

4.12 TRANSPORTATION AND NAVIGATION

The Environmental Impact Statement (EIS) analysis area for this section includes the transportation and navigation resources that could be affected by the mine site, port, transportation corridor, material sites, and natural gas pipeline corridor for each alternative. This includes surface transportation from the mine site to Cook Inlet and a small section of the Sterling Highway, air transportation from airports across the region (Dillingham to Anchorage), and water transportation on Cook Inlet, Iliamna Lake, and navigable rivers from the mine site to Cook Inlet. Navigation also includes deepwater port construction and usage from local to global users. Local and regional land, air, and water transportation systems and activities in the EIS analysis area are included. Potential impacts include:

- Additional vehicle traffic in the road-connected communities of Iliamna, Newhalen, Kokhanok, Nondalton, and Pedro Bay
- Off-road transportation access to subsistence areas
- Beneficial alternative routes for transporting goods
- Increased flight frequency to affected airports and communities
- Additional vessel traffic on Cook Inlet, with a higher volume during construction, and increased marine traffic in the port area
- Additional vessel traffic on Iliamna Lake
- Impediment of navigation along navigable rivers
- Re-routes of winter over-ice traffic on Iliamna Lake due to creation of open water

The magnitude of impacts from the project is determined by the amount of surface, air, and water traffic that would be interrupted or displaced. The duration and geographic extent of impacts depends on the location and season in which the disturbance occurs during construction, operations, or closure. Long-term impacts would last throughout the life of the project (i.e., years to decades); short-term effects would be temporary, lasting only through the construction phase, or months to years. The potential or likelihood of impacts is related to how likely the project would be to impact surface, air, and water transportation. Impacts from releases of diesel and other substances can be found in Section 4.27, Spill Risk.

4.12.1 Summary of Key Issues

Table 4.12-1: Summary of Key Issues for Transportation and Navigation

Transportation Mode	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Surface Transportation	Kokhanok, Iliamna, and Newhalen would experience an increase in volume of road traffic due to new road connections in the project area through operations. There would be 35 round trips by truck per day on the mine access road and the port access road.	South of Iliamna Lake, impacts would be the same as Alternative 1a. North of Iliamna Lake, the impacts would be truck traffic on the mine access road from the north ferry terminal to the mine site. Construction impacts would be the same as Alternative 1a, except the road would not cross the Newhalen River Road.	Same as Alternative 1a, except impacts from traffic at Kokhanok would occur at Pedro Bay instead. During operations, the pipeline ROW may create a route for ATV or snowmachine traffic between ferry terminals. The Williamsport-Pile Bay Road would experience a high-	Same as Alternative 2, except that the road from Diamond Point to the mine site would be routed through Pedro Bay. During operations and closure, this road would increase traffic in Pedro Bay from mine operations and also from the public, because this road would connect the

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Transportation Mode	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
		<p>The Kokhanok East Ferry Terminal Variant would change the terminus of the port access road but would not change traffic volume.</p> <p>The Summer-Only Ferry Operations Variant would double truck traffic in the summer and eliminate it in winter.</p> <p>The Pile-Supported Dock Variant would not affect surface transportation.</p>	<p>volume increase in traffic that would last the life of the project.</p> <p>The Summer-Only Ferry Operations Variant and Pile-Supported Dock Variant would have similar effects to surface transportation as these variants under Alternative 1.</p>	<p>communities on the northern side of Iliamna Lake over land to each other and to Cook Inlet.</p> <p>The Concentrate Pipeline Variant would reduce truck traffic on the transportation corridor from 35 round trips per day to 18; a controlled access service road would be constructed along the extension of the pipeline to Iniskin Bay.</p>
Air Transportation	<p>During construction, 10 flights per week would land at the Kokhanok airport. During operations, increased air traffic of up to 10 employee flights and one scheduled cargo flight per week would affect Iliamna and Kokhanok airports, plus additional unscheduled cargo flights. Kokhanok Airport would need improved navigation systems and lighting.</p>	<p>Same as Alternative 1a. The variants would not affect air transportation.</p>	<p>Iliamna air traffic would be the same as under Alternative 1a. This alternative would use the Pile Bay Airstrip instead of the Kokhanok Airport, and the construction cargo and passenger flight frequencies to Pile Bay would be similar to flight frequencies to Kokhanok under Alternative 1a. Impacts to Pedro Bay and Pile Bay would be similar to those discussed for Kokhanok under Alternative 1a, including the use of the airport at Pedro Bay during construction.</p>	<p>Same as Alternative 2.</p>
Water Transportation	<p>The Amakdedori port and lightering system would add new structures to Cook Inlet that would increase the risk of vessel allision¹. There would be a noticeable increase in barge and vessel traffic during operations. The new structures and additional marine traffic would not be expected to restrict water transportation.</p> <p>Bridges over the Newhalen and Gibraltar rivers would introduce pilings and the height of the bridges as obstacles, which would increase the</p>	<p>Impacts from Amakdedori port and effects to Cook Inlet would be the same as Alternative 1a.</p> <p>Impacts on Iliamna Lake water transportation would be the same as in Alternative 1a in frequency of traffic, but the ferry route and pipeline placement would be different and therefore change the specific pattern of traffic across Iliamna Lake.</p> <p>Winter travel over Iliamna Lake would be impacted from open water caused by the ice-</p>	<p>A new port at Diamond Point would add similar structures in Cook Inlet and also require dredging, which would increase the risk of vessel allision. These new structures and existing vessel traffic in Iliamna Bay would not be expected to restrict water transportation.</p> <p>Bridges over the Newhalen River, Pile River, and Iliamna River would introduce pilings and bridges that would increase the risk of vessel allision, although they are not</p>	<p>Effects on Cook Inlet and rivers would be the same as Alternative 2.</p> <p>Alternative 3 would not require a ferry and would eliminate effects on winter traffic on Iliamna Lake that would occur under Alternative 1a, Alternative 1, and Alternative 2.</p> <p>The Concentrate Pipeline Variant would not change the impacts to water transportation.</p>

Table 4.12-1: Summary of Key Issues for Transportation and Navigation

Transportation Mode	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	<p>risk of vessel allision. The bridges are not expected to restrict water transportation.</p> <p>The ferry terminals would add new structures to Iliamna Lake that could increase the risk of vessel allision and there would be additional traffic. The new structures and additional traffic would not be expected to restrict water transportation.</p> <p>Winter travel over Iliamna Lake would be impacted from open water caused by the ice-breaking ferry.</p>	<p>breaking ferry. This effect would not take place with the Summer-Only Ferry Operations Variant.</p> <p>Impacts from the Kokhanok East Ferry Terminal Variant would be similar but in a different location. The Summer-Only Ferry Operations Variant would have the same in-water structures but would increase ferry trips from one to two round trips per day in the summer, and zero in the winter. This variant would not be expected to restrict water transportation.</p>	<p>expected to restrict water transportation.</p> <p>The Summer-Only Ferry Operations Variant would have similar impacts to this variant under Alternative 1.</p> <p>Winter travel over frozen Iliamna Lake would be impacted, but this ferry route experiences fewer average days of ice than the route under Alternative 1a. This effect would not take place with the Summer-Only Ferry Operations Variant.</p> <p>The Newhalen River North Crossing Variant would have the same impacts as Alternative 2.</p>	
Navigation	<p>The Amakdedori port and lightering system would add new structures to Cook Inlet that would increase the risk of vessel allision. The new structures would not be expected to restrict navigation.</p> <p>Bridges over the Newhalen and Gibraltar rivers would introduce pilings and the height of the bridges as obstacles, which would increase the risk of allision. The bridges are not expected to limit navigation.</p> <p>The ferry terminals would add new structures to Iliamna Lake that could increase the risk of vessel allision and there would be additional traffic. The new structures and additional traffic would not be expected to restrict navigation.</p>	<p>Same as Alternative 1a. Frequency of traffic would remain the same. Location of the north ferry terminal and pipeline in Iliamna Lake would cause a difference in the traffic pattern on Iliamna Lake.</p> <p>Impacts from the Kokhanok East Ferry Terminal Variant would be similar but in a different location. The Summer-Only Ferry Operations Variant would have the same in-water structures. This variant would not be expected to restrict navigation. The Pile-Supported Dock Variant would have the same impacts to navigation as Alternative 1.</p>	<p>A new port at Diamond Point would add similar structures in Cook Inlet and also require dredging, which would increase the risk of vessel allision. These new structures in Iliamna Bay would not be expected to restrict navigation.</p> <p>Bridges over the Newhalen River, Pile River, and Iliamna River would introduce pilings and bridges that would increase the risk of vessel allision, although they are not expected to restrict navigation.</p> <p>The Summer-Only Ferry Operations Variant would have similar impacts as this variant under Alternative 1. The Newhalen River North Crossing Variant would have the same impacts as Alternative 2.</p>	<p>Effects on Cook Inlet and rivers would be similar to Alternative 2. This alternative would not require a ferry and would eliminate the impacts to Iliamna Lake navigation that would occur under Alternative 1a, Alternative 1 and Alternative 2.</p> <p>The Concentrate Pipeline Variant would not change the impacts to navigation for this alternative.</p>

Notes:

¹ Allision is a nautical term for when a vessel strikes a fixed object.

ATV = all-terrain vehicle

ROW = right-of-way

4.12.2 No Action Alternative

Under the No Action Alternative, federal agencies with decision-making authorities on the project would not issue permits under their respective authorities. The Applicant's Preferred Alternative would not be undertaken, and no construction, operations, or closure activities specific to the Applicant's Preferred Alternative would occur. Although no resource development would occur under the Applicant's Preferred Alternative, Pebble Limited Partnership (PLP) would retain the ability to apply for continued mineral exploration activities under the State's authorization process (ADNR 2018-RFI 073) or for any activity not requiring federal authorization. In addition, there are many valid mining claims in the area, and these lands would remain open to mineral entry and exploration by other individuals or companies.

It would be expected that current State-authorized activities associated with mineral exploration and reclamation, as well as scientific studies, would continue at levels similar to recent post-exploration activity. The State requires that sites be reclaimed at the conclusion of their State-authorized exploration program. If reclamation approval is not granted immediately after the cessation of activities, the State may require continued authorization for ongoing monitoring and reclamation work as it deems necessary. The level of activity and use of transportation systems in the region would be assumed to remain the same as the past 10 years.

Scoping comments expressed concerns about increased use and user conflicts at Iliamna Lake, Kamishak Bay, and Cook Inlet. Concerns were also expressed regarding how the ferry crossing and vessel traffic could impact local boaters and access, and whether snowmachine travel on Iliamna Lake would be impacted. High winds on Iliamna Lake and their potential to impact the ferry crossing were also noted. The following sections address these and other issues.

4.12.3 Alternative 1a

Alternative 1a would use the port access road between Amakdedori port and the south ferry terminal at Kokhanok. The ferry would cross Iliamna Lake between the south ferry terminal west of Kokhanok to the ferry terminal at Eagle Bay. The natural gas pipeline would be located in the transportation corridor from Amakdedori port to the south ferry terminal, cross Iliamna Lake, then come ashore between Iliamna and Newhalen, traveling north until co-locating with the mine access road to the mine site

4.12.3.1 Surface Transportation

Mine Site

Alternative 1a would involve the construction and use of roads in the mine site, and connection of mining areas with the locations of facilities and material sites.

During project construction, operations, and closure, public access to or through the mine site would be restricted at the mine site safety boundary (PLP 2018-RFI 058). Such a restriction to public access would be long term, lasting through the life of the project. The area is not commonly used by the public; however, subsistence overland travel that occurs in the area of the mine site would require adjustments to traditional routes (PLP 2018-RFI 088) (see Section 4.9, Subsistence, for impacts on access to subsistence resources). The likelihood of impacts related to travel restrictions would be certain under Alternative 1a.

Project construction, operations, and closure activities would introduce additional vehicles and road use patterns in the mine site area. The magnitude and extent of this adverse effect would be the amount of displacement of existing surface transportation modes (primarily all-terrain vehicle and snowmachine trails). Impacts in the analysis area would be long term for the life of the project

and would be certain to occur if the project is permitted and built. Impacts would include the need to take alternate overland routes around the mine site and would be most apparent during construction and operations.

Transportation Corridor

During construction, the port access road would be constructed from the Amakdedori port site to the southern shore of Iliamna Lake and the mine access road would be constructed from the northern shore of Iliamna Lake at Eagle Bay to the mine site. Construction would involve using heavy equipment (for construction, excavation, and pipeline installation) and vehicles to transport personnel, fuel, and supplies during construction activities. Crews would live in camps at work sites. A temporary airstrip would be built at Amakdedori port to facilitate the construction phase, and Amakdedori port would be used for off-loading construction equipment and supplies from air and water deliveries. The magnitude and extent of impacts from these actions would be in the number of vehicles using the roads. Road traffic in Kokhanok would increase during construction as project vehicles travel from the airstrip to the port access road. Similarly, road traffic in Iliamna and Newhalen would increase during construction from project vehicles associated with delivering goods and services from the airstrip to the mine access road and from local employees traveling to construction work sites. This volume of traffic would decrease with the transition from construction to operations but would still be higher than before construction.

Until Iliamna Lake is connected to Cook Inlet via the transportation corridor at the south ferry terminal, the Williamsport-Pile Bay Road (which connects the two waterbodies at the north end of Iliamna Lake over land) would be used to transport supplies to the beachheads on Iliamna Lake during construction (PLP 2018-RFI 037). The magnitude and extent of the impact would be an increase in the volume of vehicles on the Williamsport-Pile Bay Road during construction. The road is currently used infrequently (an average 38 trips per day in the summer only) (see Section 3.12, Transportation and Navigation) to transport commercial fishing vessels and general supplies (Kevin Waring & Associates 2010b). The impact would last throughout construction and would be certain to occur under Alternative 1a.

The intersection of the mine access road with the Newhalen River Road would connect the mine access road to the existing roads in the communities of Iliamna and Newhalen, and seasonally to Nondalton. The Kokhanok spur road would connect the Kokhanok community roads to the port access road, which would run from the south ferry terminal to Amakdedori port. The spur road would be gated to prevent vehicles from using the port access road. Additional access would be coordinated between the State of Alaska, the Lake and Peninsula Borough (LPB), PLP, and landowners. Known trail crossings would be marked, and traffic controls would be implemented for safety (PLP 2018-RFI 027). Use of the mine and port access roads, and the spur road to Kokhanok by the local communities and businesses would be scheduled and coordinated with PLP. The magnitude of impact would decrease after mine closure because mine traffic would decrease (but would not be eliminated) and the road system would be retained as long as required for the transport of bulk supplies needed for post-closure water treatment and monitoring, possibly lasting for years or decades. The adverse effects would be noticed by the nearby community members who travel through the area.

The current public roadway network in the EIS analysis area is limited to the vicinity of existing communities and is used by local residents. Local roads provide important routes for overland travel, because there are no alternative roads. The airports in Iliamna and Kokhanok are outside of each town center. The magnitude of impacts on local roads would be an increase in the number of vehicles on roads connecting the towns of Iliamna and Kokhanok to their respective airports, with fewer additional vehicles in town. The duration of the impact would be long term, and it would be certain to occur if the project is permitted and Alternative 1a is implemented.

If snow cover on land and ice formation on Iliamna Lake are adequate during winter, surface transportation occurs over land and Iliamna Lake for subsistence activities and inter-village travel. The new port and mine access roads could act as obstacles for overland inter-village and subsistence travel, although there would be marked crossing points for known trail crossings (PLP 2018-RFI 027). People using off-road vehicles and snowmachines could potentially create unauthorized trails from the project roads or rights-of-way (ROWs) to access lands and waterbodies. This would be infrequent as access to the project roads would be regulated and therefore limited. These impacts would be long term.

During project operations, daily transportation of materials (concentrate, fuel, reagents, and consumables) would require up to 35 round trips by truck per day on each leg of the road, including three loads of fuel per day. A maximum driving speed of 35 miles per hour would be enforced on the corridor roads using GPS fleet tracking technology (PLP 2018-RFI 122). Personnel would be transported to the mine site from Iliamna, and non-resident workers would remain at the mine site during their 2-week work shifts, which would minimize traffic on the mine and port access roads. Personnel who live locally would be transported daily via shuttle bus. Gates limiting unauthorized traffic would be installed on the spur road. The communities of Iliamna, Newhalen, and Nondalton could see altered traffic patterns and a higher volume of vehicles on the roads as employees are transported from the Iliamna Airport to the mine site. There are no existing roads in the vicinity of the road that would be constructed from Eagle Bay to the mine site; this road would cross the existing Newhalen River Road. Building a spur road to Iliamna would not be necessary under this alternative. The magnitude of impacts from this alternative would be the increased traffic on the Newhalen River Road (maintained by the State) between the crossing and Iliamna. The duration of impacts would be long term lasting for the life of the project and the likelihood of impacts would be certain to occur.

Impacts on surface transportation would last through the life of the mine and post-closure until the roads are no longer deemed necessary for post-closure monitoring activities. These impacts would be certain to occur under Alternative 1a.

Amakdedori Port

The temporary beachhead and workforce camps for construction, the Amakdedori port facilities (lasting for the life of the project), and post-closure facilities at Amakdedori would be located in the same general area. Currently, no existing/developed surface transportation facilities exist in the vicinity of the port site. The magnitude and extent of impacts from port construction and operation would be the amount of disrupted surface transportation activities associated with the area's subsistence and cultural uses. Figures in Section 3.9 and Appendix K3.9, Subsistence, show some subsistence use in the areas in the vicinity of Amakdedori, but not at the port site. While subsistence use in the area of the port appears to be infrequent, construction and operations activities at the Amakdedori port site could require that some traditional overland routes be altered. The port also could provide a beneficial alternative route for goods to be shipped to Iliamna Lake communities, which could be less expensive than current methods. These impacts would last for the life of the project through closure and would be certain to occur under Alternative 1a.

Natural Gas Pipeline Corridor

During construction of the pipeline on the Kenai Peninsula and connection to the compressor station near Anchor Point, summer traffic on the Sterling Highway would be affected by vehicles transporting materials to the site. The magnitude and extent of the effect would be the amount of traffic that would be delayed and disrupted due to construction of the project components. These traffic delays are expected to be similar to the usual delays experienced on the Sterling Highway

during the summer months when tourist traffic is at its highest and road construction is most active (PLP 2018-RFI 037). Construction of this portion of the pipeline is expected to take 3 months during the summer, and the effects would be cumulative with any other local delays. Disruption of traffic may include lane closures and slow vehicles in the immediate vicinity of the construction site. This disruption would be short-term, only occurring during pipeline construction; however, the likelihood of occurrence is certain under Alternative 1a.

Because construction of the pipeline would be in the main transportation corridor from Amakdedori port to the mine site and would not cross existing roads, there would be no additional disruption of community roads systems associated with pipeline installation on the south side of Iliamna Lake. To the north of Iliamna Lake, the natural gas pipeline would make landfall west of Eagle Bay near Newhalen, causing a new corridor to be constructed from the lake to the mine access road. This leg of the pipeline roughly parallels the Newhalen River Road and two smaller roads, crossing each road once. The construction of the pipeline could cause delays in transport for those using the roads between Newhalen and Iliamna, but those impacts would end after the construction phase. The new pipeline corridor could create potential for use as an all-terrain vehicle (ATV) or snowmachine path with offshoots for resource access; this impact would be long term and last for at least the life of the project.

During operations and closure, inspections and maintenance of the pipeline would not be expected to have adverse effects on over-land traffic.

4.12.3.2 Air Transportation

Existing airports in Iliamna and Kokhanok would be used to transport personnel and some supplies to and from the project area for construction and operations activities. Iliamna Airport has the capacity to facilitate the planned aircraft traffic for the project and would not require improvements. Kokhanok Airport has a runway capable of handling the anticipated commuter flights for workers, but would require improvements to lighting and navigation, and potentially air radio service. Improvements would presumably take place on the existing airport footprint and therefore would not affect surface waters, including wetlands and other waters. Additional maintenance of the Kokhanok Airport would be required with an increase in traffic and would not be anticipated to have an effect on surface waters, including wetlands and other waters (PLP 2018-RFI 027b). Transportation infrastructure improvements would remain in place after closure providing a potential beneficial impact for regional travel. Helipads would also be built at Amakdedori port and at the mine site. In the event that emergency evacuation of mine personnel is required, any of these air travel facilities could be used.

During construction, work crews would access sites by helicopter or boat until the mine access road is complete. An airstrip would be built at Amakdedori port to facilitate construction. The magnitude of impacts during construction would be the number of flights required. A Twin Otter or similar aircraft would make 20 to 40 flights per month (average of 5 to 10 flights per week) to Amakdedori port, before Kokhanok could be accessed by road. Once the Kokhanok spur road is established, the magnitude would decrease to up to 10 flights per week by Twin Otters to Kokhanok (PLP 2018-RFI 027a). The airstrip at Amakdedori would remain in place through operations for emergency use.

During operations, an estimated 600 employees would fly to Iliamna Airport from the Anchorage or Kenai airport, approximately 200 employees would fly to Iliamna and Kokhanok from surrounding community airports, and about 50 employees would travel by road to project locations; employee flights would be on a 2-week rotation. The magnitude of impacts would be measured by the number of additional weekly employee flights to Iliamna, including one Twin Otter from King Salmon, one from outlying villages, two from Dillingham, four from Kenai, and two

Q400 flights from Anchorage (10 total). If these airplanes are commercial carriers and not private charters, it could have a beneficial effect of more frequent commercial flights, providing for more flight options for local residents. Kokhanok would receive 5 to 10 employee flights per week during operations (PLP 2018-RFI 027a). Iliamna and Kokhanok airports would also receive an estimated one cargo flight per week, and six unscheduled cargo flights per year, in addition to the above passenger flights (PLP 2018-RFI 027). This would increase air traffic from the current annual operations (see Section 3.12, Transportation and Navigation). Increases of air traffic at these magnitudes have the potential to be observed by visitors to Lake Clark National Park and Preserve, where small aircraft are the primary transportation for park visitors; however, this potential would be reduced because flight paths from Anchorage to Bristol Bay generally go over Iliamna Lake or the project area (FAA 2018) (see Section 3.12 and Appendix K3.12, Transportation and Navigation), rather than the preserve. Additionally, Pebble-related air traffic would not conflict with small planes, which fly at a lower altitude and use narrow passes such as Lake Clark Pass. Helicopter traffic would remain throughout operations to perform ongoing environmental monitoring (frequency would depend on the season) and aerial inspections of the transportation corridor (weekly or monthly) (PLP 2018-RFI 027b). These effects would be long term, occurring throughout the life of the project, and would be certain to occur under Alternative 1a.

In terms of magnitude, during project closure, impacts on air traffic would decline because fewer personnel would travel to and from the project area; aerial environmental monitoring and transportation inspections would continue by helicopter (PLP 2018-RFI 027b). Additionally, project personnel would most likely use commercial airlines and cargo flights instead of private charters (PLP 2018-RFP 027a).

4.12.3.3 Water Transportation

Mine Site

No new water access would be constructed at the mine site. No water transportation impacts would occur at the mine site from the project.

Transportation Corridor

The Alternative 1a transportation corridor would cross waterbodies, including the Newhalen River, Gibraltar River, Iliamna Lake, and Cook Inlet. The lower Newhalen River Bridge would have a minimum of 32 feet of vertical clearance in the navigation channel, with 96 feet between each piling. The Newhalen River is approximately 510 feet wide at the crossing. The Gibraltar River bridge would be built where the river is approximately 100 feet wide, but the bridge would extend to 300 feet, with pilings 100 feet apart. The minimum vertical clearance would be 43 feet above the river (PLP 2018i). Existing structures on the Newhalen River include one small-boat launch and a beach landing, indicating that traffic on this river does not include larger vessels. The Gibraltar River bridge would be much smaller than the Newhalen River bridge, and the river supports smaller vessels. The magnitude of impacts due to the structures would be the increased likelihood of a vessel being impeded by either bridge, as the instream pilings would represent a risk of allision¹ to vessels.

Water transportation at the crossings on these two rivers would be directly affected during construction of the crossings and the associated increase in traffic crossing the river. Direct effects of the river crossings after construction would consist of the presence of obstacles from the bridge pilings and the height of the bridges. The risk of impacts would be reduced over the long term

¹ Allision is a nautical term for when a vessel strikes a fixed object.

(during operations and after mine closure), as compared to over the short term (during construction). These impacts to navigation would be certain to occur under Alternative 1a.

To support construction of the north and south ferry terminals and the ferry itself, small temporary barges would cross Iliamna Lake until completion of the ferry terminals. Barges may also move freight and equipment transported during construction on the Williamsport-Pile Bay Road, increasing Iliamna Lake traffic. Construction of the Eagle Bay ferry terminal may use facilities in Iliamna and Newhalen, possibly increasing road traffic and barge traffic to Iliamna creating an additional impact on lake traffic. Employees may be transported to work via boat during this phase. The magnitude of these impacts would be the amount of inter-village and subsistence travel temporarily impeded by construction traffic along the shorelines and across the lake via watercraft, and commercial traffic in Iliamna, Newhalen, and Kokhanok. Structures added to the lake would include ramps at the south ferry terminal and the Eagle Bay ferry terminal (a maximum of 115 feet wide by 155 feet long). A 200-foot by 160-foot ferry construction ramp at the south ferry terminal would extend 36 feet out into the lake. Two mooring buoys would be installed at each ferry terminal, attached to the lake substrate or to anchors 2 feet in diameter. During construction of these project components, there would be direct adverse impacts on water transportation on Iliamna Lake. These adverse impacts would be reduced during operations. The structures would be visible and lighted, but the lake is large enough to provide routes around the structures.

During mine operations, the ferry would cross Iliamna Lake year-round along an 18-mile route that would take an estimated 1.5 hours in open water, or 3 hours in ice conditions. The magnitude of impacts to other lake traffic and navigation would be one round-trip per day in open water by the ferry; this trip would not disrupt lake traffic because it would be infrequent and alternate routes across the lake would be available. The effects would last through operations and post-closure and would be expected to occur under Alternative 1a.

Scoping comments noted hurricane-force winds on Iliamna Lake, which could be hazardous for the ferry crossing in open water. Eagle Bluff, west of Kokhanok, would be downwind of the ferry route and could pose a hazard to the ferry in high winds if it lost power or steering. In addition, there are small islands in the lake within approximately 5 miles of the ferry route that could potentially be hazardous in a high wind situation. The ferry would be constructed with multiple engines, propellers, and steering to minimize the potential for loss of control and reduce impacts (PLP 2018-RFI 052). Scoping comments also noted that winds can push broken ice onshore in large piles; this onshore ice movement has potential to damage infrastructure such as the ferry terminals (especially the north ferry terminal under Alternative 1 due to prevailing wind direction) and would need to be addressed in the design.

When the lake is frozen, if ice cover is sufficient, it is used as a passageway for snowmachines and occasional passenger vehicles (PLP 2018-RFI 088). The magnitude of project impacts on winter lake transportation would be in the number of residents disrupted by cross-lake snowmachine routes and exposed to potential safety hazards from open water created by the ice-breaking ferry. Residents of Kokhanok and Newhalen traveling across Iliamna Lake between those communities would have longer travel times to avoid hazards from the ice breaking ferry. PLP would work with communities (and supply funding) to provide for the marking and maintenance of snowmachine trails between communities across Iliamna Lake and around the ferry route when lake ice is sufficient enough to support such traffic (PLP 2018-RFI 071a). Travel in darkness or white-out conditions includes inherent risks, and trail markings may not be sufficient under low-visibility conditions. The impacts would be long term and certain to occur, lasting throughout the use of the ferry. After mine closure, ferry facilities would be removed and supplies would be transported across the lake using a summer barging operation; therefore, there would be no impacts from ice-breaking ferries.

Amakdedori Port

During construction and operations, supply barges would transport materials, supplies, and equipment to Amakdedori port, creating an increase in barge traffic on Cook Inlet. The magnitude would be the increase in barge traffic during operations: approximately 27 concentrate vessels and 33 supply barges per year (an average of one vessel per week). Each concentrate vessel would require 10 lightering barge trips between the port site and lightering location to fill the bulk carrier, which would be anchored for 4 to 5 days. Diesel delivery to the port would be by tank barges with an expected maximum load of 4 million gallons to allow fewer shipments during the winter. The additional vessel traffic on Cook Inlet overall would add approximately 110 transits or port calls (an average of two per week) to the 2010 count of 480 (an average of nine per week); however, there is very little existing vessel traffic in Kamishak Bay/west Cook Inlet. Barge speeds would be between 5 and 7 knots and wake heights would not be expected to exceed natural waves at the shore (PLP 2018-RFI 039). The geographical extent of the impacts would be across Cook Inlet and the impacts would be long term, lasting throughout the life of the project.

Amakdedori port infrastructure in Cook Inlet would include an earthen causeway that would extend to 15 feet of natural water depth (1,900 feet long by up to 500 feet wide), two navigation buoys (anchored by 3-foot concrete blocks or anchors), and two lightering locations (2,300 feet by 1,700 feet, with buoys marking the corners and anchored in 80 feet of water). These structures would pose an allision risk for the infrequent traffic that occurs on the west side of the Cook Inlet and would likely be most noticeable when unfavorable sea conditions force vessels to moor in the safe harbor of Iniskin Bay. The impacts would be realized during construction from increased vessel activity, would decrease slightly during operations, and even more so post-closure, after the dock structures have been removed.

Amakdedori port would be located in Kamishak Bay, which has several identified reefs, as well as strong winds that create a funnel effect off of the surrounding mountains. Winds can be accompanied by short, choppy sea on flood currents and cause heavy swells. From Tignavik Point to Cape Douglas, vessels are warned to proceed with caution (NOAA 2017). Project vessels may encounter these winds and swells during barging and lightering activities; vessels could drift onto reefs, mud flats, or otherwise run aground at the southern end of Kamishak Bay or near Amakdedori should they lose power or steering. The duration of impact would be long term and would be expected to occur under Alternative 1a. Two lighted navigation buoys (3 feet in diameter) would be located on the reefs framing the entrance to the Amakdedori port. The nearby Augustine volcano has potential to cause a tsunami at the port site as it has in the past (PLP 2018-RFI 039) (see Section 4.15, Geohazards and Seismic Conditions).

Natural Gas Pipeline Corridor

Construction of the entire pipeline would take place during the second and third years of construction. Impacts on water transportation would be from the construction of the pipeline, with 104 miles crossing the Cook Inlet seabed and 21 miles crossing on the Iliamna Lake bed. This construction phase would involve working in and crossing a high-traffic area of Cook Inlet and would represent collision hazards for vessels transiting Cook Inlet and Iliamna Lake (Eley 2012; Nuka and Pearson 2015). The construction of the Cook Inlet crossing of the pipeline would be expected to take 30 to 40 days and would include approximately 10 construction, support, and survey vessels. These vessels would stay in Cook Inlet for the duration of this effort, some vessels would travel to shore daily to resupply. In Iliamna Lake, pipeline construction would require one barge (PLP 2018-RFI 027b). Impacts on water transportation would be short term and certain to occur.

In terms of magnitude, once the pipeline is fully operational, effects on vessel traffic and anchoring in Cook Inlet or in Iliamna Lake would be reduced. The 12-inch-diameter pipe would be placed in a trench deeper than the height of the installation, or HDD would be used to install pipe segments. If the depth of water is greater than 200 feet, the pipeline would be placed atop the seabed. This pipeline would add to the multiple pipelines and other structures already installed and located in Cook Inlet. In Iliamna Lake and Cook Inlet, vessel operators would be aware of the locations of underwater pipelines as they would be included on nautical charts. The effects of post-operational activities would be short term in duration.

4.12.3.4 Navigation

Mine Site

No new water access would be constructed at the mine site. No navigation impacts would occur from the project to the Kvichak and Nushagak rivers, which are navigable waters hydrologically connected to the mine site.

Transportation Corridor

The transportation corridor would cross the following federal navigable waterbodies:

- Newhalen River (considered navigable by the US Coast Guard [USCG] only)
- Gibraltar River (considered navigable by USCG only)
- Iliamna Lake (considered navigable by USACE and USCG)

Navigation at the Newhalen River and Gibraltar River crossings would be directly affected during construction of the bridge and by the associated increase in traffic crossing the river. Direct effects of the river crossing after construction would consist of the presence of bridge pilings and the height of the bridge as obstacles. The Newhalen River north bridge would have 29 feet of vertical clearance in the navigation channel, with 98 feet of horizontal clearance. The Newhalen River is approximately 510 feet wide at the crossing. The Gibraltar River bridge (which would require a separate permit to build) would be built where the river is approximately 100 feet wide, but the bridge would extend to 300 feet, with pilings 100 feet apart. The minimum vertical clearance would be 43 feet above the river (PLP 2018i). Navigation is not likely to be impeded by these bridges, but the instream pilings would represent an increased risk of allision to vessels. The risk of impacts would be reduced over the long term (during operations and after mine closure), as compared to over the short term (during construction). These impacts to navigation would be certain to occur under Alternative 1a.

Construction of the Eagle Bay ferry terminal may use facilities in Iliamna and Newhalen, possibly increasing road traffic and barge traffic to Iliamna creating an additional impact on lake navigation. During construction of ferry terminal components, there would be direct adverse impacts to navigation on Iliamna Lake. These adverse impacts would be reduced during operations. During operations, the ferry terminal structures would create an allision risk to vessels traveling along the shore. The structures have the potential to impact navigation, but the magnitude of impacts would be reduced because the terminals would be visible and lighted; the lake is large enough to provide routes around the structures.

Amakdedori Port

Amakdedori port infrastructure would be constructed in Cook Inlet, which is considered navigable by USACE, USCG, Bureau of Ocean Energy Management (BOEM), and Bureau of Safety and Environmental Enforcement (BSEE). For magnitude and extent, these structures would pose an allision risk for the infrequent traffic that occurs on the west side of the Cook Inlet. These structures

would be recorded on navigation charts and would not restrict navigation. The impacts would be realized during construction from increased vessel activity, would decrease slightly during operations, and even more so post-closure after the dock structures have been removed. The duration of impacts would be long term and would be expected to occur under Alternative 1a.

Natural Gas Pipeline Corridor

The construction phase would represent collision hazards for vessels transiting Cook Inlet and Iliamna Lake (Eley 2012). Impacts on navigation would be short term and certain to occur; however, these waterbodies are large and non-project related navigation would be maintained.

In terms of magnitude, once the pipeline is fully operational, effects on navigation and anchoring in Cook Inlet or in Iliamna Lake would be reduced. In Iliamna Lake and Cook Inlet, vessel operators would be notified (via a USCG-approved method) of the pipeline location. Effects of post-operational activities would be short term in duration.

4.12.4 Alternative 1

Alternative 1 differs from Alternative 1a in the location of the north ferry terminal (west of Newhalen) and the natural gas pipeline, which follows the same route. The mine access road connects the north ferry terminal to the mine site and requires the Iliamna spur road to be constructed to connect to the existing roads of Iliamna, Newhalen, and (seasonally) Nondalton. Impacts to surface transportation, air transportation, water transportation, and navigation at the mine site would be the same as under Alternative 1a.

4.12.4.1 Surface Transportation

Impacts on surface transportation at Amakdedori port and the mine site would be the same as under Alternative 1a.

Transportation Corridor

The transportation corridor for Alternative 1 would differ from Alternative 1a north of Iliamna Lake. The ferry terminal and pipeline landfall would occur west of Newhalen, creating a need for a mine access road from the terminal to the mine site. Construction impacts would be the same as under Alternative 1a, except the road would not cross the Newhalen River Road. Long term effects would be similar to Alternative 1a because of the connection of the mine road to village road systems.

Natural Gas Pipeline Corridor

Impacts of the natural gas pipeline corridor on surface transportation on the Kenai Peninsula would be the same as under Alternative 1a.

The natural gas pipeline corridor for Alternative 1 would differ from Alternative 1a; it makes landfall north of Iliamna Lake west of Newhalen at the north ferry terminal. Because construction of the pipeline would be in the main transportation corridor from Amakdedori port to the mine site and would not cross existing roads, there would be no additional disruption of community roads systems associated with pipeline installation.

During operations and closure, inspections and maintenance of the pipeline would not be expected to have adverse effects on overland traffic.

4.12.4.2 Air Transportation

Impacts on air transportation to and from the mine site, Iliamna, and Kokhanok would be the same as under Alternative 1a.

4.12.4.3 Water Transportation

Impacts on water transportation at Amakdedori port and the mine site would be the same as under Alternative 1a.

Transportation Corridor

The Alternative 1 transportation corridor would cross waterbodies including the Newhalen River (on the spur road), Gibraltar River, Iliamna Lake, and Cook Inlet. Of these crossings, seven would use bridges. Bridge construction and impacts on water transportation would be the same as Alternative 1a.

Natural Gas Pipeline Corridor

Impacts on water transportation from the natural gas pipeline would be the same as under Alternative 1a.

4.12.4.4 Navigation

Navigation impacts south and east of Iliamna Lake (including the Lake) for Alternative 1 would be the same as under Alternative 1a. North of Iliamna Lake, the Iliamna spur road would cross the Newhalen River at a different location. The lower Newhalen River bridge would have a minimum of 32 feet of vertical clearance in the navigation channel, with 96 feet between each piling. The Newhalen River is approximately 596 feet wide where the crossing would be located. Impacts would be the same as Alternative 1a.

4.12.4.5 Alternative 1—Kokhanok East Ferry Terminal Variant

The Kokhanok East Ferry Terminal Variant would have the same magnitude, duration, extent, and likelihood of impacts to air and surface transportation as Alternative 1.

For the Kokhanok East Ferry Terminal Lake Variant, there would be little change to navigation on Iliamna Lake other than relocation of the ferry terminal (in-water structures would be nearly identical). Operation of the ice-breaking ferry on Iliamna Lake at the Kokhanok east ferry terminal would be more sheltered from wind and waves, but the route would contain more navigational hazards, such as shallow water, and would be 33 percent longer, for a total impact magnitude of 27 miles (PLP 2018-RFI 078). Snowmachine access to Iliamna Lake would be provided east of the terminal to enable access to the Sid Larson Bay area without crossing the ferry route (PLP 2018-RFI 078). Alternate marked safe routes would help avoid the ferry path, but would have the potential to add to travel time, distance, and fuel costs. The duration of these impacts would be long term and would be certain to occur under this variant.

The area near the Kokhanok East Ferry Terminal Variant has thicker ice for a longer duration than the south ferry terminal. There is a substantial amount of winter traffic between Kokhanok and Sid Larson Bay (east of the community), and winter travel routes would cross the Kokhanok east ferry route. The creation of an alternate winter travel route along the Kokhanok east spur road with an access point to the lake east of the terminal would mitigate this impact by creating a route that would not cross ferry traffic. However, traffic in the town of Kokhanok would see an increase between the airport and the ferry terminal site. These impacts would also be long term and certain to occur under this variant.

4.12.4.6 Alternative 1—Summer-Only Ferry Operations Variant

The magnitude of impacts due to the Summer-Only Ferry Operations Variant would be a doubling of truck traffic in the summer to 78 round trips per day on each access road, and none in the winter. Surface transportation over ice on Iliamna Lake would not be disrupted during the winter under this variant. This variant would have the same impacts to air transportation as Alternative 1.

Under the Summer-Only Ferry Operations Variant, the number of in-water structures would be the same but there would be two ferry trips per day during open water, and no trips when there is ice cover. The risk of allision with ferry terminal components would be the same as described above, but in terms of magnitude, increased ferry traffic would increase the risk of vessel collisions, especially if two ferry vessels are needed. These impacts would be long term and certain to occur under this variant.

4.12.4.7 Alternative 1—Pile-Supported Dock Variant

The Pile-Supported Dock Variant would construct similar structures in navigable waters and would not change vessel traffic. The magnitude, duration, extent, and likelihood of impacts of a pile-supported dock to navigation and air and surface transportation would not differ from those associated with a solid fill type dock.

4.12.5 Alternative 2—North Road and Ferry with Downstream Dams

Alternative 2—North Road and Ferry with Downstream Dams would be very similar to Alternative 1a, except that a different dam design would be used to construct the bulk tailings storage facility north embankment at the mine site. The port site would be at Diamond Point instead of Amakdedori, and the port access road would go from Diamond Point to Pile Bay in Iliamna Lake. Impacts to surface transportation, air transportation, water transportation, and navigation at the mine site would be the same as under Alternative 1a.

4.12.5.1 Surface Transportation

Transportation Corridor

Effects on the Kenai Peninsula would be the same as Alternative 1a. The port location at Diamond Point would require a new port access road to be constructed to Pile Bay through Williamsport, in the vicinity of and replacing the current Williamsport-Pile Bay Road. Construction would create an increase of traffic on the road during the busy summer months. Once constructed, project-related haul trucks would share the road with privately operated trucks and vessels being portaged. The magnitude of impacts would be an increase in the volume and density of traffic. The Williamsport-Pile Bay Road is difficult to traverse, especially with wide loads, because it is steep and narrow. An improved road would make the transportation corridor more economically and logistically appealing for portaging vessels and shipping supplies to villages, as the port access road would be built to withstand the full capacity of current and potential future traffic. This would have the potential to further increase private vehicle traffic, if the proposed or existing Williamsport port could accommodate the increase. These impacts would occur every season during construction and operations, and would require coordination between PLP and private users.

There are no existing roads in the vicinity of the road that would be constructed from Eagle Bay to the mine site; potential adverse effects on current surface transportation would be similar to Alternative 1a with regard to Iliamna, Newhalen, and Nondalton. The magnitude of impacts from this alternative would be the amount of increased traffic on the section of the Newhalen River Road (maintained by the State) between the crossing and Iliamna. The duration of impacts would be long term, lasting for the life of the project and impacts would be certain to occur. Under this

alternative, Kokhanok would not be connected to the road system and therefore would not experience surface transportation effects.

Diamond Point Port

The need for a temporary beachhead during construction may be eliminated at the Diamond Point port site, but a construction camp may be necessary. The magnitude of adverse impacts on surface transportation due to port improvements and operation would be the amount of additional mine traffic to the quarry area, and the creation of a connection of the quarry with Williamsport and the road to Pile Bay. The duration and likelihood of these impacts would be long term and certain to occur under Alternative 2.

Natural Gas Pipeline Corridor

Effects of construction of the natural gas pipeline on the Kenai Peninsula would be the same as under Alternative 1a. The crossing from Ursus Cove to Cottonwood Bay over land would not affect surface transportation because there are no existing roads in the area and little to no subsistence travel; the pipeline ROW would be unlikely to be used for transportation. Construction along the road to Pile Bay would occur simultaneously with road construction and improvements, and impacts to surface transportation would be the same as discussed above. Installation of the pipeline from where it would depart from the road near Pile Bay to where it would realign north of Eagle Bay would run through the community of Pedro Bay. The magnitude of impacts would be in the increase of the number of vehicles in the village as construction vehicles work their way through and near town. This impact would be short term, occurring only during the construction phase. During operations, the pipeline ROW between the two ferry terminals may create a route for ATV or snowmachine traffic. The most likely users of this new route along the ROW would be the residents in the communities of Pedro Bay, Nondalton, Iliamna, and Newhalen. The duration of this impact would be long term lasting through the life of the project. In terms of likelihood, all impacts would be certain to occur under Alternative 2. Impacts of the new ROW on access to subsistence resources are discussed in Section 4.9, Subsistence.

4.12.5.2 Air Transportation

The frequency of flights to and from Iliamna under this Alternative would be the same as Alternative 1a; therefore, impacts to air transportation at Iliamna would be the same as Alternative 1a. Construction cargo and passenger flight frequencies to the airstrip in Pile Bay would be similar to flight frequencies to Kokhanok under Alternative 1a. The magnitude, duration, extent, and likelihood of impacts to Pedro Bay and Pile Bay would be similar to those discussed for Kokhanok under Alternative 1a, including the use of the airport at Pedro Bay during construction. PLP would not construct a new airstrip at Diamond Point, but would improve the existing airstrip near Pile Bay for limited use during construction. It is assumed that improvements would take place on the existing airport footprint and therefore would not affect wetlands and other waters.

4.12.5.3 Water Transportation

The effects of the transportation corridor on water transportation would be similar to Alternative 1a, except for the locations of the ferry terminal (at Pile Bay instead of Eagle Bay), ferry route, ferry traffic, and bridge locations. The Iliamna River, considered navigable by the USCG and the State of Alaska, would be crossed by a bridge along the Williamsport-Pile Bay Road. Water transportation would not be impeded by these bridges, but the instream pilings would create an increased risk of allision to vessels. The Gibraltar River would not be crossed in this alternative. At the crossings, the magnitude of adverse impacts on water transportation would be

the amount of construction activities occurring in the river at the crossings and the associated increase in traffic crossing the river. The magnitude of effects on water transportation at river crossings after construction would be at the bridge pilings and the height of the bridges, lasting through operations and into closure. These short- and long-term effects would be certain to occur under Alternative 2.

Under Alternative 2, the ferry terminals would not be expected to restrict traffic. The community of Pedro Bay would be affected by year-round and summer-only ferry operations in the way that Kokhanok would be as described under Alternative 1a. The northeastern portion of Iliamna Lake has a lower median number of days of ice than the southwestern portion, meaning that the ferry route and terminals in this alternative would have less of an adverse effect on winter cross-lake transportation than Alternative 1a and Alternative 1. See Section 4.9, Subsistence, for impacts of access to subsistence resource use areas.

The Diamond Point port under Alternative 2 would be similar in scale to the Amakdedori port and would pose a similar allision risk to vessels. The construction and operation of a deepwater loading facility would impact marine vessel traffic in Iniskin Bay by increasing congestion, especially during bad weather, when vessels take refuge in the bay. Dredging would be required at Diamond Point, regulated by the USACE. The magnitude of impacts from dredging and lightering activities would be in the increase in the number of vessels in the area, especially during inclement weather when vessels take refuge in Iniskin Bay. Project-related vessel activity would be similar to that discussed under Alternative 1a and would be long term, occurring during operations. The likelihood of the impact would be certain if Alternative 2 is selected and the project is permitted and built.

During construction, PLP could use Williamsport to transport supplies until adequate facilities can be constructed at Diamond Point. Navigating into Williamsport can be challenging (see Section 3.12, Transportation and Navigation) and could cause delays and incur additional cost. Given the short amounts of time when it is possible to land barges at Williamsport (high tide only), and the possibility of inclement weather, there could be impacts to other users, particularly at the beginning and conclusion of the commercial fishing season.

The magnitude, duration, and likelihood of adverse effects on water transportation from the construction and operation of the natural gas pipeline in Cook Inlet would be the same as under Alternative 1a; however, the extent of the impacts would be different as Alternative 2 would be located in an area farther north. Under Alternative 2, there would be no pipeline in Iliamna Lake.

4.12.5.4 Navigation

The effects of the transportation corridor on navigation would be similar to Alternative 1a, except for the location of a ferry terminal, ferry traffic, and bridges. The Iliamna River, considered navigable by the USCG and the State of Alaska, would be crossed by a bridge along the Williamsport-Pile Bay Road. The Iliamna River bridge would be built alongside an existing bridge built by the Alaska Department of Transportation and Public Facilities (ADOT&PF) in 2018 to replace a historic trestle bridge on Williamsport-Pile Bay Road. The new bridge would have a vertical clearance of approximately 21 feet, two sets of pilings set 67 feet apart, and would have potential to replace the ADOT&PF bridge. The upper Newhalen River Bridge would be built with a minimum vertical clearance of 25 feet, and four sets of pilings set at approximately 124 feet apart. Navigation would not be impeded by these bridges, but the instream pilings would represent an increased risk of allision to vessels. As discussed under Alternative 1a, the Newhalen River is bigger than other navigable rivers with crossings. At the crossings, the magnitude of adverse impacts on navigation would be the construction activities occurring in the river at the crossings and the associated increase in traffic crossing the river. The magnitude of effects on navigation

at river crossings after construction would consist of bridge pilings and the height of the bridges, lasting through operations and into closure. These short- and long-term effects would be certain to occur under Alternative 2.

Under Alternative 2, a ferry terminal would be constructed at Pile Bay instead of the south ferry terminal; however, it would be similar in design to Alternative 1a and would not be expected to restrict navigation.

The Diamond Point port under Alternative 2 would pose an allision risk to vessels similar to that of Alternative 1a. The construction and operation of a deepwater loading facility would impact marine vessel traffic in Iniskin Bay by increasing congestion, especially during bad weather, when vessels take refuge there. Dredging and lightering activities at Diamond Point would cause an increase in the number of vessels in the area, and would be long term, occurring during operations. The likelihood of the impact would be certain under Alternative 2.

The magnitude, duration, and likelihood of impacts on navigation from the construction and operation of the natural gas pipeline in Cook Inlet would be the same as under Alternative 1a; however, the extent of the impacts would be different as Alternative 2 would be located in an area farther north. Under Alternative 2, there would be no natural gas pipeline in Iliamna Lake.

4.12.5.5 Alternative 2—Summer-Only Ferry Operations Variant

Under the Summer-Only Ferry Operations Variant, the magnitude, duration, and likelihood of adverse effects on surface transportation traffic would be similar to the Alternative 1 variant; however, would affect the area around Pedro Bay in terms of extent. The magnitude of impacts would be the amount of increased activities and traffic along the improved Williamsport-Pile Bay Road and disruption from increased truck traffic in the summer, as the volume of mine traffic would double in intensity. Truck traffic would be absent in the winter. The impacts to the Williamsport-Pile Bay Road would be long term and certain to occur.

Under the Summer-Only Ferry Operations Variant, the in-water ferry terminal structures would be the same as described for Alternative 2, but there would be two ferry trips per day during open water and no trips when there is ice cover. The risk of allision with ferry terminal components would be the same as under Alternative 1a; however, in terms of magnitude, increased ferry traffic would increase the risk of vessel collisions, especially if two ferry vessels are needed.

4.12.5.6 Alternative 2—Pile-Supported Dock Variant

The Pile-Supported Dock Variant would construct similar structures in navigable waters and would not change vessel traffic compared to the Alternative 2 solid fill dock. The magnitude, duration, and extent of impacts of a pile-supported dock to navigation and air and surface transportation would not differ from a solid fill type dock.

4.12.5.7 Alternative 2—Newhalen River North Crossing Variant

The design of the bridge at the Newhalen River would be the same as described above for Alternative 2 and would have the same impacts to water transportation and navigation.

4.12.6 Alternative 3—North Road Only

Impacts to surface transportation, air transportation, water transportation, and navigation at the mine site would be the same as under Alternative 1a.

4.12.6.1 Surface Transportation

Effects on the Kenai Peninsula would be the same as under Alternative 1a. The magnitude, duration, and extent of adverse effects of the road from Diamond Point through Williamsport to Pile Bay would be the same as in Alternative 2.

Under this alternative, a road would be built from near Diamond Point and routed around the north side of Iliamna Lake, through Pedro Bay and to the mine site to eliminate the need for the ferry. The route would be the same as the natural gas pipeline corridor from Alternative 2, and have similar surface transportation effects during construction. The magnitude of effects of this road during operations and closure would be an average of 35 heavy truck round trips per day through Pedro Bay; there would also be additional vehicle traffic because the road would connect the communities on the north side of Iliamna Lake over land to each other and to Cook Inlet. Access would be controlled the same as under Alternative 1a, although private traffic would be allowed on the Williamsport-Pile Bay Road portion of the road. The impacts during construction would be short term; impacts during operations and closure would be long term. They would be expected to occur under Alternative 3.

The road would have similar effect on traffic in Iliamna, Newhalen, and Nondalton, as described under Alternative 2.

Effects on surface transportation at the Diamond Point port site would be the same as under Alternative 2.

Installation of the natural gas pipeline along the road from the Pile Bay spur to the mine site would occur simultaneously with road construction and improvements and have similar effects as Alternative 2.

4.12.6.2 Air Transportation

The frequency of flights to and from Iliamna under this Alternative would be the same as Alternative 1a; therefore, impacts to air transportation at Iliamna would be the same as Alternative 1a. Flight frequencies to Pedro Bay would be similar to Alternative 2, but the connecting of Pedro Bay by road to the Cook Inlet would affect frequency of flights after construction, if the road leads to more traffic through Pedro Bay. In terms of magnitude and extent, potential effects on Kokhanok would be limited to resident crew change flights.

4.12.6.3 Water Transportation

The magnitude, duration, and extent of effects of Alternative 3 would be similar as under Alternative 2 for water transportation at the Diamond Point port site, and similar to Alternative 2 waterbody crossings along the transportation corridor. This alternative would eliminate the ferry and all impacts to transportation on Iliamna Lake.

Bridges for Alternative 3 would include Iliamna River (discussed under Alternative 2 and considered navigable by the USCG and the State of Alaska) and Pile River (considered navigable by the State of Alaska). Water transportation is not likely to be impeded by these bridges, but the instream pilings would represent an increased risk of allision to vessels. Impacts from the bridges would be long term and certain to occur under Alternative 3.

As discussed under Alternative 2, water transportation at the crossings on these rivers would be directly affected during construction of the crossings due to the associated increase in vessel traffic crossing the river. Direct effects to navigation from the river crossings after construction would consist of bridge pilings and the height of the bridges. Impacts during construction would

be short term and long-term during operations and closure; they would be expected to occur under Alternative 3.

4.12.6.4 Navigation

The duration and extent of effects of Alternative 3 would be similar to Alternative 2 navigation at the Diamond Point port site and similar to Alternative 2 waterbody crossings along the transportation corridor. This alternative would eliminate the ferry and all impacts to navigation on Iliamna Lake. There would be a higher magnitude of impacts to vessels travelling to Williamsport, as the dock would occupy more of Iliamna Bay than under Alternative 2, representing an increased risk of allision; however, navigation to Williamsport would not be restricted.

Bridges for Alternative 3 would include Iliamna River (discussed under Alternative 2 and considered navigable by the USCG and the State of Alaska) and Pile River, considered navigable by the State of Alaska. The Pile River Bridge would have a 26-foot minimum vertical clearance and two sets of pilings set approximately 80 feet apart in the center of the channel. Navigation is not likely to be impeded by these bridges, but the instream pilings would represent an increased risk of allision to vessels. Impacts from the bridges would be long term and certain to occur under Alternative 3.

As discussed under Alternative 2, navigation at the crossings on these rivers would be directly affected during construction of the crossings due to the associated increase in vessel traffic crossing the river. Direct effects of the river crossings after construction would consist of bridge pilings and the height of the bridges being a risk to navigation. The impacts during construction would be short term and long-term during operations and closure; impacts would be expected to occur under Alternative 3.

4.12.6.5 Alternative 3—Concentrate Pipeline Variant

The Concentrate Pipeline Variant would result in impacts with similar magnitude, duration, and extent as those described above under surface transportation, except that truck traffic would be reduced to 18 round trips per day, reducing the magnitude of effects on overland traffic. This variant would not change the Alternative 3 impacts to navigation or air transportation.

4.12.7 Cumulative Effects

Impacts to transportation and navigation would be those actions that increase land, sea, or air facilities and traffic volumes (see Section 4.10, Health and Safety, for a discussion on health and safety impacts). The analysis area used for cumulative effects is the same as used for the analysis of direct and indirect effects, the transportation and navigation resources that could be affected by the mine site, port, transportation corridor, material sites, and natural gas pipeline corridor for each alternative. This includes surface transportation from the mine site to Cook Inlet and a small section of the Sterling Highway, air transportation from airports across the region (including Dillingham and Anchorage), and water transportation on Cook Inlet, Iliamna Lake, and navigable rivers from the mine site to Cook Inlet. Navigation also includes deepwater port construction and usage from local to global users.

Many of the actions identified in Section 4.1, Introduction to Environmental Consequences, are considered to have no potential of contributing to cumulative effects on transportation and navigation in the analysis area. These include potential mineral deposit projects that are not anticipated to occur in the operations timeframe of the project (Humble, AUDN/Iliamna, and Kamishak), activities that may occur in the analysis area but are unlikely to result in any appreciable impact on transportation and navigation (such as tourism, recreation, commercial

fishing, recreational fishing, and hunting), scientific surveys and research, clean-up of industrial pollutants and contaminated sites, or actions outside of the cumulative effects analysis area.

4.12.7.1 Past and Present Actions

Actions that have affected transportation and navigation in the past or present in the EIS analysis area include mining exploration, non-mining related projects, community development, oil and gas development, and subsistence activity. These actions have resulted in development of transportation infrastructure and have altered traffic patterns and increased traffic over land, in the air, and on waterways. In particular, the construction of the Williamsport-Pile Bay Road allows portage of fishing vessels and some cargo from Cook Inlet to Iliamna Lake during the summer season, generating road, marine and Iliamna Lake vessel traffic. Communities and roads already exist in the EIS analysis area, and activities at the mine site and other nearby mineral deposits currently include exploration drilling, which has resulted in a summer season increase in air traffic in support of exploration activities. Oil and gas activity, docks, ports, and marine vessel traffic have impacted navigation in Cook Inlet although there has been little development in Iliamna Lake and the navigable rivers.

4.12.7.2 Reasonably Foreseeable Future Actions

Reasonably foreseeable future activities in the cumulative impact study area have the potential to contribute cumulatively to impacts on transportation and navigation. The potential future actions are similar to the project in how they impact surface, air, and water transportation and navigation during construction, operations, and closure.

The future actions included in this analysis are those that would contribute to the cumulative increase in land, sea, and air traffic in the EIS analysis area. The following Reasonably Foreseeable Future Actions (RFFAs) identified in Section 4.1, Introduction to Environmental Consequences, were carried forward in this analysis based on their potential to impact transportation and navigation in the EIS analysis area: Pebble project expansion scenario; other mineral exploration projects, oil and gas exploration and development, and road improvement and community development projects.

The No Action Alternative would not contribute to cumulative effects on transportation and navigation.

The project alternatives with RFFAs' contribution to cumulative effects on transportation and navigation are summarized in Table 4.12-2.

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Pebble Project Expansion Scenario	<p>Mine Site: The mine site would mine and process more ore over a longer period of time, have a larger open pit, and create new facilities to manage water and store tailings and waste rock. This would increase and extend truck traffic in the mine site.</p> <p>A larger mine site and infrastructure footprint would be more noticeable to those traveling over land for inter-village trips and would continue to impede non-mine-related access through the mine site.</p> <p>Other Facilities: A north access road, concentrate pipeline, and diesel pipeline would be constructed along the Alternative 3 road alignment, and extended to a new deepwater port site at Iniskin Bay. The portion of the access road from the Eagle Bay 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. Although the concentrate truck traffic along the south access road would be eliminated, and truck traffic would be reduced to 21 round trips per day, the Amakdedori port facility and transportation corridor (including ferry) would continue to be used for general cargo and concentrate shipment and would extend the duration of truck and vessel traffic effects in the port area and transportation corridor, although at a reduced level. The access road to Diamond Point, if open to non-mining traffic, would increase traffic overall through the Williamsport-Pile Bay Road corridor, and could be permanent. The construction and operation of a deepwater loading facility would impact marine vessel traffic in Iniskin Bay by increasing congestion, especially during bad weather, when vessels take refuge there. Expansion would continue operation of the port facilities at a higher production rate over an extended period of time.</p> <p>An additional 58 years of mining and processing would extend the impacts on Cook Inlet marine vessel traffic.</p>	<p>Mine Site: Identical to Alternative 1a.</p> <p>Other Facilities: Alternative 1 would add a road that would be constructed between the mine site and Iniskin Bay and a new port at Iniskin Bay.</p> <p>Magnitude: The magnitude of cumulative impacts to transportation and navigation would be similar to the magnitude of Alternative 1a, with the added impacts of the additional road, concentrate and diesel pipeline, and Iniskin Bay port construction.</p> <p>Duration/Extent: The duration of cumulative impacts to transportation and navigation would be similar to as under Alternative 1a. The extent would increase to include the northern side of Iliamna Lake, Pile Bay, and Iniskin Bay.</p> <p>Contribution: This contributes to cumulative effects on transportation and navigation through additional surface, air, and vessel traffic. Therefore, this scenario would have a</p>	<p>Mine Site: Identical to Alternative 1a.</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.</p> <p>Magnitude: Cumulative effects of construction disturbance, traffic, and navigation impacts would be similar to those discussed under Alternative 1a, except the magnitude of impacts would be reduced (Alternative 2 would not develop both Amakdedori and Diamond Point transportation corridors, the corridor for the diesel and concentrate pipelines would have been disturbed for the natural gas pipeline, and the transportation and natural gas pipeline corridors would already have some impacts on transportation and navigation in Iliamna and Iniskin bays). An access road would be constructed</p>	<p>Mine Site: Identical to Alternative 1a.</p> <p>Other Facilities: Overall, expansion would use the existing north access road; a concentrate pipeline and diesel pipeline would be constructed along the existing road alignment and extended to a new deepwater port site at Iniskin Bay (a service road would also be extended to Iniskin Bay). Concentrate truck traffic would cease along the north access road after 20 years of initial operations. Changes in port vessel traffic would be identical to Alternative 2.</p> <p>Magnitude: Expanded mine site development and associated contributions to cumulative impacts would be similar to those under Alternative 2. Under Alternative 3, project expansion would continue to use the existing Diamond Point port facility, would use the same natural gas pipeline, and would use the same north access road for general vehicle traffic and Concentrate Pipeline Variant infrastructure, but would extend the</p>

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	<p>Project-generated vessel traffic in Cook Inlet would include deep-draft vessels such as concentrate transport vessels, vessels for fuel, and barges for delivery and transport of materials and supplies. Increased production and transport of concentrate through a pipeline would further increase vessel traffic on Cook Inlet, therefore increasing the magnitude, duration, and extent of impacts. The additional concentrate and diesel pipelines to Iniskin Bay would have impacts to the transportation characteristics of the region similar to those discussed for the natural gas pipeline under Alternative 2 and Alternative 3 above, primarily associated with construction activities and the development of access roads along the pipelines.</p> <p>Magnitude: Truck traffic would decrease due to concentrate being transported through a pipeline, but there could be impacts from having two active transportation corridors on navigation, air transportation, and surface transportation.</p> <p>Duration/Extent: The duration/extent of cumulative impacts to transportation and navigation would vary; concentrate truck traffic would cease after 20 years of initial operation, and concentrate vessel traffic would shift from Amakdedori to Iniskin Bay in the same time period. Because mill throughput would increase, it is possible that the frequency of vessel traffic would also increase, depending on the size of vessels being loaded. The extended timeframe of mining would have a longer duration of effects on transportation, lasting 78 years.</p> <p>Contribution: This contributes to cumulative effects on transportation and navigation through additional surface, air, and vessel traffic. Therefore, this scenario would have a larger contribution to cumulative effects in the area than Alternative 1a alone. The contribution to cumulative effects would be slightly less than Alternative 1, but more than Alternative 2 and Alternative 3.</p>	<p>larger contribution to cumulative effects in the area than Alternative 1a or Alternative 1 alone.</p>	<p>along the concentrate pipeline, and year-round ferry operations would be discontinued. With regard to traffic, truck traffic would be limited to one transportation corridor instead of two, and vessel traffic would be concentrated in the Diamond Point/Iniskin Bay area, rather than being split between Amakdedori and Iniskin facilities.</p> <p>Duration/Extent: The duration of cumulative impacts to transportation and navigation would be similar to that under Alternative 1a. The extent would avoid the Amakdedori and Kokhanok areas and Iliamna Lake.</p> <p>Contribution: The contribution to cumulative impacts would be similar to that under Alternative 1a, although affecting fewer acres and a smaller geographic area for vehicular and vessel traffic.</p>	<p>concentrate pipeline to Iniskin Bay. The port site and associated facilities would be constructed at Iniskin Bay as discussed under Alternative 1a. A diesel pipeline from the mine site to Iniskin Bay would be constructed as discussed under cumulative effects for Alternative 1a.</p> <p>Duration/Extent: The duration/extent of cumulative impacts to transportation and navigation would be similar to those under Alternative 2, except that the north access road would be constructed at the outset of the project and would not involve construction and operation of a ferry.</p> <p>Contribution: The contribution to cumulative impacts would be similar to that under Alternative 1a, although affecting fewer acres.</p>

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Other Mineral Exploration Projects	<p>Magnitude: Mining exploration activities, including additional borehole drilling, road and pad construction, and development of temporary camp facilities, would result in additional helicopter traffic in the vicinity of exploration activities, possibly based out of the Iliamna airport.</p> <p>Duration/Extent: Exploration activities typically occur at a discrete location for one season, although a multi-year program could expand the geographic area affected within a specific mineral prospect. Section 4.1, Introduction to Environmental Consequences, identifies seven mineral prospects in the EIS analysis area where exploratory drilling is anticipated (four of which are in relatively close proximity to the Pebble Project and infrastructure).</p> <p>Contribution: There would be an accumulating demand for regional and helicopter air transportation and logistical support, particularly if mining exploration activities or construction schedules of the proposed alternative and RFFAs overlap. It is likely that any increased demand for air transport could be met by adding supply, because the RFFA sites are distributed with different airstrips and staging sites, rather than clustered.</p>	Similar to Alternative 1a.	Similar to Alternative 1a.	Similar to Alternative 1a.
Oil and Gas Exploration and Development	<p>Magnitude: Onshore oil and gas exploration activities could involve seismic and other forms of geophysical exploration, and in limited cases exploratory drilling. Similar to mining exploration activities, helicopter support would be required, although the location of previous exploration activities indicate that support would likely be based out of King Salmon. Helicopter support could contribute to cumulative air traffic congestion, depending on the location(s) of drilling. Offshore oil and gas projects in Cook Inlet could contribute cumulatively to adverse impacts to boat traffic and navigation on the inlet if construction periods overlapped.</p>	Similar to Alternative 1a.	Similar to Alternative 1a.	Similar to Alternative 1a.

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	<p>From June to October, vessel traffic in the Cook Inlet typically includes large deep-draft vessels, tugs, barges, and small commercial vessels. The alternative vessel and barge delivery traffic would contribute to the disturbance of transportation access and traffic levels in Cook Inlet. Construction of the Alaska LNG project or the ASAP project would increase vessel traffic in the vicinity of Cook Inlet during the period of construction. Operation of the Alaska LNG project would generate monthly LNG carrier traffic for the duration of operations. Magnitude would increase. This project could add to the cumulative vessel traffic of Cook Inlet with Alaska LNG or ASAP.</p> <p>Duration/Extent: Seismic exploration and exploratory drilling are typically single-season, temporary activities. The 2013 Bristol Bay Area Plan shows 13 oil and gas wells drilled on the western Alaska Peninsula and a cluster of three wells near Iniskin Bay. Offshore exploration would occur on leases in southern Cook Inlet, to the east of Iniskin Bay.</p> <p>Contribution: The alternative vessel and barge delivery traffic would contribute to the disturbance of transportation access and traffic levels in Cook Inlet. The magnitude and geographic extent of effects would increase, but the duration would remain the same.</p>			
Road Improvement and Community Development Projects	<p>Magnitude: Anticipated road improvement projects in the region include new transportation corridors currently being studied in the LPB, such as the Williamsport-Pile Bay Road upgrade and the Nondalton-Iliamna River Road Corridor and Bridge, which would improve overland routes in the region (access to Nondalton) and inter-regionally from Cook Inlet to Iliamna Lake. These improvements could have positive cumulative effects on transportation with Alternative 1a. The timing of the improvements to the Williamsport-Pile Bay Road would be critical in determining whether the improvements would be positive or adverse to traffic on the road. If</p>	Similar to Alternative 1a.	The Williamsport-Pile Bay Road upgrade and the Nondalton-Iliamna River Road Corridor and Bridge construction would have cumulative effects similar to those under Alternative 1a. The magnitude, geographic extent, and duration of cumulative impacts in Alternative 2 would be greater than under	The Williamsport-Pile Bay Road upgrade and the Nondalton-Iliamna River Road Corridor and Bridge construction would have cumulative effects similar to those under Alternative 1a. The magnitude of effects would be similar to Alternative 2 and less than Alternative 1. The

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	<p>implemented during the construction phase of Alternative 1a, the adverse effects would be temporary and would affect the progress of road improvement, portaging ships, and PLP's construction schedule, and could increase duration of all three elements. If the improvements occurred before or after the construction phase of Alternative 1a, the magnitude would be far less.</p> <p>Surface transportation could cause additional traffic and some disruption along roads leading to the communities of Iliamna, Newhalen, and Nondalton via the project roads; Kokhanok community roads would be connected to the south access road, which would run from the south ferry terminal to Amakdedori port.</p> <p>Subsistence activities have the potential to affect transportation and navigation in the region, because they can increase the number of people using overland routes and boat traffic in certain areas.</p> <p>The further development of the Diamond Point Rock Quarry could have some effects on transportation if it is developed or operational during the construction phase of Alternative 1a, while the Williamsport-Pile Bay Road is used for transport. If issued, the quarry's permit to dredge could either be beneficial to transportation in the area, creating easier navigation in Iliamna Bay; or it could hinder transportation, depending on the timing and location of the dredging. Overall, the magnitude of effects and geographic extent of cumulative effects would increase, but the duration would remain the same.</p> <p>Duration/Extent: Disturbance from road construction would typically occur over a single construction season. Increased project vehicle traffic and effects on local roads would occur over the expanded mine operating period, and to a lesser degree during initial closure activities. The geographic extent would be limited to the vicinity of communities and Diamond Point.</p>		<p>Alternative 1a and Alternative 1 because the project infrastructure and logistical operations would be more concentrated in this area through all phases, having a larger compounded impact over the life of the project and beyond.</p> <p>The footprint of the Diamond Point rock quarry in Alternative 1a and Alternative 1 coincides with the Diamond Point port footprint in Alternative 2 and Alternative 3. The development of the Diamond Point Rock Quarry would have impacts on transportation and navigation similar to those during the construction phase of Alternative 1a, because the Williamsport-Pile Bay Road and Iliamna Bay would be used for transport. The magnitude of effects, geographic extent, and duration of cumulative effects would be the same as discussed for Alternative 1a.</p>	<p>development of the Diamond Point Rock Quarry would have impacts on transportation and navigation similar to those under Alternative 2. The development and operation of the Diamond Point Rock Quarry was considered above; the magnitude of effects, geographic extent, and duration of cumulative effects would remain the same as Alternative 1a.</p>

Table 4.12-2: Contribution to Cumulative Effects on Transportation and Navigation

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	Contribution: Cumulative impacts would occur associated with surface transportation between the communities for subsistence and recreational uses, in addition to the ongoing LPB, rural Alaska Village Grant Program, and other village projects.			
Summary of Project contribution to Cumulative Effects	Overall, the contribution of Alternative 1a to cumulative effects to transportation and navigation, when taking other past, present, and reasonably foreseeable future actions into account, would be minor to moderate in terms of magnitude, duration, and extent.	Similar to Alternative 1a.	Similar to Alternative 1a, although affecting a smaller amount of acreage and a smaller geographic area for vehicular and vessel traffic.	Similar to Alternative 2, except that the north access road would be constructed at the outset of the project and not involve construction and operation of a ferry.

Notes:

ASAP = Alaska Stand Alone Pipeline
EIS – Environmental Impact Statement
LNG = Liquefied Natural Gas
LPB = Lake and Peninsula Borough
PLP = Pebble Limited Partnership
RFFA = reasonably foreseeable future action