

would be limited to Diamond Point port in Cook Inlet and the northeastern side of Iliamna Lake, where seal haul-outs are located and the highest concentrations of seals are found. If Alternative 2 is selected, there is a likelihood of impacts to marine wildlife, particularly harbor seals inhabiting Iliamna Lake.

4.23.6.4 Variant Impacts Analysis

Summer-Only Ferry Operations Variant

Under the Summer-Only Ferry Operations Variant, trucks would only operate when the ferry(ies) would be running (during the open water season), which would double the number of round-trip truck trips to 70 per 24-hour day on each side of the ferry terminals during the summer (PLP 2018-065). The number of truck trips on the access roads would be one truck passing in either direction every 10 minutes during the summer. There would be additional light vehicle traffic (i.e., vehicles other than large trucks transporting concentrate, fuel, and consumables) along the transportation corridor, which would add daily vehicle trips.

The increase in vessel traffic during seasons when seals are seen in high concentrations throughout Iliamna Lake (Burns et al. 2016) may increase the likelihood of vessel interactions with Iliamna Lake seals. Given this congregation of harbor seals is around 400 animals, the loss of animals to vessel strike may have adverse effects on the success of the population.

Impacts to wildlife would vary by species; but overall, in terms of magnitude, the primary impact from an increase in summer truck traffic on the access roads would be an increase in potential for injury or mortality from collision, especially to those species that hibernate and migrate. Because higher truck traffic would occur generally when species are out of hibernation, and migratory species are breeding, collision potential would be elevated. Wildlife species would have an increased potential for both behavioral avoidance of the access roads (due to higher traffic volumes, increased noise, and increased levels of fugitive dust), and potential for collisions, especially for young-of-the-year wildlife that would not be accustomed to the road. The increase in truck traffic may increase species avoidance of foraging and breeding areas. However, this variant may also reduce injury and mortality for some species. Because the truck traffic would be eliminated during winter months, there would be a potential reduction in collisions for species that do not hibernate, such as moose. A reduction in winter-time truck traffic would decrease the potential for moose (and other wildlife) collisions, due to improved visibility for truck drivers during summer.

Specific to marine mammals, under this variant, ice-breaking would not occur, thereby eliminating negative effects of vessel traffic on overwintering seals in Iliamna Lake.

The magnitude of impacts would be 9,819 acres of habitat removal plus avoidance of surrounding habitat due to behavioral disturbance, an increased potential for injury and mortality for some species, and a decreased potential for others. The duration of impacts would last for the life of the project, but occur only during the open water season when the ferry(ies) would be operational. The extent of impacts would be primarily limited to the access roads; and if this variant is chosen and the project is permitted and constructed, it is expected that some wildlife would experience mortality.

Newhalen River North Crossing Variant

Under Alternative 2 there would be a bridge over the Newhalen River upstream of the south crossing location by approximately 0.74 mile. All impacts to wildlife species would be similar, apart from potential impacts to nesting bald eagles. No suitable golden eagle nesting habitat is present in the area around the Newhalen River bridge crossings, because the habitat is primarily riparian,

with large spruce and cottonwood trees. As detailed in Section 3.23, Wildlife Values, the latest nesting raptor surveys were conducted in July 2019, and the closest nest (determined to be active based on surveys) was approximately 1.4 miles upstream of the bridge location. There is a material site adjacent to the northern bridge abutment that is approximately 1 mile from the closest active bald eagle nest. If construction of the bridge occurs during the bald eagle nesting season (generally February through August), there is a potential for visual and noise disturbance from construction activities, depending on noise levels (especially if blasting is conducted at the material site). Prior to construction, additional permitting would likely be necessary with the USFWS to determine potential impacts to all bald and golden eagle nests in project areas. This would include additional nest surveys prior to any construction activities to determine the location of active nests, and potential avoidance and minimization measures (including avoidance buffers as detailed in Richardson and Miller 1997). Although bald eagles nest in close proximity to human activity at various locations throughout Alaska, USFWS would be consulted to determine measures necessary to ensure the nest is not disturbed during bridge construction. Once bridge construction is complete, operations are unlikely to disturb nesting eagles, because regular vehicle traffic would create less noise and would result in predictable vehicle movement. Overall, the magnitude of impacts would be low, because the only currently known active nest is 1.4 miles away from the bridge, and measures would be required by USFWS to prevent disturbance if construction occurs during the nesting season. The extent would encompass the immediate vicinity of the bridge and material site, and although the duration of noise impacts would be brief—only during construction—additional noise impacts may occur longer, depending on use of the material site. Vehicle traffic along the mine access road would last for the life of the project and potentially longer, depending on use of the road post-closure.

Pile-Supported Dock Variant

Under this variant, the total combined area of the pilings would result in less than 0.1 acre of impacts to the benthic marine environment. In terms of magnitude of impacts, this variant would decrease the acreage of habitat loss for marine wildlife. Dredging could still occur; therefore, 58 acres of the benthic marine environment would be dredged on a periodic basis. Also in terms of magnitude and extent, during construction, noise levels may be higher during pile-driving activities, as opposed to construction of an earthen causeway and wharf. In terms of extent of impacts, there would be reduced impediment to marine wildlife foraging around the port, because some species would pass between the piles instead of having to navigate around the earthen causeway and wharf. All other impacts to wildlife species would remain the same. The magnitude of impacts would be 9,753 acres of habitat loss, which includes a reduction in benthic marine habitat loss. The duration would last for the life of the project until the port is removed, and the extent would encompass the marine portion of the port. If this variant is permitted and constructed, a reduction in impacts compared to an earthen causeway port would be expected to occur.

4.23.7 Alternative 3—North Road Only

The magnitude, duration, extent, and potential for direct and indirect impacts from the mine site to wildlife species from Alternative 3 would be similar to Alternative 1a. The main differences would be no ferry in Iliamna Lake (and no ferry terminals) under Alternative 3, and the length of the road associated with the transportation corridor would be 83 miles. In terms of magnitude, this all-road option for the transportation corridor would increase the amount of permanent habitat loss and increase the potential for vehicular collisions with terrestrial wildlife, including birds. Up to 35 round trips per day for trucks transporting concentrate, fuel, and consumables would equate to a truck passing in either direction approximately every 21 minutes during a 24-hour period. There would be additional light-vehicle traffic (i.e., vehicles other than large trucks transporting concentrate, fuel, and consumables) along the transportation corridor, which would add daily

vehicle trips. Impacts to birds and terrestrial wildlife from behavioral disturbance and injury and mortality from this level of truck traffic would be similar to that previously described for Alternative 1a. The main difference would be that the transportation corridor for Alternative 3 traverses more forested vegetation communities (compared with the other alternatives) along the northern side of Iliamna Lake. In terms of extent of impacts, forested habitat along the access road would buffer some of the noise and fugitive dust generated by truck traffic, so that the distance where behavioral impacts to birds and other wildlife may occur would be less. Additionally, forested habitat along the road provides a visual buffer and adjacent cover for wildlife to use. Forest habitats also tend to trap fugitive dust from spreading farther away from the road, compared with more open habitats (which are present in greater abundance along the transportation corridors for the other alternatives).

In terms of habitat avoidance by species, caribou may avoid the transportation corridor and port by up to 3.1 miles during the calving period. Brown bears may avoid denning around the mine site, up to 7.3 miles away. They may also avoid denning around the transportation corridor and port by up to 1.2 miles.

Alternative 3 would have no ferry in Iliamna Lake; therefore, there would be no impacts to harbor seals in Iliamna Lake from the project. All other impacts to marine mammals would be similar to Alternative 2, but the Diamond Point port would be farther in Iliamna Bay under Alternative 3. There is no pile-supported dock variant under Alternative 3, and no earthen causeway and sheet pile dock. There would be a caisson dock, similar to the one described under Alternative 1a. The caisson dock would include a maintenance dredging channel that would be periodically dredged to maintain the necessary depth.

Although the full details of the port are described in Chapter 2, Alternatives, some key elements that impact wildlife include the use of an elevated, fully enclosed conveyor system to load concentrate from the port onto the lightering barges for eventual transfer to the bulk carriers moored in Iniskin Bay. There would be only one proposed lightering location in a deepwater trench on the western side of Iniskin Bay near the mouth of the bay. There would be no secondary lightering location on the western side of Augustine Island. Therefore, the risk of entanglement with cables would be less under Alternative 3. The only port design is a caisson dock design, which reduces underwater noise from sheet or pile-driving, but would necessitate dredging. The dock would be constructed in a dredged area, with a large navigation channel for vessels to approach the dock at all tidal stages, and a turning basin. This channel and turning basin would require maintenance dredging approximately every 5 years to maintain the necessary depths. This dredging would likely be conducted with a barge-mounted cutterhead suction dredge approximately every 5 years, with the dredged material stored onshore. There would be no airstrip at the Diamond Point port; instead, the existing airstrip at Pedro Bay would be used. This would remove potential overflight noise and visual disturbance impacts to marine mammals and other wildlife around the port. There would be a monopole communications tower ranging from 100 to 150 feet, with high-visibility bands and flashing red lights, in compliance with FAA and USFWS guidance. The access road to the port would be shorter compared with Alternative 2, and therefore have reduced impacts to the marine intertidal zone.

In summary, the magnitude of impacts from Alternative 3 would be a loss of 10,130 acres of habitat for a variety of wildlife species. There are no impacts to wildlife species that are unique to Alternative 3, with impacts similar to those discussed previously for Alternative 1a and Alternative 2. The duration of impacts would extend for the life of the project and longer, depending on the post-construction use of the transportation corridor. The extent would include the footprint of all project components, especially the transportation corridor. If Alternative 3 is permitted and constructed, these impacts would be expected to occur.

4.23.7.1 Variant Impacts Analysis

Concentrate Pipeline Variant

Anticipated wildlife impacts include habitat loss from the concentrate pipeline pump house (1 acre in the mine site), booster station (0.7 acre), and an increase in the transportation and natural gas pipeline corridor width by 3 feet to accommodate the concentrate pipeline and optional return water pipeline. The concentrate pipeline (and the optional return water pipeline) would be co-located in a single trench with the natural gas pipeline at the toe of the road corridor embankment. The magnitude of impacts under this variant would be 10,132 acres. Impacts to wildlife would be reduced, because the number of truck trips necessary to transport concentrate to Diamond Point port would be reduced to 18 truck trips per day (15 truck trips would transport molybdenum, and the other trips would transport consumables). This would equate to a truck passing in either direction every 40 minutes. There would be additional light vehicle traffic (i.e., vehicles other than large trucks transporting concentrate, fuel, and consumables) along the transportation corridor, which would add daily vehicle trips. The Concentrate Pipeline Variant would lower impacts by reducing the potential for injury and mortality, fugitive dust, and noise. Because the lightering barges would be loaded directly with concentrate (instead of using International Organization for Standardization containers as proposed for the other alternatives), fewer lightering trips would be needed to fill each bulk carrier. Approximately 5 to 6 lightering trips would be necessary to load each bulk carrier, as opposed to 10 trips for the other alternatives. A reduction in these impacts may cause wildlife to have less behavioral avoidance of the transportation corridor. The duration of impacts would extend for the life of the project and vary in the post-closure phase, depending on the level of vehicle traffic from local residents and traffic related to post-closure and reclamation activities. The extent would encompass the transportation and natural gas pipeline corridor; and if Alternative 3 with this variant was selected, permitted, and constructed, impacts would be expected to occur, but overall, would be lower compared with the other alternatives.

4.23.8 Cumulative Effects

Impacts to wildlife would include behavioral disturbance (from noise or presence of humans, vehicles, and equipment, and structures among others); injury and mortality from vehicular collisions, exposure to contamination or defense of life and property; or habit changes from loss, fragmentation, fugitive dust, spills, changes in water quality, or introduction or spread of invasive species. See additional discussion and impact analysis in Section 4.18, Water and Sediment Quality; Section 4.20, Air Quality; Section 4.22, Wetlands (fugitive dust); Section 4.25, Threatened and Endangered Species; Section 4.26, Vegetation (fugitive dust); and Section 4.27, Spill Risk (spills).

The cumulative effects analysis area for wildlife encompasses the footprint of the project, including alternatives and variants, the expanded mine footprint (including road, pipeline and port facilities), and any other reasonably foreseeable future actions (RFFAs) in the vicinity of the project that would result in potential synergistic and interactive effects where direct and indirect impacts to wildlife can be expected from project construction, operations, and closure. In this area, a nexus may exist between the project and other past, present, and RFFAs that could contribute to a cumulative effect on wildlife. Section 4.1, Introduction to Environmental Consequences, details the comprehensive set of past, present, and RFFAs considered for evaluation as applicable.

The cumulative effects of mineral exploration and development have been studied in the Northwest Territories of Canada, where recent mineral discoveries have led to unprecedented levels of exploration and development (Johnson et al. 2005). Specifically, the impacts of mines

and other major developments, exploration activities, and outfitter camps were assessed for their impacts to barren-ground caribou, gray wolves, brown bears, and wolverines. Researchers attempted to quantify the reduction in habitat effectiveness as a function of disturbance based on wildlife locations (from satellite and radio collars) collected during previous studies. Their results varied between species and time of year, with caribou during the post-calving season exhibiting the greatest avoidance of major development areas, which resulted in a 37 percent reduction in area of high-quality habitat, and an 84 percent increase in low-quality habitats. Both brown bears and wolves demonstrated the strongest negative response to disturbance, and a corresponding reduction in habitat effectiveness. Wolverines exhibited the lowest reduction in high-quality habitats. Research observed a decreased use of habitats within 1,640 feet to 3.1 miles from disturbance, with avoidance distances highest for major development (Johnson et al. 2005). This research is especially important for caribou, because it highlights how avoidance of major developments during the post-calving period can lead to a substantial reduction in high-quality habitat. Because the Mulchatna caribou herd is currently at severely depressed levels, and the mine site and surrounding areas are in post-calving habitat, there is a potential for cumulative impacts to a large area of seasonally important habitat.

Past, present, and RFFAs in the cumulative impact study area have the potential to contribute cumulatively to impacts on wildlife. Section 4.1, Introduction to Environmental Consequences, details the past, present, and RFFAs considered for evaluation in Figure 4.1-1. Several of these RFFAs are considered to have no potential for cumulatively impacting wildlife resources in the analysis area, such as those outside the analysis area. Some of the RFFAs include tourism, recreation, fishing, and hunting, among others. Although these ongoing activities do not necessarily result in habitat loss for wildlife species, they can result in impacts to species in the analysis area (such as regulated hunting), and therefore are cumulative. For example, access roads put in for the project have a potential to provide increased access for regulated activities, such as legal hunting by local residents, because the roads would remain open for local residential use.

4.23.8.1 Past and Present Actions

Past and present actions that have or are currently affecting wildlife in the analysis area include infrastructure development, marine vessel traffic, oil/gas and mineral exploration, residential activities, sport and subsistence hunting and sport subsistence, and commercial fishing. Most of the analysis area is undisturbed by human activity, with only a few small villages and roads. There are currently no major development projects under way. These activities have had, and are having, minimal, site-specific impacts on wildlife. In addition, many of these impacts are temporary and seasonal, based on the nature of disturbance.

4.23.8.2 Reasonably Foreseeable Future Actions

RFFAs in the cumulative effects analysis area were evaluated for impacts to both terrestrial wildlife and birds, and to impacts to marine mammals. Impacts to marine mammals would be similar to those detailed in Section 4.25, Threatened and Endangered Species, for impacts to threatened and endangered marine mammal species.

RFFAs included in this analysis are those that contribute to the cumulative loss of habitat for terrestrial wildlife, such as direct habitat loss, or avoidance of areas that are noisy or have increased human presence. Habitat loss for raptors, waterbirds, landbirds, and shorebirds would contribute to the global decline of many avian species. In particular, many species of shorebirds and songbirds are experiencing global declines; and loss of important breeding habitat, confounded by impacts of climate change, would contribute to species' declines. The cumulative impact to birds from current climate change trends could potentially favor some species (such as

shrub-breeding songbirds), but potentially lead to a decrease in other species due to habitat conversion, potential for increased fire frequency, and altered forage fish populations in Cook Inlet.

Loss of habitat and habitat fragmentation for wide-ranging species, such as caribou, may occur through the creation and expansion of new roads into calving areas and other critical life stage areas. New active mining projects in the range of the Mulchatna caribou herd may cause the herd to shift locations at critical times or seek out new foraging areas, thereby reducing overall fitness. New roads, gas lines, and other infrastructure features have the potential to cause habitat fragmentation and avoidance of preferred habitat areas, including migratory pathways. Moose would be at risk of vehicular collisions while crossing new roads, and may avoid areas of high-quality forage habitat in close proximity to roads. Additional development may alter predator-prey relationships through increased levels of certain predators, such as red foxes. Bears may change their foraging and denning areas and have increased mortality from new roads, and mortality from defense of life and property.

The following RFFAs identified in Section 4.1, Introduction to Environmental Consequences, were carried forward in this analysis based on their potential to impact terrestrial wildlife in the analysis area: Pebble Project expansion scenario; mining exploration activities for Pebble South/PEB, Big Chunk South, Big Chunk North, Fog Lake, Groundhog, Shotgun and Johnson Tract mineral prospects; Alaska Liquefied Natural Gas, Drift River Oil Pipeline, Cook Inlet Lease Sales and exploration, onshore hydrocarbon exploration; Lake and Peninsula Borough transportation, infrastructure and energy projects; Kaskanak Road Project and other road improvements; and the continued development of the Diamond Point Rock Quarry.

Potential impacts on marine mammals from RFFAs primarily include noise and behavioral disturbance, displacement from habitat alteration, altered prey resources, and bottom sediment disturbance. The potential future actions included in this analysis are based on the spatial and temporal overlap of activities on marine mammals. Some potential future actions would increase exposure to marine mammals (e.g., underwater noise, vessel traffic).

Noise, behavioral disturbance from physical presence, and vessel and aircraft traffic associated with routine operations could affect marine mammals. Noise generated during construction and operations may temporarily disturb some marine mammals, causing them to leave or avoid the area. Noise from operations of the port, lightering locations, and project vessels would last for the life of the project, and longer during post-closure. Potential effects of underwater noise on marine mammals are detailed in Appendix K4.25, Threatened and Endangered Species, and loud underwater noises can cause temporary or permanent hearing loss, mask other sounds, and cause disturbance in other ways (Southall et al. 2019). All projects with a potential to disturb marine mammals would have to comply with the MMPA (and ESA if there are ESA-listed species that might be impacted), during which time the approximate number of marine mammals that may be impacted would be determined in consultation with the USFWS and NMFS.

Those individuals or groups of marine mammals that could be disturbed by the project may experience high vessel activity during summer from recreation, commercial fisheries, barging, and other forms of commercial and scientific vessel traffic. Because of this frequent vessel activity in Cook Inlet, some marine mammals in the area may be at least partially habituated to vessel presence and noise, and impacts from vessel traffic from the project would add incremental effects to marine mammals.

The following present and RFFAs were carried forward in this analysis based on their potential to impact marine mammals in Cook Inlet: Pebble Project expansion scenario; Johnson Tract mineral exploration, Cook Inlet Oil and Gas Lease Sales, Alaska Stand Alone Pipeline Project/Alaska Liquefied Natural Gas (one or the other, project would be developed based on funding), Driver River Oil Pipeline Transportation Project, Lake and Peninsula Borough and other regional Renewable Energy Initiatives, Commercial, Sport and Subsistence Fishing, Subsistence Activities, Scientific Surveys and Research, and the continued development of the Diamond Point Rock Quarry.

The No Action Alternative would not contribute to cumulative effects on wildlife.

The RFFA contribution to cumulative effects on wildlife are summarized by alternative in Table 4.23-4.

Table 4.23-4 Contribution to Cumulative Effects on Wildlife

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
<p>Pebble Project expansion scenario</p>	<p>Mine Site: The mine site footprint would have a larger open pit and new facilities to store tailings, waste rock, and manage water, which would contribute to cumulative effects related to habitat loss, disturbance, and potential injury/mortality. At the mine site, 31,892 acres (almost 50 square miles) of habitat would be directly lost, plus additional habitat around the mine site would be avoided, with the avoidance buffer varying by species. Some species are particularly sensitive during critical life stages, such as caribou during calving and the post-calving season and bears while denning. These species in particular would likely avoid a large area around the mine site, effectively reducing the overall amount of available habitat, and potentially interrupting migration or movement corridors.</p> <p>Other Facilities: A north access road, and concentrate and diesel pipelines would be constructed along the Alternative 3 road alignment, and extended to a new deepwater port site at Iniskin Bay. Pipeline construction would have potentially limited impacts on soils from trenching activities. The construction and operation of concentrate and diesel pipelines from the mine site to Iniskin Bay would result in the loss of an additional 1,022 acres of habitat. The pipeline would follow the route of the north access road proposed under Alternative 3. The new pipeline would require construction of an adjacent access road, to be constructed in a previously undisturbed area. The construction and operation of this additional linear feature would increase the project footprint compared to Alternative 2 and Alternative 3. This would increase the likelihood of habitat fragmentation effects, because road density can adversely</p>	<p>Mine Site: Impacts would be similar to Alternative 1a, with a permanent footprint of 32,418 acres.</p> <p>Other Facilities: Impacts would be similar to Alternative 1a, except that the portion of the access road from the north ferry terminal to the existing Iliamna area road system would already be constructed. The north access road would be extended east from the Eagle Bay ferry terminal to the Pile Bay terminus of the Williamsport-Pile Bay Road. Concentrate and diesel pipelines would be constructed along the Alternative 3 road alignment and extended to a new deepwater port site at Iniskin Bay.</p> <p>Magnitude: The duration and extent of cumulative impacts to wildlife would be similar to duration and extent of Alternative 1a, although affecting a smaller number of acres.</p> <p>Duration/Extent: The duration and extent of cumulative impacts to wildlife would be similar to the duration and extent of</p>	<p>Mine Site: Impacts would be similar to Alternative 1a, with a permanent footprint of 31,528 acres.</p> <p>Other Facilities: The north access road would be extended east from the Eagle Bay ferry terminal to Iniskin Bay. Concentrate and diesel pipelines would be constructed along the Alternative 3 road alignment and extended to a new deepwater port site at Iniskin Bay. The construction and operation of concentrate and diesel pipelines from the mine site to Iniskin Bay would result in the loss of an additional habitat. The loss of habitat at the Iniskin Bay port would be the same as for Alternative 1a.</p> <p>Under Alternative 2, the additional compressor station would be at the Diamond Point port instead of the Amakdedori port, and the concentrate and diesel fuel pipelines to Iniskin Bay would be added to the natural gas pipeline trench along the existing sections of the north access road. Because the natural gas pipeline and portions of the road would already exist</p>	<p>Mine Site: Impacts would be similar to Alternative 1a, with a permanent footprint of 31,541 acres.</p> <p>Other Facilities: Overall expansion would use the existing north access road; concentrate and diesel pipelines would be constructed along the existing road alignment and extended to a new deepwater port site at Iniskin Bay. Loss of wildlife habitat would be less than Alternative 1a, Alternative 1, or Alternative 2.</p> <p>Because the natural gas pipeline and most of the road would already exist under Alternative 3, the amount of additional disturbance to terrestrial wildlife resulting from the Pebble Project expansion scenario would be less than the same scenario under Alternative 1a, Alternative 1, or Alternative 2.</p> <p>Marine mammals in the vicinity of the Diamond Point port and Iniskin Bay port would be affected by the increased vessel traffic at these locations. Effects would be compounded by</p>

Table 4.23-4 Contribution to Cumulative Effects on Wildlife

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Summary of Project contribution to Cumulative Effects	Overall, Alternative 1a would contribute to cumulative effects on wildlife populations in the region. This primarily includes both the direct loss (almost 50 square miles) and indirect loss through avoidance of habitat surrounding areas of development. The cumulative loss of habitat may result in local declines for species in the area.	Impacts would be similar to Alternative 1a, although slightly more acres of wildlife habitat would be impacted by the Pebble Project expansion scenario.	Impacts would be similar to Alternative 1a, although fewer acres of wildlife habitat would be impacted by the Pebble Project expansion scenario.	Impacts would be similar to Alternative 2, although slightly more acres of wildlife habitat would be impacted by the Pebble Project expansion scenario.

Note:

RFFAs = Reasonably Foreseeable Future Actions