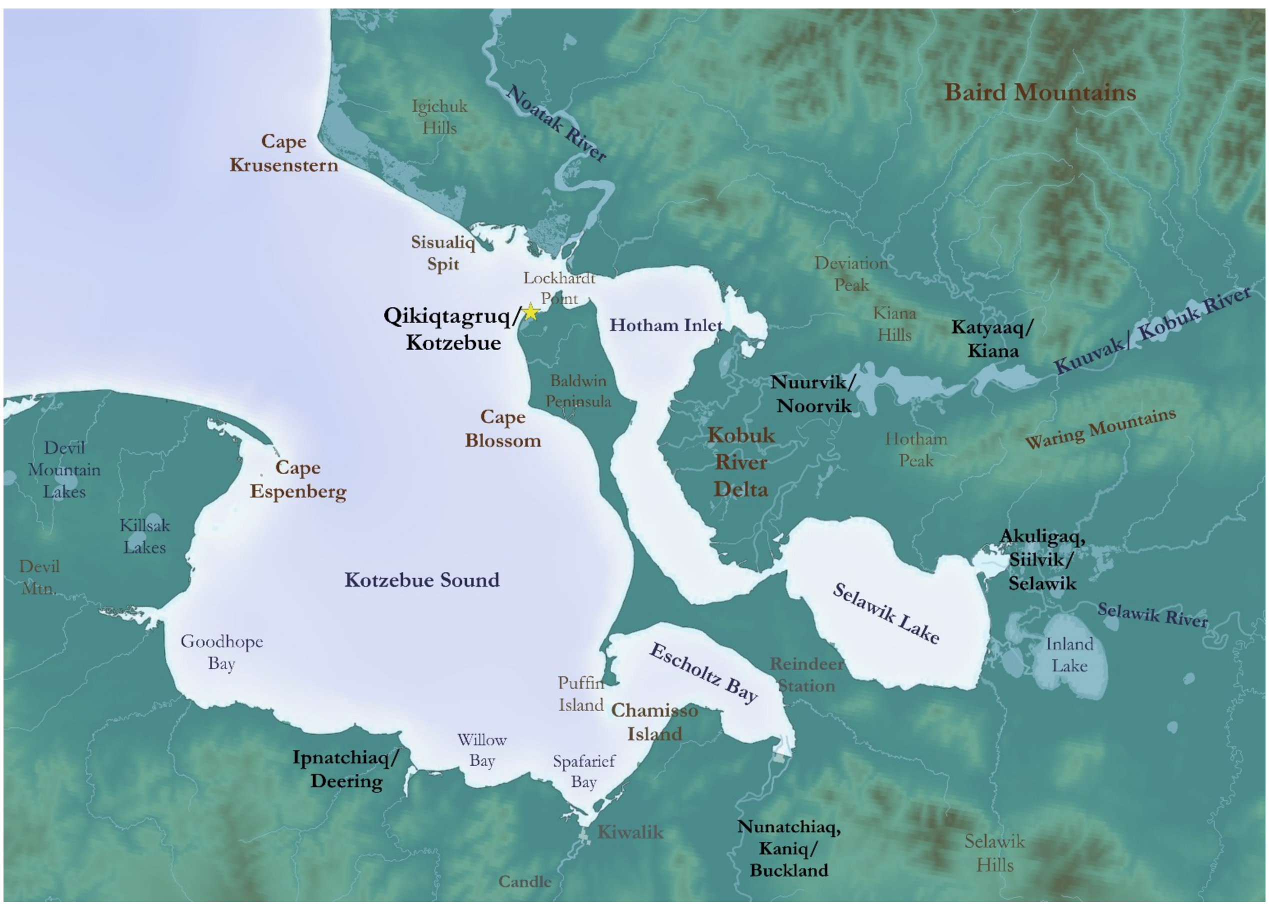

Figure 4. Vicinity Map

3 SPECIES AND NUMBER OF MARINE MAMMALS

Known ranges of a number of marine mammal species, subspecies, or distinct population segments (DPSs) encompass the portion of Kotzebue Sound in which the proposed project will occur. The species are listed in Table 2 along with their stock or population, their occurrence in the project area, and their estimated abundance. It is unlikely that several of these species will be observed in the project area due to the shallow habitat within Kotzebue Sound.

Due to the low likelihood of sightings of bowhead whales, fin whales, humpback whales, polar bears, and narwhals within the project's impact area, they will not be included in this IHA application.

Two marine mammal species that are listed under the ESA and could potentially occur in the action area; the bearded seal and the ringed seal. The proposed project is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of habitat for these species. Critical habitat has not been designated in the action area.

Table 2. MMPA Species with ranges extending into the project site

Species, Iñupiaq Name[1]	Estimated Abundance / Stock	Listing Status[2]	Occurrence in Project Impact Area
Bowhead whale, Aġvik (*Balaena mysticetus*)	16,100 (minimum) Western Arctic Stock	ESA endangered	Very rare[3]
Fin whale (*Balaenoptera physalus*)	2,554 (minimum) Northeast Pacific Stock	ESA endangered	Very rare
Humpback whale (*Megaptera novaeangliae*)	865 (minimum) Western North Pacific Stock	Western North Pacific DPS ESA endangered	Very rare
Humpback whale (*Megaptera novaeangliae*)	7,891 (minimum) Central North Pacific Stock	Hawaii DPS MMPA depleted	Very rare
Bearded seal, Ugruk (*Erignathus barbatus nauticus*)	273,676 (estimated minimum) Beringia DPS	ESA threatened	Common
Ringed seal, Natchiq (*Pusa hispida hispida*)	Est. 470,000 (estimated minimum) Alaska Stock	ESA threatened	Common

[1] Iñupiaq names generally from the Northwest Arctic Borough (NAB 2016) and the BOEM
[2] Species listed under the ESA are also considered "depleted" under the MMPA and classified as strategic stocks. (16 U.S.C. § 1362)
[3] Species highlighted in gray are considered unlikely to be found in the project area during construction and are not included in this IHA.

Species, Iñupiaq Name[1]	Estimated Abundance / Stock	Listing Status[2]	Occurrence in Project Impact Area
Polar bear, Nanuq (*Ursus maritimus*)	2,000 (estimated minimum) Chukchi/Bering Sea Stock	ESA threatened	Very rare
Pacific Walrus, Aiviq (*Odobenus rosmarus divergens*)	129,000 (estimated) Alaska Stock	MMPA protected, strategic stock	Occasional
Minke whale (*Balaenoptera acutorostrata*)	(Not available) Alaska Stock	MMPA protected	Rare
Gray whale, Aġviġluaq (*Eschrichtius robustus*)	25,849 (minimum) Eastern North Pacific Stock	MMPA protected	Rare
Killer whale, Aaġlu (*Orcinus orca*)	2,084 (identified) / Eastern North Pacific Alaska Resident Stock	MMPA protected	Occasional
	587 (identified) / Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock		
Harbor porpoise (*Phocoena phocoena*)	48,215 (estimated) Bering Sea Stock	MMPA protected, strategic stock	Occasional
Beluga whale, Sisuaq (*Delphinapterus leucas*)	39,258 (estimated) Beaufort Sea Stock	MMPA protected	Common
	12,194 (minimum) Eastern Chukchi Sea Stock	MMPA protected	Common
Narwhal (*Monodon monoceros*)	(Not available) Unidentified Stock	MMPA protected	Very rare
Spotted seal, Qasiġiaq (*Phoca largha*)	423,237 (minimum) Alaska Stock	MMPA protected	Common
Ribbon seal, Qaiġulik (*Histriophoca fasciata*)	163,086 (minimum) Alaska Stock	MMPA protected	Common

4 AFFECTED SPECIES STATUS AND DISTRIBUTION

This section describes the status, distribution, behavior, and critical habitat (ESA listed species only) for the affected species/stocks of marine mammals likely to be affected by the proposed project.

4.1 BEARDED SEAL (*ERIGNATHUS BARBATUS NAUTICUS*)

4.1.1 *STATUS*

There are two recognized subspecies of the bearded seal: *Erignathus barbatus barbatus and E. b. nauticus*. The *E. b. nauticus* subspecies occurs in the project area and consists of two DPSs: Beringia and Okhotsk. The Alaska Stock of bearded seals is defined as the portion of the Beringia DPS found in U.S. Waters (Muto *et al*. 2019). This DPS was listed as endangered under the ESA in 2012 (77 FR 76740) and is considered depleted under the MMPA (16 U.S.C. § 1362).

4.1.2 *POPULATION AND DISTRIBUTION*

Reliable population estimates for the entire Alaska Stock are not currently available, but research efforts underway offer preliminary estimates. An average population in 2012 of 301,836 seals with a minimum estimate of 273,676 is cited in the 2018 Stock Assessments out of Conn *et al.* (2014), but noted as using a limited sub-sample of the available data and potentially biased. The minimum estimate of annual mortality of bearded seals from subsistence harvest is 555 seals per year and an additional 2 per year on average are removed due to fisheries activities and scientific research (Muto *et al*. 2019).

Bearded seals have a circumpolar distribution and their normal range extends from the Arctic Ocean to Sakhalin Island, or from 80° N to 45° N. In U.S. waters, bearded seals can be found across the continental shelf throughout the Bering, Chukchi, and Beaufort Seas (Muto *et al*. 2019).

Aerial surveys of ringed and bearded seals in the Eastern Chukchi Sea in May and June reported relatively few bearded seals within inner Kotzebue Sound, as bearded seals typically congregate on offshore ice rather than nearshore. Bearded seal densities just outside of Cape Krusenstern were 0.001 – 0.7 bearded seals per seals per km^2 (Bengtson *et al.* 2005). In 1976 aerial surveys of bearded seals in the Bering Sea, densities ranged between 0.006 and 0.782 seals per seals per km^2. Bearded seals were typically spotted in groups of one to two individuals with occasional larger groupings in denser areas (Braham *et al*. 1984b).

Many bearded seals spend the winter months in the Bering Sea and then move north through the Bering Strait between late April and June. They then continue into the Chukchi Sea where they spend the summer months along the fragmented and drifting ice pack. Bearded seals have been observed in the Chukchi Sea year-round when sea ice coverage was greater than 50%. Juveniles may not migrate north to follow the ice, as most adults do, and may remain along the coasts of the Bering and Chukchi Seas. Apart from these juveniles, seasonal distribution appears to be correlated to the ice pack (Muto *et al*. 2019). Bearded seals are most common in the Sound during spring, before the more aggressive spotted seals arrive, driving them from the area until the juveniles return to the sound in fall (Huntington *et al*. 2016). Juvenile (birth-year) seals tend to remain in Kotzebue Sound near Sisualiq Spit and the mouth of the Noatak River through the summer (NAB 2016). Recently mapped ranges show adult bearded seals in Kotzebue Sound from March until June and returning in October and November (Audubon 2010).

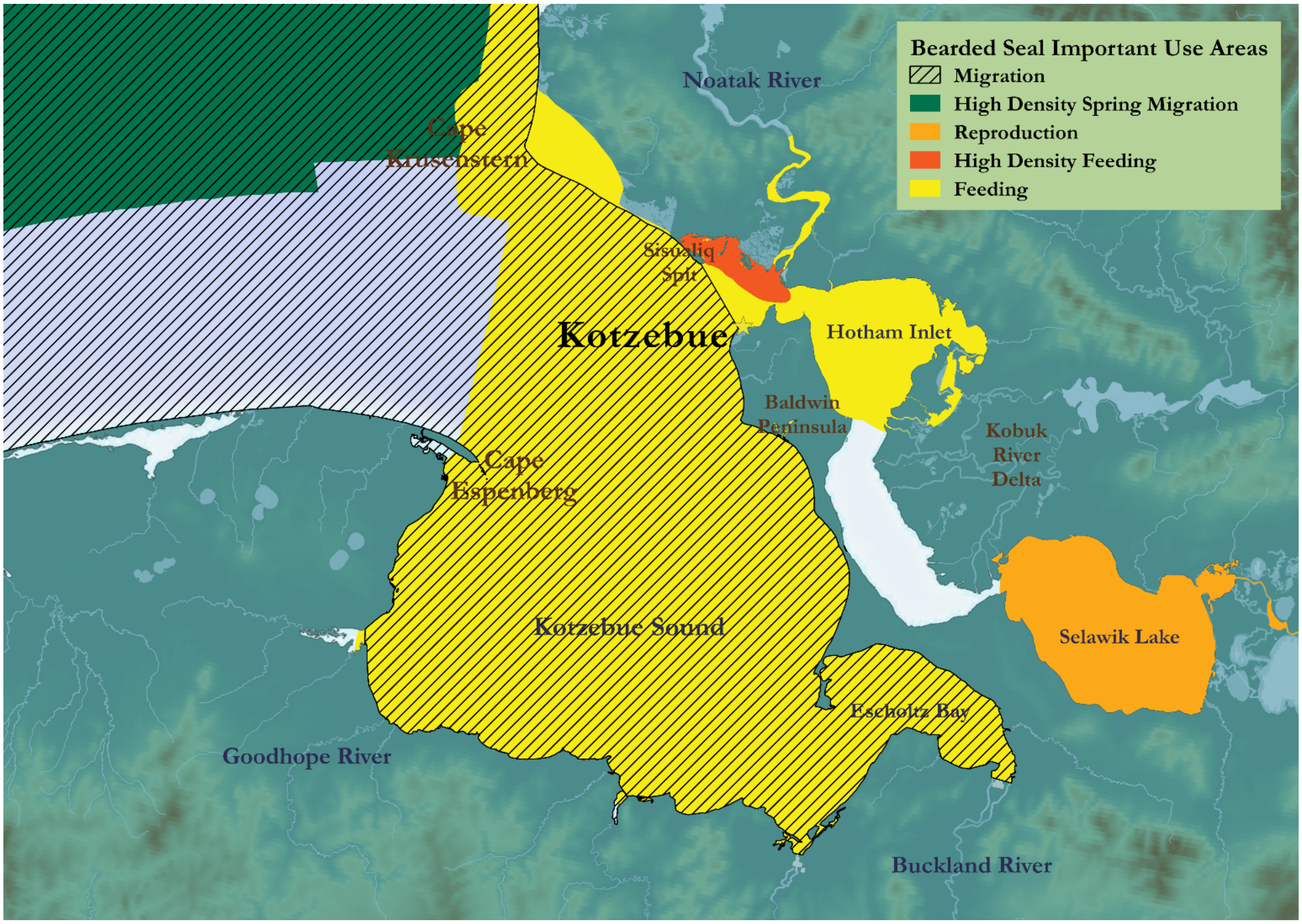

Figure 5. Bearded seal important use areas in Kotzebue Sound (NAB 2016)

4.1.3 *REPRODUCTION AND BREEDING*

Bearded seals begin breeding around 6 years of age and females give birth to a single pup in spring (March through May) while hauled out on the seasonal ice (NMFS 2019).

4.1.4 *FORAGING AND HABITAT CONCERNS*

Bearded seals consume a diet consisting primarily of benthic organisms such as demersal fishes and epifaunal and infaunal invertebrates (Muto *et al.* 2019). Bearded seals feed throughout Kotzebue Sound, but prime feeding grounds are found off the Chamisso Islands, where clam and shrimp are abundant (Huntington *et al.* 2016).

The primary source of concern for bearded seals is a loss of sea-ice habitat due to climate change. Lack of suitable ice cover with access to shallow feeding areas during summer months during which bearded seals whelp, nurse, and molt potentially decreases food availability and increases predation rates. The potential for habitat modifications due to ocean acidification also pose a potential risk to bearded seals due to changes in prey availability, although this possibility is complex and less threatening to bearded seals due to their apparent dietary flexibility. Increases in shipping and habitat modification for development also pose a potential future risk to bearded seal survival (Muto *et al.* 2019). Observations of low-snow years found that decreased snow protection around pupping dens left seal pups vulnerable to shore predators, such as jaegers, ravens, and fox (Huntington *et al.* 2016).

No critical habitat has been designated for bearded seals.

4.1.5 *HEARING ABILITY*

Bearded seals are part of the Phocidae family and are included in the phocid pinniped hearing group (NMFS 2016, 2018).

4.2 RINGED SEAL (*PUSA HISPIDA HISPIDA*)

4.2.1 *STATUS*

The ringed seal is listed as threatened under the ESA and has been petitioned to be listed as endangered. The Alaska Stock of ringed seals occurs in the project area and is considered a portion of the Arctic subspecies (*Pusa hispida hispida*). There are five recognized subspecies of ringed seals; *P. h. hispida* is the only one occurring in Alaska (Muto *et al.* 2019). The ringed seal is protected under the MMPA and is listed as depleted (16 U.S.C. § 1362).

4.2.2 *POPULATION AND DISTRIBUTION*

No reliable population estimates exist for ringed seals in U.S. Waters, although new research programs are in progress. Estimates derived for the purposes of ESA status review in 2010 placed the total population in Alaskan portions of the U.S. Chukchi and Beaufort Seas at 300,000 seals. Estimates using a very limited portion of image-based surveys currently in progress placed the U.S. Bering Sea population at 170,000 (Muto *et al.* 2019). Aerial surveys of ringed seals in the Eastern Chukchi Sea in May and June estimated ringed seal haul-out densities (adjusted for haul-out behavior) in inner Kotzebue Sound between 2 and 20 seals per km^2. These were among the highest densities perceived throughout the region (Bengtson *et al.* 2005).

Ringed seals are distributed throughout Arctic waters in all "seasonally ice-covered seas". In winter and early spring when sea ice is at its maximum coverage, they can be found in the northern Bering Sea, in Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort Seas. In years with particularly extensive ice coverage, they may occur as far south as Bristol Bay (Muto *et al.* 2019). In 1976 aerial surveys of ringed seals in the Bering Sea, densities ranged between 0.005 and 0.017 seals per seals per km^2 (Braham *et al.* 1984b). Surveys made in 1964 of seals in their breeding grounds in the Sea of Okhotsk found a density of 0.1 to 2 seals per km^2 (Canada, GofCNRC 1965).

Seasonal movement patterns have not been well documented; however, they generally winter in the Bering and Chukchi Seas and it is believed they migrate north in spring as the seasonal ice melts and retreats. Presumably, they continue moving north and spend summers in the pack ice of the northern Chukchi and Beaufort Seas. They may also appear on nearshore ice remnants in the Beaufort Sea. Movement becomes increasingly restricted in the fall as freeze-up progresses, and it is thought that seals move south and west from summer grounds in the Beaufort Sea along with the ice pack (Muto *et al.* 2019).

Cooperative satellite tagging efforts between local hunting experts and biologists have found that, while ringed seals are present in Kotzebue Sound year-round, juveniles are more likely to travel long distances while adults stay closer to the Sound. Ringed seals are common in the Sound during spring before the more aggressive spotted seals arrive, driving them from the area until they return to the Sound in fall (Huntington *et al.* 2016). Recently mapped ranges show ringed seals in Kotzebue Sound from February until June and returning in October and November (Audubon 2010).

Figure 6. Ringed seal important use areas in Kotzebue Sound (NAB 2016)

4.2.3 *REPRODUCTION AND BREEDING*

Ringed seals use the ice as a platform for pupping and nursing in late winter to early spring. Females reach breeding age between 3 and 7 years of age and males between three years and nine years of age. Mating is thought to take place under the ice near birth lairs and occurs in late winter to early spring while pups are still being nursed. Females give birth to one pup annually in snow-covered birth lairs, the use of which is unique to ringed seals. Weaning of pups is typically complete prior to the ice break up in the spring (NMFS 2019C).

4.2.4 *FORAGING AND HABITAT CONCERNS*

Foraging occurs in highly productive open waters and along the edges of the ice. They consume mostly small prey that vary seasonally. The cod family makes up the majority of the ringed seal's diet from late fall through the spring. Young seals tend to consume mostly crustaceans; adults may as well if foraging in the open water. Ringed seals dive to depths of up to 150 feet or more while foraging (NMFS 2019C).

The primary source of concern for ringed seals is a loss of sea-ice habitat due to climate change. Observations of low-snow years found that decreased snow protection around pupping dens left seal pups vulnerable to shore predators, such as jaegers, ravens, and fox (Huntington *et al.* 2016). Lack of suitable ice cover with access to shallow feeding areas during summer months during which ringed seals whelp, nurse, and molt potentially decreases food availability and increases predation rates. The potential for habitat modifications due to ocean acidification also pose a potential risk to ringed seals due to changes in prey availability. Increases in shipping and habitat modification for development also pose a potential future risk to ringed seal survival (Muto *et al.* 2019).

No critical habitat has been designated for ringed seals.

4.2.5 *Hearing Ability*

Ringed seals are part of the Phocidae family and are included in the phocid pinniped hearing group (NMFS 2016, 2018).

4.3 Minke Whale (*Balaenoptera acutorostrata*)

4.3.1 *Status*

The minke whale is protected under the MMPA but is not listed as a strategic or depleted species. Minke whales are also not listed as threatened or endangered under the ESA, although no abundance estimates are available for minke whales (Muto *et al.* 2019).

4.3.2 *Population and Distribution*

The minke whale population status is considered stable and they are the most abundant rorqual, or "great whale", in the world (NMFS 2019E). Visual surveys have been conducted for minke whales in some parts of Alaska, but not within the project area (Muto *et al.* 2019).

Minke whales are widely distributed throughout the northern hemisphere and are found in both the Pacific and Atlantic oceans. Minke whales in Alaska are considered migratory and during summer months are typically found in the Arctic and during winter months are found near the equator (NMFS 2019E). Minke whales were reported as sometimes present in Kotzebue Sound during the summer months and two individuals beached in the mouth of the Buckland River in autumn during the late 1970s (Frost *et al.* 1983b).

4.3.3 *Reproduction and Breeding*

Minke whales are believed to calve in the winter months (NMFS 2019E); however, little is known about their breeding areas.

4.3.4 *Foraging and Habitat Concerns*

Minke whales feed by side-lunging through schools of prey and are opportunistic predators feeding on a variety of crustaceans, plankton, and small school fish (NMFS 2019E).

4.3.5 *HEARING ABILITY*

Minke whales have a generalized hearing range of 7 Hz to 35 kHz and fall under the Low-frequency Cetacean hearing group (NMFS 2019E).

4.4 GRAY WHALE (*ESCHRICHTIUS ROBUSTUS*)

4.4.1 *STATUS*

The Eastern North Pacific Stock gray whale was listed as endangered under the ESA in 1970 (35 FR 18319); however, it was delisted in 1994 due to a successful recovery (59 FR 31094). The Eastern North Pacific Stock grey whale is protected under the MMPA but is not listed as a strategic or depleted species (NMFS 2019D).

4.4.2 *POPULATION AND DISTRIBUTION*

The minimum population estimate for this stock is 25,849, an increase of 21% since 1988 (Carretta *et al* 2019, NPFMC 2009b). Gray whales are generally solitary creatures and travel together alone or in small groups (NMFS 2019D).

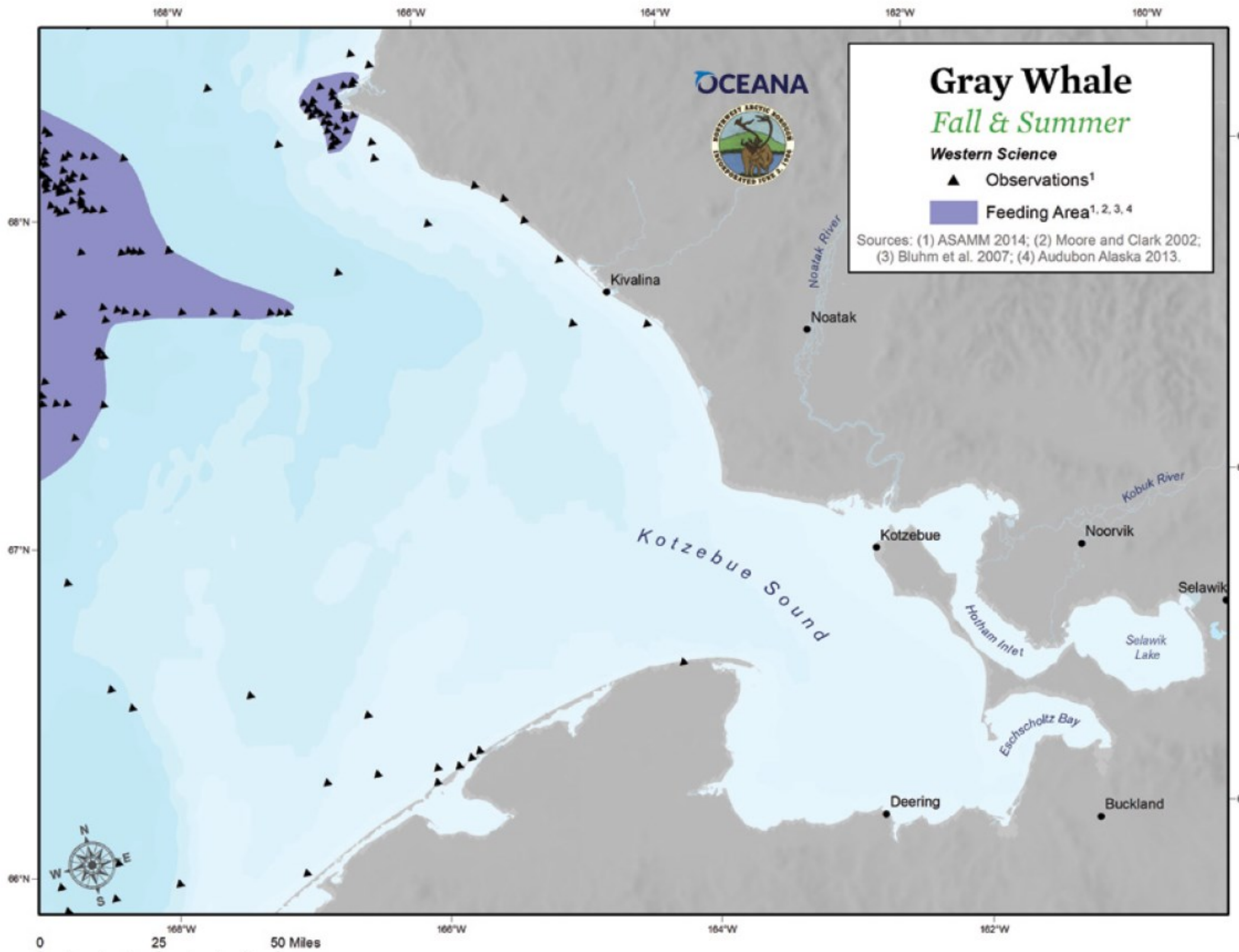

Figure 7. Compiled gray whale sightings and feeding observations (NAB 2016)

Grey whales are distributed throughout the North Pacific Ocean and are found primarily in shallow coastal waters (NMFS 2019D & Carretta *et al* 2019). There are currently two populations of gray whales in the North Pacific Ocean: the eastern North Pacific population and the endangered western North Pacific Population. Only the eastern North Pacific populations range extends into the project areas. Most whales in the eastern population spend the summer and fall months feeding in the Chukchi, Beaufort, and northwestern Bering Seas (Carretta *et al* 2019). Despite the shallow waters, gray whales can be found feeding in the outer area of Kotzebue Sound between May and November (Audubon 2010).

Gray whales do occasionally enter shallower waters to feed, which occasionally results in strandings. There have been five reports between 2010 and 2019 of gray whale strandings within inner Kotzebue Sound, including one in Hotham Inlet. An additional unidentified large whale was reported stranded south of Cape Blossom in 2018 (Savage, pers. comm. 2019). Gray whales were reported as present and feeding (sometimes in large numbers) in Kotzebue Sound (Figure 7) and a gray whale was harvested by whale hunters at Sisualiq in 1980 (Frost *et al*. 1983b).

4.4.3 *REPRODUCTION AND BREEDING*

Breeding occurs outside of Alaska in the wintering grounds of Baja California. Gray whales reach breeding age between 6 and 12 years. Every two to three years females give birth to a single calf after a gestation period of 12 to 13 months (NMFS 2019D and Marine Mammal Center 2019).

4.4.4 *FORAGING AND HABITAT CONCERNS*

Gray whales are primarily bottom feeders preying on benthic and epibenthic invertebrates such as amphipods. They feed by swimming slowly along the sea floor, on their sides, sucking up sediment containing food from the sea floor (NMFS 2019D).

4.4.5 *HEARING ABILITY*

Grey whales are baleen whales and fall under the Low-frequency Cetacean hearing group (NMFS 2019D).

4.5 KILLER WHALE (*ORCINUS ORCA*)

4.5.1 *STATUS*

Five stocks of the killer whale are found in Alaskan waters: the Eastern North Pacific (ENP) Alaska Resident Stock; the ENP Northern Resident Stock; the ENP Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock; the AT1 Transient Stock; and the West Coast Transient Stock (Muto *et al.* 2019).

None of the stocks have ranges shown extending into the Chukchi Sea (Muto *et al.* 2019); however, sightings of killer whales have been reported in Kotzebue Sound in the 1980s and recently in 2008 (Eruich 2016, Lowry *et al.* 1987). The ENP Alaska Resident Stock and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock are the only stocks with a known range into the Bering Sea and it is believed that animals from these stocks may have ranges extending into the Chukchi Sea and Kotzebue Sound. Neither stock is listed as depleted under the MMPA, nor are they listed as threatened or endangered under the ESA (Muto *et al.* 2019).

4.5.2 *POPULATION AND DISTRIBUTION*

The ENP Alaska Resident Stock is estimated to include a minimum of 2,084 identified individuals; however, there is no reliable information available on current population trends. The minimum population estimate for the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock is 587 animals based on a count of photo-identified individuals (Muto *et al.* 2019).

Killer whales are found in every ocean of the world (NMFS 2018b) and are the most widely distributed marine mammal (Allen and Angliss 2014); however, killer whales occur at higher densities in colder waters of both hemispheres (Muto *et al.* 2019). Killer whales are found all throughout the North Pacific and along the entire coast of Alaska. Resident killer whales have large ranges and in the North Pacific are found year-round in ice-free waters of the Chukchi and Bering Seas, the Aleutian Islands and the Gulf of Alaska (Wynne 2017).

Killer whales have been reported hunting beluga whales and even grey or minke whales in Eschscholtz Bay and the mouth of the Buckland River as early as the 1970s (Frost *et al.* 1983b). Recently, subsistence users and researchers have noted a significant decrease in the distribution and activity of beluga whales in the Sound. It is believed that an increase in killer whale activity within the bay may be responsible as evidence indicates that increased predation may be encouraging silence in the belugas that remain (Huntington *et al.* 2016b, Eurich 2016).

Photo identification of individuals spotted in the southern Chukchi sea during transect surveys (during which at least 37 individuals were spotted six times) identified transient type killer whales. Based on reports of predation of belugas and harbor porpoises, it appears likely individuals found in the southern Chukchi Sea and Kotzebue Sound are of the transient, mammal-eating population of the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock (Clarke 2013).

4.5.3 *Reproduction and Breeding*

Killer whales do not have a distinct breeding season and their birthing rate is not well understood; however, it is estimated that killer whales will give birth once every five years (NMFS 2018b).

4.5.4 *Foraging and Habitat Concerns*

Killer whales have no natural predators and are known as the top carnivores currently living on the Earth (Pitman 2011). The species has the most varied diet of all cetaceans; however, the transient populations typically hunt marine mammals while the resident populations feed on fish, particularly salmon and Atka mackerel (Barrett-Lennard *et al.* 2011, Parsons *et al.* 2013). Residents often travel in much larger and closer groups than transients and have been observed sharing fish they catch. Transient killer whales feed on other marine mammals including Steller sea lions, harbor seals, and various species of cetaceans. They are also more likely to rely on stealth, making less frequent and less conspicuous calls and skirting "along shorelines and around headlands" in order to hunt their prey in highly coordinated attacks (Barrett-Lennard *et al.* 2011).

4.5.5 *Hearing Ability*

Killer whales rely on underwater sound for a variety of reasons including navigation, feeding, and communication. Killer whales use echolocation to assist with food gathering — transient killer whales use it rarely and most likely for hunting, while resident whales use it to locate salmon (Au *et al.* 2004). Killer whale social signals resemble the sound of mid-range tactical sonar (Southall *et al.* 2007), with signals commonly occurring as pulsed calls, whistles, and clicks (Szymanski *et al.* 1999). Increases in noise levels near killer whale habitat, like that associated with increasing vessel traffic, have been found to result in an increase in the duration of killer whale calls (Foote *et al.* 2004 as cited in Southall *et al.* 2007). Killer whales are part of the mid-frequency cetacean functional hearing group, with their estimated auditory bandwidth between 150 Hz and 160 kHz (Southall *et al.* 2007).

4.6 Harbor porpoise (*Phocoena phocoena*)

4.6.1 *Status*

The Bering Sea stock of harbor porpoise is not designated as depleted under the MMPA, nor is it listed as threatened or endangered under the ESA, but it is considered strategic as it is believed that mortality and injury rates would exceed thresholds if current abundance information was available (Muto *et al.* 2019).

4.6.2 *POPULATION AND DISTRIBUTION*

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California. NMFS currently acknowledges three stocks of harbor porpoise within this range (Muto *et al.* 2019), with the one encompassing the action area – the Bering Sea stock – ranging from throughout the Aleutian Islands and into all waters north of Unimak Pass. This stock is estimated to include a minimum of 40,150 individuals; however, because the survey data are more than 8 years old the minimum population estimate is considered unknown and there are no reliable information available on current population trends (Muto *et al.* 2019).

The harbor porpoise frequents nearshore waters and coastal embayments throughout their range, including bays, harbors, estuaries, and fjords less than 650 feet (198 m) deep (NMFS 2018H). The presence of harbor porpoises was detected in Kotzebue Sound between September and November and between January and March during acoustic monitoring in 2014 & 2015. Porpoises had not previously been reported under the ice in the Chukchi (Whiting *et al.* 2019).

4.6.3 *REPRODUCTION AND BREEDING*

Harbor porpoises are believed to typically mate during summer months and give birth between May and July; however, very little is known about their reproduction and breeding (NMFS 2018H)

4.6.4 *FORAGING AND HABITAT CONCERNS*

Harbor porpoises forage primarily on Pacific herring, other small schooling fish, and cephalopods and will occasionally feed on squid and octopus (NMFS 2018H). In Southeast Alaska, large numbers of harbor porpoise may form temporary feeding aggregations in areas of localized prey concentration, such as Icy Strait and Sumner Strait (Muto *et al.* 2019).

4.6.5 *HEARING ABILITY*

Based on their hearing capacity, Harbor porpoise are considered to be in the high frequency functional hearing group, with assumed sensitivity matching sound they generate (NMFS 2016). Harbor porpoise' best estimated hearing ranges from 16 to 140 kHz with maximum sensitivity occurring between 100 and 140 kHz (Kastelein *et al.* 2005). The peak frequency produced by harbor porpoises for echolocation is 120 to 130 kHz, which corresponds with the maximum sensitivity range.

4.7 BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

4.7.1 *STATUS*

There are five stocks of the beluga whales that occur in Alaska: the Eastern Chukchi Sea Stock, the Beaufort Sea Stock, the Eastern Bering Sea Stock, the Bristol Bay Stock and the Cook Inlet Stock. While each stock is unique and isolated from one another genetically and/or physically there is some crossover of the Eastern Chukchi Sea and the Beaufort Sea Stock during the late summer. The Eastern Chukchi Sea is the primary stock in the area; however, the Beaufort Sea Stock may also occur in the project area. Both stocks are protected under the MMPA, but neither is listed as a strategic or depleted species. Neither of the stocks found in the project area are listed as threatened or endangered under the ESA (Muto *et al.* 2019).

4.7.2 *POPULATION AND DISTRIBUTION*

The current minimum population estimate for the Eastern Chukchi Sea Stock is 12,194 whales; however, the population trend of this stock is unknown. The minimum population estimate for the Beaufort Sea Stock is 32,453 whales; however, because the data are more than 8 years old, this is not considered a reliable estimate. The population trend of this stock is unknown; however, surveys conducted in 2007-2009 indicate the stock is either stable or increasing (Muto *et al* 2019).

Beluga whales are distributed throughout seasonally ice-covered Arctic and subarctic waters of the Northern Hemisphere both offshore and in coastal waters (Muto *et al.* 2019. Factors including ice cover, tidal conditions, access to prey, temperature, and human interactions affect the seasonal distribution (Muto *et al.* 2019).

The Beaufort Sea and Eastern Chukchi Sea Stocks of beluga whales migrate between the Bering and Beaufort/Chukchi Seas seasonally (Muto *et al* 2019). The Beaufort Sea Stock leaves the Bering Sea in early spring and move through the Chukchi Sea and into the Canadian waters of the Beaufort Sea. In late fall this stock returns to the Bering Sea. The Eastern Chukchi Sea Stock move into the Chukchi Sea and western Beaufort Sea for the summer months and migrate to the Bering Sea in the fall. Belugas from the Eastern Chukchi Sea Stock are known to move into coastal areas in late June until about mid-July (Muto *et al* 2019).

Acoustic surveys for beluga in the northeastern Chukchi Sea detected them in every month between April and November (Delarue *et al* 2010). As ice begins to break up between late May and mid-June, belugas move into the Sound from the northwest to Sisualiq Spit and then down the Baldwin Peninsula to Escholtz Bay. Belugas continue to move throughout the Sound until winter. (NAB 2016, Audubon 2010).

Reports of belugas at Sisualiq include groups of 75 – 100 individuals, described as moving clockwise into the Sound. Along the west coast of Baldwin peninsula, they have been reported in groups of 200 – 300, culminating in groups of 1,000 or more in Eschscholtz Bay and near the Chamisso Islands (Frost *et al.* 1983).

4.7.3 *REPRODUCTION AND BREEDING*

Belugas return to their birth areas during the summer where they give birth every two to three years. They give birth in the warmer waters during the summer where the calves, lacking blubber to protect them from cold water, can remain in warmer, shallow waters of tidal flats and estuaries. Females reach breeding age between 9 and 14 years, slightly earlier than males. Mating is believed to occur in the late winter and early spring months, either during the migration or at the wintering grounds (NMFS 2019F). Belugas in Kotzebue Sound are known to concentrate to give birth in Eschscholtz Bay, with smaller numbers giving birth in Selawik Lake or Goodhope Bay (NAB 2016). Of late, subsistence users and researchers have noted a significant decrease in the distribution and activity of beluga whales in the Sound. It is believed that an increase in killer whale activity within the bay may be responsible as evidence indicates that increased predation may be encouraging silence in the belugas that remain. (Huntington *et al.* 2016b, Eurich 2016).

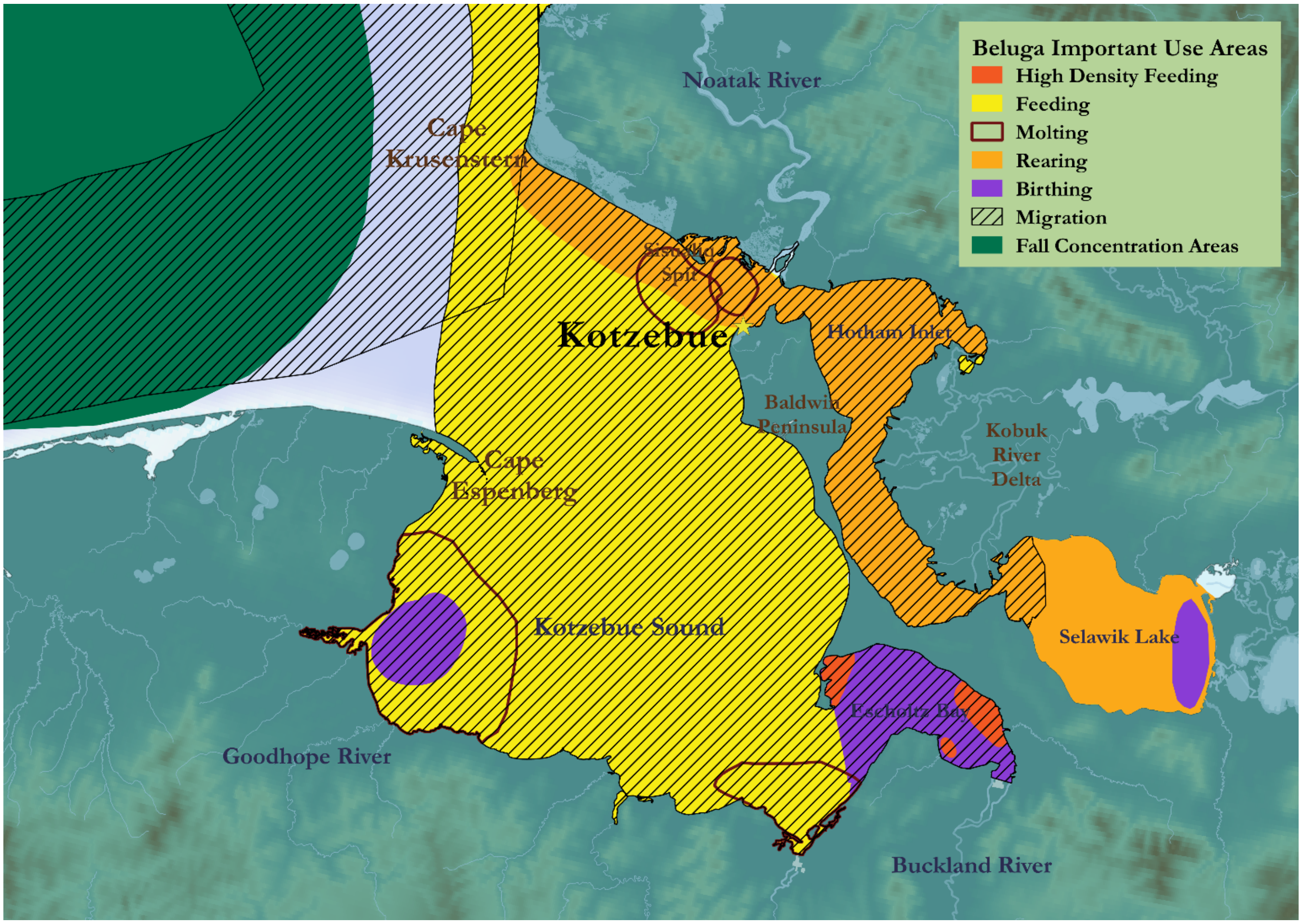

Figure 8. Beluga whale distribution patterns in Kotzebue Sound (NAB 2016)

4.7.4 *FORAGING AND HABITAT CONCERNS*

Beluga whales eat a varied diet consisting of a variety of fishes (salmon, cod, sole, herring, smelt and flounder), octopus, squid, crabs, shrimp, clams, snails, and sandworms. (NMFS 2019F).

4.7.5 *HEARING ABILITY*

Beluga whales produce a wide variety of sounds including whistles, squeals, moos, chirps, and clicks – earning them the nickname "canaries of the sea". Beluga whales rely on their hearing for echolocation, navigation and hunting (NMFS 2019F). Beluga whales are toothed whales and are in the mid-frequency cetacean hearing group.

4.8 SPOTTED SEAL (*PHOCA LARGHA*)

Spotted seals are an important resource for Alaska Native subsistence hunters. Approximately 64 Alaska Native communities in western and northern Alaska, from Bristol Bay to the Beaufort Sea, regularly harvest ice seals (Ice Seal Committee 2016 as cited in Muto *et al.* 2019).

4.8.1 *STATUS*

The Alaska Stock of the spotted seal is protected under the MMPA but is not listed as a strategic or depleted species. The Alaska Stock of spotted seals are also not listed as threatened or endangered under the ESA. The minimum population of spotted seal in the U.S. portion of the Bearing Sea in the spring is 423,237 spotted seals. This estimate is based on the number present in the U.S. portion of the Bering Sea in the spring, when all of the Alaska Stock is believed to be in the Bering Sea (Muto *et al.* 2019).

4.8.2 *POPULATION AND DISTRIBUTION*

Spotted seals are distributed along the continental shelf of the Bering, Chukchi, and Beaufort Seas in Alaska. They are also distributed in the Sea of Okhotsk south to the western Sea of Japan and northern Yellow Sea. Spotted seals are grouped into three Distinct Population Segments (DPS) based on their breeding area: the Bering Sea DPS, the Okhotsk DPS and the Southern DPS. The Alaska Stock of spotted seals is defined as the portion of the Bering Sea DPS that is U.S. waters. The Bering Sea DPS includes breeding areas in the Bering Sea and portions of the East Siberian, Chukchi, and Beaufort Seas (Muto *et al.* 2019).

The distribution of spotted seals is seasonally related to the life periods when spotted seals haul out land and when the spotted seals haul out on sea ice for whelping, nursing, breeding and molting. From the late-fall through spring spotted seals are distributed where sea ice is available for them to haul out. From summer through fall the seasonal sea ice has melted and spotted seals use land for hauling out (Muto *et al* 2019). An estimated 69,000 – 101,000 spotted seals from the eastern Bering Sea use the Chukchi Sea during the spring open-water period (Boveng *et al.* 2017). In 1976 aerial surveys of spotted seals in the Bering Sea, densities ranged between 0.013 and 1.834 seals per seals per km^2 (Braham *et al.* 1984).

Spotted seals are known to haul out between June and December in Krusenstern Lagoon, the Noatak River delta, the tip of the Baldwin Peninsula, and Cape Espenberg (Audubon 2010). Subsistence users report that spotted seals move into the area in July, following fish runs into the Sound and up the Noatak River (NAB 2016). Spotted seals in the Chamisso Islands were reported in groups of up to 20, but they may reach groups of over 1,000 at Cape Espenberg (Frost *et al.* 1983b).

4.8.3 *REPRODUCTION AND BREEDING*

Spotted seals reach breeding age around 5 years of age. Pupping and nursing in the Bering Sea begins early to mid-April after a gestation period of 10 months. Pups are nursed for three to six weeks before being weaned. Mating occurs shortly after pups have been weaned. Pups that are born on the sea ice remain on the sea ice and rarely enter the water until they are weaned (NMFS 2019I).

4.8.4 *FORAGING AND HABITAT CONCERNS*

Spotted seals forage primarily on a variety of fishes and consume some crustaceans and cephalopods as well. Adults primarily consume fish while young seals consume mostly crustaceans. Spotted seals feed near exclusively on the continental shelf in waters less than 650 feet deep (NMFS 2019I).

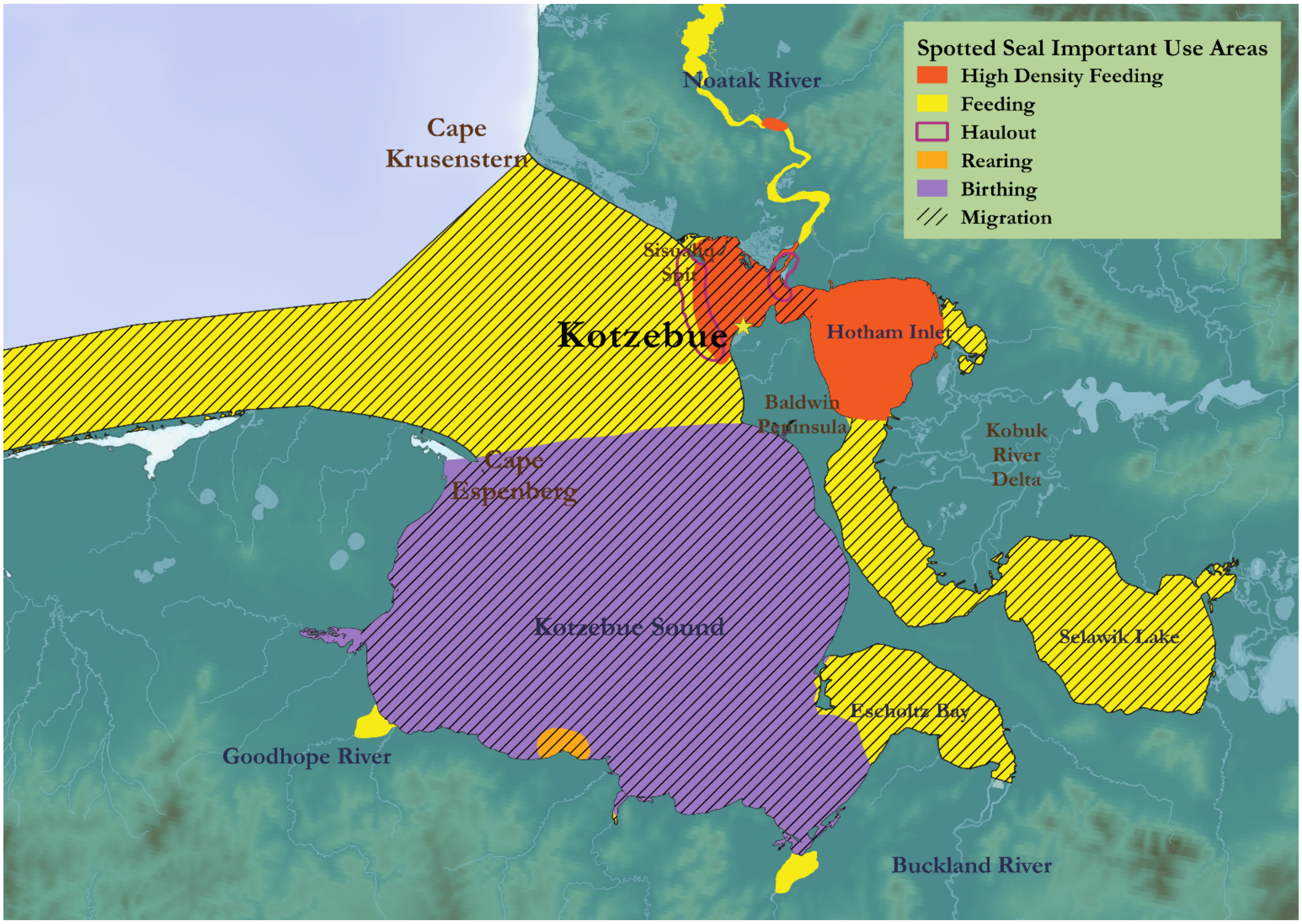

Figure 9. Spotted seal important use areas in Kotzebue Sound (NAB 2016)

4.8.5 *HEARING ABILITY*

Spotted seals are part of the Phocidae family and are included in the phocid pinniped hearing group.

4.9 RIBBON SEAL (*HISTRIOPHOCA FASCIATA*)

4.9.1 *STATUS*

The ribbon seal is protected under the MMPA but is not listed as a strategic or depleted species under the MMPA. The ribbon seal is not listed as threatened or endangered under the ESA. There is no reliable population estimate for the entire stock; however, some partial, but useful, abundance estimates have been developed (Muto *et al.* 2019).

4.9.2 *POPULATION AND DISTRIBUTION*

The minimum population of the Alaska Stock is estimated at 163,086 ribbon seals. Reliable data on the population trend of this stock is not currently available (Muto *et al.* 2019).

Ribbon seals range from the North Pacific Ocean and Bering Sea into the Chukchi and western Beaufort Seas in Alaska. The Bering Sea ice is occupied by ribbon seals from late March to early May. From May to mid-

July the ice recedes, and ribbon seals move further north into the Bering Strait and the southern part of the Chukchi Sea (Muto *et al.* 2019). An estimated 6,000 – 25,000 ribbon seals from the eastern Bering Sea use the Chukchi Sea during the spring open-water period (Boveng *et al.* 2017). In 1976 aerial surveys of ribbon seals in the Bering Sea, maximum reported densities were 0.002 seals per seals per km^2 (Braham *et al.* 1984).

Range mapping of the ribbon seal shows them present in the project vicinity from June to December; however, they typically concentrate further offshore, outside of the Sound (Audubon 2010).

4.9.3 *REPRODUCTION AND BREEDING*

Ribbon seals reach breeding age between one and five years of age and give birth to a single pup on offshore season sea ice in April and early May (NMFS 2019J). Weaning of most ribbon seal pups is completed by mid-May. Mating occurs shorting after weaning (NMFS 2019J).

4.9.4 *FORAGING AND HABITAT CONCERNS*

Ribbon seals consume a variety of fishes, cephalopods, and crustaceans. It is known that they typically feed less during the spring; however, the information available about their feeding habits is limited (NMFS 2019J).

4.9.5 *HEARING ABILITY*

Ribbon seals are part of the Phocidae family and are included in the phocid pinniped hearing group (NMFS 2016, 2018).

5 TYPE OF INCIDENTAL TAKE AUTHORIZATION REQUESTED

Under Section 101(a)(5)(D) of the MMPA, Crowley requests an IHA for takes by Level B harassment (i.e., behavioral disturbance or temporary [hearing] threshold shift) (NMFS 2018b) during certain operations associated with the construction of the proposed project. Crowley requests an IHA for one year with an effective date of June 1, 2020.

Take is requested for the installation of piles, as described in Section 1. The noise levels and potential impact isopleths that are expected to result from the construction of this project are described in detail in the sections below. Mitigation measures (including operational shutdown and monitoring zones) will be incorporated into the project to minimize the potential for unauthorized injury or harassment. Protocols for observations and mitigation methods are discussed in detail in Section 11 and in Appendix C. Takes of non-permitted species will be prevented by the mitigation measures described in Section 11.

5.1 METHOD OF INCIDENTAL TAKING

The project includes vibratory pile installation and removal within the requested species' habitat range. Planned construction methodologies will temporarily increase the underwater and airborne noise within the project area. This increase in noise has the potential to result in the behavioral disturbance and temporary threshold shifts (TTS).

5.2 REGULATORY THRESHOLDS AND MODELING FOR THE EFFECTS OF ANTHROPOGENIC SOUND

Unless otherwise noted, the following notations will be used to express thresholds:

- Peak Sound Pressure Level (SPL_{PK}): The maximum absolute value of the instantaneous sound pressure that occurs during a specified time interval, measured in dB re: 1 µPa (e.g., 198 dB_{PEAK}). (Caltrans 2015)
- Average Root Mean Square Sound Pressure Level (SPL_{RMS}): A decibel measure of the square root of mean square pressure. For pulses, the average of the squared pressures over the time that comprises that portion of the wave form containing 90 percent of the sound energy of the impulse in dB re: 1 µPa (for underwater) and in dB re: 20 µPa is used (e.g., 185 dB_{RMS}). (Caltrans 2015)
- Sound Exposure Level (SEL): The integral over time of the squared pressure of a transient waveform, in dB re: 1 μPa^2–sec. (e.g., 173 dB_{SEL}). This approximates sound energy in the pulse. (Caltrans 2015)
- Cumulative Sound Exposure Level (SEL_{CUM}): Cumulative exposure over the duration of the activity within a 24-hour period. (NMFS 2018)

5.2.1 *UPDATED CUMULATIVE SOUND THRESHOLD GUIDANCE, PTS*

Determination of the cumulative underwater sound exposure levels (SEL_{CUM}) required to cause permanent threshold shift (PTS) in marine mammals within the project area was based on the technical guidelines published by NMFS on August 03, 2016 and revised in April, 2018. This guidance considers the duration of the activity, the sound exposure level produced by the source during one working day, and the effective hearing range of the receiving species. Regulatory thresholds for potentially affected species, measured in one-day SEL_{CUM}, are summarized below.

Table 3. SEL_{CUM} PTS Onset Thresholds. (NMFS 2018)

UNDERWATER - (dB re: 1 μPa^2 s)					
Source	**Low Frequency Cetaceans (LF)**	**Mid-Frequency Cetaceans (MF)**	**High Frequency Cetaceans (HF)**	**Phocid Pinnipeds (PW)**	**Otariid Pinnipeds (OW)**
Non-impulsive Noise	199	198	173	201	219
Impulsive Noise	183	185	155	185	203

Calculation of PTS impact isopleths under the new guidance utilized the methods presented in Appendix D of the *2018 Revision to Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* and the most recent version of the associated User Spreadsheet Tool (NMFS 2018). The spreadsheet accounts for effective hearing ranges using Weighting Factor Adjustments (WFAs), and this application uses the recommended values therein. Activity durations were estimated based on similar project experience.

5.2.2 *UPDATED PEAK SOUND THRESHOLD GUIDANCE, TTS AND PTS*

In addition to thresholds for cumulative noise exposure, onset thresholds for peak sound pressures must be considered for impulsive sources. Peak sound pressure level (SPL_{PK}) is defined as "the greatest absolute instantaneous sound pressure within a specified time interval and frequency band" (NMFS 2018).

Table 4. SPL_{PK} Thresholds for Impulsive Noise. (NMFS 2018)

UNDERWATER - (dB re: 1 μPa)					
Source	**Low Frequency Cetaceans (LF)**	**Mid-Frequency Cetaceans (MF)**	**High Frequency Cetaceans (HF)**	**Phocid Pinnipeds (PW)**	**Otariid Pinnipeds (OW)**
TTS Onset	213	224	196	212	226
PTS Onset	219	230	202	218	232

None of the sound sources for this project are anticipated to be above peak sound thresholds.

5.2.3 *INTERIM SOUND THRESHOLD GUIDANCE, BEHAVIORAL DISTURBANCE*

The updated guidance described above does not address behavioral disturbance from underwater or airborne noise. The interim sound threshold guidance previously published by NMFS and summarized in Table 5 will be used for estimating exposure behavioral disturbance isopleths (NMFS 2015).

Airborne noise thresholds have not been established for cetaceans (NMFS 2015), and no adverse impacts are anticipated from airborne noise to cetaceans in the project area.

Table 5. Behavioral Disturbance Thresholds. (NMFS 2015)

UNDERWATER - (dB re: 1 µPa)		
Source	**Cetaceans & Pinnipeds**	
Non-impulsive Noise	120	
Impulsive Noise	160	
AIRBORNE - (dB re: 20 µPa)		
Source	**Harbor Seals**	**Other Pinnipeds**
All Source Types	90	100

Per the interim guidance, the practical spreading loss model was used to determine the zones in which pinnipeds and cetaceans have the potential to face behavioral disturbance from underwater noise.

The formula for calculating practical spreading loss in *underwater noise* is:

$$TL = GL \times \log \frac{R_1}{R_0}$$

where TL is the transmission loss (dB), GL is the geometric loss coefficient (15 is the only valued allowed without real-time sound source verification), R_1 is the range to the target sound pressure level (m), and R_0 is the distance from the source of the initial measurement (m).

Per the interim guidance, the spherical spreading loss model was used to determine the zones in which pinnipeds and cetaceans have the potential to face behavioral disturbance from airborne noise.

The formula for calculating spherical spreading loss in *airborne noise* is:

$$TL = GL \times \log \frac{R_1}{R_0}$$

where TL is the transmission loss (dB), GL is the geometric loss coefficient (20 is the standard value), R_1 is the range to the target sound pressure level (m), and R_0 is the distance from the source of the initial measurement in meters.

5.3 SOURCES OF ANTHROPOGENIC SOUND

In the Technical Guidance (NMFS 2018), sound sources are divided as;

- Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay.
- Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do.

5.3.1 *UNDERWATER SOURCES*

Table 6. Parameters for underwater noise calculations

Source	Source Type	Predicted Source Level (SPL RMS)[1]	Sound Exposure Level (SEL)[2]	Peak Source Level (SPL RMS)[3]	WFA[4]	Estimated Duration		
						Piles per Day	Minutes per Pile	Ant. Days of Effort
Temporary pile installation (Pipe piles 18")	Non-impulsive, continuous	158.0	144.0	174.0	2.5 kHz	10.0	10.0	17
Temporary pile removal (Pipe piles 18")	Non-impulsive, continuous	158.0	144.0	174.0	2.5 kHz	10.0	10.0	17
(*Alternate*) H-pile installation (HP14x89 or similar)	Non-impulsive, continuous	158.8	144.0	173.8	2.5 kHz	10.0	10.0	(17)
(*Alternate*) H-pile removal (HP14x89 or similar)	Non-impulsive, continuous	158.8	144.0	173.8	2.5 kHz	10.0	10.0	(17)
Anchor piles (14" HP14x89 or similar)	Non-impulsive, continuous	158.8	144.0	173.8	2.5 kHz	10.0	10.0	2
Sheet piles (20" PS31 or similar)	Non-impulsive, continuous	160.7	161.1[5]	171.5	2.5 kHz	9.0	10.0	44

[1] Average underwater RMS sound pressure levels are reported in dB re: 1 µPa @ 10 meters.
[2] Sound exposure levels (SEL) are reported in dB re: 1 µPa²-sec @ 10 m. SELs are averaged over one sec. unless otherwise noted.
[3] Average underwater peak sound pressure levels are reported in dB re: 1 µPa @ 10 meters.
[4] A Weighting Factor Adjustment of 2.5 was used for all Level A isopleth calculations.
[5] Sheet pile driving SELs reported as 2-second average, so impact period was divided by half to predict cumulative effects.

Source	Source Type	Predicted Source Level (SPL RMS)[1]	Sound Exposure Level (SEL)[2]	Peak Source Level (SPL RMS)[3]	WFA[4]	Estimated Duration		
						Piles per Day	Minutes per Pile	Ant. Days of Effort
Gravel Fill	Non-impulsive, continuous	132.8	122.8	Not Avail.	2.5 kHz	11 (hours per day)		30

Temporary installation and later removal of 18" template pipe piles will be accomplished using a vibratory hammer. The Pritchard Lake Pumping Plant in Sacramento, CA included vibratory pile driving of three 18" pipe piles in approximately 3 meters of water (Caltrans 2015). Sound pressure levels (SPLs) for the Pritchard Lake plant vibratory driving averaged 158 dB re: 1 µPa @ 10 m (SPL RMS) and peaked at an average 174.0 dB re: 1 µPa @ 10 m (peak RMS). Vibratory installation is used as a proxy for vibratory removal. In the event that 14" steel H-Piles are used for temporary template piles; the source levels below will be used for installation and removal.

Vibratory pile driving of 14" steel H-Piles was monitored during the Port of Anchorage Test Pile Project (Caltrans 2015). For this report, average RMS SPLs for eleven discrete pile driving events were averaged (at 156.7 dB re: 1 µPa @ 10 m). The standard deviation (σ) was determined (6.3 dB), and any measurements outside of the range of ±1σ was rejected. The remaining nine reported values were averaged to determine a predicted source level of 158.8 dB re: 1 µPa @ 10 m. The same procedure was followed with the reported average Peak SPLs for six discrete pile driving events (not all events had peak levels available) for a predicted Peak SPL of 173.8 dB re: 1 µPa 2 10 m.

For 20" sheet pile driving, source levels measured during the UniSea G1 Dock Replacement project and reported in the UMC Dock Replacement Project IHA Application (PND 2016) were used. In this study, sound source levels during sheet pile driving were measured at an average SPL RMS of 160.7 dB re: 1 µPa @ 10 m and an average peak of 171.5 dB re: 1 µPa @ 10 m.

For fill placement and compaction within the sheet pile cells, no direct measurements were available. Instead, as a proxy, measurements from a Cook Inlet Bucket Dredging project were used (Dickerson *et al.* 2001). The bucket dredging project measured sound levels during barge loading, bottom contact, bucket closing, bucket digging, and winch in operations, which have multiple similarities to the sound-producing activities during fill placement. The measured source levels from Dickerson *et al.* (2001) were averaged, producing an RMS SPL of 132.8 dB re: 1 µPa @10 m. This proxy value is likely conservative, as the values measure in Dickerson were for underwater activities. The fill placement for this project will be entirely within closed sheet pile cells.

Sound Exposure Levels (SELs) for 24" piles were reported in the SR 520 Bridge Replacement Test Pile Project at 144 dB re: 1 µPa2-sec @ 10 m (Caltrans 2015) and were used as a proxy for 18" and 14" pile-driving.

Vibratory pile driving of 24" steel pipe piles will be conducted into filled, compacted cells; therefore, no in-water noise is anticipated. Only airborne noise is anticipated as a result of this activity.

5.3.2 AIRBORNE SOURCES

Table 7. Airborne Sources

Source	Source Level[1]
Temporary pile installation — (Pipe piles 18")	87.5
Temporary pile removal — (Pipe piles 18")	87.5
(*Alternate*) H-pile installation — (14" HP14x89 or similar)	87.5
(*Alternate*) H-pile removal — (14" HP14x89 or similar)	87.5
Anchor piles — (14" HP14x89 or similar)	87.5
Sheet piles — (20" PS31 or similar)	96.4
Bollard piles — (Pipe piles 24")	92.1

Data for airborne noise levels of vibratory driving of 18-inch piles from Laughlin (2010) was measured at 87.5 dB_{L5EQ} re: 20 µPa at 15 meters. In this case, dB_{L5EQ} (or the 5-minute average continuous sound level) was considered equivalent to dB_{RMS} values, which would be calculated in a similar fashion. Vibratory removal of 18-inch piles is assumed to create lower noise levels than installation, so this value was also used for pile removal. Airborne noise levels for 14" anchor pile driving were treated similarly.

Data for airborne noise levels from sheet pile driving were not available, so source levels for vibratory installation of 30" piles from Laughlin (2010) was used as a proxy.

Airborne noise levels for vibratory driving of 24" pipe piles were measured during the Bangor Test Pile Program at 92 RMS L_{EQ} dB re: 20 µPa at 15.2 meters (NAVFAC 2015).

Anticipated source levels for airborne noises are not anticipated to exceed disturbance thresholds for non-harbor seal pinnipeds beyond the 10-meter safety shut-down radius, so no additional impact isopleths were included for airborne noises.

[1] Source levels for airborne noises are reported in dB_{L5EQ} re: 20 µPa @ 15 meters.

5.4 CALCULATED IMPACT ISOPLETHS

Table 8. Calculated Isopleths – Underwater Sources

Source	PTS Onset Isopleth (m)					Behavioral Disturbance Isopleth (m)
	Low Frequency Cetaceans (LF)	Mid-Frequency Cetaceans (MF)	High Frequency Cetaceans (HF)	Phocid Pinnipeds (PW)	Otariid Pinnipeds (OW)	Cetaceans & Pinnipeds
Temporary pile installation (Pipe piles 18")	6.06	0.54	8.96	3.68	0.26	3414.5
Temporary pile removal (Pipe piles 18")	6.06	0.54	8.96	3.68	0.26	3414.5
(*Alternate*) H-pile installation (HP14x89 or similar)	6.87	0.61	10.15	4.17	0.29	3871.5
(*Alternate*) H-pile removal (HP14x89 or similar)	6.87	0.61	10.15	4.17	0.29	3871.5
Anchor piles (14" HP14x89 or similar)	6.87	0.61	10.15	4.17	0.29	3871.5
Sheet piles (20" PS31 or similar)	9.17	0.81	13.56	5.57	0.39	5168.1
Gravel Fill	0.04	0.004	0.07	0.03	0.002	71.4

P | N | D

6 NUMBER OF MARINE MAMMALS THAT MAY BE AFFECTED ----------------------

The number of marine mammals that may be exposed to noise is calculated by estimating the likelihood of a marine mammal being present within calculated impact isopleths during the associated activities. Expected marine mammal presence is determined by past observations and general density near the proposed project area during construction.

6.1 BEARDED SEALS

Aerial surveys of ringed and bearded seals in the Eastern Chukchi Sea in May and June reported relatively few bearded seals within inner Kotzebue Sound, as bearded seals typically congregate on offshore ice rather than nearshore. Bearded seal densities just outside of Cape Krusenstern were 0.001 – 0.7 bearded seals per seals per km^2 (Bengtson *et al.* 2005). In 1976 aerial surveys of bearded seals in the Bering Sea, densities ranged between 0.006 and 0.782 seals per seals per km^2. Bearded seals were typically spotted in groups of one to two individuals with occasional larger groupings in denser areas (Braham *et al.* 1984). A maximum anticipated density of 0.78 was used in estimated take calculations.

6.2 RINGED SEALS

Ringed seals are distributed throughout Arctic waters in all "seasonally ice-covered seas". In winter and early spring when sea ice is at its maximum coverage, they can be found in the northern Bering Sea, in Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort Seas. In years with particularly extensive ice coverage, they may occur as far south as Bristol Bay (Muto *et al.* 2019). In 1976 aerial surveys of ringed seals in the Bering Sea, densities ranged between 0.005 and 0.017 seals per seals per km^2 (Braham *et al.* 1984). Surveys made in 1964 of seals in their breeding grounds in the Sea of Okhotsk found a density of 0.1 to 2 seals per km^2 (Canada, GofCNRC 1965). A maximum anticipated density of 0.02 was used in estimated take calculations.

6.3 MINKE WHALES

Minke whales were reported as sometimes present in Kotzebue Sound during the summer months and two individuals beached in the mouth of the Buckland River in autumn during the late 1970s (Frost *et al.* 1983b). For take calculations, a conservative estimate of seven minke whales in the impact area throughout the season was used.

6.4 GRAY WHALES

Gray whales sometimes enter shallower waters to feed, which occasionally results in strandings. There have been five reports between 2010 and 2019 of gray whale strandings within inner Kotzebue Sound, including one in Hotham Inlet. An additional unidentified large whale was reported stranded south of Cape Blossom in 2018 (Savage, pers. comm. 2019). Gray whales were reported as present and feeding (sometimes in large numbers) in Kotzebue Sound and a gray whale was harvested by whale hunters at Sisualiq in 1980 (Frost *et al.* 1983b). For take calculations, a conservative estimate of seventeen gray whales in the impact area throughout the season was used.

6.5 KILLER WHALES

Photo identification of individuals spotted in the southern Chukchi sea during transect surveys (during which at least 37 individuals were spotted six times) identified Gulf of Alaska, Aleutian Islands, and Bering Sea Transient killer whales. Sightings reported included two sightings of 14 whales each in July, 3 sightings of 18 whales each in August, and one sighting of 5 whales in September (Clarke 2013).

Harassment of killer whales during the project is likely to be of the same individuals on an ongoing basis. Due to the remote location at the fringes of the known range of either anticipated stock, it is unlikely that more than one or two pods would be located in the region during construction, thereby limiting the effects of the project. For take calculations, a conservative estimate of 2 North Pacific Alaska Resident Stock and 12.33 (an average of the three reported group sizes) transient killer whales in the impact area was used. Based on feeding patterns, it is expected that they will be within the project's impact area no more than 25% of the time and will often pursue prey elsewhere.

6.6 HARBOR PORPOISES

The harbor porpoise frequents nearshore waters and coastal embayments throughout their range, including bays, harbors, estuaries, and fjords less than 650 feet (198 m) deep (NMFS 2018H). The presence of harbor porpoises was detected in Kotzebue Sound between September and November and between January and March during acoustic monitoring in 2014 & 2015. Porpoises had not previously been reported under the ice in the Chukchi (Whiting *et al.* 2019). For take calculations, it was estimated that no more than 150 harbor porpoises would be present in the project area throughout the season.

6.7 BELUGA WHALES

Reports of belugas at Sisualiq include groups of 75 – 100 individuals, described as moving clockwise into the Sound. Along the west coast of Baldwin peninsula, they have been reported in groups of 200 – 300, culminating in groups of 1,000 or more in Eschscholtz Bay and near the Chamisso Islands (Frost *et al.* 1983). An estimate of 100 whales per day per stock (Beaufort Sea and Eastern Chukchi Sea) was used, given the transient nature of the whales within the bay.

6.8 SPOTTED SEALS

The distribution of spotted seals is seasonally related to the life periods when they haul out on land and when they haul out on sea ice for whelping, nursing, breeding and molting. From the late-fall through spring spotted seals are distributed where sea ice is available for them to haul out. From summer through fall the seasonal sea ice has melted and spotted seals use land for hauling out (Muto *et al* 2019). An estimated 69,000 – 101,000 spotted seals from the eastern Bering Sea use the Chukchi Sea during the spring open-water period (Boveng *et al.* 2017). In 1976 aerial surveys of spotted seals in the Bering Sea, densities ranged between 0.013 and 1.834 seals per seals per km^2 (Braham *et al.* 1984).

Spotted seals are known to haul out between June and December in Krusenstern Lagoon, the Noatak River delta, the tip of the Baldwin Peninsula, and Cape Espenberg (Audubon 2010). Subsistence users report that spotted seals move into the area in July, following fish runs into the Sound and up the Noatak River (NAB 2016). Spotted seals in the Chamisso Islands were reported in groups of up to 20, but they may reach groups of over 1,000 at Cape Espenberg (Frost *et al.* 1983b). A maximum anticipated density of 1.5 was used in estimated take calculations.

6.9 RIBBON SEALS

Ribbon seals range from the North Pacific Ocean and Bering Sea into the Chukchi and western Beaufort Seas in Alaska. The Bering Sea ice is occupied by ribbon seals from late March to early May. From May to mid-July the ice recedes, and ribbon seals move further north into the Bering Strait and the southern part of the Chukchi Sea (Muto *et al.* 2019). An estimated 6,000 – 25,000 ribbon seals from the eastern Bering Sea use the Chukchi Sea during the spring open-water period (Boveng *et al.* 2017). In 1976 aerial surveys of ribbon seals in the Bering Sea, maximum reported densities were 0.002 seals per seals per km^2 (Braham *et al.* 1984). A maximum anticipated density of 0.002 was used in estimated take calculations.

Range mapping of the ribbon seal shows them present in the project vicinity from June to December; however, they typically concentrate further offshore, outside of the Sound (Audubon 2010).

6.10 CALCULATION OF ESTIMATED TAKES BY ACTIVITY

Estimated offshore areas of impact were mapped based on the calculated impact isopleths in Table 8 and accounting for shoreline areas. Rates of take for each species were estimated as follows:

- For seal species with an estimated abundance based on sightings per area, this number was multiplied by the offshore area of impact for each activity (Table 9).
- For minke whales, it is estimated no more than 7 might occur in the project area over the construction season.
- For gray whales, it is estimated no more than 17 might occur in the project area over the construction season.
- For killer whales, it is estimated no more than 14.33 might occur in the project area 25% of the time.
- For harbor porpoises, it is estimated no more than 150 might occur in the project area over the construction season.
- For beluga whales, an estimated rate of take of 100 belugas per day was assumed.

The number of days for each activity was increased by a contingency of 10% to account for the possibility of construction overages.

Table 9. Estimated number of takes by species and activity

		Temp. Piles	Temp. Removal	Anchor Piles	Sheet Piles	Gravel Fill	
	Days of Construction	22	22	3	55	38	
	Offshore area of impact (km^2)	24.8	24.8	32.1	52.5	0.81	
Species	Estimated rate of take (per day)	Number of Estimated Takes per Activity					Total Takes
Bearded seals	0.78	368	368	76	2007	21	2840
Ringed seals	0.02	10	10	2	52	1	75
Minke whales	0.04	1	1	1	2	2	7
Gray whales	0.12	3	3	1	6	4	17
Killer whales	4.5	86	86	14	221	149	556
Harbor porpoises	1.2	23	23	4	59	40	149
Beluga whales	100	1900	1900	300	4900	3300	12300
Spotted seals	1.5	863	863	177	4708	49	6660
Ribbon seals	0.002	1	1	1	6	1	10

For harassment zones outside of observable range, takes will be recorded at the assumed rates described above or on refined density estimates based on daily observations. Based on a projected maximum observable area of 2,000 meters from each observation point, Crowley anticipates that 19.6 km^2 of the offshore monitoring zone will be visible. The assumed rate of take for seals will be reduced based on the visible range on a given observation day and actual takes recorded for those areas under observation. Other rates are not contingent on area.

7 ANTICIPATED IMPACT ON SPECIES OR STOCKS

The proposed project has the potential to impact marine mammals by increasing noise levels. Likely effects may include temporary behavioral responses to non-injurious noise from in-water construction activities and minor alteration in foraging or resting areas. Underwater sounds will likely minimally displace schools of forage fish in the action area. Physical elements of critical habitat will not be affected by the proposed action. ESA-listed species may experience some energetic cost from short term dispersal of prey, resulting in short term expenditure of energy seeking other sources or waiting for prey to re-aggregate following noise effects.

7.1 NOISE

Pinnipeds and cetaceans are sensitive to underwater and airborne noise. Recent studies have shown that even moderate levels of underwater noise can cause a temporary loss in hearing sensitivity in some marine mammals (Kastak *et al.* 2005). Increases in noise levels from in-water activities can reduce a marine mammal's capability to hear other noises, like background noise and noise created by their prey and predators, otherwise known as auditory masking (Southall *et al.* 2007). This results in difficulties with communication, predator avoidance, and prey capture, among others. Anthropogenic sounds can also result in behavioral modification, including changes in foraging and habitat use or separation of mother and infant pairs (MMC 2007).

Marine mammals can also experience changes in sensitivity to sounds after exposure to intense sounds for long periods. These changes, called threshold shifts, can occur on a temporary or permanent level, depending on the intensity of the sound and length of time to which the animal is exposed to the sound. Typically, TTS includes impacts to middle-ear muscular activity, increased blood flow, and general auditory fatigue (Southall *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. PTS would occur if the animal subjected to the increased sound level did not return to pre-exposure conditions within an order of weeks or if the animal exhibited physical injuries (Southall *et al.* 2007).

The proposed project will have the possibility of resulting in Level B harassment of pinnipeds and cetaceans. Level B harassment is temporary in nature, and the impacts associated with the potential harassment resulting from this project will be temporary. Mitigation measures discussed in Section 11 are expected to eliminate the potential for PTS or Level A harassment.

8 ANTICIPATED IMPACT ON SUBSISTENCE

Marine mammals are harvested from Kotzebue Sound during all seasons by the residents of Qikiqtaġruq (Kotzebue), Ipnatchiaq (Deering), Nunatchiaq (Buckland), Nuataaq (Noatak), and Nuurvik (Noorvik). Traditional harvests include bowhead and beluga whales and all four seal species. Subsistence fishing also occurs year-round, with gill net ice-fishing in the winter and rod-and-reel or gill-net fishing in the summer. Pacific herring, Dolly Varden char, whitefishes, Arctic and saffron cod, and sculpin are among the species most commonly harvested (NPFMC 2009).

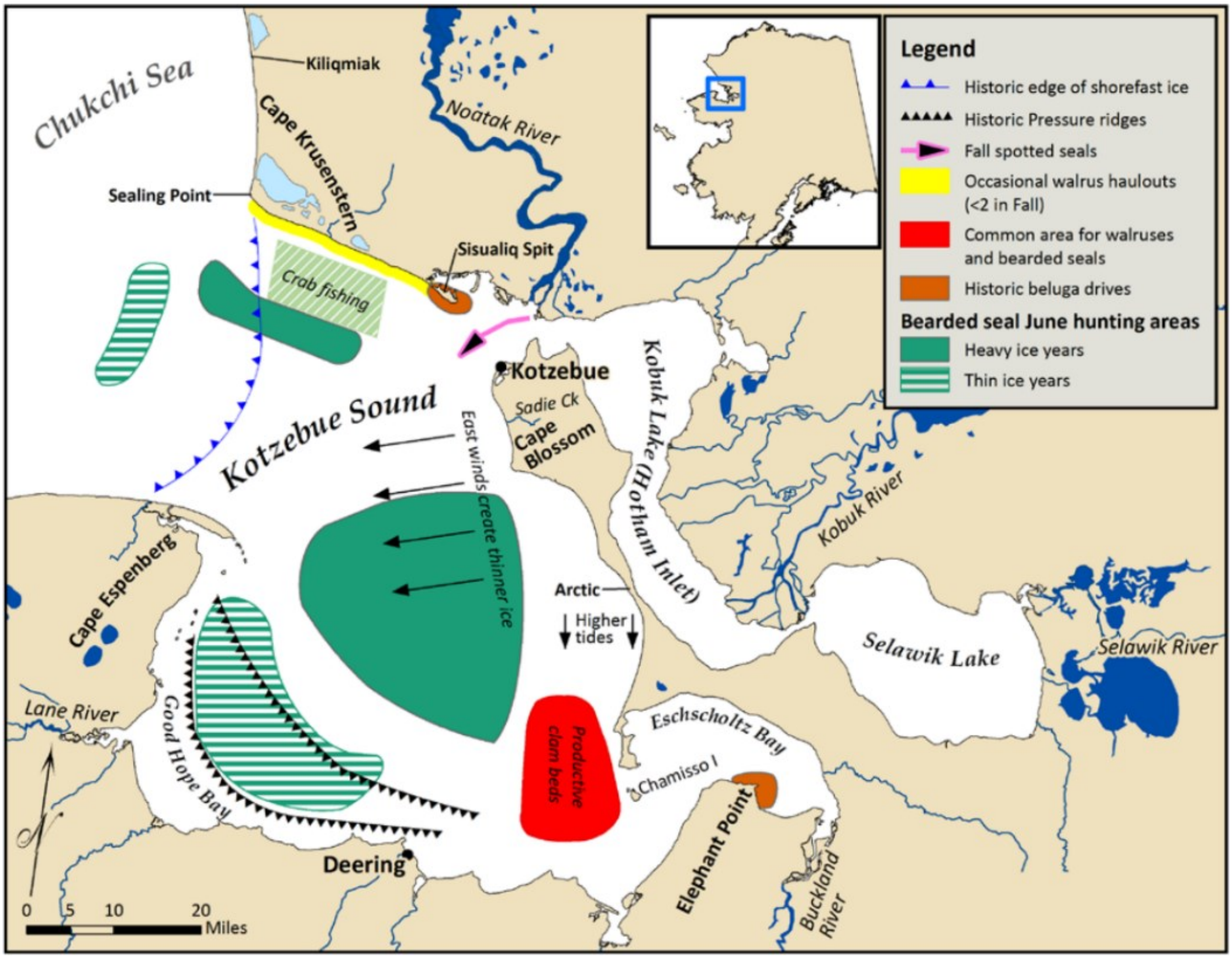

Figure 10. Areas of special importance to subsistence species (Huntington *et al.* 2016b)

Bowhead whale are harvested almost exclusively by the residents between Kivalina and Point Hope, but beluga whale are routinely hunted throughout the sound in spring and summer (NAB 2016). Traditional hunting grounds for beluga (sisuaq) are directly across from Kotzebue at Sisualiq Spit (Huntington *et al.* 2016). Regional hunters report a significant change in the presence of beluga whales in the Sound. There are no longer sufficient whales to make a coordinated drive hunt on Sisualiq Spit, as was traditional. Belugas are no longer common in Eschscholtz Bay, either. Hunters attribute the decrease to a variety of factors, including engine noise (both air and vessel traffic have increased), lack of coordinated hunts, and killer whale pressure (Huntington *et al.* 2016b). A gray whale harvest at Sisualiq was reported to the Alaska Department of Fish & Game (ADF&G) in 1980 (Frost *et al.* 1983b).

Bearded and ringed seals are the most commonly harvested seals in the Kotzebue Sound area (Huntington *et al.* 2016); however, the Northwest Arctic Borough (2016) reported harvest efforts for all four species in Kotzebue Sound. With the exception of bearded seals, there were limited hunting efforts in the spring (March – May) with nearly twice as much harvest effort in the fall (September – November) and significantly less hunting in summer (June – August). Hunt effort for bearded seals appears equal in spring and fall (NAB

2016). Huntington *et al*. (2016) report that bearded and ringed seals are hunted from breakup until the spotted seals arrive, at which point the more aggressive spotted seals chase them from the area. Generally, hunters reported that there is less need for seal hunting than in the past because they are needed less for sled dog feed and sealskin storage containers (Huntington *et al*. 2016).

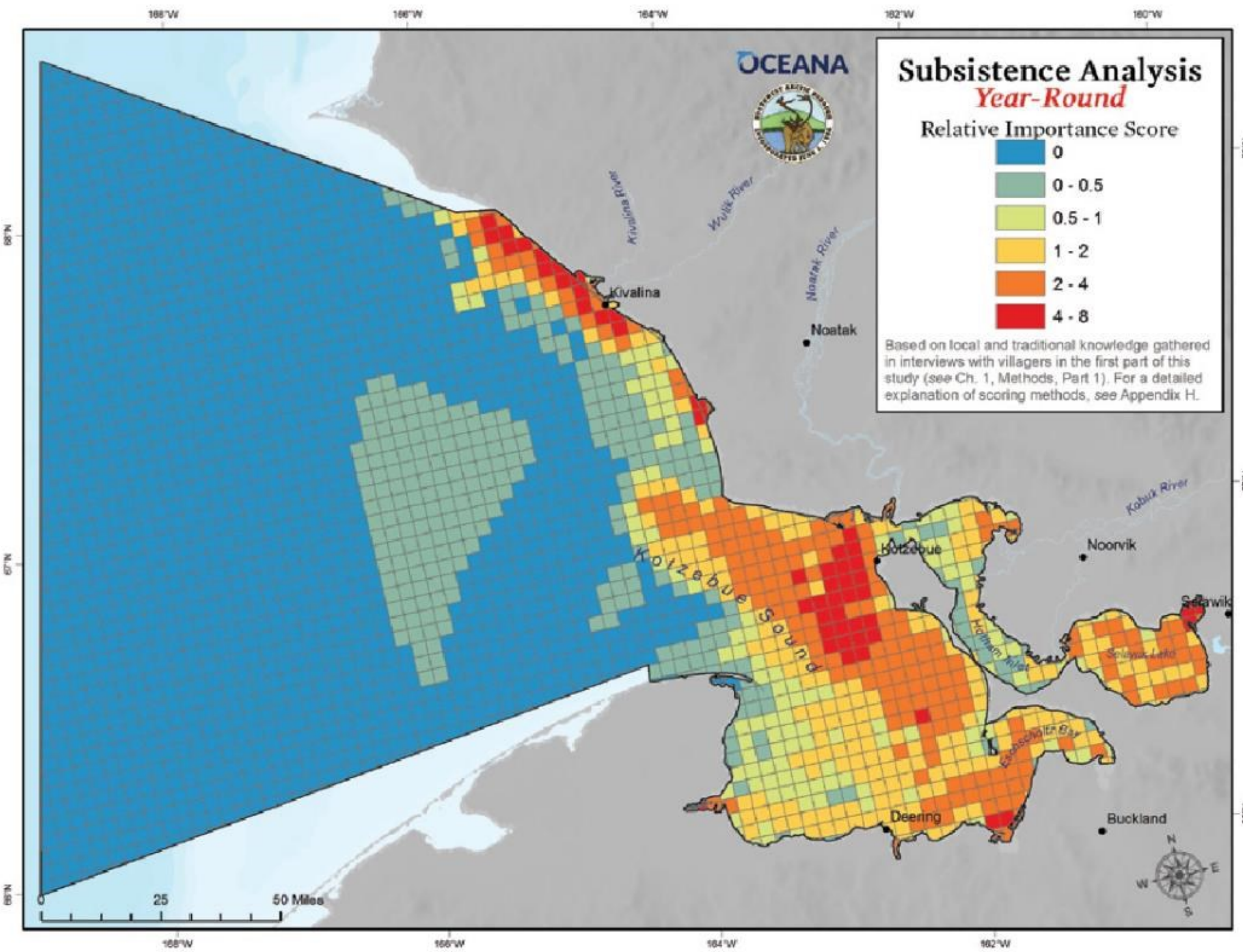

Figure 11. Areas of relative subsistence importance in Kotzebue Sound (NAB 2016)

Bearded seals are the primary focus for Kotzebue Sound hunters in the spring, with harvests occurring near Cape Krusenstern and Goodhope Bay. In thinner ice years, there is less suitable denning habitat for ice seals and more danger for seal hunters to camp out and to approach the seals. Hunters report that there is no longer ice for hunting bearded seals into July, as there was in the 1980s. Now the ice is all gone in June. In September, the yearling seals return to the Sound when the ice begins to form, spending time in the rivers feeding on fish until freeze-up (Huntington *et al*. 2016).

Spotted seals arrive during the molt and are common throughout the area in summer, feeding on fish in the Sound, up the rivers, and in the larger lakes. In the fall, spotted seals gather on the newly formed ice flows and ride the ice in the prevailing winds to the southwest towards Shishmaref (Huntington *et al*. 2016).

Ribbon seals have always been infrequent in Kotzebue Sound, but are seen less frequently by hunters now. They are not harvested for human consumption, but their hides are harvested and meat and blubber used as dog food. Ribbon seals are reported as increasingly rare in Kotzebue Sound (Huntington *et al*. 2016).

Walrus are found in the Sound near Chamisso Island with their young in the spring, staying while there is ice in the area. In the fall, they may rarely haul out at Cape Krusenstern (Huntington *et al*. 2016b).

Subsistence fisheries in Kotzebue Sound include seasonal fishing for chum salmon and year-round fishing for Pacific herring, Dolly Varden char, whitefishes, Arctic and saffron cod, and sculpin (NPFMC 2009).

8.1 IMPACT ON SUBSISTENCE HUNTING

A draft Subsistence Plan of Cooperation (POC) has been distributed to potentially affected communities and subsistence organizations. The plan will be revised and adapted using community input, and communication will remain ongoing throughout the project. The POC is attached as Appendix B of this application.

Bowhead whale are primarily targeted outside of the Sound, and the project is not expected to impact any prey species or migratory behavior. No impact to subsistence bowhead whale harvest is anticipated.

Beluga whales have been traditionally harvested in abundance at Sisualiq. Project impacts are not expected to reach traditional harvest areas, but Crowley will coordinate with local subsistence groups to avoid or mitigate impacts to beluga whale harvests.

Project activities avoid traditional ice seal harvest windows, so are not expected to negatively impact hunting of bearded or ringed seals. Crowley will coordinate with local communities and subsistence groups to avoid or mitigate impacts to ice seal harvests.

The project is not expected to have any adverse effects on subsistence fisheries or water quality. Mitigation practices will be implemented as described in Section 11 to provide additional assurance that resources will be protected.

9 ANTICIPATED IMPACT ON HABITAT

Critical habitat is defined as "specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations for protection" and "specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation." Critical habitat typically supports unique foraging, refugia, or reproductive habitat features.

None of the species listed in this IHA have critical habitat within the action area.

9.1.1 *DIRECT IMPACTS*

The primary reason that animals might leave habitats in the project area would be due to elevated noise levels.

Construction activities will likely have temporary impacts on listed species foraging or resting habitat through increases in underwater and airborne sound from project activities. Project-related disturbances might be detectable at beaches nearby on the Baldwin Peninsula, but are not expected to reach more heavily used haul-out areas at Sisualiq Spit. Effects will be short-term and are not anticipated to extend beyond the construction phase of the project. Best management practices and mitigation used to minimize potential environmental effects from project activities are described in Section 11.

While it is possible that pinnipeds and cetaceans may avoid the project area during construction, they are not likely to abandon the site altogether.

9.1.2 *INDIRECT IMPACTS*

Indirect effects to marine mammals, such as noise-induced dispersal or disaggregation of prey, would be insignificant and discountable due to the temporary nature of the activity. After activities cease each day, it is expected that forage fish will re-aggregate and become more available.

9.1.3 *CUMULATIVE IMPACTS*

The sum of these effects is not expected to adversely modify habitat or jeopardize the local populations of marine mammals. Current and habitual use of the dock is expected to continue at existing levels. As this project proposes no significant long-term effects to protected species or their habitat, it is not expected to contribute significantly to cumulative impacts with other potential projects.

10 ANTICIPATED IMPACT OF LOSS OR MODIFICATION OF HABITAT

The proposed project is not likely to result in the permanent loss or modification of any marine mammal habitat.

11 MITIGATION MEASURES

The following mitigation measures will be implemented during permitted activities in order to ensure the least practicable adverse impact, to minimize the effects of authorized impacts, and to record unavoidable, observable effects.

The proposed project avoids impacts as much as practicable, but impacts cannot be avoided entirely as this project is dependent on maritime access by nature. The following measures and BMPs will be incorporated by the applicant in order to minimize potential impacts:

11.1 WATER QUALITY PROTECTION

- New sheet piles will be installed seaward of the existing dock, containing it and removing the need for demolition or disturbance of the existing dock. Enclosing the existing dock will also provide more dockside space for safe handling of bulk fuel deliveries.
- A silt curtain will be deployed during pile driving operations to prevent turbidity and negative impacts to water quality. This measure will also prevent fish from entering the injury isopleth for fish during pile driving. Both results will reduce the potential for impacts to prey species.
- Fill placed in the tidelands will be clean gravel fill. Fill will contain relatively few fines to reduce impacts to turbidity and/or sedimentation. Fill placement will be placed in completed sheet pile cells, providing containment and removing the need for a silt curtain.
- The dock will 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 will not be stored below the ordinary high-water mark. All chemicals and petroleum products will be properly stored to prevent spills. No petroleum products, cement, chemicals, or other deleterious materials will be allowed to enter surface waters.
- Oil booms will be readily available for containment should any releases occur.
- The contractor will check for leaks regularly on any equipment, hoses, and fuel storage that occur at the project site.

11.2 NOISE MITIGATION

Noise levels will be minimized during construction by the use of appropriately-sized piles. The use of vibratory pile driving methods will also reduce sound levels entering the water during construction and reduce the impacts to marine mammals, fish, and seabirds. Properly sized equipment will be used to drive piles.

11.3 IN-WATER OR OVER-WATER CONSTRUCTION ACTIVITIES

During all in-water or over-water construction activities having the potential to affect marine mammals, a shutdown zone of 10 meters will be monitored to ensure that marine mammals are not endangered by physical interaction with construction equipment.

11.4 OBSERVATION AND SHUTDOWN PROCEDURES

Qualified observers with stop-work authority will be on site before and during any in-water or over-water construction. Observers will monitor permitted activities in accordance with protocols reviewed and approved by NMFS. At least the minimum number of observers necessary to view the entire monitoring area will be onsite, depending on construction activities, environmental conditions, and harbor activities. A detailed 4MP is found in Appendix C.

All permitted pinnipeds and cetaceans that come within monitoring zones for permitted activities will be recorded as potential exposures. NMFS will be notified and consulted if non-permitted species come within the monitoring zones. If any marine mammal is observed approaching a shutdown zone, permitted activities will cease.

11.5 VESSEL INTERACTIONS

To minimize impacts from vessels interactions with marine mammals, the crews aboard project vessels will follow NMFS's marine mammal viewing guidelines and regulations as practicable. (https://www.fisheries.noaa.gov/alaska/marine-life-viewing-guidelines/alaska-marine-mammal-viewing-guidelines-and-regulations).

11.6 COMPENSATORY HABITAT MITIGATION

Crowley has requested a permit for the proposed project under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act from the USACE. To receive that permit, Crowley will be required to avoid, minimize, and mitigate impacts to intertidal habitat. For impacts that cannot be avoided or minimized, Crowley will coordinate compensatory mitigation with USACE.

12 MITIGATION MEASURES TO PROTECT SUBSISTENCE USERS

A Plan of Cooperation (POC) has been developed for this project and is included in Appendix B. Proposed measures for prevention or mitigation of water quality and noise impacts to protected species, described in Section 11, is expected to similarly benefit subsistence uses of those resources. Additionally, Crowley will coordinate with potentially-affected community and subsistence groups, as described in the POC, to mitigate any other identified negative impacts to subsistence activities.

13 MONITORING AND REPORTING

13.1 MONITORING PLAN

Monitoring measures for the potential impacts the project could have on marine mammals are discussed briefly in Section 11 and at length in the 4MP.

13.2 REPORTING

The procedures for reporting are listed below and in the 4MP.

13.2.1 *Injured or Dead Marine Mammal*

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder shall report the incident to the Office of Protected Resources (301-427-8401) and the NMFS Alaska Regional Stranding Coordinator (877-925-7773) as soon as feasible. Detailed additional instructions are included in the 4MP.

13.2.2 *Annual Report*

A comprehensive annual marine mammal monitoring report documenting marine mammal observations will be submitted to NMFS at the end of the project. The draft report will be submitted to NMFS within 90 calendar days of the end of the in-water work period. The report will include marine mammal observations (pre-activity, during-activity, and post-activity). A final comprehensive report will be prepared and submitted to NMFS within 30 calendar days following resolution of comments on the draft report from NMFS. Details of the annual report are described in the 4MP.

14 Suggested Means of Coordination

The data recorded during marine mammal monitoring for the proposed project will be provided to NMFS in the monitoring report. This report will provide detailed information on the usage of the site during project activities by protected species. The monitoring data will inform NMFS and future permit applicants about the behavior and adaptability of pinnipeds and cetaceans in the region for future projects of a similar nature.

15 Conclusion

For the reasons described in this document, Crowley has determined that the proposed project is likely to result in the Level B harassment of bearded seals, ringed seals, minke whales, gray whales, killer whales, harbor porpoises, beluga whales, spotted seals, and ribbon seals. This project has implemented impact minimization measures, including a 4MP, to reduce the potential for unauthorized harassment.

While the project has the potential to result in minor behavioral effects or minor injury to any marine mammals present during project activities, based on the analysis presented in this document, these individual impacts will have a negligible effect on the stocks of marine mammals described in this document or on their habitats.

16 LITERATURE CITED

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Appendix A. Project Permit Drawings

Appendix B. Subsistence Plan of Cooperation

Appendix C. Marine Mammal Monitoring and Mitigation Plan (4MP)