4.9 SUBSISTENCE

This section describes potential impacts of the Pebble Project on subsistence in communities near Iliamna Lake, in the Kvichak and Nushagak river drainages, and on the southwest coast of Kenai Peninsula. The magnitude, geographic extent, and duration of impacts are assessed for each project phase. Potential impacts include:

- Changes in resource availability – construction and operation of project facilities may impact fish and wildlife habitat, and decrease or displace fish, wildlife, and vegetative resources used for subsistence.
- Changes in access to resources – project facilities and transportation corridors may open or remove areas from subsistence activities, or facilitate or restrict access to subsistence resources. In addition to physical access, project activity may change the character of the subsistence activities.
- Changes in competition for resources – changes to local population from direct and indirect employment and construction of project transportation access corridors may result in increased competition for subsistence resources.
- Changes in sociocultural conditions – direct/indirect employment opportunities for local residents and the presence of new large scale industrial facilities may have adverse and beneficial sociocultural effects.

Comment [A1]: Recommend replacing with "eliminate"

4.9.1 No Action Alternative

Under the No Action Alternative, the mine would not be constructed; however, Pebble Limited Partnership (PLP) would still be permitted to perform exploratory activities and research at the site and would be expected to do so. Resource availability would not change from the conditions present during exploration activity and environmental studies at the action alternatives' proposed mine site. Local employment from exploration would be minimal. Potential effects to sociocultural aspects of subsistence (see below for an explanation of sociocultural dimensions of subsistence) would include a loss of income for a small number of people to fund subsistence activities (see Section 4.3, Needs and Welfare of the People—Socioeconomics), while labor and time available for subsistence would increase for those individuals. There would be no additional direct or indirect effects on subsistence. Existing trends in subsistence activities and resources would continue.

4.9.2 Alternative 1 – Applicant's Proposed Alternative

4.9.2.1 Changes in Resource Availability

During the 4-year construction phase, project activities would, in varying degrees, affect the availability and abundance of traditional and subsistence resources through habitat loss; mortality; behavioral disturbance and displacement resulting from increased noise, vehicle/aircraft/ferry traffic, and human activity; fugitive dust deposits on vegetation; concerns about contamination of resources; avoidance of traditional use areas; and increased costs and times for traveling to more distant areas (see Section 4.23, Wildlife Values, Section 4.24, Fish Values, Section 4.25, Threatened and Endangered Species, and Section 4.26, Vegetation, for discussions of project impacts on fish, wildlife, and vegetation).

Comment [A2]: Workers and experts brought in over the life of the mine would be eligible after one year to subsistence rights available to Alaska citizens.

During the operations phase, the effects of project activities would be similar. However, the effects would last for 20 years, and occur with less intensity along the transportation corridor than during construction because operations activities would be less disruptive than

construction activities, although regular vehicle and ferry traffic and the physical presence of transportation corridor elements would continue to affect availability of subsistence resources. At the mine site, effects could occur with more intensity, associated with mining activity, noise, and expansion of the open pit and the waste rock and tailings storage.

Resources and species of concern that have been identified through the scoping process and environmental baseline documents include salmon, caribou, moose, seal, berries, small mammals, and firewood. With regard to the mine site, displacement and ~~individual~~ mortality of fish would occur in the upper portions of the North and South Fork Koktuli Rivers directly affected by mine facilities, but given the limited number of fish observed in that area and the quality of fish habitat, impacts would not be noticeable downstream from the affected channels (see Section 4.24, Fish Values). Similarly, there would be displacement of any moose, caribou, small land mammal, and upland birds that use the proposed mine site, but this would represent a small percentage of available habitat. These impacts to fish and wildlife would not be expected to impact harvest levels, since there would be no population-level decrease in resources and alternative, and in many cases assuming best case scenario (e.g. no tailings dam failure, ability of pollution containment and treatment facilities to capture and function perfectly under all weather conditions e.g., floods, and no accidents) more productive, habitats are available.

With regard to transportation facilities such as access roads and Iliamna Lake ferry operations, there would be loss of habitat from the facility footprint, potential displacement of individual fish and wildlife from human activities and noise, and potential injury and mortality from strikes with truck traffic (large and small land mammals) (see Section 4.23, Wildlife Values). However, the facility footprint would be small with regard to the total habitat available, and culverts would be required on the access road to allow for fish passage. Vehicle collisions with large and small land mammals would not have a population-level effect. There would be some site specific habitat fragmentation from project facilities, causing behavioral disturbance to terrestrial wildlife and birds and localized changes in distribution.

There would be direct loss of resource availability for berries and firewood in the project footprint and the immediate area of mine and transportation facilities; but these resources are commonly available in the project area, and there are alternative gathering areas available that are traditionally used.

Fugitive dust impacts would occur within a narrow corridor on either side of the roadways as described in Section 4.26, Vegetation. The heaviest dust deposition would be anticipated to occur within 35 feet of the road and vegetation and berry picking activity may avoid dusted areas. Some localized impacts of dust settlement in stream channels where fishing occurs may be noticeable, but implementation of dust suppression and enforcement of slow speed limits at all stream crossings would minimize dust-related impacts to aquatic ecosystems. Impacts would be expected to extend through the life of the project and would be localized to the area of disturbance. Fugitive dust from construction, roadways, and mining activities deposited in streams and on berries, other traditionally used plants, plants that animals eat, and water, would discourage subsistence users from harvesting these resources near the areas affected by the mine site and the transportation corridor. Subsistence users also may avoid harvesting waterfowl because of concerns about birds becoming contaminated from landing on and using open water at mine site facilities.

The communities closest to project infrastructure and transportation activities, including the mine site, transportation corridor, the ferry and terminals, port, and airports, would be the most affected by changes in resource availability. These communities include Nondalton, Iliamna, Newhalen, Pedro Bay, Igiugig, and Kokhanok. In contrast, communities in the Nushagak River

Comment [A3]: No scientifically defensible population analysis was done for the impact area. No quantitative estimate was attempted to determine how many salmon actually rear in the impact zone. Therefore, this is a subjective statement that gives the reader the unsubstantiated and biased impression that there are very few fish in the area. Recommend removing.

Comment [A4]: This statement is also not supported by quantifiable scientifically defensible information and should also be removed.

Comment [A5]: See critique of Pebble EBD Escapement Index counts Woody 2012 provided.

Comment [A6]: There is no scientifically defensible grounds for this statement. If rearing habitat for Chinook and Coho salmon are eliminated as well as habitat for Dolly Varden, Rainbow Trout, other important subsistence fish species as well as the fish they feed on, then over time there may well be downstream effects.

Comment [A7]: The assumption that impacts to water will not impact water downstream does not appear to be supported here and does not seem realistic.

Comment [A8]: While the mine footprint may be relatively small, impacts likely will greatly exceed that area in regards to the disturbance which will displace wildlife. Displacement can be a greater impact than population decreases ...

Comment [A9]: This analysis should estimate probabilities for failure of water treatment systems every x years etc., or water containment systems every x years. Red Dog ...

Comment [A10]: See comments and provided citations regarding impacts of industrial roads on fish populations in sec. 4.24. Fish Values Woody.

Comment [A11]: All culverts need to be constructed to ensure future fish passage regardless of whether anadromous fish are currently present.

Comment [A12]: Road construction has impacted migration of caribou in association with the Red Dog Mine road. These could have population level impacts as they delay migrat ...

Comment [A13]: Please provide citation.

Comment [A14]: Normally, vegetation impacts from crustal element road dust is expected 50 meters from the road bed. This ...

Comment [A15]: Precipitation events will be a primary factor introducting sediment to watersheds and stream crossings from roads, and the >8,000 acres of disturbed area at mi ...

Comment [A16]: How will waterfowl and other subsistence species be discouraged from using the tailings reservoir? Will it be fenced? Will t ...

drainage and in the Kvichak River drainage below Igiugig would experience little to no impact on resource availability as the potential impact on fish is small. Residents in Port Alsworth use an area in the vicinity of the mine site and along the north mine access road to harvest caribou, moose, other land mammals, waterfowl, upland birds, and berries though the areas closer to and surrounding this community see higher concentrations of use and it is expected that there would be little to no impact on resource availability in the concentrated use areas closer to the community during operations. On the east side of Cook Inlet, the construction and decommissioning of the natural gas pipeline would disturb a small area near the Sterling Highway but distant from communities traditionally pursuing subsistence activities, and would have a very low potential to impact subsistence users.

During construction and operations, the effects of project activities on resource availability would be primarily localized in the vicinity of project facilities and activities. While the mine site is within subsistence harvest areas used by five communities, it provides relatively poor fish and wildlife habitat and is not within the area of highest intensity overlapping subsistence users. Portions of the transportation corridor, primarily in the vicinity of Upper Talarik Creek and Gibraltar Lake and River are more heavily used (see Section 3.9, Subsistence). Truck traffic along these portions of the transportation corridor could displace moose and other land mammals in the immediate vicinity of the transportation corridor. Subsistence users that harvest resources in the immediate vicinity of the transportation corridor, particularly those from Iliamna, Newhalen, and Kokhanok, would likely need to make some adjustments to where they might traditionally harvest some subsistence resources to target resources that would be less affected by project activities. These adaptive approaches would likely sustain harvest levels for affected communities, but may increase the expenses and time needed to harvest subsistence resources.

Many project features would be removed or reclaimed, or both, during closure. Once restoration activities have been completed, impacts on the availability of subsistence resources would be reduced as these areas become revegetated and return to a more natural state than their condition during operations. The pit lake at the mine site would fill during the decades after mine closure. This would introduce a new standing waterbody, and concern about contamination of waterfowl was expressed during scoping. While there would be exceedance of water quality standards for specific metals, during the phases of closure (see Appendix K 4.18) risks to wildlife and birds from potential contaminants exposure would be limited and short-term, since the pit lake is anticipated to not support habitat that is attractive to many species of waterfowl and shorebirds and alternate habitat, including open water for staging, is available in the area. Some project facilities, including the pipeline, power plant, limited camp and storage facilities, access roads, and mine water treatment plant, would remain in use after mine closure as long as needed to support closure activities. Impacts on resource availability would be localized, in the vicinity of remaining infrastructure and activities (see Section 4.26, Vegetation, and Section 4.23, Wildlife Values, for discussions on vegetation restoration and impacts to wildlife).

The likelihood of impacts to subsistence resource availability in the project area during construction and operations would be high but have the highest intensity in the immediate vicinity of the project components. Disturbance, displacement, individual mortalities such as vehicle collisions with large land mammals and physical loss of stream habitat, and the loss of acres of habitat from project components would be the primary impacts to subsistence resources, but would be of low magnitude based on lack of population-level effects to fish and wildlife and the general availability of similar habitat to that affected by the project footprint. Impacts from the transportation corridor and associated uses would be intermittent to prolonged over the construction period and 20 year operations period. The duration of impacts would

Comment [A17]: This section should acknowledge assumption of best case scenario conditions e.g. tailings dam does not fail; pollution collection, containment, and treatment systems work perfectly throughout Alaska's harsh floods and winters.

Comment [A18]: Please provide evidence supporting limited impact on fish. Potential downstream impacts from changes in streamflow would affect populations supporting communities in both drainages. Please refer to NPS comments on Subsistence in the draft Fish Resource section.

Comment [A19]: Workers and experts brought in over the life of the mine will be eligible after one year to subsistence and hunting rights available to Alaska citizens therefore potentially competing for the limited big game resources in the area.

Comment [A20]: Review of the Pebble EBD indicates no scientifically defensible estimates were made of the actual number and species of fish that will be eliminated by this proposed project footprint. The Chinook and Coho Salmon rearing habitat within the proposed Tailings facility is good habitat based on survey parameters (ADFG AWC 2018). Small fish find refuge from larger fish predators in these small headwaters, and is unclear why the habitat is suggested to be "poor" here. These same upper headwaters are the nursery for Chinook and Coho Salmon.
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Comment [A21]: In section 3.9, it is already acknowledged that individuals have needed to adapt to changing distributions of subsistence resources which have had negative consequences. Knowing that significant disturbance and development will occur in some core use areas guarantees increases in time and expense to find/harvest subsistence ...

Comment [A22]: Due to the type of ore body Pebble is, (Seal 2018) the pit lake will likely be acidic with high concentrations of dissolved copper, zinc, and other heavy metals that are highly toxic to aquatic life and important subsistence fish species. The pit lake water h ...

Comment [A23]: Please provide supporting evidence of this statement (NPS recognises that this information may be contained in the wildlife section). Water bodies of similar size and depth in the area of the proposed project shoud be studied to determine what waterfowl and othe ...

Comment [A24]: Mines like this generally require perpetual water treatment

Comment [A25]: Please provide quantitative fisheries data

Comment [A26]: Will the road be removed after the mine closes? Recommend including estimated failure rate of culverts based on an unusual weather event and other causes over a 20 year period.
How frequently will culverts be replaced?

extend beyond the life of the mine but would decrease in intensity after closure and would cease when project restoration is complete.

Comment [A27]: The tailings dam will have to be maintained into perpetuity, and the pit will need to be monitored and potentially managed. This should be reflected in this deiscussion.

4.9.2.2 Changes in Access to Resources

During the construction phase, access to the area in the immediate vicinity of the project components would be impaired or restricted. Such restrictions would affect communities located near project infrastructure that use this land for or to access subsistence fishing, hunting, gathering, education of youth on subsistence traditions, and other customary practices. Construction of linear features, such as the roads and pipeline, could interrupt travel to resources or communities on the other side of the right-of-way (ROW). For example, construction of the natural gas pipeline and south access road could inconvenience residents of Kokhanok accessing subsistence areas south and west of the community during 1 of the 4 years of construction. Additionally, construction-related vessel traffic crossing Iliamna Lake could inconvenience other vessel traffic and subsistence activities. Safety considerations and presence of project equipment and personnel may restrict hunting activities in proximity to project facilities, and would be subject to consultation with potentially affected communities.

During the operations phase, the project footprint of the mine site, Iliamna Lake ferry terminals, access roads areas, and Amakdedori port would not be available for subsistence uses. Hunting may be restricted in the vicinity of those areas, and a raised gravel road may present a barrier to snowmachine and all-terrain vehicle (ATV) crossing. However, such restrictions would have minimal impact on access to subsistence resources because these project components would occupy a relatively small portion of the nearby communities' harvest areas, and because mitigating measures would be in place to minimize or avoid impact, such as providing marked crossing points across the transportation corridor and around the ferry terminals (PLP 2018-RFI 027). However, crossing at designated points may add travel time for subsistence users.

PLP would work with local communities to identify safe, practicable ways for residents to use the access roads, such as scheduled escorted convoys for private vehicle transport, and address hunting guidelines in proximity to project facilities. Trails and crossing points would be sign-posted and appropriate traffic controls would be established to ensure public safety (PLP 2018-RFI 027). Once constructed, the transportation corridor roads and the natural gas pipeline corridor ROW could have a positive effect on access to subsistence resources (depending on the level of access agreed to between the State, PLP, and the Lake and Peninsula Borough [LPB]) because these cleared routes could facilitate some overland travel by ATVs and snowmachines.

The Iliamna Lake ice-breaking ferry would disrupt winter travel over the frozen lake by creating a corridor of open water and potentially adding to travel time and increasing fuel expenditures by subsistence users. In addition, the open water in the ferry's wake would present a safety hazard for subsistence users. However, the project would work with communities (and supply funding) to provide for the marking and maintenance of snowmachine trails between communities across Iliamna Lake when lake ice is thick enough to support such traffic (PLP 2018-RFI 071a) (see Section 3.12 Transportation and Navigation). For the Kokhanok east ferry terminal site variant, snowmachine access to Iliamna Lake would be provided to the east of the terminal to enable access to the Sid Larson Bay area without crossing the ferry route (PLP 2018-RFI 078). PLP would work with local communities to find solutions for ferry transportation use (PLP 2018-RFI 027). The summer-only ferry variant would have no impact to winter access across Iliamna Lake.

Comment [A28]: NPS is concerned that the open water channel through winter will have a widespread effect on lake ice due to wind and wake action, including creation of a wider channel than designed and shortened shoulder season in a large portion of the lake as ice takes longer to form and break up occurs at a faster rate.

At closure, roads in the transportation corridor would remain for monitoring purposes and so could continue to facilitate overland travel for subsistence access. The ferry facilities would be

removed and supplies would be transported across the lake using a summer barging operation; thus, there would be no impacts from ice-breaking ferries after closure. Many of the other project features would be removed and/or reclaimed; therefore, adverse impacts on access to subsistence resources would be greatly reduced.

Impacts of access in the transportation corridor to subsistence users in the EIS analysis area would be of medium magnitude and localized geographic extent due to the ability to access other areas for harvest of resources. This is primarily because the Upper Talarik Creek portion of the transportation corridor is identified as a high overlapping area for subsistence users for two communities (Iliamna and Newhalen) and used by two others (Nondalton and Igiugig), and the Gibraltar River and Lake portion of the transportation corridor is a high overlapping subsistence use area for Kokhanok that is also used by Igiugig. Impacts of the transportation corridor and associated uses would be intermittent to prolonged over the 24 year period of construction and operation. The duration of impacts would be long-term, extending beyond the life of the mine. The likelihood of impacts is high.

The following sections evaluate project impacts on access to subsistence resource harvest areas for the six communities located closest to the project components, as project facilities and activities may restrict access in areas of overlapping subsistence use by these communities. It is based on reported and historical use of these areas as described by SRB&A (2011b), Fall et al. (2006), and Krieg et al. (2009) and presented in Section 3.9, Subsistence. For most of the communities, the contemporary use areas mirror the traditional use of the lands used to harvest subsistence resources, while in some communities the movement of animals (e.g., the Mulchatna caribou herd) to different areas has changed patterns of use and hunters have focused attention on different areas or resources. The figures in Section 3.9, Subsistence, show the multi-year subsistence use areas and the relative number of subsistence users for the six communities closest to the project components. It is possible that some downriver communities in the Kvichak and Nushagak River drainages may occasionally use the project area for subsistence activities, but their high frequency use areas are closer to the location of their communities (see Appendix K3.9).

The impacts to use areas and access to these areas from construction and operations of the natural gas pipeline would be the same as described for the transportation corridor.

The mine site would impact all six of the listed communities in similar ways. Construction, operations, and closure may affect access to subsistence hunting and fishing on these lands. Project-related activities, such as blasting and operation of heavy equipment and helicopters, would adversely restrict access. Lake community residents that may have otherwise traveled through the mine site area to reach subsistence resources further north and west would have to take alternative routes and potentially travel farther distances to avoid the mine site and infrastructure. However, the mine site is not shown as a high frequency overlapping use area for any of the six communities.

Impacts to accessing the mine site for subsistence use and harvest would be most concentrated near the mine site area and would diminish with distance. The effects would be localized in geographic extent; there is availability of alternate areas in traditional subsistence areas for activities. Impacts of the mine site and associated uses would be intermittent to prolonged. The duration of impacts would extend beyond the life of the project, with diminishing intensity as the site is reclaimed during closure. The likelihood of impacts would be high.

Iliamna

Construction and operations of the mine access roads (including a bridge over the Newhalen River) and the north ferry terminal under Alternative 1 would likely disrupt access to a portion of

the overall harvest areas near Upper and Lower Talarik creeks, which are medium- to high-use areas for Iliamna subsistence users, particularly for moose and other land mammals. While there are other areas shown as medium to high uses areas for moose and other land mammals, hunters who traditionally use the Upper and Lower Talarik creeks areas would be affected. The south ferry terminal, Kokhanok east ferry terminal variant, and south mine access road would be located in lower overlapping use areas that Iliamna residents' access for resources.

Under the summer-only ferry variant the volume of haul trucks on the access roads would double in the summer, which could result in a greater impact in terms of access to resources in the use areas near the ferry terminals and access roads. Summer ferry traffic would also double, increasing from one daily round-trip to two; however, that impact would be low intensity, as boat traffic by subsistence users would only be minimally affected by the increase.

Until Iliamna Lake is connected to Cook Inlet through the transportation corridor at the southern ferry terminal, the Williamsport-Pile Bay Road may be used to transport supplies to Iliamna Lake during construction (PLP 2018-RFI 037). If this route were to be used, the volume of traffic on Williamsport-Pile Bay Road would increase during construction, which could affect access to resources, though this would be in an area accessed by a low to moderate number of subsistence users.

Newhalen

Construction and operations of the mine access roads (including a bridge over the Newhalen River) and the north ferry terminal under Alternative 1 and the variants may disrupt access to a portion of the overall harvest areas near Upper and Lower Talarik creeks, which are medium- to high-use areas for Newhalen subsistence users. Impacts to access would be similar to those described above for Iliamna. The south ferry terminal and south mine access road and variants are located in an area with lower overlapping uses that Newhalen residents access for resources. Under the summer-only ferry variant, the volume of haul trucks on the access roads would increase, which could result in a greater impact in terms of access to resources in the use areas near the ferry terminals and access roads. Ferry traffic would also double, increasing from one daily round-trip to two; however, that impact would be low intensity, as boat traffic would only minimally be affected by the increase.

If the Williamsport-Pile Bay Road is used during construction, the volume of traffic on this route would increase, which could affect access to resources though this would be in an area accessed by a low number subsistence users.

Pedro Bay

Construction and operations of the mine access roads and ferry terminals under Alternative 1 and the variants may displace access to a small portion of the overall harvest areas near the Upper and Lower Talarik creeks, which show low overlapping uses for Pedro Bay harvesters.

If the Williamsport-Pile Bay Road is used during construction, the volume of traffic on this route would increase, which could affect access to resources; this would be in an area accessed by a moderate to high number of residents.

Nondalton

Construction and operations of the mine access roads (including a bridge over the Newhalen River) and ferry terminals under Alternative 1 and variants may impact access to the use areas near the Upper and Lower Talarik creeks, which are used by a low to moderate number of

Nondalton subsistence users. Impacts on access in this area would be similar to those described for Iliamna.

Igiugig

Construction and operations of the mine access roads and the north ferry terminal under Alternative 1 may disrupt access to a small portion of the overall harvest areas near Upper and Lower Talarik creeks, although they are low-use areas for Igiugig subsistence users. The south ferry terminal, south mine access road, and Kokhanok east ferry variant would be located in areas that a low to moderate number of Igiugig residents report as accessing for resources.

The ferry traffic would be noticeable to those using Iliamna Lake to access areas at the north east end of the lake, in the Sid Larson Bay and areas around the community of Kokhanok. These areas are all used by a low number of subsistence users in Iguigig. The impact would be of higher magnitude in the winter, when the ice-breaking ferry would be operating. However, there would be safe access on the eastern side of Kokhanok to access Sid Larson Bay without crossing the path of the ferry under the Kokhanok east ferry terminal variant.

Kokhanok

Construction and operations of the mine access roads, ferry terminals, and the east Kokhanok ferry terminal may impact Kokhanok residents' access to portions of the high overlapping harvest use areas in the immediate area surrounding the community, and the Gibraltar Lake and River areas. Portions of lower overlapping use areas near the Upper and Lower Talarik creeks where large land mammals are hunted would also be affected. Under the summer-only ferry variant, the volume of haul trucks on the southern access road would double in the summer, which could result in a greater impact in terms of access to resources in the use areas near the ferry and south access road. Summer ferry traffic would also double, increasing from one daily round-trip to two; however, that impact would be low intensity, as subsistence user boat traffic would only minimally be affected by the increase.

During the winter when the ferry would be breaking ice, ferry traffic would be noticeable to those using Iliamna Lake to access areas at the north east end of the lake, in the Sid Larson Bay and areas around the community of Kokhanok. Traditional access routes used by some Kokhanok residents would be affected, but there would be safe access on the eastern side of Kokhanok to access Sid Larson Bay without crossing the path of the ferry under the Kokhanok east ferry terminal variant.

Construction and operations of the Amakdedori port under Alternative Action 1 would affect access for residents of Kokhanok to low overlapping use areas for taking of marine invertebrates and seals in Kamishak Bay. Construction of the Amakdedori Port under Alternative 1 is not expected to impact access to resources for communities other than Kokhanok because resident of other communities do not harvest resources in that area.

4.9.2.3 Changes in Competition for Resources

The project would result in employment opportunities for non-local workers during construction and operations; however, such opportunities are unlikely to increase competition for subsistence resources from sport hunting and fishing in areas where project employees are working or housed. Employees would be prohibited from hunting, fishing, and gathering while onsite to minimize competition to local subsistence resources. Non-local mine site employees would be transported to and from the mine site by aircraft, so that non-local employees could continue to live outside the region and commute to project work sites. Similarly, access to and use of project roads and other facilities for non-resident sport hunting would be prohibited. Non-local workers

would not likely contribute to an increase in recreational use, although some may occasionally stay in the area when off duty or visit for recreational trips to nearby destinations.

There is potential for a small population increase in communities closest to the mine site (see Section 4.3, Needs and Welfare of the People—Socioeconomics), which could increase resource competition among local residents. It is possible that visibility of the area for mine workers would encourage more recreational and sport hunting; however, such activities would require travel back to the region by non-local workers and be subject to the management of the ADF&G. The largest impacts could occur in Iliamna, which may see a small increase in population related to businesses developed to support the project.

After closure, the potential for non-local project employees to increase competition for subsistence resources would decrease.

4.9.2.4 Changes in Sociocultural Dimensions of Subsistence

Project construction and operations would result in both beneficial and adverse effects on sociocultural dimensions of subsistence. Subsistence activities are both cash dependent and highly cash-efficient. Cash income is required to pay for equipment, supplies, and operating costs, but modest cash investments result in large subsistence harvests and well-being. Increased incomes from project employment for local employees would likely be partially or largely invested in subsistence activities, increasing the efficiency and reliability of subsistence equipment and providing financial resources for a greater level of subsistence activities. Project activities would increase employment opportunities for residents of the project area, particularly for those living in communities surrounding Iliamna Lake. The number of local people who would be hired during the construction phase is not known, but PLP intends to prioritize opportunities for residents of the project area or those with close ties to the area (PLP 2018-RFI 027). During the operations phase, an estimated 50 employees would come from communities connected to project sites by road and an additional 200 employees would come from surrounding communities (out of 850 total employees during operations) (PLP 2018-RFI 027).

The effect of income on subsistence success (i.e., subsistence production) is evident among households with unique demographic structures. In many communities, 30 percent of households produce 70 percent of the subsistence harvest. These “super households” are distinguished because they include multiple working-age males, tend to have high incomes, and often are involved in commercial fishing. These three factors support high-producing households to be able to combine subsistence activities with paid employment and to arrange considerable labor in flexible ways that maximize harvests of subsistence foods, which are then shared with other households in the community and region. In contrast, the low-producing households usually have lower incomes, and are led by a single female or non-Native head of household, are single-person households, or households composed of elders (Wolfe et al. 2010).

At the same time, subsistence activities are labor intensive and require large investments of time and effort in hunting, fishing, and processing subsistence foods. Many subsistence resources are available only at certain times of the year. To the extent that project related employment reduces the time available for these employees to participate in subsistence activities and to pass on skills and knowledge to the next generation, their harvest effectiveness may decline. Proposed shift-work schedules, with two weeks at the project site and two weeks off in the community would likely reduce, but not eliminate, the conflict between project employment and subsistence activities.

Increased employment of adults and changes in work schedules would impact the nature of time spent training young people to subsistence hunt and fish. This change would impact the

amount and quality of traditional knowledge passed on to younger generations and could potentially result in an adverse effect to communities. Households and communities would have to adjust to new roles of subsistence labor, changes in sharing networks, and possible changes in harvest levels. Rotational work schedules could affect levels of subsistence in different ways, since some families could adapt positively and some would find this an adverse effect. Legal hunting seasons are short, and if work schedules conflicted with seasons, then the effect on subsistence harvests could be greater. A main hunter's absence from the community at important times of the season or year could have a greater impact. However, the effects could be reduced, but not eliminated, with planned periods of leave options that allow for continuation of traditional subsistence practices and schedules during subsistence harvest periods.

Out-migration of mine project employees from local communities has been identified as an adverse sociocultural effect on subsistence. At the Red Dog Mine, nearly 50 percent of the workforce from local communities eventually migrated to lower cost, higher amenity communities like Anchorage and Wasilla, because the mine operator provided no-cost transportation to the mine site for workers' shifts (Tetra Tech 2009). To the extent that high-harvesting households relocated away from the community, the reduction in subsistence foods available in the community would be disproportionately larger. While a large in-migration of population is not anticipated, Alternative 1 may lead to changing population patterns in the region (see Section 4.3, Needs and Welfare of the People). The population in some potentially affected communities has been declining due to out-migration. The project could reduce or eliminate the decline because of the increase in employment opportunities and indirect effects improving education and infrastructure. Therefore, the impacts on population and effects to sociocultural changes of subsistence are difficult to anticipate.

Comment [A29]: It is unclear how mine development improves education and infrastructure.

Local residents participate in subsistence activities to a high degree. The level of participation may be affected by changes in resource abundance and quality, season and bag limits, changes in physical access, changes in cultural perceptions of resources (e.g., fish and animals are seen as tainted/contaminated, or water as polluted), the physical presence of project facilities in an area that was previously undeveloped and comfort level pursuing subsistence activities in their vicinity, and the times and funds available for subsistence activities. Changes in harvest participation are a leading indicator of cultural changes; continued participation is important to the transfer of knowledge and skills across generations, to the formation of social relationships within and between communities, and to cultural continuity. To the Yup'ik and Dena'ina cultures in the project area, salmon provide a large proportion of their nutritional food resources and represent an essential part of the language, spirituality, and social relations. In particular, subsistence and customary practices are the foundation of culture, maintain the connection of people to their land and environment, and support healthy diet and nutrition (Boraas and Knott 2013).

To the extent that project activities would have adverse impacts on resource abundance, availability, quality, and access, corresponding adverse sociocultural impacts on affected communities would occur, related to community health/well-being and cultural identity. Under routine operating conditions, the communities affected would likely be limited to those closest to the project's infrastructure and transportation activities: Nondalton, Iliamna, Newhalen, Pedro Bay, Igiugig, and Kokhanok. However, there could still be perceived concerns regarding potential contamination and the safety of subsistence resources in communities downriver from the project area.

Comment [A30]: Please see NPS comments on subsistence resources in the Fish Resources chapter.

Comment [A31]: Upriver as well. Contamination of migratory and anadromous resources would make the extension into upriver areas

At closure, both time commitments for and cash income from project employment would cease. Households would have to adjust to reduced cash income to support the maintenance and operating costs of a subsistence lifestyle. Workers who moved out of local communities may

choose not to return. The indirect effects of mine employment and income on subsistence practices would cease.

4.9.3 Action Alternative 2—North Road and Ferry

Impacts from the changes in the sociocultural dimension of subsistence would be the same as Alternative 1 for all project components. Impacts from the changes in resource availability, access to subsistence resources, and competition for resources would be the same as Alternative 1 at the mine site. Along the transportation corridor and natural gas pipeline, impacts would be similar to Alternative 1, except for differences described below.

Changes in resource availability along the transportation corridor and the natural gas pipeline for Alternative 2 would be similar to Alternative 1, but would affect a different area for the access road, ferry, pipeline and port, and therefore affect communities to a different degree. Individual mortality and behavior disturbance to and displacement of subsistence resources would occur at approximately the same levels as described under Alternative 1. The primary difference is that there are fewer communities using the area in between Pile Bay and Williamsport for subsistence, and so the magnitude and geographic extent of the impact would be less than Alternative 1. Based on the frequency of areas of overlapping subsistence users, Nondalton, Newhalen, and Pedro Bay use the North Road alignment to the Eagle Bay ferry terminal to a lesser degree, and Iliamna has a higher frequency use. Pedro Bay has high frequency overlapping use of the area of the Pile Bay terminal and portions of access road from Pile Bay to Williamsport. All six project area communities use the eastern end of Iliamna Lake for seal hunting to some degree.

Along the ferry route there would be a higher magnitude impact to resource availability for seals, than Alternative 1 because the ferry would pass through more seal hunting areas under Alternative 2. There would be less impact to seal hunting under the summer-only ferry operations as they do not tend to congregate in this area of the lake in the summer months and the preferred time for hunting seals is in the winter (see Section 4.23, Wildlife Values).

Under Alternative 2, there would be an overland pipeline ROW from Pile Bay to the mine site. This could introduce some competition to subsistence users from recreational sport hunting and fishing, although because of the relatively low recreational use of the area, the magnitude would be expected to be small.

4.9.3.1 Changes in Access to Resources

Iliamna

The mine access road from Eagle Bay would be located in medium- to high-use areas accessed by residents of Iliamna and would be likely to impact access. There are overlapping use areas near the Newhalen River and further inland, and near the site of the ferry terminal at Eagle Bay. The ferry under Action Alternative 2 would traverse the eastern portions of Iliamna Lake that are accessed by residents with low to medium overlapping uses. The ice-breaking ferry would disrupt access to these areas, and similar to Alternative 1 safe winter travel routes would need to be developed with arrangements between PLP and affected communities. With the summer-only ferry variant, there would be little disruption to access in the winter on Iliamna Lake or the mine access roads, but the summer access to resources would have a higher level of disruption from an additional daily ferry trip and a doubling of truck traffic on the mine access roads.

The addition of a pipeline ROW would potentially create an overland route that could be used by Iliamna residents to access additional subsistence resources.

Diamond Point port construction and operations under Alternative 2 could affect Iliamna residents' access to harvests locations in Cook Inlet. However, these areas are reported as low-use areas for harvested resources near Iliamna Bay and north of Augustine Island.

Newhalen

The mine access roads of Alternative 2 would be located in the vicinity of a medium to high overlapping use area near the Newhalen River and would be likely to impact access to resources in the areas inland north of the community. The ferry route would be south of the islands in Iliamna Lake that are accessed by residents, but would not pass close to the islands and would not likely disrupt access in the summer. In the winter, the ice-breaking ferry could disrupt access to all resource use areas on the northeast end of the lake. With the summer-only ferry variant, there would be little disruption to access in the winter on Iliamna Lake or the mine access roads, but summer access to resources would have a higher level of disruption from an additional daily ferry trip and a doubling of truck traffic on the mine access roads.

The addition of a pipeline ROW would potentially create an overland route that could be used by Newhalen residents to access additional subsistence resources.

Diamond Point port construction and operations under Alternative 2 would not be expected to affect Newhalen access to harvests locations, as they do not access resources in that location.

Pedro Bay

The mine access roads and use of the Williamsport-Pile Bay Road under Alternative 2 would likely impact access to resource harvest areas for Pedro Bay residents in high overlapping use areas near the community and inland from Iliamna Lake and in Pile Bay, and have similar impacts to access as described in Alternative 1. However, there is the existing Williamsport-Pile Bay road, and Pedro Bay has experience with the adverse and beneficial effects of a road on subsistence access. The ferry route would be south of the islands in Iliamna Lake that are used by residents of Pedro Bay, and so access to those islands and their resources would not be likely to be affected. As described for Iliamna, winter ferry operations would impact traditional access and create travel safety concerns that would need to be mitigated in consultation with PLP.

The addition of a pipeline ROW would potentially create an overland route that could be used by Pedro Bay residents to access additional subsistence resources.

Diamond Point port construction and operations under Alternative 2 could impede access to subsistence activities and fishing and marine invertebrate harvesting for Pedro Bay residents in Iliamna Bay and near Augustine Island as the port would be located in the vicinity of these use areas. However, there is existing vessel traffic to Williamsport during the summer months, and some vessel traffic associated with the quarry at Diamond Point.

This community is smaller than the other lake communities and does not go as far to harvest subsistence resources. Therefore, small amounts of disruption would have a greater intensity of impact to this community.

Nondalton

The mine access roads of Alternative 2 are likely to impact access to resource harvest areas for Nondalton residents as they would be located in the vicinity of medium overlapping use areas. Impacts would be similar to those described for Iliamna. The ferry route would be south of the islands in Iliamna Lake that are used by residents of Nondalton; therefore, access to those

islands and their resources would not likely be affected. However, winter subsistence harvest of seals would be affected by ferry operations, similar to impacts discussed for Iliamna.

The addition of a pipeline ROW would potentially create an overland route that could be used by Nondalton residents to access additional subsistence resources.

Diamond Point port construction and operations under Alternative 2 would not be expected to affect Nondalton access to harvests locations as they do not access resources in that location.

Iguigig

Neither the transportation corridor, ferry, nor Diamond Point port of Alternative 2 are anticipated to impact the access to resource harvest areas for Igiugig residents as fewer subsistence users search for and harvest resources in these areas.

Kokhanok

The mine access roads of Alternative 2 are less likely to impact access to resource harvest areas for Kokhanok residents as fewer subsistence users search and harvest in areas inland from the north side of Iliamna Lake and closer to the mine site.

The ferry route would be south of islands in Iliamna Lake that are accessed by residents for seal hunting, but would not pass close to the islands and would not likely disrupt access in the summer. In the winter, the ice-breaking ferry could disrupt access to seal hunting in winter which is the preferred time of year when this activity occurs. With the summer-only ferry variant, there would be no disruption to access in the winter on Iliamna Lake, but summer access to resources would be more noticeable from an additional daily ferry trip. This area sees a low level of use by Kokhanok residents and the magnitude of disruption from the ferry would be small.

Diamond Point port construction and operations under Alternative 2 would not be expected to affect Kokhanok residents' access to harvest locations, as they do not typically access resources in that location.

4.9.4 Action Alternative 3—North Road Only

Impacts from the changes in the sociocultural dimension of subsistence would be the same as Alternative 1 for all project components. Impacts from the changes in resource availability, access to subsistence resources, and competition for resources would be the same as Alternative 1 at the mine site. Along the transportation corridor and natural gas pipeline, impacts would be the same as Alternative 1, except that there would be no ferry operations and access would be provided entirely by road.

Changes in resource availability along the transportation corridor and the natural gas pipeline for Alternative 3 would be similar to Alternative 1, but occurs over a different geographic area. Individual mortality and behavioral disturbance to, and displacement of, subsistence resources would occur at approximately the same levels. The primary difference is that there are slightly fewer communities using the area between Pile Bay and Williamsport for subsistence (Iliamna, Newhalen, Nondalton, and Pedro Bay). However, there are a high number of overlapping use areas along the road corridor of Alternative 3 from Pedro Bay to the mine site for Iliamna and Pedro Bay, and so the magnitude of the impact to those communities would be a little higher than Alternative 1.

Under Alternative 3, there would be a road from Pile Bay to the mine site, it would be under controlled access, limiting potential competition to subsistence uses of resources from non-local

recreational sport hunting and fishing. The magnitude of potential would be expected to be small.

Access to subsistence resource use areas would be the similar to Alternative 2 for residents of Iliamna, Newhalen, Pedro Bay, Nondalton, Iguigig, and Kokhanok. The primary difference is the road from Pile Bay to the mine site, which would affect access in ways similar to the discussion for Alternative 1. There would be no ferry operations, and therefore no impacts to winter seal hunting access on Iliamna Lake.

4.9.5 Summary of Key Issues

See Table 4.9-1 for a summary of key issues.

Table 4.9-1: Summary of Key Issues for Subsistence

Impact	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variants
Impacts to availability of subsistence resources	Reduced availability of subsistence resources through habitat loss, disturbance and displacement of resources, fugitive dust deposits on resources, and increased costs and time for traveling to harvest areas.	Similar impacts to Alternative 1 would affect subsistence resources in the Alternative 2 project area.	Similar impacts to Alternative 1 would affect subsistence resources in the Alternative 3 project area.
Impacts in competition for resources	There would be some availability to access other areas for harvest of resources, which could increase competition in some areas by providing additional access for local residents.	The addition of the pipeline ROW may increase competition for resources in that area by providing additional access for local residents.	Similar to Alternative 1
Impacts to sociocultural dimensions of subsistence	Beneficial effects from new income to invest in subsistence activities. Challenges in balancing time required for employment and time for subsistence activities. Adverse effects from out-migration, particularly if high-harvesting households leave.	Same as Alternative 1	Same as Alternative 1

Table 4.9-1: Summary of Key Issues for Subsistence

Impact	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variants
Impacts to access to subsistence resources	Snowmachine access could be disrupted in the winter by the ice-breaking ferry, and could also create a safety hazard. PLP would put measures in place to minimize impacts, such trail marking and crossings. The east Kokhanok ferry terminal variant would allow for access to Sid Larson Bay without crossing the ferry route. There would be no impact from ferry traffic during the winter under the summer-only ferry variant.	Impacts would be the same as for Alternative 1, except that the routes affected would be trails from Pedro Bay and the north end of the lake instead of the mid-lake region. There would be no impact during the winter under the summer-only ferry variant.	Impacts would be similar to Alternative 2, except the impacts from the road from Pile Bay to the mine site would be more similar to the road under Alternative 1.

4.9.6 Cumulative Effects

Past, present, and reasonably foreseeable future actions (RFFAs) as described in Section 4.1, Introduction to Environmental Consequences, have the potential to contribute cumulatively to effects on subsistence resources and uses. These RFFAs may result in direct and indirect effects on subsistence resources and uses. The following RFFAs apply to the consideration of cumulative effects on subsistence resources and uses.

- Pebble Project build-out—develop 55 percent of delineated resources over a 78 year period
- Pebble South/PEB
- Big Chunk South*
- Big Chunk North*
- Fog Lake*
- Groundhog*
- Shotgun
- Johnson Tract*
- Copper Joe*
- Donlin Gold
- Diamond Point Rock Quarry
- ASAP
- Alaska LNG
- Drift River Oil Pipeline
- Cook Inlet Lease Sales
- Hydrocarbon Exploration*
- LPB Transportation Projects
- LPD Capital Improvement Projects
- USDA Rural Development Projects
- LBP Renewable Energy Projects
- Nushagak Intertie Project
- Subsistence Activity
- Tourism, Recreation, Hunting, Fishing
- Scientific Surveys and Research

**Indicates exploration activities only.*

Each of these RFFAs contribute to the increased potential for impacts on subsistence resources, as each involves some aspect of ground-disturbing activity that can lead to the disturbance and displacement of subsistence resources at those locations.

Actions that expand mineral development near the Pebble deposit and around Iliamna Lake contribute to landscape-level effects, where there is continuous introduction of additional impediments to the movement of people and animals; increased noise, vibration, and atmospheric pollution; and increased numbers of people to the area. Expansion would increase the geographic area affected by the project by combining project elements of Alternative 1 and 3, with potential combined impacts to resource availability, access to resources, competition, and sociocultural dimensions of subsistence. Expansion of the mine site would affect more fish habitat in the upper reached of the North and South Forks of the Koktuli Rivers, and Upper Talarik Creek. The Pebble Project build-out RFFA would contribute to the cumulative effects with additional infrastructure, habitat loss, and disturbance over a long period of time, up to an additional 98 years depending on the period of post-mining milling and closure activities.

These effects can affect the quality and cultural experience of subsistence activities, leading to adverse impacts on subsistence resources that are central to cultural belief systems and the way of life of local people. Effects such as habitat fragmentation, noise, and potential for increased access for recreational hunting and fishing disrupt subsistence cycles, which may result in direct impacts on resource gathering areas and harvest quantities. Local residents have observed that there has already been a loss to subsistence opportunities and the way of life due to planning and exploration activities that are associated with the Pebble Project from helicopter traffic and that there have been disruptions to local wildlife. Subsistence users in Nondalton noted that their community uses traditional trapping and hunting areas near Groundhog Mountain (Fall et al. 2006). Impacts to Nondalton from the Groundhog project (listed above) would be additive to impacts from the proposed Pebble Project and the Pebble expansion RFFA, likely causing them to travel further and expend more time to trap and hunt.

These types of effects are also applicable to an increase in resource development actions along the coast of Cook Inlet, which may impact those communities that use Amakdedori and Iniskin Bay areas for subsistence resources and access to sites that are important for harvest and cultural practices central to the healthy relationship of people to the land they inhabit. The cumulative impacts would be long-term to permanent, and geographically broad in scope (i.e., regional level).

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