US Army Corps of Engineers
Alaska District

Environmental Assessment and Finding of No Significant Impact

Section 117 Expedited Erosion Control Project Kivalina, Alaska

Photo by Jim Kulas
NANA Corp. 2006

September 2007

Finding of No Significant Impact

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (Corps), has assessed the environmental effects of the following action:

Section 117 Expedited Erosion Control Project
Kivalina, Alaska

The Corps has been authorized to execute this Expedited Erosion Control Project in accordance with Fiscal Year 2005 Consolidated Appropriations, Section 117 (PL 108-447) that authorizes structural and non-structural projects for coastal erosion of affected Alaska communities. This is an expedited, emergency action.

An environmental assessment titled Section 117 Expedited Erosion Control Project, Kivalina, Alaska has been written for this action. The action entails constructing a 3,100 foot-long rock revetment around the south end of Kivalina to protect the city from coastal erosion. The revetment will be constructed in phases to control erosion as needed. The first phase will construct up to 900 feet of revetment starting in 2008. The entire project may take up to 10 years to complete. The total project footprint will be about 5.7 acres.

This project has been evaluated for its effects on several significant resources, including fish and wildlife, threatened or endangered species, marine resources, and cultural resources. No significant short or long term adverse effects to wildlife were identified. Minor, but long-term inconvenience for use of the waterfront and beach by the residents of Kivalina will result from this project. Disruption of longshore drift of beach sediments could result in eventual changes in the Singuak entrance channel morphology. This project has a 15-year project life. The long-term effects of a disruption of longshore drift in this situation are poorly understood and it is anticipated that the community will be relocated to a more stable site by the time potential adverse effects caused by a disruption of longshore drift are manifested.

This Corps action complies with the National Historic Preservation Act, the Endangered Species Act, the Clean Water Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the National Environmental Policy Act. The completed environmental assessment supports the conclusion that the site investigation does not constitute a major Federal action significantly affecting the quality of the human and natural environment. An environmental impact statement is therefore not necessary for the proposed action.

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Kevin J. Wilson
Colonel, Corps of Engineers
District Commander

Date

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1.0 Community Profile

Kivalina, Alaska is a community of about 400 persons living on an 8-mile-long barrier island that separates a 16-mile-long lagoon (Kivalina Lagoon) from the Chukchi Sea (figure 1). The community of Kivalina was founded at its current location in 1905 when a school was built on an island near the mouth of the Wulik River, and a settlement grew around the school. A post office was established in 1940 and an airstrip was added in 1960. The community was incorporated as a 2nd-class city in 1969 and electrified in the 1970's.

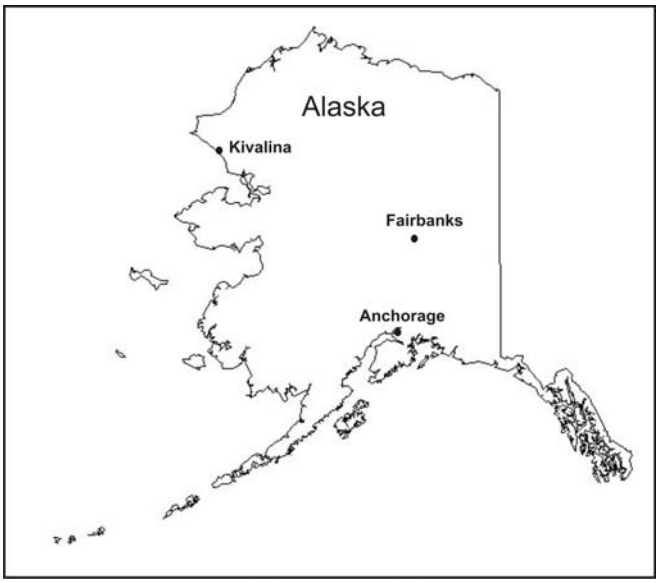

Figure 1. The location of Kivalina in Alaska compared with Anchorage and Fairbanks.

Kivalina is a traditional Inupiat Eskimo community where Alaska Natives comprise 97 percent of the population. Governmental entities include the City of Kivalina, Northwest Arctic Borough, and the Native Community of Kivalina (IRA). Assisting organizations include the Regional Health Corporation (Maniilaq Association), NANA Regional Corporation, Northwest Arctic Schools, Northwest Arctic Economic Development Commission, and the Northwest Inupiat Housing Authority. The parenthetical (IRA) means the community of Kivalina has organized itself under the 1934 Indian Reorganization Act, with a constitution, elections and so on as prescribed there.

Kivalina experienced explosive growth between 1966 and 1982 (Burch 1985). The population increased by 58 percent, occupied houses increased by 88 percent, and living space increased by 364 percent during this period of growth. Other changes include new churches, a new school, and a water tank. Other changes such as the switch from dog teams to mechanized transportation, kerosene lamps to electric lights, and heating with driftwood and seal oil to heating with stove oil and propane, were

prominent. Growth continued with the construction of new houses over the past several years.

Currently, public facilities in Kivalina include the McQueen School, two churches, recreation center, post office, community hall, National Guard Armory, and a Maniilaq operated health clinic (ADCA 2006). Local government is of mayor/council form. A volunteer fire department is established. There is currently no Village Public Safety Officer assigned to the community, and law enforcement is through the Alaska State Trooper post in Kotzebue.

Potable water is transported from the Wulik River through a surface line during summer, and treated and stored in community tanks. Water is hauled from the treated-water tank to the community laundry and homes. About 1/3 of the community homes have storage tanks that provide running water. In the remainder of homes, water is dipped from 30-gallon plastic garbage cans typically kept in the living room or arctic entry of the home. Only the school, teachers housing, and the clinic have individual water systems.

There is no water-flushed sewage system in Kivalina other than at the school, teachers' housing, and the clinic. Homes and facilities typically use 5-gallon waste pails known as "Honey Buckets." The community has four waste-bucket collection points for human waste.

The Alaska Community Electric Cooperative (AVEC) provides electricity with diesel-powered generators.

The economy of Kivalina is a mixture of cash and subsistence economies (ADCA 2006). The local subsistence economy depends largely on subsistence practices such as harvesting marine mammals, fish, waterfowl, caribou, and other wildlife in addition to local vegetation for food. Some cash economy employment is available in Kivalina. The school district, Maniilaq Association, community council, local stores, and local air carrier businesses provide permanent and part-time employment. Some residents also work at the nearby Red Dog Mine or port and in Kotzebue, Fairbanks and Anchorage. The Native craft industry is expanding and adding to the economy of the community.

2.0 Purpose and Need

The barrier island on which Kivalina is located has long been subject to the coastal and riverine processes of accretion and erosion. Storm events in 2004 and 2005 eroded the Chukchi Sea shoreline in the vicinity of the AVEC fuel tank farm, the McQueen School, and along the airstrip. Kivalina lost 25 to 30 feet of beach erosion along their shoreline and 20 feet of beach erosion towards the airstrip (U.S. Senate Commerce Subcommittee 2006). Storms in September and October 2006 resulted in erosion up to 50 feet inland and exposed the permafrost in some areas (Golder Associates 2007). If expedited action is not taken to control erosion of the beaches at Kivalina, the school, teachers housing, tank farm, and other vital infrastructure could be lost to the Chukchi Sea during future storm events. The State of Alaska and the Federal government

implemented emergency actions to prevent further erosion which could lead to loss of community power and/or the school.

In 2006 the NWAB constructed approximately 1,500 feet of sand-filled gabion type shore protection using a proprietary gabion basket design. This effort failed and even caused an accelerated rate of erosion in the area of shoreline associated with the failed effort (USACE 2007). The Northwest Arctic Borough (NWAB) is also currently seeking $30 million to construct an emergency escape road to allow the residents of Kivalina to evacuate in the event of a major storm surge and flood event.

The community has recognized the need to relocate from the present location and has been pursuing this action for over 25 years. It is expected that the relocation of the community could take up to 15 years (USACE 2006). This bank stabilization project is needed to provide 15 years of interim erosion protection during which planning and relocation of the community can proceed.

3.0 Project Description

The project consists of a 3,100-foot-long erosion control structure around the south end of the island barrier (figure 2). The structure would be constructed in phases with construction of up to 900 feet of revetment in the initial phase starting in 2008 (figure 3). The first phase would protect vulnerable infrastructure including the school, teachers housing, and tank farm from storm damage. The remaining 2,200 feet would be constructed in increments over the next 10 or more years as needed and funded. The exact length of the incremental phases in addition to the initial 900-foot increment would be determined as needed to control erosion and protect structures.

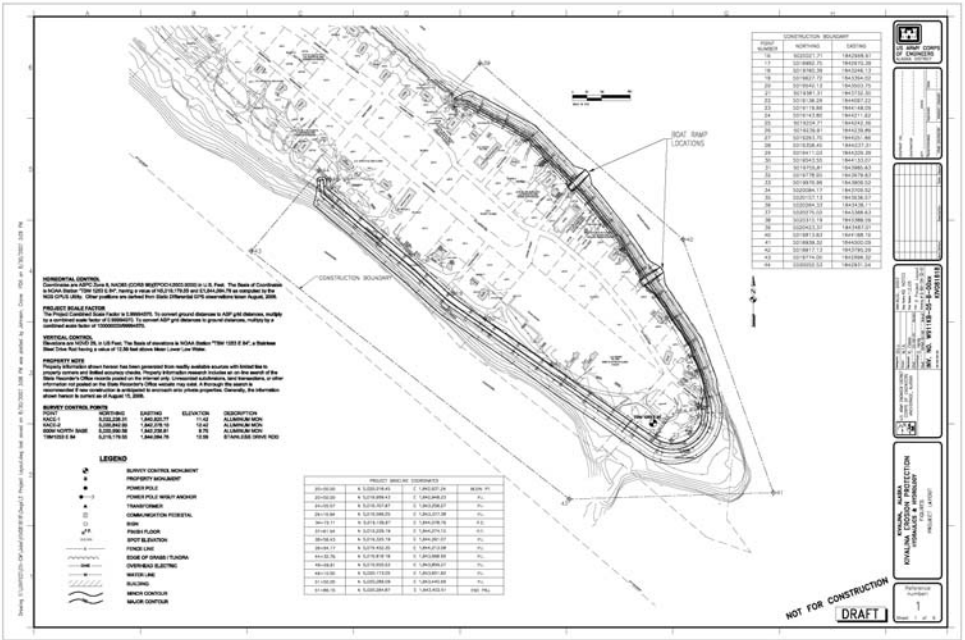

Figure 2. The conceptual length of an erosion control structure at Kivalina (Alternative 4 shown).

4.0 Alternatives

Alternatives initially considered for interim protection against riverine and coastal erosion at Kivalina included: (1) a no-action alternative (2) sheet-pile wall; (3) sandbag revetment (4) rock revetment; (5) gabion revetment; (6) offshore berm; (7) community relocation; and (8) articulated concrete mat. With exception of the no- action alternative, the alternatives considered in this EA include removal of the failed NWAB structure at Kivalina. Alternative plans 2, and 5, 6, 7 and 8 were screened and eliminated from further consideration. Alternatives1 and 4, no action and rock revetment were selected for further consideration. A brief description of the alternatives initially considered follows.

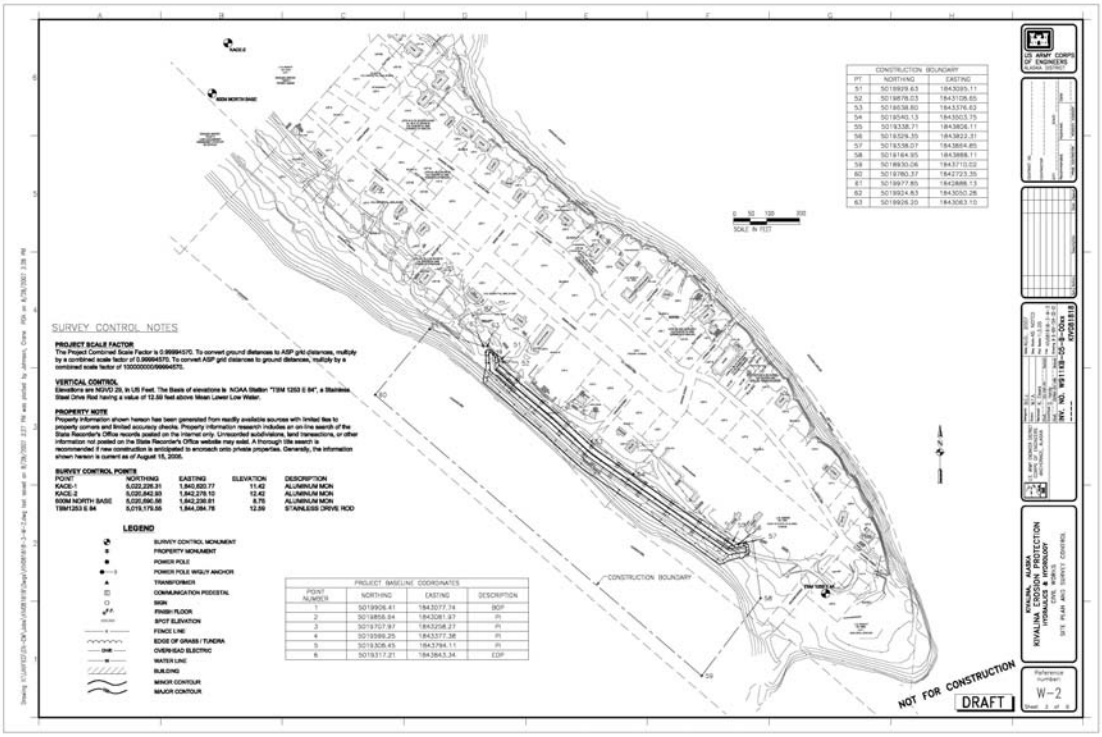

Figure 3. The conceptual length of the initial phase of an erosion control structure at Kivalina (Alternative 4 shown).

4.1. Alternatives Initially Considered

Alternative 1 - No Action Alternative. The no-action alternative would leave the beach at Kivalina without erosion protection. The beach would remain as it is and storm surges would continue to jeopardize existing infrastructure in the city.

Alternative 2 - Sheet-pile Wall. A sheet-pile wall was recently considered for a similar project with similar conditions at Unalakleet, Alaska, and design and cost criteria from the Unalakleet project was used for comparison. Sheet pile is a ridged structure which directs wave energy upward, requiring a relatively higher structure to prevent overtopping, and downward requiring extensive toe protection to prevent erosion. The Unalakleet sheet-pile wall design has a higher top elevation but shorter length than the wall requirements for Kivalina. Cost for the Unalakleet sheet-pile

alternative was $16.4 million. Adjusting for elevation and length, a sheet-pile wall alternative at Kivalina is estimated to be in excess of $31 million and was eliminated from further consideration as a result.

Alternative 3 - Sandbag Revetment. A revetment of large (2 cubic yard) poly-weave sandbags filled with local sand would be constructed by Alternative 3. A local borrow site would be selected so that it would not contribute to future erosion on either the Chukchi Sea or Kivalina Lagoon side of the barrier island.

Sandbag revetments have been used successfully on the Alaskan North Slope for temporary and semi-permanent protection of offshore oil exploration and production islands, but experience has shown that sand bag structures of this type typically require a yearly replacement of approximately 10-15 percent of the sand bags. This structure is anticipated to have a 5- to 7-year service life requiring two full replacements during the 15-year project life. This alternative was eliminated from further consideration because of associated replacement and maintenance costs.

Alternative 4 – Rock Revetment. Alternative 4 is a rock revetment along the same alignment as proposed for Alternative 3. The conceptual length of this alternative is shown in figure 2 and the initial phase of this alternative is shown in figure 3. The revetment would have a crest elevation of 14.0 feet MLLW on the Chukchi Sea side to protect the shoreline from wave run-up. The revetment crest on the lagoon side would be 11.0 feet MLLW. The toe of the revetment would vary from 0 to 2 feet MLLW. The base of the revetment would be about 80 feet wide. The total footprint of the project would be about 5.7 acres.

Rock to construct the revetment would likely be transported by barge from an established quarry, the closest of which is in Nome, Alaska.

Rock revetments have proven to be the most cost effective structures in similar situations and have performed well in the Alaska coastal environment. Rock revetment would have a design life well in excess of the 15-year service requirement and provide sufficient time for the community to relocate to a new town site. This alternative was selected for further consideration.

Alternative 5 – Gabion Revetment. Alternative 5 would construct a shore protection revetment similar to the failed structure installed by NWAB at Kivalina in 2006 (figure 4). This structure would tie into the existing structure and create a continuous revetment from the AVEC oil tanks to the project end on the lagoon shoreline. The Alaska

Figure 4. Kivalina showing the gabion structure installed by the NWAB in 2006. (photo: Jim Kulas, NANA Corp. 2006).

District does not believe that this type of structure is sufficiently durable to withstand storm and ice conditions at Kivalina. This alternative was eliminated from further consideration due to associated costs and the poor performance of the NWAB project.

Alternative 6 – Offshore Berm. Of-shore berms might be feasible to redirect and/or reduce the impact of waves and current action, but would have little effect on riverine induced erosion. This alternative was eliminated from further consideration due to projected cost and failure to provide complete protection.

Alternative 7 – Community Relocation. This alternative initially considered relocating structures that would be affected by erosion to other sites on the barrier island, but because there is limited land available on the island this idea was restructured to relocating the entire community. While not an interim solution, community relocation would resolve the erosion issue at Kivalina.

Preliminary costs developed as part of the master-plan for relocation of Kivalina anticipates the cost of relocation to be $176 million (USACE 2006). This is more expensive than any other alternative considered and is therefore eliminated from further consideration as an interim protection alternative, although relocation continues to be the permanent solution being pursued by the community.

Alternative 8 – Articulated Concrete Mat. Articulated concrete mats have a high run up potential, and to avoid overtopping by storm waves, they would require a structure that is taller than a rock revetment. The concrete mat structure would require a crest elevation of 15.8 feet MLLW on the Chukchi Sea side of the island and 11.0 feet MLLW on the lagoon side. The revetment would extend towards the water at a 3:1 slope until the toe was buried approximately 3 feet below the original grade. The toe elevation would vary from approximately 0 feet to -2 feet MLLW. The concrete mat would be underlain with a filter fabric.

This alternative has been investigated for other locations in Alaska and has not proven to be cost-effective and to perform satisfactorily when used in the harsh Alaskan coastal environment. One reason for the high cost of articulated concrete mat is the lack of a production facility in Alaska thereby requiring it be constructed outside of Alaska and transported to the project site. This alternative was dropped from further consideration due to cost and previous unsuccessful performance.

4.2 Selected Alternative

Alternative 4, rock revetment, was selected as the preferred alternative because of cost effectiveness, low maintenance, and proven performance under harsh Alaskan environmental conditions. A plan view of the entire project and initial project phase is shown in figures 2 and 3. A typical cross section of the selected alternative's rock revetment is shown in figure 5.

The rock revetment would require some sloping of existing banks (figure 5). This sloping might require an archeologist to be on site during the excavation. The rock

revetment would also require a sand/gravel base (figure 5). The entire project (figure 2) would take an estimated 7,500 yd^3 of sand and gravel fill and the initial project phase (figure 3) would take 3,900 yd^3 of the total fill

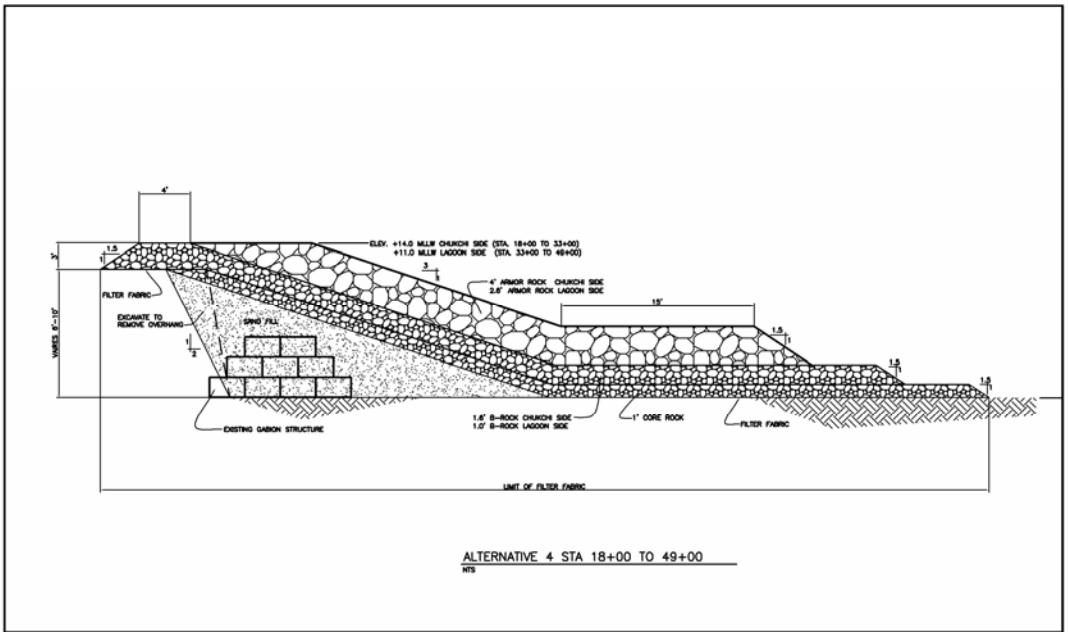

Figure 5. A typical cross section of the Alternative 4 rock revetment that was selected for phased construction at Kivalina, Alaska.

As mentioned above, rock for the revetment would be barged to Kivalina during the open water shipping season (July – September). The nearest quarry to Kivalina for armor stone is in Nome, Alaska, approximately 300 vessel miles south of Kivalina. It is likely that Nome would be the source of the core and armor stone in figure 5. Estimated quantities for the first phase and the total project are in the following table.

Table 1. Estimated project quantities.

Phase 1 (up to 900 feet length)

Material	**Estimated Quantity yd^3**
Sand	3,900
Core Rock	3,500
B-Rock	3,300
Armor Stone	6,100

Total Project (estimated 3,100 feet length)

Material	Estimated Quantity yd^3
Sand	7,500
Core Rock	7,900
B-Rock	8,100
Armor Stone	13,500
Excavation	13,000

The 13,000 yd^3 of excavated material in Table 1 would be incorporated back into the project at the toe of the revetment for beach nourishment.

This sand and gravel fill in figure 5 could be barged from Nome, or it could be excavated (mined) from one of two local sources (figure 6). Approximately 7,500 yd^3 of local material would be needed for the entire project. The first 900-foot increment would require about 3,900 yd^3. Mining this material from Kivalina Lagoon was considered, but bore samples from the lagoon show that the material may be too variable in composition for use on this project (Alaska District 2004).

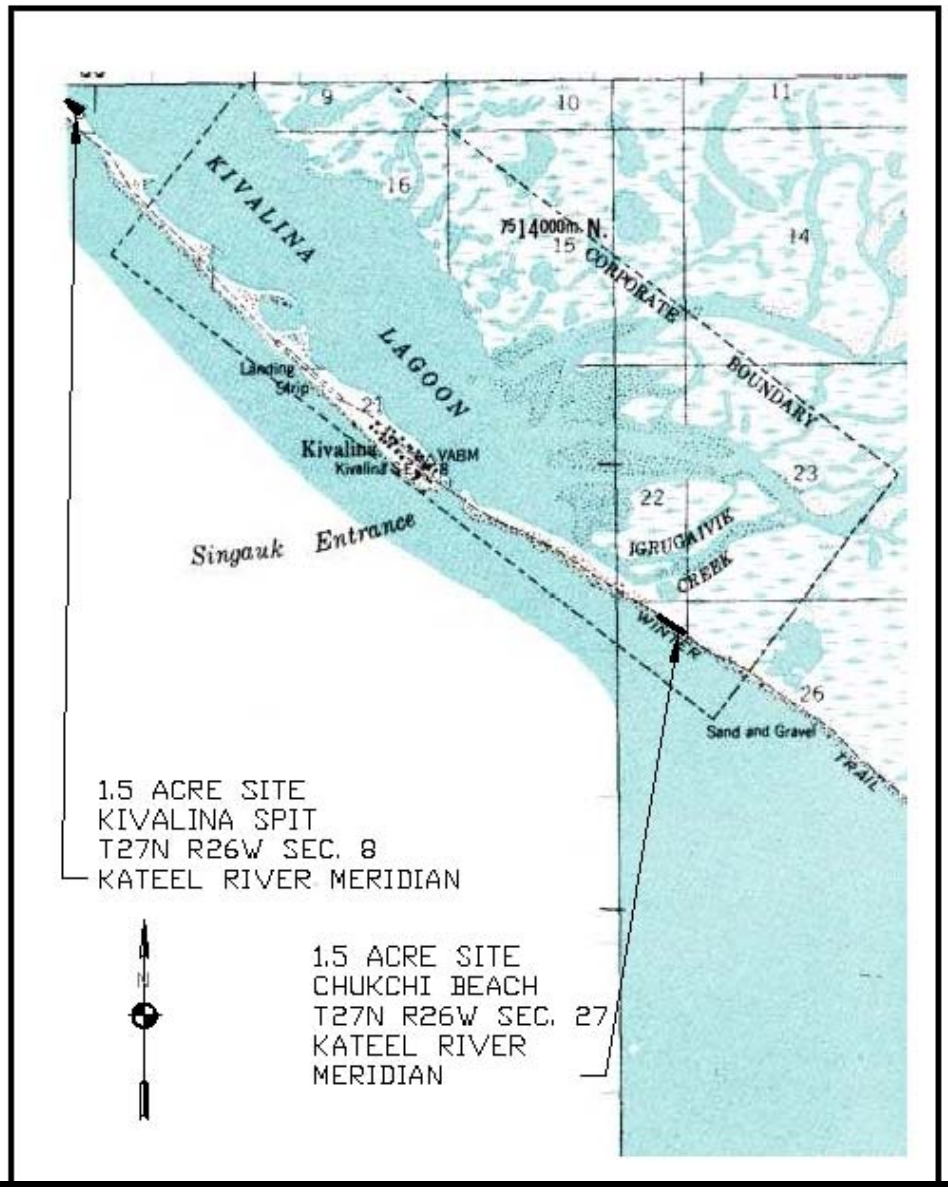

Figure 6. Proposed locations for procurement of sand and gravel from local sources.

One possibility of acquiring clean local material is by stripping the beach about 1 mile south of Kivalina (figure 6 Chukchi Beach Site). Material stripping would take place across a 100-foot wide by 700-foot-long area on the wetted face of the beach berm (figure 7). Stripping would be done incrementally with no more than 18 inches of material removed for any one project phase. Ideally, stripping would be done in the spring before the beach is smoothed by storm waves to take advantage of windrows of material pushed higher on the beach by the pushing action of shorefast ice.

Landing a barge one or more times on the beach would be required to load and transport the material to the project site. The material would be stripped from the beach with heavy equipment that might include graders or loaders.

Figure 7. Dimensions of the potential Chukchi Beach materials site.

A second option for local material would be to mine a borrow pit just north of the airport and adjacent to the Kivalina Lagoon on the lagoon side of the barrier island (figure 6 Kivalina Spit Site). This site would encompass 1.5 acres (figure 8) and be excavated in increments similar to the beach site, but barge landings at the site would not be necessary. Equipment to mine and transport the material likely would be offloaded on the Chukchi Sea side of the island and driven to the site. A major difference between the two sites is that the lagoon site would not heal itself with infusions of longshore drift between uses as the beach site would likely do.

Figure 8. Dimensions of the potential Kivalina Spit materials site.

4.3 Project Timing

This project may be constructed in phased increments starting with protection of the section of Chukchi Sea waterfront most vulnerable to erosion and resulting property damage. The initial phase of the project is scheduled to start in 2008 with construction of less vulnerable sections over future years as need is assessed and funding is appropriated. The total duration of the project could be up to 10 or more years. Although rock revetments typically last 50 or more years, the life expectancy of this project is not projected beyond 15 years from construction because the community is expected to relocate to a more stable site within that period of time (USACE 2006).

5.0 Affected Environment

5.1 Fish

The Wulik River is well known for its abundance of large Dolly Varden char. These anadromous fish enter the river via Kivalina Lagoon during late summer to spawn and overwinter. Juvenile fish and adults outmigrate to sea in June where juveniles spend up to several years at sea before returning to the river. This species is very important to the subsistence economy of Kivalina residents and is harvested from the lagoon and river.

Five species of Pacific salmon are known to migrate up and spawn in the Wulik River. These species run throughout the summer months with chum and pink salmon the most abundant during July and August. Pacific salmon are important subsistence species in Kivalina, but are secondary to Dolly Varden char.

Several species of anadromous whitefish are found in the Wulik River, Kivalina Lagoon, and near-shore coastal waters of the Chukchi Sea. Inconnu are the largest of these whitefish species and are sometimes caught in coastal waters and the Wulik River. The center of abundance for inconnu is in the Kotzebue area of Alaska. Whitefish are very important to the subsistence economy of Kivalina residents.

Arctic grayling are a freshwater fish that are sometimes caught in Kivalina Lagoon, but not specifically in the project area.

Rainbow smelt are anadromous toothed smelt that are indigenous to most all Chukchi Sea lagoons that are open to the sea. This species is caught during summer, but is not particularly important for subsistence.

Several species of marine fish, some of which are relatively brackish-water tolerant, are found in Kivalina Lagoon and near-shore coastal waters. These include Bering flounder, yellowfin sole, starry flounder, saffron cod, Arctic cod, Pacific herring sculpin, and capelin. The most important of these marine species to local subsistence users are saffron cod, which are locally known as “tom cod.” This small cod species is fished through the lagoon ice with considerable success during winter.

The species discussed above can be found in the immediate project vicinity, but would be relatively few in number within the wetted footprint of the project. Most of these

species are present in local waters during summer, but the saffron cod and Arctic cod are found inside the lagoon during winter. Dolly Varden overwinter in the Wulik River and the eggs and juveniles of Pacific salmon are found in the Wulik River during winter. Most marine species migrate to deeper offshore water during winter and would only be found in shallow water offshore of the project site during summer.

5.2 Marine Mammals

Marine mammals of subsistence importance near Kivalina include ringed and bearded seal, bowhead and beluga whale, and polar bear. Other near-shore whales include killer whales, gray whales, and occasionally minke whales. None of these marine mammals, with exception of the polar bear during winter, would be expected to use the project site. Ringed and bearded seals would be expected to inhabit the landfast ice and drifting floes after breakup within near-shore waters close offshore of the project site. The summer stock of beluga whales may occasionally venture close to the community, but generally avoid noisy environs and would not likely approach close to the beach as they once were known to do. Bowhead whales typically inhabit water deeper than about 60 feet and would not likely approach the project site unless ice leads forced them close to the beach during the spring migration.

Gray whales are most likely to be the large baleen whales found in near-shore waters near Kivalina during summer. This species is known to migrate relatively close inshore from June through October. Gray whales of the eastern Pacific stock spend winters in Mexico and summers in the Bering and Chukchi seas. Gray whales are aggressive and not often hunted by Alaska Natives for subsistence.

5.3 Terrestrial Mammals

There are few terrestrial mammals on the barrier island. Brown bears sometimes swim across the lagoon to visit the landfill and small mammals including voles, shrews, and weasels might be found in the small patches of beach rye grass that is present in some areas of the island.

5.4 Birds

The terrestrial area surrounding Kivalina is inhabited during summer by numerous species of waterfowl, shorebirds, raptors, and passerine birds. The marine waters in summer are inhabited by seabirds including loons, sea ducks including eiders (waterfowl), and members of the gull family of sea birds. Terrestrial birds on the barrier island are likely to be a variety of passerine birds including longspurs and sparrows, buntings, gulls, ravens, shorebirds, swallows, ptarmigan, and raptors including short-eared owls, rough legged hawks, harriers, and snowy owls. Most birds are migratory and leave for the winter, but buntings, snowy owls, and perhaps the common raven stay through the winter. Birds likely found on the project site would include gulls, shorebirds, passerine birds, and occasionally waterfowl resting on the beach.

5.5 Vegetation

There is little vegetation on the Kivalina barrier island. Beach rye grass is in patchy distribution, and succulent perennial beach flowers are found near the limits of high

tide. Marine kelp or vascular eelgrass is not known to be present in this region of the Chukchi Sea coast.

5.6 Marine Invertebrates

Infaunal marine invertebrates are almost absent from Arctic beaches because of the ice gouging during winter and wave action during summer and fall. Offshore beyond the effects of ice and waves a diverse fauna of invertebrate life is possible depending on the type of substrate present. Muddy and sandy substrate can host several species of marine polychaete worms, clams, tunicates, sponges, and borrowing anemones. Sea stars are abundant and amphipods, isopods, helmet crabs, red king crabs, and hyas crabs can be relatively abundant locally during winter.

Small clams and brackish-water tolerant amphipod species are found inside the lagoon.

5.7 Endangered and Species of Federal Concern

Several endangered or threatened species are found in the Kivalina area, but none are found on the project site. These species include the Steller's eider, spectacled eider, and bowhead whale.

Traditional ecological knowledge is that Steller's eiders were once plentiful in Kivalina Lagoon, but are seldom seen now that the Alaska breeding population is in lower abundance. Non-breeding spectacled eiders are alleged by the U.S. Fish and Wildlife Service spectacled eider fact sheet to inhabit coastal lagoons between Kivalina Lagoon and Point Hope, 80 miles north.

Bowhead whales are spring migrants past Kivalina, and are hunted for subsistence. This large baleen species migrates through offshore leads in pack ice and seldom comes inshore of the landfast ice edge unless a lead forms and entices the animals close to shore. Landfast ice typically extends offshore to about the 60 to 70-foot bathymetric contour, which can be several miles offshore in the vicinity of Kivalina. This species would not be expected closer than 3 or 4 miles of the project site, and only during March, April and May.

The yellow billed loon is a species being considered by the U.S. Fish and Wildlife Service for listing under the Endangered Species Act (Federal Register June 6, 2007). This loon migrates through the Kivalina area in abundance and may occasionally rest in marine waters offshore of Kivalina or in Kivalina Lagoon.

The polar bear is being considered by the Fish and Wildlife Service for listing under the Endangered Species Act (Federal Register February 9, 2006). This marine mammal is also protected by the Marine Mammal Protection Act of 1972, as amended (MMPA). The MMPA prohibits the "take" of polar bears and other marine mammals. Informal consultation with the U.S. Fish and Wildlife Service regarding polar bears was conducted with the decision that to prevent a take of polar bears, work on this project would immediately stop and construction personnel would vacate the immediate area

should a polar bear wander on to the construction site (C. Perham, Personal communication). Under the MMPA, a take is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Alaska Natives are allowed to take polar bears for subsistence.

Informal consultation correspondence with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service under Section 7 of the Endangered Species Act is in Appendix A.

5.8 Essential Fish Habitat

The National Marine Fisheries interactive mapping web page and the 2005 Essential Fish Habitat Environmental Impact Statement (NMFS 2005) was consulted to determine if essential fish habitat existed in the Kivalina area. The web page does not cover this area, but maps in Appendix D of the impact statement indicate that the waters of Kotzebue Sound including waters offshore of Kivalina are within the general distribution of and may be essential fish habitat for the below species.

Table 2. Marine species found in the Chukchi Sea that have essential fish habitat in the Bering Sea.

Species	Life Phase
Snow crab	Adults and eggs
Alaska plaice	Adult and late juvenile
Sculpin species	Adult and late juvenile
Yellowfin sole	Adult and late juvenile
Pacific salmon	Adults, eggs, and juveniles

5.9 Tides and Currents

The Bering Sea is approximately 20 inches higher in elevation than the Chukchi Sea and the Alaska coastal water mass flows northward through Bering Strait at speeds up to 1 to 2 knots as a result. Advection to colder Arctic Ocean water assists the northward flow along the Alaska coast. Although the coastal water mass flows northward at a fairly steady rate, the net longshore drift of gravel on the beach at Kivalina is southward because of large storms from the northwest that overpowers the surface flow and directs it southward along the beach.

The official tide recording station nearest to Kivalina is in Kotzebue Sound at Kiwalik, approximately 130 miles southeast of Kivalina. Tides at Kiwalik are bi-diurnal with a mean range of 2.1 feet, MHHW of 2.7 feet, and mean tide of 1.3 feet.

Water level data at the entrance of Kivalina Lagoon (Singuak Entrance) was collected by Triton Consultants Ltd. (1999). Marine water levels in the Kivalina area are determined principally by wind-driven storm surges and astronomic tides. Typical annual surge amplitudes are reported as 3-foot wind driven and 0.5 foot tidal. Triton tabulated extreme water level estimates in the Kivalina area as reported below. Estimates are derived from the various sources listed (Triton 1999, page 6-9).

Table 3. Estimated water levels in the Kivalina area (Triton 1999).

Source	Record Duration	Negative (-)	Positive (+)
U.S. Army	100 year		10.6 ft
API (offshore)	100 year	-2 ft	12 ft
Kivalina	2.5 year	-3.4 ft	7.5 ft
Kotzebue	2.0 year	-1.8 ft	4.9 ft
Triton Model	38 year	-9 ft	16 ft

5.10 Physiography

The barrier island on which Kivalina is located is 13 feet in elevation at the airport. The island is 8 miles long and up to about 1/4 mile wide at the widest point. Singuak Entrance, a narrow outlet of Kivalina Lagoon to the Chukchi Sea is on the southern end of the island (figure 9). The Wulik River flows through this entrance. The Wulik River and Chukchi Sea are continually imparting change to the geomorphology of the area around Singuak Entrance, with recent changes being erosion of bars and shoals and an overall reduction of land mass.

Figure 9. Modern Kivalina showing the Singuak Entrance in foreground (photo: Millie Hawley)

This 1939 aerial photo of Kivalina (figure 10) shows bars and an offshore shoal currently not present to this extent.

Figure 10. Kivalina showing extent of bars and shoals in Singuak Entrance in 1939 (Photo: unknown photographer).

There is onsite geomorphological evidence that the Wulik River once entered the Chukchi Sea at Igrugaivik Creek about ¾ miles southeast of its present entrance. Aleksandr Kashevarov, an Alaska Native and Captain of a Russian-American Company expedition to the Arctic Slope described in 1838 the outlet of the Wulik River as being in the southernmost part of the lagoon (Burch 1994, 1998). An old riverbank, which could have been formed by Kashevarow's river mouth, truncates the beach berm about ¾ miles southeast of the present entrance. The ice cellars and reindeer corral discussed in the following section are behind this riverbank.

Beach berms along this section of Chukchi Sea coast line were built up over time by ice and large storms, and are generally higher than the tundra behind it. Material comprising the berms is generally washed sand and gravel of Pleistocene origin with material added by longshore drift of coastal erosion and sediment transported by local rivers (Moore 1966). These berms give the coastal tundra some protection during all but the severest of storms. Overtopping by severe storms is evidenced by driftwood up to about ¼ mile inland in some places on the tundra.

5.11 Air Quality

Kivalina is not within a non-attainment zone for air quality and air quality is generally very good. There are few man made sources in the area that would degrade the quality of the air. Sources are a small number of ATVs, the AVEC diesel generators, and the occasional aircraft that lands at the airport. The Red Dog Mine is over 50 miles away and the Red Dog Portsite is 17 miles south on the coast, but these facilities are not likely to have an appreciable effect on the quality of air at Kivalina.

5.12 Archaeological and Historical Resources

Numerous cultural resources have been reported in the vicinity of Kivalina. The community lies within the boundaries of the Cape Krusenstern Archaeological District National Historic Landmark (NOA-00042). The town site of Kivalina (NOA-00004) has yielded archaeological material and occupation is believed to date to at least 1780.

The Alaska Division of Parks conducted an archaeological survey in the Kivalina area along the proposed routes for buried water and sewer transmission lines. The area of potential effect was between the school and the water tank to the west. Nine auger tests were placed along the area of potential effect. Eroding riverbanks and several ice cellars were also examined, but nothing considered of archaeological or historical significance at that time was found (Bowers and Turney 1975).

Igrugaivik Creek Camp (NOA-00301), about 1 mile south of Kivalina near where it is proposed that sand and gravel be stripped from the beach for construction (figure 7) includes 55-gallon drums placed in the ground along a ridge adjacent to Igrugaivik Creek. These drums were formerly used for food storage. There are also 34 circular features, 16 rectangular features, a standing drying rack, and a wall tent frame and where the spit meets a former mouth of the Wulik River. A cluster of whale meat ice cellars or caches (NOA-00298 cold storage caches) are on high ground surrounding a small lake on this site. Two of approximately 13 ice cellars' noted in 2000 appear to still be in use.

A large pile of reindeer antlers from a 1930's vintage reindeer corral (NOA-00302) is present on the riverbank near this site. Remains of the corral include barbed fence wire and the bases of wood posts. The beach where material for construction is proposed to be stripped is adjacent to these cultural sites (figure 6).

Ernest (Tiger) Burch conducted extensive anthropological and ethnographic work in Kivalina and reported many fall and spring settlements in the Kivalina district (Burch

1998). The following sites discussed by Burch were in the area of modern Kivalina (Burch 1998:32 and 39). *Itiptigvik* was a spring settlement along the spit at the north end of Kivalina Lagoon. *Piŋu* was the location of a spring seal hunting camp near the north end of Kivalina Lagoon and between 1890 and 1950 it was the site of winter sod houses. *Kiŋiktuuraq* was a spring camp on a high bank at the extreme southern end of Kivalina Lagoon. During the early 18th century the major outlet of Kivalina Lagoon was apparently located there. The name means "little old rise in the ground" and likely is NOA-301. *Uallik* was the name of Kivalina as early as 1895 and served as a population center after freeze-up.

NOA-298, NOA-301, and NOA-302 have been determined eligible for the National Register of Historic Places. No evaluation of eligibility has been completed for NOA-00004, *Itiptigvik,* or *Piŋu.* The community lies within the boundaries of the Cape Krusenstern Archaeological District National Historic Landmark (NOA-00042).

5.13 Subsistence

Many people in Kivalina harvest plants, mammals, fish, and fowl for subsistence and preserve the harvest using traditional methods. Methods of preservation include drying fish and meat on outdoor racks, storage in natural ice cellars and in home freezers, or frozen storage outside homes during winter.

5.14 Land Ownership

Land under the project footprint below ordinary high water is owned by the State of Alaska as intertidal land. With exception of one privately held lot on the lagoon side of the project, land under the project foot print above ordinary high water is owned by the City of Kivalina (#ADL413569, May 23, 1969).

Land on the beach south of Kivalina from which material may be taken (figure 7), is owned by the State of Alaska as intertidal land. Land north of the airport and landfill from which material may be taken (figure 8) is owned by the NANA Regional Corporation of Kotzebue, Alaska.

6.0 Environmental Consequences

6.1 Biological Consequences

The footprint of this project on the Chukchi Sea side of the island is limited to the highly disturbed upper tide levels where invertebrate marine life is practically non-existent due to the annual lifting and bulldozing effect of the landfast ice and substrate disruption caused by large waves rolling in across shallow water. Consequently, effects of this project on invertebrate marine life would be negligible. The footprint on the lagoon side has been disturbed by more than 100 years of human activity and erosion.

There would be minor loss of habitat for migrating shorebirds that might rest on the project footprint, but this habitat is not especially important to the shorebirds in the Kivalina area. The rock revetment might attract more gulls to the immediate area during summer than would normally be seen because the rock would provide a

convenient resting structure for the gulls. This potential, but minor local increase in gull abundance, is not expected to pose additional hazards to aircraft landing and departing the nearby runway. Winter resident species including snowy owls and common ravens would likely find the rock revetment a convenient structure on which to perch.

This project is not expected to adversely impact local fish abundance or migration patterns. The project would not adversely impact polar bears during winter or terrestrial mammals in any known or predictable way.

The project would not adversely impact threatened or endangered species in any known or predictable way.

The National Marine Fishery Service web page delineating EFH was consulted and the Corps has determined that this project would not adversely impact essential fish habitat in any known or predictable way.

Some marine mammals can be sensitive to noise from vessels. Core and armor stone would be shipped to Kivalina during the open water shipping season (July – September). Nome, Alaska is a likely source of this stone. Barges transporting materials from Nome would transit the Bering Strait to Kivalina and would share waters of the Bering and Chukchi seas with an unknown number of marine mammals.

If the stone is barged from Nome, the tugs and barges would be additive to the existing vessels shipping ore concentrated from the Red Dog Mine and vessels shipping fuel and supplies to communities between Nome and Barrow that have only coastal access for materials that cannot be shipped by air. Noise from these vessels would result in a small increase to the existing vessel noise in the Bering and Chukchi seas, but this small increase is not expected to result in adverse impacts on marine mammals in the Bearing Sea or Chukchi Sea. Studies at the Red Dog Portsite, 17 miles south of Kivalina, show that underwater noise from tugs working may be heard up to 6.5 miles from the source (USACE 2005).

Noise and vibration from actual construction is not expected to have any long-term effect on marine mammals. Most seals and whales would be gone with the ice by the time construction would start and would not be adversely affected, but small numbers of bearded and ringed seals might be temporarily disturbed by construction noise if construction were to occur during the ice-covered months. The summer stock of beluga whales and gray whales sometimes come close to shore, and noise and activity from construction could disturb these marine mammals and cause them to temporarily alter their behavior.

There is a rare chance that a polar bear could be left behind on shore by receding ice and wander into the construction zone during summer. If this should occur the natural behavior of the polar bear may be temporarily altered. Mitigation for this potential

situation is discussed in the section on endangered species and species of Federal concern (Section 4.7).

6.2 Physical Consequences

The net longshore drift at Kivalina is southward and a rock revetment could interfere with this geologic process over time. The result of a potential long-term disruption of longshore drift in this situation is not entirely understood, but it typically results in accretion on the up current side of the structure and erosion on the down current side of the structure. This would likely be the long-term net effect of a rock structure at Kivalina, and the Singuak Entrance channel could advance toward Kivalina and the rock revetment as the result of less shoal building material moving southward along the Chukchi Sea side of the barrier island.

It was anticipated for planning purposes that rock and other fill materials would be shipped from Nome, but it is possible to obtain sand and gravel materials locally by stripping about 1 foot from the wetted face of storm surge berms on the beach about 1 mile south of Kivalina.

Stripping on the Chukchi Beach Site would be done incrementally with no more than 18 inches of material removed for any one project phase. Stripping is anticipated to be done in spring before the beach is smoothed by storm waves to take advantage of windrows of material pushed higher on the beach by the pushing action of shorefast ice. Incremental stripping in this fashion is within the range of natural losses and gains and would allow the beach to heal itself through longshore drift or to wave and ice action through the successive summer and winter. The berm crest and sparse vegetation growing on it would be untouched by this method. This method is not expected to contribute to overtopping of the berm due to storm surges smaller than what would be required to overtop the existing berm, or result in damage to the cultural features, tundra or permafrost behind the berm.

As previously mentioned, the net longshore drift of beach material is southward. Material on this section of beach is slowly moved along southward until it is temporarily shunted offshore by the Omikviorok River; after which it returns to the beach only to be stopped by the Red Dog Mine Portsite dock where it is stripped from north side and transported by loader to the south side. Material from high on the protective berms contributes to longshore drift as it is dragged into the active drift zone by storm waves. The material dragged into the active zone and transported south by longshore drift is replaced by material from up current so the berm maintains a more or less stable height.

This process is relatively stable until it is disrupted by a man-made structure, natural feature or catastrophic event such as an unusually destructive storm. Ice also has an active berm building role and equilibrium of the protective berm is generally reestablished over varying periods of time. Teck-Cominco Alaska, Inc., operator of the Red Dog Mine, is currently permitted by the Corps of Engineers to discharge up to 50,000 yd^3 of longshore drift annually on the south side of the Portsite dock (ACOE

Permit CC-830359 Chukchi Sea 9 Renewal). The source of this material is longshore drift from the area that would be stripped to provide gravel for this project. A consequence of stripping the berms between the Red Dog Mine Portsite and Kivalina could eventually be less longshore drift at the dock. This effect would only be temporary because material lost to stripping for this project should eventually be replaced by material from the Wulik River and from north of Kivalina.

Kivalina is not within a non-attainment area where air quality standards are not met. Exhaust from equipment used to construct this project is not expected to significantly degrade existing air quality at Kivalina. Some minor dust may result during construction. This dust may temporarily reduce air quality in the village during construction when winds are onshore.

6.3 Social Consequences

The beach that includes the project footprint is currently used by local resident for diverse purposes during periods of calm weather. Uses include subsistence fishing, walking, ATV travel, and beaching of boats. Construction of a rip-rap rock revetment on the footprint shown in figure 3 would deny or make some of these uses to the residents inconvenient because the current design does not include access ramps to the beach on the Chukchi Sea side of the island. Access to the exposed portion of the beach over a large rock structure could be difficult for some less agile persons and impossible for ATVs. People would have to go around the north end of the revetment to access the beach on the Chukchi Sea side of the island. Access across the revetment on the lagoon side of the island would be provided (figure 2).

Residents would not be able to safely beach or anchor riverboats adjacent to a rock revetment. This structure could result in some crowding of boats immediately north of the structure on the lagoon side. Inconvenience would result, but it is not expected to have a significant effect on the subsistence hunting and gathering of wild foods over the 15 year life of the project.

Minor dust may result from construction. This dust may reduce the quality of subsistence foods that are exposed to the air in the vicinity of the project when winds are onshore.

6.4 Cultural Resource Consequences

The project footprint is adjacent to NOA-00004 and within the boundaries of the Cape Krusenstern Archaeological District National Historic Landmark (NOA-00042). The proposed sand sources are near known cultural resources. NOA-298, NOA-301, and NOA-302 have been determined eligible for the National Register of Historic Places. No evaluation of eligibility has been completed for NOA-00004, *Itiptigvik,* or *Piŋu.* Should these sand sources be selected, effects will be assessed and mitigated through consultation with the Alaska State Historic Preservation Officer, as required under the National Historic Preservation Act. In addition, potential adverse effects to NOA-00004 and Cape Krusenstern Archaeological District National Historic Landmark

(NOA-00042) will also be assessed and mitigated. This may include archaeological survey and documentation, use of an archaeological monitor, or other actions.

7.0 Cumulative Effects

Some physical impacts of this project would be cumulative to those of the failed NWAB gabion project in 2006. The footprint on the Chukchi Sea side of the island that was disturbed for that project would also be disturbed over a wider area for this project. The proposed project footprint on the lagoon side would occupy the footprint used for sandbags and filter material placed as early as 2003.

The effects of this project would not be cumulative to the effects of relocating the community to an undetermined but nearby site.

The Northwest Arctic Borough is drafting plans for an emergency escape road should storm surge flood Kivalina (ASCG 2005). Several alternatives for this road requiring a combination of a causeway and bridge or bridge to the exit the barrier island by vehicle in an emergency are proposed. The effects of this potential future project, if constructed, would be cumulative to the effects of this project.

8.0 Coastal Management Program

This action is subject to the Alaska Coastal Management Program (ACMP) and the administrative and enforceable policies of the Northwest Arctic Borough. A guide to preparing an ACMP consistency determination for Federal activities was prepared and will be submitted to the ACMP administrators with this EA. The Administrative and enforceable policies of the Northwest Arctic Borough were also reviewed for project compliance. The Corps has determined the project is consistent with ACMP and the administrative and enforceable policies of the Northwest Arctic Borough to the maximum extent practicable. Concurrence with the determination by the State of Alaska ACMP administrators is pending review of this EA by the Alaska Department of Natural Resources.

9.0 Permits and Approvals

Consistency with the ACMP is discussed in Section 5.0 above.

This project would place fill in tidal waters of the United States and requires evaluation under Section 404(b)(1) of the Clean Water Act as a result. This evaluation is appended as Appendix B.

Because this project requires a Section 404(b)(1) evaluation, it also requires compliance with Section 401 of the Clean Water Act. Section 401 gives the State of Alaska authority to issue a certificate of assurance that water quality would not be impaired in excess of State standards as a result of the project. Issuance of a 401 certificate by the Alaska Department of Environmental Conservation is pending their review of this EA.

The Wulik River and Kivalina Lagoon have been catalogued as anadromous water by the Alaska Department of Fish and Game (Sport Fish Division fish distribution web page) and an Alaska Department of Natural Resources Title 41 Fish Habitat permit is required as a result. An application for this permit will be submitted with this EA. Issuance of a fish habitat permit is pending receipt of the application and review of this EA by the Alaska Department of Natural Resources.

This project is subject to the National Historic Preservation Act (NHPA) and is being coordinated with the State Historical Preservation Officer (SHPO). The SHPO is reviewing the project and will provide project guidelines in accordance with the Act.

This project was coordinated with Marine Mammals Management of the U.S Fish and Wildlife regarding the potential of needing a permit potential for take of polar bears under the MMPA. The results of this coordination are discussed in Section 4.7.

A State of Alaska, Division of Mining, Land and Water land use permit would be required to place the erosion control revetment on State owned tidelands. Tidelands are defined by the State as that portion of the intertidal zone below the elevation of mean high water. Submerged lands are defined by the State as those below the lowest tidal elevation. The State of Alaska, with few exceptions, owns these lands out to 3 miles offshore. A supplemental questionnaire for use of marine waters (tide and submerged lands) accompanied the permit application. The Alaska District Real Estate Division would submit this application to the Alaska Department of Natural Resources, Division of Mining, Land and Water.

If material is excavated (mined) from State owned lands (upland, tidal or submerged), the material might have to be purchased by application. A material sale application (form 102-143 Rev. 04/2006) might have to be submitted for purchase of the material. The Alaska District Real Estate Division or the Corps contractor would submit this application to the Alaska Department of Natural Resources, Division of Mining, Land and Water if needed.

Barge landings on State owned beaches are covered under the doctrine of Navigational Servitude as described by the Commerce Clause of the Rivers and Harbors Act of 1899 and reiterated in the Submerged Lands Act of 1953. This EA is notice to the State of Alaska, Division of Mining, Land and Water that the Federal government would land barges on State owned tideland to construct this project without application for permit.

10.0 Preparer

This EA was prepared by Larry D. Bartlett, Biologist, Civil Work Branch, U. S. Army Corps of Engineers Alaska District. The EA was edited, formatted, by Diane Walters

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Appendix A
Correspondence

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701
August 9, 2007

Mr. Larry Bartlett
Environmental Resources Section
U.S. Army Corps of Engineers
P.O. Box 6898
Elmendorf AFB, AK 99506-6898

Re: Erosion Control Revetment at Kivalina

Dear Mr. Bartlett:

Thank you for your request for information on endangered and threatened species pursuant to Section 7 of the Endangered Species Act of 1973, as amended (Act). Based on the information you provided, we understand you are working on a project to construct an erosion control revetment on the barrier island upon which Kivalina is located.

The revetment project will involve placing geotextile fabric below layers of core rock and armor rock. The revetment will armor 1,500 feet of the Chukchi Sea side of the spit, wrap around the point, and continue 1,500 feet on the Kivalina Lagoon side. Plans and cross sectional figures of the structure were included with your project description. Rock materials for the project will be barged from Nome, and construction is scheduled to begin in summer 2008.

While it is likely that spectacled (*Somateria fischeri*), and Alaska-breeding Steller's (*Polysticta stelleri*) eiders, both listed as threatened under the Act, and the Yellow-billed loon (*Gravia adamsii*), a proposed species, migrate past Kivalina, none of these species are thought to breed in the project area. The project will result in construction of a low wall following the existing coastline which should not pose a collision risk for migrating eiders or loons. Adverse effects to these species from the proposed project are not anticipated.

Members of the Chukchi/Bering Seas stock of polar bears (*Ursus maritimus*), may occur in the Kivalina area. The project will result in hardening of the existing shoreline. However, as the project is adjacent to the community of Kivalina, heavy use of the area by polar bears is unlikely. Polar bears are currently proposed for listing under the Act, but a conference opinion is only required if the project is likely to jeopardize the continued existence of a species proposed for listing, or result in the destruction or adverse modification of proposed critical habitat. No critical habitat has been proposed for polar bears, and the Service concludes the proposed project will not result in jeopardy for the species; therefore, further discussions under the Act are not required.

Polar bears are also protected under the Marine Mammal Protection Act (MMPA), which prohibits take of polar bears and other marine mammals, with a few specific exceptions. Under the MMPA, "take" is defined as: "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal." We recommend continued coordination with the Marine Mammals Management Office of the Service (contact details below), to determine if construction activities are likely to result in any form of take. If so, it may be advisable to apply for "harassment" authorization under the MMPA. This would require you to provide the Service with a specific project description including: location, timing, and description of all activities, and a polar bear–human interaction plan.

The Service concludes that this project is not likely to adversely affect listed or proposed species. Preparation of a Biological Assessment or further consultation under section 7 of the Act regarding this project is not necessary. This conclusion applies only to endangered and threatened species under our jurisdiction. If you need further assistance, please contact Sarah Conn at (907) 456-0499.

Sincerely,

Ted Swem

Ted Swem
Branch Chief
Endangered Species

U. S. Fish & Wildlife Service Marine Mammals Management Contacts

Craig Perham, Tel. (907) 786-3810 or e-mail craig_perham@fws.gov

or

Susi Miller, Tel. (907) 786-3828 or e-mail susanne_miller@fws.gov

From: Brad Smith [Brad.Smith@noaa.gov]
Sent: Thursday, September 06, 2007 1:12 PM
To: Bartlett, Larry D POA
Subject: Re: FW: Kivalina request for Informal consult

Larry; I have reviewed the material provided concerning an erosion control revetment at Kivalina, Alaska. No threatened or endangered species for which NMFS bears responsibility, nor their critical habitat, would be expected to occur within the immediate area of this project.

The Corps correctly identifies the bowhead whale as an endangered species occurring offshore of Kivalina.

Appendix B
Section 404(b)(1) Guidelines Evaluation
for
Section 117 Expedited Erosion Control Project, Kivalina, Alaska

Section 404(b)(1) Guidelines Evaluation
for
Section 117 Expedited Erosion Control Project, Kivalina, Alaska

Project Description

The U.S. Army Corps of Engineers, Alaska District has been authorized to expedite construction of an erosion control project at Kivalina, Alaska. The purpose of the project is to control erosion of beaches on both the Chukchi Sea and Kivalina Lagoon sides of the barrier island on which the community of Kivalina (population 400) has been located since 1905.

The project consists of a 3,100-foot-long rock revetment barrier around the south end of the island barrier (EA figure 2). The revetment would be constructed in phases with construction of the first phase starting in 2008. The first project phase would protect vulnerable infrastructure including the school, teachers housing, and tank farm from storm damage. Up to 900 feet of revetment would be constructed during the first phase of the project (EA figure 3). The remaining 2,200 feet would be constructed in increments over the next 10 or more years as needed and funded. The exact length of the incremental phases in addition to the initial 900-foot increment would be determined as needed to control erosion and protect structures.

A typical cross section of the revetment is in figure 2. The revetment on the Chukchi Sea side would have a base width of 80 feet and a crest elevation of 14.0 feet MLLW to control wave run-up. The revetment crest on the lagoon side would crest at 11.0 feet MLLW. The toe of the revetment would vary from 0 to 3 feet MLLW. The quantity of material needed is estimated to be 16,800 yd^3 for the first increment and 37,000 yd^3 for the entire 3,100 feet of the project. Rock to construct the revetment would likely be transported by barge from an established quarry, the closest of which is in Nome, Alaska. This rock is from approved, uncontaminated sources. Sand and gravel for base under the core rock (EA figure 5) would be mined from one of two local places (EA figure 6).

Approximately 7,500 yd^3 of local material would be needed for the entire project. The first 900-foot increment would require about 3,900 yd^3. Mining this material from Kivalina Lagoon was considered, but bore samples from the lagoon show that the material may be too variable in composition for use on this project (Alaska District 2004).

One possibility of acquiring clean local material is by stripping the beach about 1 mile south of Kivalina. Material stripping would take place across a 100-foot-wide by 700-foot-long area on the wetted, intertidal face of the beach berm (EA figure 7). Stripping would be done incrementally with no more than 18 inches of material removed for any one project phase. Stripping is anticipated to be done in spring before the beach is smoothed by storm waves to take advantage of windrows of material pushed higher on the beach by the pushing action of shorefast ice. Incremental stripping in this fashion is within the range of natural losses and gains and would allow the beach to heal itself

through longshore drift or to wave and ice action through the successive summer and winter. The berm crest and sparse vegetation growing on it would be untouched by this method. This method is not expected to contribute to overtopping of the berm due to storm surges smaller than what would be required to overtop the existing berm, or result in damage to the cultural features, tundra, or permafrost behind the berm.

A second option for local material would be to mine a borrow pit on land owned by the NANA Regional Corporation just north of the airport and adjacent to the Kivalina Lagoon on the lagoon side of the barrier island. This site would encompass 1.5 acres and be excavated in increments similar to the beach site. A major difference between the two sites is that the lagoon site would not heal itself between uses as would the beach site, but remain a flooded pit for years in the future.

The Authority for this project is Fiscal Year 2005 Consolidated Appropriations, Section 117 (PL 108-447) that authorizes structural and non-structural projects for coastal erosion of affected Alaska communities.

Physical and Biological Environment

Infaunal invertebrate life on the beach where this project would be constructed and gravel excavated is almost absent because of gouging and piling of sediments by ice during winter and spring, and because of wave action that reaches to considerable distance offshore during summer storms. Epi and meio faunal invertebrates including Calanoid copepods, Mysid shrimp, cumaceans, amphipods, and helmet crabs are relatively common on near-shore subtidal zone substrate during summer (Blaylock and Houghton 1983), but absent during winter. This project is not expected to adversely impact area populations of these invertebrates.

Shorefast ice can be about 5 feet thick offshore and may thicken as it approaches shore. Shorefast ice may be attached to the bottom for a considerable distance from the beach, and considerable quantities of material can be transported alongshore in this fashion. .

A diversity of marine and anadromous fish is found near the project site, but few are expected to occupy the actual project footprint. Fish expected to occasionally be found on the project site include capelin, Pacific herring, Dolly Varden, and saffron cod.

There is no terrestrial or marine vegetation of significance on the project site or on the areas where local material would potentially be excavated.

There are no wetlands or special aquatic sites associated with this project and this project is not expected to result in adverse impacts to adjacent wetlands or special aquatic sites. Kivalina Lagoon adjacent to the community is used mostly for boat mooring and is not considered to be a special aquatic site.

This project will not adversely impact currents or the circulation of water in the Chukchi Sea or Kivalina Lagoon, but it will result in temporary disruption of longshore drift of sand and gravel sediment along the beach. The net longshore drift in vicinity of

the project is southward, and projects such as this are expected to accrete sediments on the up current side and erode sediments on the down current side until a new equilibrium of the beach line is reached. This natural geologic process is not expected to adversely impact the aquatic environment or biological populations found in the project vicinity.

Kivalina is on the migratory path of numerous species of terrestrial birds, waterfowl, seabirds, and shorebirds from about May through October. Resident birds during summer and winter include common ravens, snowy owls, willow ptarmigan, and snow buntings. Use of the project footprint by birds is minimal because it is in such close proximity to human habitation and activity. Migrating shorebirds would lose some habitat to the project footprint, but the revetment would also provide perching habitat for the common raven, snowy owl, and a variety of gulls. This project would not adversely impact the area population of any bird species.

Marine mammals in the project vicinity include ringed seals, bowhead whales, bearded seals, beluga whales, gray whales, polar bears, orca whales, minke whales, and spotted seals. Ringed and bearded seals and polar bears are seen during winter, bowhead and beluga whales are occasionally seen during early spring and summer, while gray whales, minke whales and spotted seals are occasional summer visitors. Use of the project footprint by marine mammals is minimal because of its proximity to human habitation and activity.

No terrestrial animals would be adversely impacted by this project.

Endangered Species

Species listed as threatened or endangered under the Endangered Species Act in the project vicinity include the bowhead whale, Steller's eider, and spectacled eider. The yellow billed loon is a species of concern for listing that migrates through the Kivalina Area (Federal Register June 6, 2007, USFWS 2007). Bowhead whales migrate past the project site through offshore leads in the ice from about March through May. An occasional straggler may pass during early June. Bowhead whales are large mammals and typically avoid shallow water. Consequently, they would not be found within the intertidal zone on the project site and would not be affected by construction activities during summer. The National Marine Fisheries Service was consulted regarding bowhead whales, but did not reply to a written request for informal consultation.

Steller's and spectacled eiders, and the yellow billed loon may use offshore marine waters and Kivalina Lagoon for resting habitat during their northward migration but are not likely to use habitat immediately adjacent to the community because of human and domestic dog activity in the immediate project area. The project is not expected to result in significant adverse impact to any of these listed species or the yellow-billed loon. The Fish and Wildlife Service was consulted regarding these bird species.

Essential Fish Habitat
The National Marine Fisheries Service considers waters cataloged as anadromous waters by the Alaska Department of Fish and Game as essential fish habitat (NMFS 2005). Coastal waters, the Kivalina Lagoon and the Wulik River are essential fish habitat for Pacific salmon.

Marine waters of Kotzebue Sound including waters offshore of Kivalina are within the general distribution of and may be essential fish habitat for the following species and life phases; however, the project is not anticipated to have more than minimal impact on EFH.

Species	**Life Phase**
Snow crab	Adults and eggs
Alaska plaice	Adult and late juvenile
Sculpin species	Adult and late juvenile
Yellowfin sole	Adult and late juvenile
Pacific salmon	Adults, eggs, and juveniles

Determination of Cumulative and Secondary Effects
Cumulative or secondary effects on fish and wildlife populations or the aquatic ecosystem in the project vicinity as a result of the proposed action are expected to be negligible. Stripping local material from the beach 1 mile south of Kivalina is not expected to have adverse impacts to tundra or cultural resources inland from the protective crest of the berm.

Other Determinations
The proposed project would have no appreciable detrimental effects on any of the following:

- Municipal and private water supplies;
- Recreational or commercial fisheries;
- Water-related recreation;

The project will limit free access to the beach for persons driving ATVs. These vehicles will have to access the beach at low tide from the ends of the project after it is completed. This limitation is not considered to be an inconvenience and not an appreciable detrimental effect. The revetment would also make it difficult for some persons to access the beach by clambering over the amour stones. No pedestrian access is incorporated in the project design and persons unable to clamber over the stones would have to access the beach by going around the ends of the revetment.

This project would change the aesthetic view of Kivalina. The shoreward or aerial view of Kivalina from the west, south, and east would no longer be a view of a natural sand beach, but would be a view of a man-made rock revetment.

The action is not expected to have an effect on cultural or historical resources, but consultation with the State Historical Preservation Officer is ongoing and an archeologist would be on site during construction requiring excavation.

Findings of Compliance or Non-Compliance with the Restrictions on Discharge

A. Adaptation of the Section 404 (b)(1) Guidelines to this Evaluation

The proposed project complies with the requirements set forth in the Environmental Protection Agency's Guidelines for Specification of Disposal Sites for Dredged or Fill Material.

B. Evaluation of availability of practicable alternatives to the proposed discharge site, which would have less adverse impact on the aquatic ecosystem

An environmental assessment was prepared in conjunction with planning for this project. No practicable alternative for placement of the revetment exists because the revetment is needed to protect Kivalina from storm surge erosion.

C. State Water Quality Standards

The proposed project would not be expected to have an appreciable adverse effect on water supplies and recreation requiring high quality water. Coastal water is typically turbid due to wave action and river runoff during the construction season. The project would not introduce significant petroleum hydrocarbons, radioactive materials, residues, or other pollutants into the Chukchi Sea or Kivalina Lagoon. A temporary and inconsequential increase in turbidity may result from the proposed action.

D. Toxic Effluent Standards or Prohibition under Section 307 of the Clean Water Act

Rock would be contaminant free and be barged to Kivalina from an established and approved quarry. The proposed actions are not expected to increase levels of contaminants in the aquatic or terrestrial ecosystems. Measures would be taken to prevent contaminant release into the environment from heavy machinery operation associated with placement of revetment rock.

E. Endangered Species Act of 1973

The proposed project would not have an adverse effect on Steller’s and spectacled eiders, or bowhead whales, or other threatened and endangered species or their critical habitats. This determination has been coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, agencies responsible for management of protected species.

F. Essential Fish Habitat

The action would not adversely impact essential fish habitat (EFH) including salmon populations or their habitats. This determination has been coordinated with the National Marine Fisheries Service, which is responsible for managing EFH under the Magnuson-Stevens Fishery Conservation and Management Act.

G. Evaluation of Extent of Degradation of the Waters of the United States

There are no municipal water supplies in the area that could be negatively affected by the proposed project. Recreation and commercial interests would not be adversely impacted. There would be no significant adverse impacts to plankton, fish, shellfish, wildlife, or special aquatic sites.

Appropriate and Practicable Steps Taken To Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

All appropriate and practicable steps would be taken to minimize potential adverse impacts of the discharge (revetment) on the aquatic ecosystem. The proposed action would comply with the requirements of the guidelines.

Literature Cited

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