



**U.S. Army Corps
of Engineers**
Alaska District

SHISHMAREF PARTNERSHIP Shishmaref Relocation and Collocation Study

Shishmaref, Alaska

Preliminary Costs of Alternatives

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1. INTRODUCTION

1.1 Background

The U.S. Army Corps of Engineers, Alaska District (District) is currently investigating erosion problems in the community of Shishmaref, a Native Alaskan Community located on Sarichef Island. The island is located on the north coast of the Seward Peninsula, about 100 miles southwest of Kotzebue. The island is one of a chain of barrier islands that are parallel to the northern shoreline of the Seward Peninsula and separates the Chukchi Sea from a saltwater lagoon on the leeward side of the islands.

In response to the ongoing concerns over the threat posed to Shishmaref by the continuing seaward erosion, the community was selected by Congress to be part of the Section 203, Tribal Partnership Program, a study authority to assist Native Alaskan communities with water resource-related planning needs. In subsequent legislation, Congress asked to know about the practicality of and costs associated with relocating Shishmaref to the mainland.

1.2 Purpose of Report

Under an environmental and planning services contract, Tetra Tech was tasked by the District to undertake the study presented in this report to assist the District in determining preliminary costs of four alternative courses of action being considered in response to the ongoing erosion of Sarichef Island that threatens the safety, security, and integrity of Shishmaref. The four alternative courses of action addressed in this study and report are as follow:

- Alternative A - Shishmaref Staying in Place
- Alternative B - Shishmaref Relocating to a New Mainland Site
- Alternative C - Shishmaref Collocating to Nome
- Alternative D - Shishmaref Collocating to Kotzebue

This report has been prepared in support of a NEPA EIS currently being prepared by the District. The EIS is examining the environmental effects associated with the above alternatives, as well as a No-Action alternative.

1.3 Approach

The basic approach taken in this study to assist the District in identifying preliminary costs associated with the above alternatives involved compiling, assessing, and presenting information gathered from (a) research of existing published information; (b) contact with appropriate agencies, developers, trades, contractors, and others knowledgeable on the subject; and (c) limited site reconnaissance. In this process, relevant information has been compiled on the following:

- Basic physical needs of the Shishmaref community.
- Development constraints and opportunities associated with each of the four alternatives.
- Capital requirements associated with meeting each of the identified physical needs of the Shishmaref community for each alternative.

Inherent in this approach has been the need to develop an array of general and specific assumptions, so that reasonable and defensible costs for the identified requirements could be synthesized from the available information. Those general assumptions that are applicable to multiple alternatives are presented below as part of this introductory section. Additional specific assumptions relevant to individual alternatives are included in the separate discussions of those alternatives and are presented in subsequent sections of this report.

It is important to note at this point that this cost study addresses only the physical needs of the Shishmaref community, and other community needs such as social, cultural, and economic, are being addressed by other studies.

1.4 Contents and Format of This Report

The information compiled and synthesized in this report is presented in six sections and four appendices, as described below.

Section 1.0 – Presents the background, purpose, and approach of this study; the general assumptions made in the study; as well as the basic physical community needs identified for Shishmaref.

Section 2.0 – Addresses the constraints, opportunities, assumptions, capital requirements, and preliminary costs associated with the alternative of Shishmaref staying in place (Alternative A).

Section 3.0 – Examines the constraints, opportunities, assumptions, and concept plan, including capital requirements and preliminary costs and schedule associated with the alternative of Shishmaref relocating to a new site on the mainland south of the saltwater lagoon (Alternative B).

Section 4.0 – Discusses the constraints, opportunities, assumptions, concept plan, including capital requirements and preliminary costs and schedule associated with the alternative of Shishmaref collocating to the City of Nome, approximately 120 miles to the south of Shishmaref, on the southern coast of the Seward Peninsula (Alternative C).

Section 5.0 – Addresses the constraints, opportunities, assumptions, concept plan, including capital requirements and preliminary costs and schedule associated with the alternative of Shishmaref collocating to the City of Kotzebue, about 100 miles to the northeast of Shishmaref, on Baldwin peninsula in Kotzebue Sound (Alternative D).

Section 6.0 – Presents a summary of the total costs of alternatives, and discusses the limitations of this study and report.

Appendix 1 – Provides detailed cost tables for each of the four alternatives addressed in this study.

Appendix 2 – Presents information from selected agencies contacted during the course of this study.

Appendix 3 – Provides comments from the independent technical review of this draft report.

Appendix 4 – Presents information provided by Alaska Department of Transportation and Public Facilities (AK-DOT-PF), and by Alaska Native Tribal Health Consortium (ANTHC).

1.5 General Assumptions in this Study

To provide a framework for the cost categories considered in this study, general and specific assumptions were developed. The general assumptions for the study are listed below. Specific assumptions associated with each of the four alternatives are included with the discussion of each alternative in Sections 2 through 5.

The following General Assumptions were developed that are applicable to one or more alternatives:

- For the purposes of determining preliminary costs associated with the alternatives being addressed, the physical relocation of Shishmaref (including collocation) is assumed to occur over a five-year period.
- Prior to the five-year relocation period, a period of up to five years would be required to complete the necessary planning (with significant community involvement); prepare designs; coordinate with the array of relevant local, state,

and Federal agencies; obtain necessary permits; secure the required real estate and easements; and establish a plan for funding through programs, grants, and other fiscal opportunities available for the relocation/collocation efforts.

- The costs developed and identified in this study for the staying-in-place alternative (Alternative A) cover activities anticipated in three somewhat arbitrary time horizons: (a) “near-term” (1 to 5 years); (b) “intermediate-term” (5 to 15 years); and (c) “long-term” (beyond 15 years).
- The costs developed and identified in this study for the relocation alternative (Alternative B) and the two collocation alternatives (Alternatives C and D) cover only those actions anticipated during the five-year relocation (or collocation) period, or even beyond in some instances. It is assumed that costs associated with technical studies, planning, design, permitting, and coordination will be identified and developed by others during the preceding five-year planning and design period.
- The costs associated with the relocation alternative (Alternative B) and the two collocation alternatives (Alternatives C and D) include the 10-year erosion protection project developed by the District. This cost is considered necessary to help insure that the Shishmaref community can remain at the present location during the pre-relocation period.
- Costs identified for the stay-in-place alternative (Alternative A) associated with infrastructure capital requirements that may be implemented in the next five years are not included with the relocation and collocation alternatives (Alternatives B, C, and D) based on the expressed reluctance by agencies to fund any major improvements and upgrades to infrastructure due to the impending relocation.
- If and when Shishmaref either relocates to a new mainland site, or collocates to Nome or Kotzebue, all the people making up the existing Shishmaref community

will move to that location, not to multiple locations. This may or may not occur when the actual move occurs, but this assumption was made to simplify the analysis.

- Houses that have been designated “movable” based on the site reconnaissance trip in July 2004 are assumed to be re-locatable to the new mainland site, as well as the two collocation sites.
- The population level of the Shishmaref community to be used for identifying costs associated with its relocation and collocation is based on the 2002 population level published by the Alaska Department of Community and Economic Development (ADCED) in June 2003 (pop. 589).
- The identification of base costs associated with relocation of the Shishmaref community to a new mainland site will be based on providing the village with the same level of water and sewer service and other infrastructure services that currently exist.
- Incremental costs associated with relocation of the Shishmaref community to a new mainland site will be identified for providing all dwellings with water and sewer service that meets acceptable and feasible regional/agency standards.
- Existing structures in Shishmaref are categorized as either “movable” or “non-movable” to either the new mainland site or the two proposed collocation sites. Development of relocation and collocation costs for replacement of all non-movable structures will assume new construction.
- Relocation and collocation cost estimates developed for this study include initial implementation capital costs only. Other life cycle costs, such as for operation, maintenance, and replacement, are not included (See the District’s Hydrology and

Hydraulics Appendix of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* for additional information).

1.6 Physical Needs of Shishmaref Community

Based on the facilities, services, and structures that exist in the City of Shishmaref on Sarichef Island, and the current plans and expressed desires of the community for upgraded services, the following physical needs of the Shishmaref community were identified to which costs were applied:

- **Defined Village Site.** The City of Shishmaref needs sufficient developable land area to provide for the existing land uses and private and public elements making up the community listed below. In addition, the community desires to have sufficient reserves of developable land to expand to as the community continues to grow and develop. The existing City comprises approximately 350 acres of land, including airfield, water source preserve, and those summer camps that are located on Sarichef Island.
- **Housing.** The community needs a sufficient number of homes to provide for the 589 residents making up the village. At present it is estimated that there are 153 occupied homes in the community, with an average household size of four.
- **Commercial and Industrial Buildings.** The existing community includes three commercial buildings and one industrial building (Native Store; Trading Post; Washeteria; and Tannery).
- **Public/Community Buildings.** The existing community contains the following public, community, and storage buildings: Health Clinic; School; City Hall/Post Office; Armory; Fire/Rescue Station and City Shop; Church; Library; Community Hall; Friendship Center; and 20 storage buildings.

- **Fresh Water Supply, Treatment Facility, and Distribution System.** The Shishmaref community needs an adequate, reliable, and safe supply of fresh water for the current population and expected future growth. Currently, the water supply, treatment, and distribution systems serving the community are inadequate, unsafe, and below regional standards. This will be further discussed in Section 2.3.
- **Sanitary Waste Collection, Treatment/Disposal System.** The community needs to have adequate systems and facilities to collect, treat, and dispose of sanitary wastes to promote and maintain a safe environment for its residents. Existing facilities and system for collection and treating/disposing of sanitary wastes are inadequate, below regional standards, and do not conform to applicable public health and safety regulations. This element will be further discussed in Section 2.3.
- **Solid Waste Collection System and Landfill.** Shishmaref needs to have an adequate system and facilities, which meet applicable health and safety standards and regulations, to collect and dispose of solid wastes generated in the community to support a safe environment for its residents. The existing landfill facility is below regional standards and does not conform to applicable public health and safety regulations. This will be further discussed in Section 2.3.
- **Electrical Generation Facility and Distribution System.** The Shishmaref community needs to have an adequate, reliable and sufficient source of electrical power; an essential ingredient of a safe and vibrant community. Currently, the Alaska Village Electric Cooperative (AVEC) provides adequate electricity to the community with three diesel generators and a network of overhead distribution lines.
- **Bulk Fuel Storage.** The community needs to have a sufficient and reliable supply of diesel and gasoline fuels for heating, power generation, vehicles, and equipment. Because of the remoteness of the community's location, having sufficient and safe bulk storage facilities (tank farms) are a must. The bulk storage facilities for the community include: Bering Straits Schools (54,200 gals); AVEC (122,200 gals); City

(87,200 gal); Nayokpuk Trading Post (82,600 gal); Native Store (130,200 gal); U.S. Fish & Wildlife (3,100 gal); Lutheran Church (6,900 gal); National Guard (9,700 gal); and City Water Department (8,200 gal). However, the existing bulk storage tanks for the generating plant are in need of refurbishment or replacement, as are certain elements in the generating plant. These needs will be further discussed in Section 2.3.

- **Roads.** The community needs a network of internal and service roads to connect the various elements comprising the city. The existing internal community roadways are narrow and covered with up to several inches of sand/silt, and contain no gravel. As a result, the frequent occurrences of wind-blown dust during summer, and muddy conditions during the spring thaw and following summer rainfalls are common problems. This is further discussed in Section 2.3.
- **Airfield.** An essential element of the city that helps ensure the safety and well being of the Shishmaref people is a properly functioning and serviceable airfield and associated facilities. The community is well served by a 5,000-foot by 70-foot paved runway and associated facilities, which were constructed and are maintained by the Alaska Department of Transportation and Public Facilities (AK DOT-PF).
- **Barge Landing Facility.** The continued existence and well being of the community greatly depends on inflow of the hundreds of items and various materials required for daily living. Because of the remoteness and island setting of Shishmaref the majority of the items and materials essential to the community are brought in by barges during summer. Currently, there are adequate landing areas for supply barges to deliver goods along either of the channels on the west and east sides of the island, as well as the beach area just north of the Native Store (See the District's *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* for additional information).

- **Harbor and Boat Storage Facility.** Small boat usage is essential for transportation needs and to maintain the subsistence lifestyle of the Shishmaref community. The community has no designated harbor facilities, and fishing and other boats anchor offshore on the south side of Sarichef Island (on saltwater lagoon side), and boats are stored on shore (See the District's *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* for additional information).
- **Communication Facilities.** The satellite communication, Cable TV, and telephone facilities and services that the Shishmaref community is currently using provide an essential link between this remote location and the rest of the world.
- **Summer Camps.** The numerous shore-side privately-owned lots, located along the northern and southern perimeter of Sarichef Island, are used by members of the Shishmaref community for summer drying of subsistence foods; boat building, repair and maintenance; and a variety of other work activities.

2. ALTERNATIVE A - REMAINING AT EXISTING LOCATION

2.1 Introduction

In this alternative, the community of Shishmaref would remain in its present location on Sarichef Island for the foreseeable future. A basic premise of this alternative is that the seaward erosion that has been threatening the safety and integrity of the community can be halted by installation and periodic refurbishment of physical measures. This alternative also helps to differentiate for other alternatives between those costs related to upgrades and those costs related to the actual relocation.

The approach taken in developing preliminary capital costs associated with this alternative included the following:

- Gathering and compiling preliminary information from community officials (e.g., Tony Weyiouanna) and agencies involved in providing community infrastructure and facilities (e.g., ANTHC, AK DOT-PF, AVEC) about the condition and remaining life expectancy of existing infrastructure; homes; community, business, industrial, and other structures; as well as the constraints to and opportunities for further development or expansion.
- Determining preliminary capital requirements associated with meeting the physical needs of the community (described previously in Section 1.6), and taking into account the community and agency plans and timelines for replacing, refurbishing, and upgrading community infrastructure and facilities in the foreseeable future.
- Identifying and applying reasonable assumptions as to time horizons for implementation, planning and funding, as a basis and framework for developing preliminary capital costs associated with this alternative.

- Identifying those agencies that would typically participate in planning and implementing the capital requirements associated with meeting the physical needs of the community.

It is important to note that this cost study addresses only the physical needs of the Shishmaref community, and that other community needs such as social, cultural, and economic, are being addressed by other studies.

The remainder of this section presents the following relevant information and discussions regarding this alternative:

- The potential erosion control measures being considered by the District to ensure the ongoing safety and integrity of the Shishmaref community.
- For each of the community physical needs listed in Section 1.6, a discussion of relevant existing conditions; constraints; assumptions; and any identified community and agency plans.
- The preliminary capital costs developed for the erosion control measures under consideration.
- The anticipated capital requirements and preliminary costs associated with this alternative, in meeting the physical community needs of Shishmaref.
- A list of those agencies that would typically provide funding and other assistance in meeting the physical community needs.

2.2 Erosion Measures Being Considered by Alaska District

A discussion of these measures is provided in the *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* being prepared by the District.

2.3 Physical Community Needs

Physical Area for Community

Considering the land use constraints imposed by the current community build out, the vulnerability of the island to flooding and storm surge, and the land and setback requirements of the freshwater collection area and the airfield safety zone, there is minimal land available on the island for housing, infrastructure, and facility expansion and growth. These physical limitations have historically and will continue to make it difficult for the community to expand and grow.

Homes and Personal Storage Buildings

There are 153 private homes, two commercial rental houses, and four unoccupied houses in Shishmaref. The homes are of various ages, and the majority of them are between 10 and 30 years old. The four unoccupied houses are not in good enough condition to be lived in, but the remaining homes are in fair to good condition. The houses are either wood-frame or modular construction, and foundations are post-and-pad, piles, triodetic, or some combination. Most homeowners in the community have at least one storage shed on their lot, mostly of wood-frame construction.

Homes in the community are repaired, renovated, expanded, and replaced as needed, based the financial ability of homeowners, available labor, and availability of public funds for qualifying homes. Financial assistance for renovating and replacing homes is available through Bering Straits Housing Authority (BSHA), HUD, and other sources, in accordance with applicable housing programs. In the past 10 years, many of the HUD homes, the BSHA homes, and the non-program-supported homes have been renovated and/or weatherized, and some have been

replaced. It is assumed that capital improvement costs of residential houses will not be included in this alternative.

Commercial and Industrial Buildings

The community has three commercial buildings (Native Store; Trading Post; Washeteria), and one industrial building (Tannery). The Native Store and Washeteria are in fair condition and likely have about 10 years of useful life remaining before needing major renovation or replacement. The Trading Post is in slightly better condition and should have about 15 years of remaining useful life. The Tannery building is in good condition and should have at least 40 years of useful life remaining.

Public/Community and Storage Buildings

The existing community has the following major public and community buildings:

- Health Clinic
- School
- City Hall/Post Office
- Armory
- Fire/Rescue/City Shop Building
- Church
- Library
- Community Hall
- Friendship Center
- Storage Buildings

The Health Clinic, built in the 1980s, was partially renovated several years ago. However, further upgrades (which are needed), have been placed on hold by the Denali Commission because of the possible relocation. The Clinic is currently below regional health standards and in need of upgrading and refurbishment.

The School was renovated in 2002, and is in good condition and of adequate size, and should serve the community for the next 30 to 40 years.

The City Hall building, which was built in 1981, is near the end of its service life and is considered by some community leaders to be a fire hazard.

The Fire/Rescue Building, which is combined with the City's heavy equipment maintenance shop, is also near the end of its service life and is considered by some community leaders to be a safety hazard.

The Church was built in 1984 after the former one burned down, and is near the end of its service life, mainly as a result of the poor condition of the foundation, which causes the basement to become full of water during the spring, summer, and fall, causing water damage to the structure. According to some community leaders, this has made the structure somewhat unsafe.

The Community Hall, which was built in the 1970s, is nearing the end of its service life. The roof and boiler were renovated three or four years ago.

The Friendship Center, which was built on pilings in about 1982, was renovated about seven years ago, and should serve the community for at least another 15 years.

The existing Storage Buildings are mostly of wood frame construction, and are of varying age. These structures are maintained and repaired as required.

Fresh Water Supply, Treatment, and Distribution Facilities

The existing water supply system includes a 15-acre fenced catchment area located approximately 1,000 feet to the east of the community Washeteria/Water Treatment Facility. This catchment area collects snow and rainfall, and routes it through an arctic pipe to the treatment facility, where it is treated and stored in a 1.3 million-gallon above ground insulated storage tank. A second insulated treated water storage tank, which holds 400,000 gallons, is located near the school. The two tanks are connected via a piped loop. Treated water is supplied to the Washeteria and school, and is picked up by individuals from the watering point at the Washeteria and taken to their homes.

The catchment system collects up to 3 million gallons per year, but the two storage tanks provide inadequate storage. The community can run out of water before the end of winter, and families

have to supplement their supply with cut ice from the mainland. Families also supplement their individual supply by collecting rainwater during spring, summer, and fall.

The existing water supply and treatment facilities at Shishmaref were developed in the 1980s, and are reaching their design life and in need of improvements. Also, the existing water treatment system is inadequate and does not meet either EPA's Surface Water Treatment Rule (re: *Giardia lamblia*), or EPA's Disinfection Byproducts Rule. Because of this, the residents of Shishmaref do not drink the water, although many households use it for washing clothes and for flush-haul facilities, where applicable.

The present plans of the community, working together with the Alaska Native Tribal Health Consortium (ANTHC), are to spend \$800,000 (provided by "Safe Drinking Water Program" – EPA) to accomplish the following: (a) upgrade the water catchment area in summer 2005; and (b) upgrade treatment plant in winter 2005. These upgrades are currently in the design phase at ANTHC.

Three wells were drilled in the 1970s; however saltwater is all that was found. Once the entire community converts to a flush and haul system for sanitary waste (see below) the consumption rate would most likely increase, requiring an additional water source.

ANTHC has developed a preliminary cost estimate for upgrading the Fresh Water Supply, Treatment, and Distribution Facilities on Sarichef Island. The cost estimate is based on a 25 year design life, design population of 800, water consumption of 30 gallons per capita day and storage capacity equal to 66% of annual requirement. A new catchment area of approximately 48 acres would be constructed at an estimated cost of \$12,000,000. A new water treatment plant would be constructed at an estimated cost of \$3,000,000. Several new water storage tanks would be constructed to achieve the estimated 7,460,000-gallon volume capacity requirement. Based on an estimated cost of \$2.20 per gallon for water storage tanks, the water storage is estimated to cost \$16,412,000.

Sanitary Waste Collection and Treatment Facilities

Most families in Shishmaref use individual honey buckets (most with plastic bag liners) in their homes to collect sanitary waste. Individual homeowners can either choose to pay a fee and have their honey buckets and/or bags collected by city staff and hauled to the lagoon/landfill pit at the far end of the runway, or they can haul their own honey buckets and bags to the pit.

A flush-haul sanitary wastewater system has been in the process of being implemented in the community since the early 1990s. There are 47 homes with flush-haul systems installed, and 31 of the 47 systems are working. There are three existing permitted lagoons near the Washeteria, which are used for treating gray and black water from the Washeteria.

The trend toward installing flush-haul systems in the community is expected to continue in the foreseeable future. The estimated cost to install a flush-haul system is \$28,000 per house. There are currently no plans for upgrades or improvements to the wastewater lagoon, however ANTHC has estimated the need for a new 6 acre lagoon. The estimated cost to construct the new waste water lagoon is \$3,000,000. It should be noted that the space available for expansion of the lagoon/landfill is very limited.

The community has expressed the desire to develop piped water distribution and sewage collection systems over time to help improve sanitary conditions in the village. However, piped water and sewer utilities at the existing community site are not feasible, according to ANTHC. The required 128-acre catchment area and the required 15.6 million gallon water storage volume are too great and the cost of operation would be too high for the community to support.

Solid Waste Collection and Disposal

The community operates an un-permitted landfill/waste lagoon pit on the far west end of the runway that has been in use since the late 1990s. As is the case with sewage waste, residents can either choose to pay the city to collect and haul their trash to the landfill, or they can haul their own.

There are currently no plans for upgrading, expanding, or moving the landfill. The location of the landfill is in violation of the FAA regulation requiring that a landfill be sited at a safe

distance from an airfield. If the community were to remain in the present location, a plan for an additional (permitted) landfill area in an approved location would be necessary. However, as mentioned above, the space available for expansion of the existing landfill or developing a new one is limited.

Electric Utility

AVEC provides electricity to the community through three generators located within a power plant in the village. The existing system consists of one 500-kW, one 300-kW, and one 200-kW diesel generators. The existing switch-gear allows each generator to run separately or in combination. There are 188 electrical service connections in Shishmaref, which draw approximately 160-kW in the summer and up to 350-kW in the winter. The existing system is in need of being replaced within 5 years.

AVEC estimates that a new power generating plant would cost \$1,900,000. AVEC also estimates that annual diesel fuel requirements would be approximately 270 gallons per capita and about 30,000 gallons for each of the public, commercial, and industrial buildings.

A conceptual design report on bulk fuel tank farm and power plant upgrades needed for Shishmaref was prepared by PDC, Inc. for AVEC in June 2002. Based on visual inspections of the tanks as part of this study, it was determined that most of the tanks are in poor condition. Most of the tanks have leaks at joints or valves, failing foundations, and inadequate liner and dike systems. Five entities have agreed to participate in developing a new consolidated bulk fuel farm facility at Shishmaref: AVEC; the City of Shishmaref; Bering Strait School District; Nayokpuk General Store; and Shishmaref Native Store. Other entities in Shishmaref that store fuel, and are not participating include the Alaska National Guard, Lutheran Church, and the U.S. Fish and Wildlife Service.

In their 2002 conceptual design report for the bulk fuel tank farm upgrade in Shishmaref, AVEC further suggests that about 216,000 gallons of diesel fuel would be required for the power plant (Year One). Based on an estimated cost of \$5.00 per gallon for fuels storage tanks, the AVEC storage is estimated to cost \$1,080,000. The costs associated with the fuel storage tanks include an entirely new, complete turn-key, code-compliant facility. AVEC estimates that the total cost

for a new power generation plant is \$2,980,000, including the plant, fuel storage tank, piping, and initial fuel requirements.

Additional Bulk Fuel Storage

In addition to the above-described bulk fuel storage required by AVEC for the electric utility, the bulk fuel requirements for other commercial and institutional elements of community are as follow:

- Bering Straits Schools (54,200 gals.).
- City (87,200 gals.).
- Nayokpuk Trading Post (82,600 gals.).
- IRA Store (130,200 gals.).
- U.S. Fish & Wildlife (3,100 gals.).
- Lutheran Church (6,900 gals.).
- National Guard (9,700 gals.).
- City Water Department (8,200 gals.).

As mentioned above, the City of Shishmaref, Bering Strait School District, Nayokpuk General Store, and Shishmaref Native Store are participating in a joint effort to develop a new upgraded tank farm in Shishmaref. The new tank farm is expected to have the following bulk fuel capacities for these entities:

- The City of Shishmaref (44,200 gals.).
- Bering Straits Schools (60,000 gals.).
- Nayokpuk Trading Post (135,000 gals.).
- Shishmaref Native Store (186,000 gals.).

The additional capacity of the tank farm would be 425,200 gallons. The estimated cost of this portion of the new tank farm is \$2,126,000. If the other entities not participating in this new tank farm effort decide in the future to upgrade their tanks, a feasibility study and plans for these upgrades will be needed.

Roads

The only gravel road in the community is the 1.2-mile long single-lane (with turnouts) haul road to the landfill, constructed in 1998 by the AK DOT-PF. Based on an estimated cost of \$2,000,000 per mile for road construction (AK DOT-PF), the road is estimated to cost \$2,400,000.

Airfield

The existing runway at Shishmaref was built in 1986 at a cost of approximately \$4,700,000. The runway is approximately 5,000 feet long and 70 feet wide. The runway section is a 2 to 5-foot embankment with geogrid, and contains no gravel. A storage building for snow removal equipment was constructed around 1994. The runway taxiway and apron, along with installation of some new fencing, were rehabilitated in 1996. To date, the total rehabilitation improvement cost is approximately \$2,070,000. The airport facilities have an estimated 5 to 8 years of service life remaining. At this time, future plans by AK DOT-PF for upgrading the airport include repaving and surface rehabilitation. The estimated cost of the upgrade is \$2,500,000.

Barge Landing Facility

There are adequate landing areas for supply barges to deliver goods along either of the channels on the west and east sides of Sarichef Island, as well as the eroding beach area just north of the Native Store. Members of the community have expressed the desire to have a more stable and reliable barge landing area developed for the village. If the community stays in the present location, the structural erosion control measures constructed along the northern shoreline may preclude the use of the existing barge landing area near the Native Store. This could mean that the community may have to develop a formal barge landing in an area not subject to erosion. If this happens, a plan for developing this facility and for acquiring necessary funding will be required (See the District's *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* for additional information).

Harbor and Boat Storage Facility

Boats are stored on the Shishmaref Lagoon during the summer and on land during the winter. It is assumed that if the community remains in the present location, no additional harbor or boat

storage facilities would be required in the foreseeable future. However, some members of the community have expressed the desire to have a marina and boat storage facility developed for the village. If the community decides to proceed with the development of this facility, a plan for development and for securing necessary funding will be required. (See the District's *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* for additional information).

Communication Facilities

The existing satellite communication link, cable TV, and telephone service facilities serving the community are adequate and have several years of useful life remaining. There are no plans for major upgrades or expansion of these facilities in the foreseeable future. However, it is anticipated that those upgrades needed to keep the equipment in step with communications industry technology would be undertaken as needed by the providers of these services.

Summer Camps

If the community remains in the present location, the numerous shore-side summer camp areas will continue to be used by members of the Shishmaref community for summer drying of subsistence foods; boat building, repair and maintenance; and a variety of other work activities.

2.4 Preliminary Capital Costs Associated with Proposed Erosion Control Measures

The preliminary capital costs associated with the erosion control measures being considered by the District are included in Table 2-1, below. Further discussion of these costs is provided in the *Hydrology and Hydraulics Appendix* of the *Shishmaref Erosion Protection, Relocation, and Collocation Study EIS* being prepared by the District.

2.5 Capital Requirements, Preliminary Costs, and Timeline for this Alternative

If the Shishmaref community stays in the present location on Sarichef Island, capital requirements in the near-term (1-5 years); intermediate-term (5-15 years); and long-term (beyond 15 years) are expected to meet some of the identified physical needs of the community. The

anticipated capital requirements and preliminary costs associated with this alternative in these three time periods are summarized in Table 2-1. More detailed preliminary costs associated with these capital requirements are presented in Appendix 1.

Capital requirements and costs associated with potential long-term (currently unplanned) physical community needs: (a) expanding or developing a solid waste landfill

Table 2-1: Summary of Capital Requirements and Preliminary Costs - Alternative A

Near Term (1-5 years)		
Physical Community Need	Capital Requirements	Preliminary Cost
Erosion Protection Measures	Sarichef Island erosion protection - Capital cost	\$4,234,480
Public/Community Buildings	Replace City Hall/Post Office, Fire/Rescue Station, and construct a new City Shop.	\$3,600,000
Water Supply and Treatment Facilities	Upgrade water catchment area and water treatment plant.	\$15,000,000
Sanitary Waste Collection and Treatment	Upgrade remaining homes with indoor plumbing and flush-haul system.	\$8,830,000
Electric Utility	Construct new power plant and bulk fuel tank farm.	\$2,980,000
Bulk Fuel Storage	Construct new fuel tank farm.	\$2,126,000
<i>Contingency (25%)</i>		\$9,192,620
TOTAL COST (1-5 years)		\$45,963,100
Intermediate Term (5-15 years)		
Physical Community Need	Capital Requirements	Preliminary Cost
Commercial and Industrial Buildings	Replace Native Store, Trading Post, and Washeteria.	\$4,620,000
Public/Community Buildings	Replace Health Clinic, Church, Community Hall and Friendship Center.	\$4,890,000
Water Supply and Treatment Facilities	Upgrade water storage system.	\$16,412,000
Sanitary Waste Collection and Treatment	Upgrade sewer lagoon system.	\$3,000,000
Roads	Upgrade landfill road.	\$2,400,000
Airfield	Repaving and Surface Rehabilitation.	\$2,500,000
<i>Contingency (25%)</i>		\$8,455,500
TOTAL COST (5-15 years)		\$42,277,500
Long Term (15 + years)		
Physical Community Need	Capital Requirements	Preliminary Cost
Commercial and Industrial Buildings	Replace Tannery.	\$1,500,000
Public/Community Buildings	Replace School.	\$15,360,000
<i>Contingency (25%)</i>		\$4,215,000
TOTAL COST (15 + years)		\$21,075,000
<i>Annual Erosion Protection O&M Cost*</i>		\$2,544,696

*Not Included in the Total Cost

2.6 Agencies Potentially Assisting in this Alternative

A preliminary inventory has been made of the agencies that could potentially assist in this alternative through a variety of means, including (a) funding, through programs, grants, and other opportunities; (b) planning, design, and construction support; and (c) relevant information and advice, based on experience gained from working with rural Alaska native communities. Table 2-2, below, presents a preliminary list of those agencies that may be able to offer assistance to Shishmaref in meeting some capital requirements identified for this alternative.

Table 2-2: Agencies Potentially Able to Assist with Capital Requirements in Alternative A

Capital Requirements	Agencies
Erosion Protection	U.S. Army Corps of Engineers (USACE); Natural Resources Conservation Service (NRCS); Department of Community and Economic Development (DCED).
Physical Area for Community	Shishmaref Native Corporation (SNC); Bering Straits Native Corporation (BSNC); U.S. Department of the Interior – Bureau of Indian Affairs (BIA).
Housing	Housing and Urban Development (HUD); Bering Straits Housing Authority (BSHA); Alaska Rural Cap; Alaska Housing Finance Corporation (AHFC); NW Inupiat Housing Authority (NIHA); Association of Village Council Presidents (AVCP); Kawerak.
Commercial and Industrial Buildings	DCED; Norton Sound Economic Development Council (NSED); U.S. Economic Development Administration (AEDA).
Public/Community Buildings	Kawerak; DCED; U.S. Department of Agriculture - Rural Development (USDA-RD); Norton Sound Health Corporation (NSHC); U.S. Public Health Service (USPHS); Indian Health Services (IHS); Bering Straits School District (BSSD).
Water Supply and Treatment Facilities	Alaska Native Tribal Health Consortium (ANTHC); Alaska Department of Environmental Conservation (ADEC); Environmental Protection Agency (EPA); USDA-RD; USPHS; IHS.
Sanitary Waste Collection and Treatment Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Solid Waste Collection and Disposal Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Electric Utility	Alaska Villages Electric Cooperative (AVEC); Denali Commission; AIDEA/Alaska Energy Authority (AEA).
Bulk Fuel Storage	AVEC; Denali Commission; AIDEA/AEA.
Roads	Alaska Department of Transportation and Public Facilities (AK DOT-PF); Kawerak; U.S. DOT; BIA.
Airfield	AK DOT-PF; Federal Aviation Administration (FAA).
Barge Landing Facility	USACE; AK DOT-PF.
Small Boat Harbor and Storage Facility	USACE.

3. ALTERNATIVE B - RELOCATING TO A NEW MAINLAND SITE

3.1 Introduction

In this alternative, the community of Shishmaref would relocate south across the saltwater lagoon to a new site on the mainland. There are a number of relocation sites on the mainland currently being considered by the community and the District. For the purposes of this study and report, the information provided by the Natural Resource Conservation Service (NRCS) for the Tin Creek site has been used as a basis for developing costs associated with this alternative.

The basic assumptions made in determining preliminary capital costs associated with this alternative included the following:

- The physical relocation of Shishmaref to a new mainland site would occur over a five-year period.
- Prior to this five-year relocation period, a period of up to five years would be required for the community and involved agencies to complete the necessary planning (with significant community involvement); prepare designs; coordinate with the array of relevant local, state, and Federal agencies; obtain necessary permits; secure the required real estate and easements; and establish a plan for funding the relocation through programs, grants, and other fiscal opportunities available for this effort.
- The costs developed for this alternative are associated to those actions anticipated during the five-year relocation period, or beyond (where appropriate). Costs of activities during the preceding five-year planning and design period associated with technical studies, planning, design, permitting, and coordination will be identified and developed by others.

- The costs developed for this alternative include a preliminary estimate of the decommissioning, closure, and clean up activities that may be required on Sarichef Island regarding the existing fuel tank farms, sewage lagoons, and landfill.

It is also important to note that this cost study addresses only the physical needs of the Shishmaref community, and that other community needs such as social, cultural, and economic, are being addressed by other studies.

The approach taken in developing preliminary capital costs associated with this alternative included the following:

- Gathering and compiling preliminary information from community officials (e.g., Tony Weyiouanna) and agencies involved in providing community infrastructure and facilities for Shishmaref (e.g., ANTHC, AK DOT-PF).
- Developing a preliminary “concept plan” for meeting the physical needs of the Shishmaref community (described previously in Section 1.6) at the new mainland site. The concept plan includes capital requirements and preliminary costs, and the anticipated sequence of actions that would likely occur during the five-year relocation period to the new mainland site, and in some cases, after the five-year relocation period.
- Identifying those agencies that would typically participate in the implementation of the concept plan.

The remainder of this section presents (a) a description of the concept plan for meeting physical community needs at the new mainland site, including the anticipated capital requirements, preliminary costs, and schedule associated with the concept plan; and (b) a list of those agencies that would typically provide funding and other assistance in implementing the concept plan.

3.2 Concept Plan

The concept plan developed for this alternative is primarily a compilation of specific plans for meeting each of the identified physical community needs at the new mainland site, taking into account reasonable phasing of infrastructure and basic services that allows time for the necessary funding to be acquired. The physical needs of the Shishmaref community described earlier in Section 1.6, and discussed in other parts of this report, constitute the “elements” of the concept plan.

Also included in the plan are the possible actions and costs associated with the decommissioning, closure, and potential clean up of the existing fuel tank farms, sewage lagoons, and landfill.

The specific plans for meeting the physical capital requirements of each of the concept plan elements are briefly discussed below. Included in these discussions are the preliminary costs associated with these capital requirements and the anticipated general time frame for implementation.

Physical Area for Community

It is anticipated that the new relocation site for the Shishmaref community would meet basic criteria desirable for development of the new community including (a) not in a flood or erosion hazard area; (b) adequate drainage, with a maximum of 10% slopes; (c) ground and soil conditions favorable to supporting infrastructure; (d) sufficient overall size to allow for community growth and expansion; (e) accessible by land, air and water; and (f) good access to subsistence areas.

For the purpose of identifying and developing preliminary costs associated with this alternative, it is assumed that the Shishmaref community would relocate to the Tin Creek site. In this area, Shishmaref would acquire approximately 100 acres of land to accommodate residential housing; community structures; roads; rights-of-way and easements; as well as room for growth expansion in the foreseeable future. The community would also acquire approximately 500 acres of land for other facilities including airport; sewage lagoons; solid waste landfill; and barge landing and

small boat harbor facilities. The estimated cost of the land area required for the new community is not known at this time because the cost of raw land on the mainland has not yet been determined.

It is anticipated that the actual land requirements of the new community would be determined during the five-year period preceding the five-year relocation period assumed for this study, during which time all required feasibility studies, community development plans, designs, and implementation planning would occur.

Homes and Personal Storage Buildings

According to the 2000 U.S. Census the average household size in Shishmaref was 3.96 persons. Relocating the community of Shishmaref with a population of 589 people to the new site at that same household size would require approximately 150 houses. Based on the July 2004 reconnaissance trip, it is estimated that 137 of the existing Shishmaref homes on Sarichef Island could be moved to the new site. Based on available information on the cost of moving each house across an ice road during the winter season (\$25,000 per house), the estimated cost to move the 137 homes from the existing community to the new site is \$3,425,000. It is anticipated that a suitable ice road could be constructed with a dozer within a few days and there would be minimal to no damage to the structures being moved.

Based on available information on general soil conditions at the new site, it is assumed that all of the houses would require new pile foundations, which are estimated to cost approximately \$25,000 per house, installed. From the site reconnaissance in July 2004, it is estimated that 36 of the 137 houses now have a triodetic frame or grade beam system, which would allow them to be directly placed on a new pile foundation. It is further assumed that the remaining 101 houses would require that a triodetic frame be attached prior to being placed on a new pile foundation. Installed triodetic frames are estimated to cost approximately \$30,000 per house. To provide the remaining 13 houses, it is assumed that an additional 13 new modular homes would be barged from Seattle or Anchorage and set on new pile foundations, at an estimated cost of \$300,000 per house. Therefore, the estimated combined cost for achieving the required 150 homes at the new site is \$13,780,000.

Most homeowners have a personal storage shed on their lots next to their homes. These existing storage sheds are mostly of wood-frame construction, and is therefore assumed that they would not be movable to the new site. Assuming that new 8 feet by 8 feet storage sheds of wood-frame construction would be constructed for each home at the new site, and based on a construction cost of a wood-framed shed of \$2,000, the estimated cost of providing the sheds is \$300,000.

Once the houses have been placed each house will need to be connected to the utility infrastructure. The estimated cost to connect each structure to the utilities is \$35,000. Therefore, the estimated total cost to connect all 150 houses is \$5,250,000.

Commercial and Industrial Buildings

The two existing commercial stores in Shishmaref (Native Store and Trading Post) are approximately 3,600 and 6,800 square feet in size, respectively. It is assumed that these two stores would not be movable; therefore two new stores of equal size would be constructed at the new site for the community. Based on a standard construction cost of \$300 per square foot for commercial building space in the area, the estimated cost of replacing these structures is \$3,120,000. It is assumed that the Washeteria is not movable and would be constructed at the new site for an estimated \$1,500,000.

It is assumed that the existing industrial building in Shishmaref (Tannery) would be movable to the new site. The estimated cost for moving the Tannery to the new site is \$240,000.

Public/Community and Storage Buildings

The existing community has the following major public and community buildings:

- Health Clinic
- School
- City Hall/Post Office
- Armory
- Fire/Rescue/City Shop Building
- Church
- Library

- Community Hall
- Friendship Center
- Storage Buildings

It is assumed that the community of Shishmaref would have needs at the new site for all of the existing public and community buildings. Based on the July 2004 site reconnaissance, it is anticipated that only the four existing schoolteacher houses and the two armory buildings would be movable to the new site, and that all other public/community structures would need to be new construction. Based on available information the estimated cost to move the schoolteacher houses from the existing community to the new site across an ice road during the winter season is \$25,000 per house. It is assumed that these houses would require new pile foundations, estimated to cost approximately \$25,000 per house installed. It is also assumed that the houses would require triodetic frames prior to being placed on a new pile foundation, with an estimated to cost of \$30,000 per house. Therefore, the estimated total cost of moving these four schoolteacher houses is \$320,000.

The two movable armory buildings within the existing community have already been moved back from the eroding seaward shoreline and set on triodetic frames. Using available information, the anticipated cost to move these armory buildings from the existing community to the new site (across an ice road during the winter season) is \$25,000 per structure. It is assumed that these structures would require new pile foundations (at \$25,000 per building). Therefore, the estimated total cost of moving these two armory buildings is \$100,000.

The estimated construction costs (without contingencies) for replacing the other public and community buildings listed above in the new site are summarized in Table 3-1.

Table 3-1: Estimated Construction Costs (without contingencies) for Replacing Most of the Public and Community Buildings

Building	Approx. Size (sq.ft)	Cost Basis	Total Cost
Health Clinic	2,800	\$300 per sq.ft.	\$840,000
School	32,000	\$480 per sq.ft.	\$15,360,000
City Hall/Post Office	4,500	\$300 per sq.ft.	\$1,350,000
Fire/Rescue/City Shop	5,750	Split into a 2,500 sq.ft. Fire/Rescue building and	\$750,000
		5,000 sq.ft. shop \$300 per sq.ft.	\$1,500,000
Church	6,500	\$300 per sq.ft.	\$1,950,000
Library	2,000	\$300 per sq.ft.	\$600,000
Community Hall	4,500	\$300 per sq.ft.	\$1,350,000
Friendship Center	2,500	\$300 per sq.ft.	\$750,000
Storage Buildings	20 bldgs; 200 sq. ft. each	\$150 per sq.ft.	\$600,000
TOTAL			\$25,050,000

Fresh Water Supply, Treatment, and Distribution Facilities

The new community site would need new water supply, treatment, and distribution facilities developed at the new site. ANTHC has developed a preliminary cost estimate for providing new Fresh Water Supply, Treatment, and Distribution Facilities at the new site. The cost estimate is based on a 30-year design life, design population of 824, water consumption of 80 gallons per capita day and storage capacity equal to one month consumption. A new water source would be developed at an estimated cost of \$1,000,000. A raw water line at an estimated length of 3,500 linear feet would be installed at \$250 per foot for a total estimated cost of \$875,000. A new water treatment plant would be constructed at an estimated cost of \$3,000,000. New water storage tanks would be constructed to achieve the estimated 2,000,000-gallon volume capacity requirement. Based on an estimated cost of \$2.20 per gallon for water storage tanks, the water storage is estimated to cost \$4,400,000.

With adequate up-front planning, treated water could be supplied to residents in phases, to allow time (if appropriate) for necessary funding to become available. It is therefore assumed that the physical planning for the new Shishmaref community site would layout a grid of roads,

easements and rights-of way that would allow for the eventual construction of a piped water distribution loop to serve all residents and buildings. All planned rights-of-way and easements would become part of individual lot deeds.

As a first phase, the initial water distribution system for the community at the new mainland site would be the same as it is now in the existing community on Sarichef Island; a watering point at the washeteria/water treatment facility where community members can come and fill individual water containers. Later, as a subsequent phase (or phases) in a time frame to be determined by the community, with help from the ANTHC, a looped pipe distribution system could be installed along roadways and easements, to provide running water to the entire community. ANTHC has developed a preliminary cost estimate for providing a water distribution system at the new site. The new water distribution system would be constructed at an estimated cost of \$250 per linear foot. The total estimated length of the water distribution system of 16,000 linear feet would have a total estimated cost of \$4,000,000.

Sanitary Waste Collection and Treatment Facilities

The majority of homeowners in the existing Shishmaref community on Sarichef Island use honey buckets for sanitary waste collection, which are hauled individually or collectively by city staff to the sewage lagoon. However, since the early 1990s, the community has been in the process of implementing a flush and haul system throughout the village. About one-third of the homes have flush and haul systems.

ANTHC has developed a preliminary cost estimate for providing a flush-haul wastewater collection and treatment system at the new site. The new flush-haul wastewater collection element would include indoor plumbing and flush-haul tanks, an 8-acre waste water lagoon, and haul equipment. The estimated cost to install plumbing in the remaining houses is \$30,000 per house, and to install flush-haul tanks in the remaining houses is \$28,000 per house. The estimated cost to construct a new wastewater lagoon is \$3,000,000. The estimated cost of the operation equipment and support facilities is \$1,000,000.

As is the case with the water distribution system, the community would have the option of developing the sanitary waste collection system in phases, to allow flexibility with regard to

available funding. As an initial phase, a flush and haul system would be installed for every homeowner and building (as appropriate). Later, at a time to be determined by the community with help from the ANTHC, the flush and haul system could be (fairly readily) replaced with a piped collection system, which is also installed along roadways and easements and connected to the wastewater treatment lagoons. ANTHC has developed a preliminary cost estimate for providing the piped wastewater collection system for the new site. This piped wastewater collection system would include collection piping, a collection/pump station, and operation equipment and support facilities. The collection piping would be constructed at an estimated cost of \$300 per linear foot, for a total estimated cost of \$4,800,000. The estimated cost of the collection/pump station is \$1,500,000. The estimated cost of the operation equipment and support facilities is \$1,500,000.

Solid Waste Collection and Disposal

A 15-acre permitted solid waste landfill would be developed for the mainland site in an appropriate location that would meet all applicable regulations. For purposes of this cost estimate it is assumed that a lined landfill will be required and would be at least 10,000 feet from the airport runway per FAA standards. ANTHC has developed a preliminary cost estimate for providing a new Solid Waste Landfill and Recycle Center at the new site. The cost estimate is based on a 40-year design life, design population of 824, solid waste generation of 7 lbs per capita day, and 800 pounds per cubic foot compacted garbage density. A new collection/recycle center would be developed in-town at an estimated cost of \$1,000,000. The estimated cost of the solid waste transport equipment is \$750,000. A new solid waste landfill disposal facility and maintenance equipment is estimated to cost \$1,950,000.

Electric Utility

A new power generating plant and distribution system would be constructed at the new mainland community site. It is assumed that the plant would be located close to the water treatment/storage facilities, so that the waste heat from the plant could be used to help keep the water system from freezing. Also, AVEC suggests the generating plant be located within about 200 feet from the bulk fuel storage, to reduce the length of connection piping. It is assumed, therefore, that the power plant and tank farm would be constructed near the community, which would require about 1.5 miles of fuel pipeline from the barge landing area. However, it is

acknowledged that the most feasible location for the power generating plant will be determined during the community planning and design period preceding the five-year relocation period.

AVEC estimates that a new power generating plant would cost \$1,900,000. AVEC also estimates that annual diesel fuel requirements would be approximately 270 gallons per capita and about 30,000 gallons for each of the public, commercial, and industrial buildings. Also, fuel delivery would require development of a barge landing facility.

In their 2002 conceptual design report for a bulk fuel tank farm upgrade in Shishmaref, AVEC further suggests that about 216,000 gallons of diesel fuel would be required at start-up of the power plant (Year One). Based on an estimated cost of \$5.00 per gallon for fuels storage tanks, the AVEC storage is estimated to cost \$1,080,000. AVEC estimates that the total cost for a new power generation plant is \$3,780,000, including the plant, fuel storage tank, piping, and start-up fuel requirements.

In addition, it is assumed that 8.5 miles of electric utility distribution lines would be required for the new community site. Based on a cost provided by AVEC of \$200,000 per mile, this service would cost an estimated \$1,700,000.

AVEC suggests that future development of supplemental power from wind energy could significantly reduce the annual cost of diesel fuel. AVEC's preliminary suggestion includes two turbines, one 66-kw and one 100-kw, at a total estimated cost of \$1,000,000. This possibility should be further explored by the city and AVEC for possible implementation following the relocation period.

Additional Bulk Fuel Storage

The existing community of Shishmaref currently has approximately 382,100 gallons of additional bulk fuel storage. Based on the 2002 AVEC report, it is assumed that the new site would require approximately 425,000 gallons of additional bulk fuel storage. Based on the fuel storage tank farm cost used by AVEC of \$5.00 per gallon, the estimated cost of the additional bulk fuel storage for the new site is \$2,126,000.

Roads

It is anticipated that the new community site would require approximately 11 miles of new gravel roadways, based on reasonable separation requirements between major facilities such as the airfield, landfill, and sewage lagoon. The 11 miles of anticipated roadways would include approximately 4 miles of internal roads in the community, as well as the following service roads:

- A 2-mile road to the barge landing and boat storage area (including a bridge over Tin Creek).
- A 2-mile road to the airport.
- A 0.5-mile road to the water source.
- A 1.5-mile road to the landfill.
- A 1.0-mile road to the sewage lagoon.

It is assumed that the gravel required for the internal community roads and for these service roads would be barged in from Nome or other sources.

Based on information provided by AK DOT-PF, the anticipated cost to construct new roads that would be appropriate for the area is approximately \$2,000,000 per mile. In addition, the estimated cost of the bridge over Tin Creek is \$1,500,000.

Airfield

A new airport facility (runways and associated buildings) would be developed at the new mainland site. AK DOT-PF has developed a preliminary cost estimate for providing a new airfield at the new site. The cost estimate is based on a 100-foot by 5,000-foot runway, with up to a 300-acre area required, and assuming up to 1,000,000 cubic yards of gravel are used.

Barge Landing Facility

It is assumed that a new barge landing area on the saltwater lagoon would be constructed approximately 1.5 miles from the new community site. The lagoon is shallow and would require a dredged channel to allow barge access to the shore. It is assumed that the channel would need

annual maintenance. The estimated initial capital cost of the channel is \$3,695,920. The estimated annual maintenance cost is \$395,176.

Harbor and Boat Storage Facility

It is assumed that for the new mainland site the community would store their small boats in the saltwater inlet during the summer and place them on high ground during the winter, similar to the existing community site on Sarichef Island. Therefore, no costs have been attributed to these facilities.

Communication Facilities

The new mainland site would require new communication capabilities including in-state and long distance phone service, internet service, TV stations, radio stations, cable TV, and teleconferencing facilities. It is estimated that 26,500 linear feet of communication utility service would be required to service the new mainland site. The estimated cost from TelAlaska to relocate the telecommunication facilities, including service lines, is \$1,142,000. The remaining communication utilities are estimated at \$24 per linear foot to install, for a cost of \$636,000.

Summer Camps

It is anticipated that the summer camps on Sarichef Island would continue to be used and that additional summer camps at the new mainland site would be developed if required. Therefore, no costs have been attributed to these facilities. For additional information on the use of summer camps, see the *Cultural Resources Impact Assessment* being prepared for the *Shishmaref Erosion Protection, Relocation, and Collocation EIS* being prepared by the District.

Decommissioning and Closure

At some time following the anticipated five-year relocation period, the existing fuel tank farms, sewage lagoons, and landfill will likely need to be decommissioned, closed, and cleaned up, as necessary. As a first step in this post-relocation activity, a site characterization and risk assessment study and closure/clean up plan would be completed for the above facilities. The estimated cost for this study and plan is \$300,000. After this study and plan, the other activities

and estimated costs that would likely be associated with the applicable decommissioning, closure, and clean up of these facilities are discussed below.

Fuel Tank Farm: Decommissioning the 32 existing fuel tanks would involve draining and drying, cutting (to render unusable), and posting signage on each tank. Assuming a cost of \$2,500 per tank for these activities, the estimated cost of decommissioning the tanks is \$80,000. Because many of the existing tanks have small leaks, it is anticipated that soil remediation would be required following decommissioning. The most likely method for remediation would involve on-site treatment of soil using specialized heating equipment that could be barged in. As a worst case, it is estimated that up to 190,000 cubic feet of soil would need remediation. Based on an assumed weight of 130 pounds per cubic foot of soil, this equates to approximately 12,350 tons of soil. At an assumed cost of \$200 per ton for soil remediation, and an assumed mobilization/demobilization cost of \$50,000 for special equipment, the estimated cost of soil remediation is \$2,820,000.

Sewage Lagoons: The existing sewage lagoon at the school is approximately 200 feet by 200 feet, and the existing sewage lagoon at the Washeteria is approximately 200 feet by 350 feet. Site closure activities may involve treating the water in the lagoons with a flocculent, disinfection, and applying the treated water to land or discharging it to the sea. The residual solids in the lagoons could be tested for contaminants, then pumped out onto temporary drying beds, and if warranted, the residual cake could be burned in equipment that could be barged in. The lagoons would then likely be filled and graded using local material. The estimated total cost for clean up of the two lagoons, assuming the above activities (including equipment mobilization/demobilization), is \$600,000.

Solid Waste Landfill: The current landfill comprises a honey bucket cell approximately 110 feet by 170 feet, and a solid waste cell that is approximately 200 feet by 300 feet. Typical site closure activities for similar landfills include characterizing and removing hazardous materials, filling, and grading. Assuming the above activities, and the use of local material for fill, the estimated site closure and clean up cost for the current landfill is \$400,000.

A previous 100-foot by 100-foot landfill, located just north of the current landfill, was closed (buried and graded) in about 1986. No further site closure and clean up activities are anticipated for this closed landfill.

3.3 Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative B

The anticipated capital requirements and preliminary costs (including contingencies) associated with the above concept plan elements, allocated in a logical sequence over the five-year relocation period, and beyond (as appropriate), are summarized below in Table 3-2. More detailed preliminary costs associated with these capital requirements are presented in Appendix 1.

Table 3-2: Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative B

Year 1		
Physical Community Need	Capital Requirements	Preliminary Cost
Erosion Protection Measures	Sarichef Island erosion protection - Capital cost	\$3,356,480
Physical Area for Community*	Real estate.	Unknown
Barge Landing Facility	Construct barge landing - Capital cost plus 1 years of maintenance	\$3,695,920
Roads	Construct road system phase I (25%) and bridge.	\$7,000,000
Sanitary Waste Collection and Treatment	Construct sewage lagoon.	\$3,500,000
Solid Waste Collection and Disposal	Construct solid waste landfill	\$3,700,000
Public/Community Buildings	Construct the community hall building as a multipurpose complex.	\$1,385,000
<i>Contingency (25%)</i>		<i>\$5,659,350</i>
TOTAL COST (Year 1)		\$28,296,750
Year 2		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase II (25%).	\$5,500,000
Bulk Fuel Storage	Construct fuel tank farm.	\$2,126,000
Electric Utility	Construct power generation facilities phase I (50%).	\$2,740,000
Water Supply and Treatment Facilities	Develop water source and construct water treatment plant.	\$4,875,000
<i>Contingency (25%)</i>		<i>\$3,810,250</i>
TOTAL COST (Year 2)		\$19,051,250

Table 3-2 (cont.): Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative B

Year 3		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase III (25%).	\$5,500,000
Electric Utility	Construct power generation facilities phase II (50%).	\$2,740,000
Water Supply and Treatment Facilities	Construct water storage tanks.	\$4,400,000
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase I (20%).	\$3,866,000
Commercial and Industrial Buildings	Construct Native Store, Trading Post and Washeteria.	\$4,725,000
Public/Community Buildings	Construct Health Clinic	\$875,000
<i>Contingency (25%)</i>		<i>\$5,526,500</i>
TOTAL COST (Year 3)		\$27,632,500
Year 4		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase IV (25%).	\$5,500,000
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase II (60%).	\$11,598,000
Public/Community Buildings	Construct City Hall/Post Office, Fire/Rescue Station and City Shop.	\$3,705,000
Communication Facilities	Construct communication facilities.	\$1,778,000
<i>Contingency (25%)</i>		<i>\$5,645,250</i>
TOTAL COST (Year 4)		\$28,226,250

Table 3-2 (cont.): Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative B

Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase III (20%).	\$3,866,000
Commercial and Industrial Buildings	Construct Tannery.	\$275,000
Public/Community Buildings	Construct Church, Library, storage and Friendship Center and relocate Armory.	\$4,175,000
Sanitary Waste Collection and Treatment	Install indoor plumbing and flush and haul systems to unequipped homes.	\$7,900,000
<i>Contingency (25%)</i>		\$4,054,000
TOTAL COST (Year 5)		\$20,270,000
Beyond Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Airfield	Construct airport facilities.	\$25,000,000
Public/Community Buildings	Construct school and teacher housing	\$15,855,000
Decommissioning and Closure	Decommissioning, closure, and clean up activities	\$3,820,000
<i>Contingency (25%)</i>		\$11,168,750
TOTAL COST (Beyond Year 5)		\$55,843,750
TOTAL COST (Relocating to a New Mainland Site)		\$179,320,500
<i>Annual Barge Facilities O&M Cost*</i>		\$493,970

*Not Included in the Total Cost

Incremental Upgrades		
Physical Community Need	Capital Requirements	Preliminary Cost
Water Supply and Treatment Facilities	Water distribution piping throughout community.	\$4,000,000
Sanitary Waste Collection and Treatment	Sewer collection piping throughout community.	\$7,800,000
<i>Contingency (25%)</i>		\$2,950,000
TOTAL COST (Incremental Upgrades)		\$14,750,000

3.4 Agencies Potentially Assisting in This Alternative

A preliminary inventory has been made of the agencies that could potentially assist in this alternative through a variety of means, including (a) funding, through programs, grants, and other opportunities; (b) planning, design, and construction support; and (c) relevant information and advice, based on experience gained from working with rural Alaska native communities. Table 3-3, below, presents a preliminary list of those agencies that may be able to offer assistance to Shishmaref in meeting some capital requirements identified for this alternative.

Table 3-3: Agencies Potentially Able to Assist with Capital Requirements in Alternative B

Capital Requirements	Agencies
Physical Area for Community	Shishmaref Native Corporation (SNC); Bering Straits Native Corporation (BSNC); U.S. Department of the Interior – Bureau of Indian Affairs (BIA).
Housing	Housing and Urban Development (HUD); Bering Straits Housing Authority (BSHA); Alaska Rural Cap; Alaska Housing Finance Corporation (AHFC); NW Inupiat Housing Authority (NIHA); Association of Village Council Presidents (AVCP); Kawerak.
Commercial and Industrial Buildings	DCED; Norton Sound Economic Development Council (NSEDC); U.S. Economic Development Administration (AEDA).
Public/Community Buildings	Kawerak; DCED; U.S. Department of Agriculture - Rural Development (USDA-RD); Norton Sound Health Corporation (NSHC); U.S. Public Health Service (USPHS); Indian Health Services (IHS); Bering Straits School District (BSSD).
Water Supply and Treatment Facilities	Alaska Native Tribal Health Consortium (ANTHC); Alaska Department of Environmental Conservation (ADEC); Environmental Protection Agency (EPA); USDA-RD; USPHS; IHS.
Sanitary Waste Collection and Treatment Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Solid Waste Collection and Disposal Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Electric Utility	Alaska Villages Electric Cooperative (AVEC); Denali Commission; AIDEA/Alaska Energy Authority (AEA).
Bulk Fuel Storage	AVEC; Denali Commission; AIDEA/AEA.
Roads	Alaska Department of Transportation and Public Facilities (AK DOT-PF); Kawerak; U.S. DOT; BIA.
Airfield	AK DOT-PF; Federal Aviation Administration (FAA).
Barge Landing Facility	USACE; AK DOT-PF.
Small Boat Harbor and Storage Facility	USACE.

4. ALTERNATIVE C – COLLOCATING TO NOME

4.1 Introduction

In this alternative, the community of Shishmaref would move (collocate) to the City of Nome, located about 120 miles to the south, on the south shore of the Seward Peninsula.

The basic assumptions made in determining preliminary capital costs associated with this alternative included the following:

- The physical relocation of Shishmaref to the City of Nome would occur over a five-year period.
- Prior to this five-year relocation period, a period of up to five years might be required for the Shishmaref community, the City of Nome, and involved agencies to complete the necessary planning (with significant community involvement); prepare designs; coordinate with Nome and the array of relevant local, state, and Federal agencies; obtain necessary permits; secure the required real estate and easements; and establish a plan for funding the collocation through programs, grants, and other fiscal opportunities available for this effort.
- The costs developed for this alternative are for those actions anticipated during the five-year collocation period, or beyond. Costs of activities during the preceding five-year planning and design period associated with technical studies, planning, design, permitting, and coordination will be identified and developed by others.
- The costs developed for this alternative include a preliminary estimate of the decommissioning, closure, and clean up activities that may be required on Sarichef Island regarding the existing fuel tank farms, sewage lagoons, and landfill.

It is also important to note that this cost study addresses only the physical needs of the Shishmaref community, and that other community needs such as social, cultural, and economic, are being addressed by other studies.

The approach taken in developing preliminary capital costs associated with this alternative included the following:

- Gathering and compiling preliminary information from (a) the City of Nome and the Nome Joint Utility System staff; (b) agencies involved in providing and supporting development of community infrastructure and facilities in Nome; and (c) agencies, developers, trades, contractors, realtors, and others knowledgeable about land development, real estate, housing, public, commercial, and industrial structures in the Nome area.
- Developing a preliminary “concept plan” for meeting the physical needs of the Shishmaref community (described previously in Section 1.6) at Nome, that includes capital requirements and preliminary costs, and the anticipated sequence of actions that would likely occur during the five-year collocation period to the Nome site, and at some time after that period.
- Identifying those agencies that would typically participate in the implementation of the concept plan.

The remainder of this section presents: (a) a description of the concept plan for meeting physical community needs at a Nome site, including the anticipated capital requirements, and preliminary costs and schedule associated with the concept plan; and (b) a list of those agencies that would typically provide funding and other assistance in implementing the concept plan.

4.2 Concept Plan

The concept plan developed for this alternative is primarily a compilation of specific plans for meeting each of the identified physical community needs at the new Nome site, taking into account the city's current and planned infrastructure (including capacities) to accommodate both present and projected population levels and reasonable phasing of infrastructure and basic services that allows time for the necessary funding to be acquired. The physical needs of the Shishmaref community described earlier in Section 1.6, and discussed in other parts of this report, constitute the "elements" of the concept plan.

Also included in the plan are the possible actions and costs associated with the decommissioning, closure, and potential clean up of the existing fuel tank farms, sewage lagoons, and landfill.

The specific plans for meeting the physical requirements of each of the concept plan elements are briefly discussed below. Included in these discussions are the preliminary costs associated with these capital requirements, and the anticipated general time frame for implementation.

Physical Area for Community

The City of Nome has a current population of approximately 3,448 (2003 Demographer's estimate) and is estimated to be increasing at a rate of approximately one percent per year. The growth in Nome in recent years has occurred in three main areas: (a) the west side of town near the airport; (b) north of town in a subdivision called Icy View; and (c) the northeast side of town, which is the area of the planned hospital campus, institutional and private housing, and new National Guard Armory. Current infrastructure project planning and designs in the city take into account development trends in these areas.

For this study it is assumed that the community of Shishmaref would be located within 3 miles of the city center, possibly in one of the above-mentioned locations, in order to be efficiently connected to the city infrastructure. Due to the historical mining activity and claims filed, there is a considerable amount of private land in the Nome area. The value of raw undeveloped land in Nome is approximately \$1,000 per acre. It is anticipated that the community of Shishmaref would require about 100 acres of land to accommodate the residential housing; community

structures; internal roads; and required rights-of-way and easements. Based on a \$1,000 per acre cost of raw land, the estimated real estate cost is \$100,000.

It is also assumed that all required feasibility studies, community development plans, designs, and implementation planning would occur during the five-year period preceding the five-year collocation period identified for this study.

Homes and Personal Storage Buildings

According to the 2000 U.S. Census the average household size in Shishmaref was 3.96 persons. Collocating the community of Shishmaref with a population of 589 people to Nome at that same household size would require approximately 150 houses.

Many members of the Shishmaref community have expressed that it would be their preference, and more practical, to move their homes to the relocation site rather than construct new homes. Based on the July 2004 reconnaissance, and discussions with members of the community, it is estimated that 137 homes on Sarichef Island could be moved to Nome.

The estimated cost to move houses from the existing community to Nome via barge during the summer season is \$82,000 per house. It is anticipated that there would be minimal to no damage to the structures being moved. Due to the general soil conditions at Nome it is assumed that all of the houses would require new pile foundations, which are estimated to cost approximately \$25,000 per house installed.

Also, based on the site reconnaissance in July 2004, it was determined that 36 of the 137 houses have a triodetic frame or grade beam system allowing them to be placed on a new pile foundation. It is assumed that the remaining 101 houses would require a triodetic frame prior to being placed on a new pile foundation. Installed triodetic frames are estimated to cost \$30,000 per house.

To provide the 150 houses required, it is assumed that an additional 13 new modular homes would be transported from Seattle or Anchorage and set on new pile foundations at an estimated

cost of \$280,000 per house. Based on the above assumptions, the estimated cost to provide the 150 houses in Nome for the Shishmaref community is \$21,300,000.

Most homeowners have a personal storage shed next to their homes. The existing storage sheds are mostly of wood-frame construction, and would likely not be movable to Nome. It is assumed that new 8 feet by 8 feet storage sheds of wood-frame construction would be constructed for each home at the collocation site. Based on a construction cost of \$2,000 per shed, the estimated cost of providing the sheds is \$300,000.

Once the houses have been placed and the mainline utilities constructed, each house will need to be connected to the utility infrastructure. The estimated cost to connect each structure to the utilities is \$30,000. Therefore, the estimated total cost to connect all 150 houses is \$4,500,000.

Commercial and Industrial Buildings

It is expected that during the five-year planning period preceding the collocation, the practicality and feasibility of re-establishing the Native Store, Trading Post, and Tannery in some form in Nome would be determined. For the purpose of identifying preliminary capital costs associated with this alternative, it has been assumed that the Tannery building would be moved to Nome.

Public/Community and Storage Buildings

Nome is currently planning and designing a new 38-acre hospital complex with 15 beds. It is assumed that this modern health facility would be adequate to handle the health and related social needs of the Shishmaref community.

The school system in Nome would need to be expanded by approximately 32,000 square feet of newly constructed classroom space. It is assumed that the four existing schoolteacher houses at the existing Shishmaref community site on Sarichef Island would be moved to Nome to handle additional teacher requirements of the collocated Shishmaref community. Based on the standard construction costs for school building expansion in Nome of approximately \$375 per square foot, the estimated cost for the additional classroom space is \$12,000,000. The estimated total cost for moving the four schoolteacher houses (including triodetic frames and pile foundations) would be \$548,000.

It is assumed that the equivalent of most of the commercial and community structures that are presently part of the existing Shishmaref community on Sarichef Island such as Trading Post and Native Store, City Hall, Post Office, Armory, Fire/Rescue Station, City Shop, exist in Nome, and will have adequate capacity (or expansion capability) to handle the collocating Shishmaref community. Therefore, the remaining community structures that would be constructed in Nome for the Shishmaref community are assumed to include the Church, Library, Community Hall, and Friendship Center. Based on a standard construction cost in Nome for commercial and community structures of approximately \$250 per square foot, the estimated cost of these buildings is \$3,875,000.

Once the buildings have been placed and the mainline utilities constructed, each building will need to be connected to the utility infrastructure. The estimated cost to connect each structure to the utilities is \$30,000. The estimated total cost to connect the Public/Community buildings is \$270,000.

It is assumed that the new Shishmaref community site in Nome would need approximately 20 community storage facilities. It is anticipated that these storage facilities would be 10 feet wide by 20 feet long, and be of wood-frame construction. Based on a standard construction cost of \$100 per square foot, the estimated cost of these storage facilities is \$400,000.

Fresh Water Supply, Treatment, and Distribution Facilities

Nome's water system has a ground water source comprised of three wells with a combined capacity of about 750 gpm. The water is treated with fluoride and is chlorinated as it is piped from the source into two 1 million gallon water storage tanks. The water is heated using waste heat from the power plant and all water mains and connections are continuously circulated. Currently, there are approximately 1,700 residential water connections, with about 1,900 total number of connections. Water (and sewer) lines have been upgraded from utilidors to direct bury throughout the city.

Based on present capacities, it is assumed that the existing water supply, treatment, and storage facilities would be adequate to handle the water needs of the Shishmaref community without any

upgrades. However, a new looped water main pipeline would need to be constructed throughout the new community to connect the residential and community structures to the City water system. It is estimated that 17,500 linear feet of mainline water would be required to service the new Shishmaref community. Based on an estimated cost of approximately \$335 per linear foot for water main piping (including, connections, over excavation and export, import fill, 8x15 Arctic pipe, gate valves, and fire hydrants), the expected cost for this utility would be \$5,862,500.

Sanitary Waste Collection and Treatment Facilities

The sewer lines throughout Nome have been upgraded from utilidors to direct bury. The city currently has a two-cell sewage lagoon system equipped with a blower house and aeration lines. Currently the sewage treatment system is permitted for 770,000 gallon per day, with actual treatment at about 400,000 gallon per day. The effluent from the lagoons is carried in a pipe that travels approximately 2,700 feet off shore where it discharges.

It is assumed that 17,500 linear feet of mainline sewer, and a new pump station would be required to service the new subdivision. Based on a standard cost of \$435 per linear foot (including connections, over excavation and export, import fill, Arctic sewer pipe, manholes, and cleanouts), the estimated cost of these facilities is \$7,612,500.

As mentioned previously, 47 of the 137 homes that would be moved to Nome from Shishmaref have flush and haul systems. Therefore, it is assumed that these 47 homes would be converted to city sewer hook-ups, and the remaining 90 houses would have indoor plumbing installed and be hooked up to the collection system. Based on a cost of installing indoor plumbing of approximately \$30,000 per house, the estimated cost for these services is \$2,700,000.

It is also assumed that at some point after the five-year relocation period it would become necessary for an additional treatment cell to the sewage lagoon system to adequately handle the sanitary wastes from the Shishmaref community and the anticipated growth of Nome. The estimated cost of adding this third cell is \$750,000.

Solid Waste Collection and Disposal

At present, the City of Nome collects solid waste weekly from residential neighborhoods and transports it to the fairly new city solid waste landfill located on Beam Road. It is anticipated that the existing landfill has adequate capacity for a number of years to handle additional solid waste that would be generated by the Shishmaref community, but that expansion would be likely in the future. It is therefore assumed that \$250,000 of the cost of future expansion of the landfill would be attributable to the new Shishmaref community.

Electric Utility

The existing power plant in the City of Nome has a capacity of 10.9 MW. The actual electricity power demand is about 3.4 MW, with peaks approaching 5.0 MW. Currently, excess heat from the generators is used to heat the water distribution system. The existing bulk fuel storage for power generation is 3.4 million gallons.

The city is in the process of planning and designing a new electrical power generating system that would have a capacity of 15 MW. The new system will be able to provide heat to structures within close proximity.

It is anticipated that the new generating system would have adequate capacity to handle the increased population from Shishmaref. However, it is expected that a new one-million-gallon fuel tank would be needed for additional fuel storage requirements. Based on the standard fuel tank cost of \$1.25 per gallon, the estimated cost of the new bulk fuel tank is approximately \$1,250,000. Also, it is anticipated that 17,500 linear feet of overhead power lines and poles would be required to service the new Shishmaref community. Based on an assumed cost of overhead power in Nome of approximately \$85,000 per mile, the estimated cost of the new distribution lines is \$282,200.

Additional Bulk Fuel Storage

For the purpose of identifying preliminary capital costs associated with this alternative, it has been assumed in this study that fuel needs of the new Shishmaref community would be met by existing bulk fuel supplies in Nome.

Roads

Nome is a regional center of transportation for many surrounding villages. There are several local roads that provide access to surrounding villages including Teller, Council, and Kougarok River. Most of the city streets within Nome are paved. Major transportation improvements would not be required to handle the Shishmaref community. However, it is estimated that 17,500 linear feet of internal roadway would be required for the new Shishmaref subdivision. Based on a standard development cost for new local roadways in the Nome area of approximately \$1,500,000 per mile, the estimated cost of the internal roadway improvements is \$4,980,000.

Airfield

The Nome airport has two paved runways of sufficient length to handle jet traffic. There are daily scheduled jet flights linking Nome to Anchorage, Kotzebue, and Fairbanks as well as scheduled and chartered non-jet aircraft and helicopter services to villages. It is anticipated that all air travel needs of the Shishmaref community would be accommodated with the existing airport and air services.

Barge Landing Facility

The Nome port and berthing infrastructure can accommodate vessels with up to an 18-foot draft. The port also offers lightering services that distribute cargo to the surrounding villages.

Harbor and Boat Storage Facility

Nome has developed a seasonal floating dock and boat launch facility in the harbor. It is anticipated that the small boat owners of the Shishmaref community would have the option of either keeping their boats at the marina dock at the harbor, or at their homes or a boat yard within the community. The boats would then be transported and launched at the harbor for ocean going activities.

Communication Facilities

The City of Nome has full communication capabilities including, in-state and long distance phone service, internet service, TV stations, radio stations, cable TV, and teleconferencing facilities. It is estimated that 17,500 linear feet of communication utility service would be

required to service the new Shishmaref community subdivision. At an assumed linear foot cost of \$40 for these combined communication utility services, the estimated service connection cost for the new community is \$ \$700,000.

Summer Camps

It is anticipated that during the five-year planning period preceding the five-year collocation period, the need for and location of summer camps to support the subsistence activities of the collocated Shishmaref community would be determined. For the purposes of determining the preliminary capital costs associated with this alternative, no capital costs have been identified for this element.

Decommissioning and Closure

At some time following the anticipated five-year relocation period, the existing fuel tank farms, sewage lagoons, and landfill will likely need to be decommissioned, closed, and cleaned up, as necessary. As a first step in this post-relocation activity, a site characterization and risk assessment study and closure/clean up plan would be completed for the above facilities. The estimated cost for this study and plan is \$300,000. After this study and plan, the other activities and estimated costs that would likely be associated with the applicable decommissioning, closure, and clean up of these facilities are discussed below.

Fuel Tank Farm: Decommissioning the 32 existing fuel tanks would involve draining and drying, cutting (to render unusable), and posting signage on each tank. Assuming a cost of \$2,500 per tank for these activities, the estimated cost of decommissioning the tanks is \$80,000. Because many of the existing tanks have small leaks, it is anticipated that soil remediation would be required following decommissioning. The most likely method for remediation would involve on-site treatment of soil using specialized heating equipment that could be barged in. As a worst case, it is estimated that up to 190,000 cubic feet of soil would need remediation. Based on an assumed weight of 130 pounds per cubic foot of soil, this equates to approximately 12,350 tons of soil. At an assumed cost of \$200 per ton for soil remediation, and an assumed mobilization/demobilization cost of \$50,000 for special equipment, the estimated cost of soil remediation is \$2,820,000.

Sewage Lagoons: The existing sewage lagoon at the school is approximately 200 feet by 200 feet, and the existing sewage lagoon at the Washeteria is approximately 200 feet by 350 feet. Site closure activities may involve treating the water in the lagoons with a flocculent, disinfection, and applying the treated water to land or discharging it to the sea. The residual solids in the lagoons could be tested for contaminants, then pumped out onto temporary drying beds, and if warranted, the residual cake could be burned in equipment that could be barged in. The lagoons would then likely be filled and graded using local material. The estimated total cost for clean up of the two lagoons, assuming the above activities (including equipment mobilization/demobilization), is \$600,000.

Solid Waste Landfill: The current landfill comprises a honey bucket cell approximately 110 feet by 170 feet, and a solid waste cell that is approximately 200 feet by 300 feet. Typical site closure activities for similar landfills include characterizing and removing hazardous materials, filling, and grading. Assuming the above activities, and the use of local material for fill, the estimated site closure and clean up cost for the current landfill is \$400,000.

A previous 100-foot by 100-foot landfill, located just north of the current landfill, was closed (buried and graded) in about 1986. No further site closure and clean up activities are anticipated for this closed landfill.

4.3 Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative C

The anticipated capital requirements and preliminary costs (including contingencies) associated with the above concept plan elements, allocated in a logical sequence over the five-year relocation period, and beyond (as appropriate), are summarized below in Table 4-1. More detailed preliminary costs associated with these capital requirements are presented in Appendix 1.

Table 4-1: Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative C

Year 1		
Physical Community Need	Capital Requirements	Preliminary Cost
Erosion Protection Measures	Sarichef Island erosion protection - Capital cost	\$3,356,480
Physical Area for Community	Real estate.	\$100,000
Water Supply and Treatment Facilities	Water distribution piping throughout community.	\$5,862,500
Sanitary Waste Collection and Treatment	Sewer collection piping throughout community.	\$7,612,500
Roads	Construct road system phase I (20%).	\$996,000
<i>Contingency (25%)</i>		\$4,481,870
TOTAL COST (Year 1)		\$22,409,350
Year 2		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase II (80%).	\$3,984,000
Public/Community Buildings	Construct Community Hall.	\$1,155,000
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase I (20%).	\$5,225,800
Electric Utility	Construct power distribution facilities phase I (60%).	\$169,320
<i>Contingency (25%)</i>		\$2,633,530
TOTAL COST (Year 2)		\$13,167,650
Year 3		
Physical Community Need	Capital Requirements	Preliminary Cost
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase II (60%).	\$15,677,400
Electric Utility	Construct power distribution facilities phase I (40%).	\$112,880
Communication Facilities	Construct communication distribution facilities.	\$700,000
<i>Contingency (25%)</i>		\$4,122,570
TOTAL COST (Year 3)		\$20,612,850

Table 4-1 (cont.): Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative C

Year 4		
Physical Community Need	Capital Requirements	Preliminary Cost
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase III (20%).	\$5,225,800
Commercial and Industrial Buildings	Construct Tannery.	\$441,000
Public/Community Buildings	Construct Church, Library, Friendship Center and storage.	\$3,240,000
Sanitary Waste Collection and Treatment	Install indoor plumbing to unequipped homes.	\$2,700,000
Bulk Fuel Storage	Construct bulk fuel tank.	\$1,290,000
<i>Contingency (25%)</i>		\$3,224,200
TOTAL COST (Year 4)		\$16,121,000
Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Public/Community Buildings	Expand School and relocate school teacher houses.	\$11,898,000
Sanitary Waste Collection and Treatment	Expand sewage lagoon.	\$750,000
Solid Waste Collection and Disposal	Expand solid waste landfill	\$250,000
<i>Contingency (25%)</i>		\$3,224,500
TOTAL COST (Year 5)		\$16,122,500
Beyond Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Decommissioning and Closure	Decommissioning, closure, and clean up activities	\$3,820,000
<i>Contingency (25%)</i>		\$955,000
TOTAL COST (Beyond Year 5)		\$4,775,000
TOTAL COST (Collocating to Nome)		\$93,208,350

4.4 Agencies Potentially Assisting in This Alternative

A preliminary inventory has been made of the agencies that could potentially assist in this alternative through a variety of means, including (a) funding, through programs, grants, and other opportunities; (b) planning, design, and construction support; and (c) relevant information and advice, based on experience gained from working with rural Alaska native communities. Table 4-2, below, presents a preliminary list of those agencies that may be able to offer assistance to Shishmaref in meeting some capital requirements identified for this alternative.

Table 4-2: Agencies Potentially Able to Assist with Capital Requirements in Alternative C

Capital Requirements	Agencies
Physical Area for Community	Shishmaref Native Corporation (SNC); Bering Straits Native Corporation (BSNC); U.S. Department of the Interior – Bureau of Indian Affairs (BIA).
Housing	Housing and Urban Development (HUD); Bering Straits Housing Authority (BSHA); Alaska Rural Cap; Alaska Housing Finance Corporation (AHFC); Association of Village Council Presidents (AVCP); Kawerak.
Commercial and Industrial Buildings	DCED; Norton Sound Economic Development Council (NSEDC); U.S. Economic Development Administration (AEDA).
Public/Community Buildings	Kawerak; DCED; U.S. Department of Agriculture - Rural Development (USDA-RD); Norton Sound Health Corporation (NSHC); U.S. Public Health Service (USPHS); Indian Health Services (IHS); Bering Straits School District (BSSD); Maniilaq.
Water Supply and Treatment Facilities	Alaska Native Tribal Health Consortium (ANTHC); Alaska Department of Environmental Conservation (ADEC); Environmental Protection Agency (EPA); USDA-RD; USPHS; IHS.
Sanitary Waste Collection and Treatment Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Solid Waste Collection and Disposal Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Electric Utility	Alaska Villages Electric Cooperative (AVEC); Denali Commission; AIDEA/Alaska Energy Authority (AEA).
Bulk Fuel Storage	AVEC; Denali Commission; AIDEA/AEA.
Roads	Alaska Department of Transportation and Public Facilities (AK DOT-PF); Kawerak; U.S. DOT; BIA.
Airfield	AK DOT-PF; Federal Aviation Administration (FAA).

5. ALTERNATIVE D – COLLOCATING TO KOTZEBUE

5.1 Introduction

In this alternative, the community of Shishmaref would move (collocate) to the City of Kotzebue, located about 100 miles to northeast, on the Baldwin peninsula in Kotzebue Sound.

The basic assumptions made in determining preliminary capital costs associated with this alternative included the following:

- The physical relocation of Shishmaref to the City of Kotzebue would occur over a five-year period.
- Prior to this five-year relocation period, a period of up to five years might be required for the Shishmaref community, the City of Kotzebue, and involved agencies to complete the necessary planning (with significant community involvement); prepare designs; coordinate with Kotzebue and the array of relevant local, state, and Federal agencies; obtain necessary permits; secure the required real estate and easements; and establish a plan for funding the collocation through programs, grants, and other fiscal opportunities available for this effort.
- The costs developed for this alternative are for those actions anticipated during the five-year collocation period, or beyond. Costs of activities during the preceding five-year planning and design period associated with technical studies, planning, design, permitting, and coordination will be identified and developed by others.
- The costs developed for this alternative include a preliminary estimate of the decommissioning, closure, and clean up activities that may be required on Sarichef Island regarding the existing fuel tank farms, sewage lagoons, and landfill.

It is also important to note that this cost study addresses only the physical needs of the Shishmaref community, and that other community needs such as social, cultural, and economic, are being addressed by other studies.

The approach taken in developing preliminary capital costs associated with this alternative included the following:

- Gathering and compiling preliminary information from (a) the City of Kotzebue, Northwest Arctic Borough (NWAB), Northern Alaska Native Association (NANA), Kikiktagruk Inupiat Corporation (KIC), Kotzebue Elders Council, TRC Construction, Kotzebue Electric Association (KEA), and Northwest Arctic Borough School District;; (b) agencies involved in providing and supporting development of community infrastructure and facilities in Kotzebue; and (c) agencies, developers, trades, contractors, realtors, and others knowledgeable about land development, real estate, housing, public, commercial, and industrial structures in the Kotzebue area.
- Developing a preliminary “concept plan” for meeting the physical needs of the Shishmaref community (described previously in Section 1.6) at Kotzebue, that included capital requirements and preliminary costs, and the anticipated sequence of actions that would likely occur during the five-year relocation/collocation period to the Kotzebue site, and at some time after that period.
- Identifying those agencies that would typically participate in the implementation of the concept plan.

The remainder of this section presents (a) a description of the concept plan for meeting physical community needs at the Kotzebue site, including the anticipated capital requirements, and preliminary costs and schedule associated with the concept plan; and (b) a list of those agencies that would typically provide funding and other assistance in implementing the concept plan.

5.2 Concept Plan

The concept plan developed for this alternative is primarily a compilation of specific plans for meeting each of the identified physical community needs at the new Kotzebue site, taking into account the city's current and planned infrastructure (including capacities) to accommodate both present and projected population levels, and reasonable phasing of infrastructure and basic services that allows time for the necessary funding to be acquired. The physical needs of the Shishmaref community described earlier in Section 1.6, and discussed in other parts of this report, constitute the "elements" of the concept plan.

Also included in the plan are the possible actions and costs associated with the decommissioning, closure, and potential clean up of the existing fuel tank farms, sewage lagoons, and landfill.

The specific plans for meeting the physical requirements of each of the concept plan elements are briefly discussed below. Included in these discussions are the preliminary costs associated with these capital requirements, and the anticipated general time frame for implementation.

Physical Area for Community

The City of Kotzebue has a current population of approximately 3,076 (2003 Demographer's estimate) and is estimated to be increasing at a rate of approximately 3 percent per year. The growth in Kotzebue is expected to occur on the bluff east of the city center, where planned subdivisions have been platted and recorded. Current infrastructure project planning and designs in the city account for this area, and future expansion and growth of the city is expected to occur in that area.

It is assumed that the community of Shishmaref would be located within 3 miles of the city center, possibly in or near the above-mentioned location, in order to be efficiently connected to the city infrastructure. The value of raw undeveloped land in Kotzebue is approximately \$5,500 per acre. It is anticipated that the community of Shishmaref would require about 100 acres of land to accommodate the residential housing, community structures, internal roads, and required

rights-of-way and easements. Based on the above per-acre cost of raw land, the estimated real estate cost is \$550,000.

It is also assumed that all required feasibility studies, community development plans, designs, and implementation planning would occur during the five-year period preceding the five-year collocation period identified for this study.

Homes and Personal Storage Buildings

The 2000 U.S. Census reported the average household size in Shishmaref as 3.96 persons. Collocating the community of Shishmaref with a population of 589 people to Kotzebue at that same household size would require approximately 150 houses.

Many members of the Shishmaref community have expressed that it would be their preference, and more practical, to move their homes to the relocation site rather than construct new homes. Based on the July 2004 reconnaissance, and discussions with members of the community, it is estimated that 137 homes on Sarichef Island could be moved to Kotzebue.

The estimated cost to move houses from the existing community to Kotzebue via barge during the summer season is \$82,000 per house. It is anticipated that there would be minimal to no damage to the structures being moved. Due to the general soil conditions at Kotzebue it is assumed that all of the houses would require new pile foundations, which are estimated to cost approximately \$25,000 per house installed.

Also, based on the site reconnaissance in July 2004, it was determined that 36 of the 137 houses have a triodetic frame or grade beam system allowing them to be placed on a new pile foundation. It is assumed that the remaining 101 houses would require a triodetic frame prior to being placed on a new pile foundation. Installed triodetic frames are estimated to cost \$30,000 per house.

To provide the 150 houses required, it is assumed that an additional 13 new modular homes would be transported from Seattle or Anchorage and set on new pile foundations at an estimated cost of \$300,000 per house. Based on the above assumptions, the estimated cost to provide the 150 houses in Kotzebue for the Shishmaref community is \$21,600,000.

Most homeowners have a personal storage shed next to their homes. The existing storage sheds are mostly of wood-frame construction, and would likely not be movable to Kotzebue. It is assumed that new 8 feet by 8 feet storage sheds of wood-frame construction would be constructed for each home at the collocation site. Based on a construction cost of \$2,000 per shed, the estimated cost of providing the sheds is \$300,000.

Once the houses have been placed and the mainline utilities constructed, each house will need to be connected to the utility infrastructure. The estimated cost to connect each structure to the utilities is \$35,000. Therefore, the estimated total cost to connect all 150 houses is \$5,250,000.

Commercial and Industrial Buildings

It is expected that during the five-year planning period preceding the collocation, the practicality and feasibility of reestablishing the Native Store, Trading Post, and Tannery in some form in Kotzebue would be determined. For the purpose of identifying preliminary capital costs associated with this alternative, it was assumed that the Tannery building would be moved to Kotzebue.

Public/Community and Storage Buildings

Kotzebue has recently constructed a new modern medical health center, operated by Maniilaq. It is assumed that this health facility would be adequate to handle the health and related social needs of the Shishmaref community.

The school system in Kotzebue would need to be expanded by approximately 32,000 square feet of newly constructed classroom space. Based on the standard construction costs for school building expansion in Kotzebue of approximately \$375 per square foot, the estimated cost for the additional classroom space is \$12,000,000. It is assumed that the four existing schoolteacher houses at the existing Shishmaref community site on Sarichef Island would be moved to Kotzebue to handle additional teacher requirements of the collocated Shishmaref community. The estimated total cost for moving the four school teacher houses (including triodetic frames and pile foundations) would be \$548,000.

It is assumed that the equivalent of most of the commercial and community structures that are presently part of the existing Shishmaref community on Sarichef Island such as the Trading Post and Native Store, City Hall, Post Office, Armory, Fire/Rescue Station, City Shop, presently exist in Kotzebue, and will have adequate capacity (or expansion capability) to handle the collocating Shishmaref community. Therefore, the remaining community structures that would be constructed in Kotzebue for the Shishmaref community are assumed to include the Church, Library, Community Hall, and Friendship Center. Based on a standard construction cost in Kotzebue for commercial and community structures of approximately \$300 per square foot, the estimated cost of these buildings is \$4,650,000.

Once the buildings have been placed and the mainline utilities constructed, each building will need to be connected to the utility infrastructure. The estimated cost to connect each structure to the utilities is \$30,000. On this basis, the estimated total cost to connect the Public/Community buildings is \$280,000.

It is assumed that the new Shishmaref community site in Kotzebue would need approximately 20 community storage facilities. It is anticipated that these storage facilities would be 10 feet wide by 20 feet long, and be of wood-frame construction. Based on a standard construction cost of \$150 per square foot, the estimated cost of these storage facilities is \$600,000.

Fresh Water Supply, Treatment, and Distribution Facilities

Kotzebue's existing water source, treatment plant, and storage tank for the City of Kotzebue are at their capacity limits with the current population and foreseeable near-term growth. The City is currently pursuing planning efforts to develop East Lake as a possible new source of water, and are constructing a new 1.5-million-gallon water tank to meet the needs of current storage capacity. Kotzebue is also in the process of securing funding to upgrade their water treatment and distribution system.

It is assumed, based on present capacities, that it would be necessary to develop a new water source, construct a new water storage tank, and construct a new water treatment and looped water distribution system, on top of the bluff east of the city center, to handle the community from Shishmaref. The preliminary cost estimate for providing these facilities is based on the

ANTHC cost estimates provided previously for Alternative B (relocation to new mainland site). Based on these estimates, a new water source would be developed at an estimated cost of \$1,000,000. A raw water line at an estimated length of 12,000 linear feet would be installed at \$250 per foot for a total estimated cost of \$3,000,000. A new water treatment plant would be constructed at an estimated cost of \$3,000,000. New water storage tanks would be constructed to achieve the estimated 2,000,000-gallon volume capacity requirement. Based on an estimated cost of \$2.20 per gallon for water storage tanks, the water storage is estimated to cost \$4,400,000. The estimated cost of a pump station is \$1,500,000. It is estimated that 30,000 linear feet of mainline water would be required to service the Shishmaref subdivision. Based on an estimated cost of approximately \$335 per linear foot for water main piping (including, connections, over excavation and export, import fill, 8x15 Arctic pipe, gate valves, and fire hydrants), the expected cost for this utility would be \$10,050,000.

Sanitary Waste Collection and Treatment Facilities

The existing sewage treatment lagoon system for the City of Kotzebue is at its capacity limit with the current population and foreseeable near-term growth. It is assumed that it would be necessary to construct a new sewage lagoon system to handle the community from Shishmaref. The estimated cost of constructing a new sewage lagoon system is \$3,500,000. The estimated cost of the collection station is \$1,500,000.

It is estimated that 30,000 linear feet of mainline sewer and a new pump station would be required to service the new Shishmaref subdivision. Based on a standard cost of \$435 per linear foot (including connections, over excavation and export, import fill, Arctic sewer pipe, manholes, and cleanouts), the estimated cost of these facilities is \$13,300,000.

As mentioned previously, 47 of the 137 homes that would be moved to Kotzebue from Shishmaref have flush and haul systems. Therefore, it is assumed that these 47 homes would be converted to city sewer hook-ups, and the remaining 90 houses would have indoor plumbing installed and be hooked up to the collection system. Based on an assumed cost for installing indoor plumbing of approximately \$30,000 per house, the estimated cost for these services is \$2,700,000.

Solid Waste Collection and Disposal

The existing City landfill has approximately a 7-year capacity. The last landfill cell was built 4 years ago. It is assumed that a new landfill cell would be required to handle the community from Shishmaref. The anticipated cost of constructing a new landfill cell is \$1,500,000.

Electric Utility

The existing power plant in the City of Kotzebue has a capacity of 11.2 MW. The actual electricity power peak demand is approximately 4.0 MW.

It is anticipated that the new Shishmaref community would add approximately 1 MW of demand, which would require adding a new diesel generator to the system. The new generator would cost approximately \$1.75 million. Adding to the existing capacity would require a new (PSD) permit for air from Alaska Department of Environmental Conservation (ADEC) and EPA.

Also, a new 1 million gallon fuel tank would be required to handle the additional demand of the Shishmaref community. Based on the standard fuel tank cost of \$1.25 per gallon, the estimated cost of the new bulk fuel tank is \$1,250,000

It is estimated that 30,000 linear feet of overhead power service would be required to service the new Shishmaref community subdivision. Using an estimated cost of overhead power in Kotzebue of approximately \$120,000 per mile, the cost of the new distribution lines is \$681,800.

Additional Bulk Fuel Storage

For the purpose of identifying preliminary capital costs associated with this alternative, it has been assumed in this study that fuel needs of the new Shishmaref community would be met by existing bulk fuel supplies in Kotzebue.

Roads

There are approximately 26 miles of local gravel roads in and around Kotzebue, and there are no developed roads to surrounding villages. Major transportation improvements would not be required to handle the new Shishmaref community subdivision since local city roads could

provide access to potential developable areas within three miles of the city center. However, it is estimated that 30,000 linear feet of internal roadway would be required for the new Shishmaref subdivision. Based on a standard development cost for new local roadways in the Kotzebue area of about \$2,000,000 per mile, the estimated cost of the internal roadway improvements is \$11,360,000.

Airfield

Kotzebue is a regional center of air transportation for many villages in the NWAB. The Kotzebue airport has one paved runway and a crosswind gravel runway of sufficient length to handle jet traffic. There are daily scheduled jet flights linking Kotzebue to Anchorage, Nome, and Fairbanks as well as scheduled and chartered non-jet aircraft and helicopter services to villages. It is anticipated that all air travel needs of the Shishmaref community would be accommodated by the existing airfield and airport services.

Barge Landing Facility

The Kotzebue port and berthing infrastructure handles shallow draft vessels, which lighter cargo to shore where it can be warehoused. The port provides lightering services that distribute cargo to NWAB villages. It is anticipated that the existing facility would accommodate the needs of the Shishmaref community.

Harbor and Boat Storage Facility

Kotzebue has a small boat harbor in Swan Lake; however, it is in need of improvements to handle the current number of boats in the area. It is anticipated that Small boat owners of the Shishmaref community would keep their boats at their homes or a boat yard within the community, and these boats would then be transported and launched at the harbor for ocean going activities.

Communication Facilities

The City of Kotzebue has full communication capabilities including, in-state and long distance phone service, internet service, TV stations, radio stations, cable TV, and teleconferencing facilities. It is estimated that 30,000 linear feet of communication utility service would be required to service the new Shishmaref community subdivision. At an estimated linear foot cost

of \$40 for these combined communication utility services, the estimated service connection cost for the new community is \$1,200,000.

Summer Camps

It is anticipated that during the five-year planning period preceding the five-year collocation period, the need for and location of summer camps to support the subsistence activities of the collocated Shishmaref community would be determined. For the purposes of determining the preliminary capital costs associated with this alternative, no capital costs have been identified for this element.

Decommissioning and Closure

At some time following the anticipated five-year relocation period, the existing fuel tank farms, sewage lagoons, and landfill will likely need to be decommissioned, closed, and cleaned up, as necessary. As a first step in this post-relocation activity, a site characterization and risk assessment study and closure/clean up plan would be completed for the above facilities. The estimated cost for this study and plan is \$300,000. After this study and plan, the other activities and estimated costs that would likely be associated with the applicable decommissioning, closure, and clean up of these facilities are discussed below.

Fuel Tank Farm: Decommissioning the 32 existing fuel tanks would involve draining and drying, cutting (to render unusable), and posting signage on each tank. Assuming a cost of \$2,500 per tank for these activities, the estimated cost of decommissioning the tanks is \$80,000. Because many of the existing tanks have small leaks, it is anticipated that soil remediation would be required following decommissioning. The most likely method for remediation would involve on-site treatment of soil using specialized heating equipment that could be barged in. As a worst case, it is estimated that up to 190,000 cubic feet of soil would need remediation. Based on an assumed weight of 130 pounds per cubic foot of soil, this equates to approximately 12,350 tons of soil. At an assumed cost of \$200 per ton for soil remediation, and an assumed mobilization/demobilization cost of \$50,000 for special equipment, the estimated cost of soil remediation is \$2,820,000.

Sewage Lagoons: The existing sewage lagoon at the school is approximately 200 feet by 200 feet, and the existing sewage lagoon at the Washeteria is approximately 200 feet by 350 feet. Site closure activities may involve treating the water in the lagoons with a flocculent, disinfection, and applying the treated water to land or discharging it to the sea. The residual solids in the lagoons could be tested for contaminants, then pumped out onto temporary drying beds, and if warranted, the residual cake could be burned in equipment that could be barged in. The lagoons would then likely be filled and graded using local material. The estimated total cost for clean up of the two lagoons, assuming the above activities (including equipment mobilization/demobilization), is \$600,000.

Solid Waste Landfill: The current landfill comprises a honey bucket cell approximately 110 feet by 170 feet, and a solid waste cell that is approximately 200 feet by 300 feet. Typical site closure activities for similar landfills include characterizing and removing hazardous materials, filling, and grading. Assuming the above activities, and the use of local material for fill, the estimated site closure and clean up cost for the current landfill is \$400,000.

A previous 100-foot by 100-foot landfill, located just north of the current landfill, was closed (buried and graded) in about 1986. No further site closure and clean up activities are anticipated for this closed landfill.

5.3 Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative D

The anticipated capital requirements and preliminary costs (including contingencies) associated with the above concept plan elements, allocated in a logical sequence over the five-year relocation period, and beyond (as appropriate), are summarized below in Table 5-1. More detailed preliminary costs associated with these capital requirements are presented in Appendix 1.

Table 5-1: Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative D

Year 1		
Physical Community Need	Capital Requirements	Preliminary Cost
Erosion Protection Measures	Sarichef Island erosion protection - Capital cost	\$3,356,480
Physical Area for Community	Real estate.	\$550,000
Roads	Construct road system phase I (20%).	\$2,272,000
Water Supply and Treatment Facilities	Develop water source and construct water treatment plant.	\$8,500,000
Sanitary Waste Collection and Treatment	Construct sewage lagoon.	\$3,500,000
Solid Waste Collection and Disposal	Expand solid waste landfill	\$1,500,000
<i>Contingency (25%)</i>		<i>\$4,919,620</i>
TOTAL COST (Year 1)		\$24,598,100
Year 2		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase II (30%).	\$3,408,000
Public/Community Buildings	Construct Community Hall.	\$1,385,000
Water Supply and Treatment Facilities	Water distribution piping throughout community.	\$10,050,000
Sanitary Waste Collection and Treatment	Sewer collection piping throughout community.	\$14,550,000
Electric Utility	Upgrade power generation facilities.	\$1,750,000
<i>Contingency (25%)</i>		<i>\$7,785,750</i>
TOTAL COST (Year 2)		\$38,928,750
Year 3		
Physical Community Need	Capital Requirements	Preliminary Cost
Roads	Construct road system phase III (50%).	\$5,680,000
Water Supply and Treatment Facilities	Construct water storage tanks.	\$4,400,000
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase I (20%).	\$5,427,800
Electric Utility	Construct power distribution facilities phase I (60%).	\$408,960
<i>Contingency (25%)</i>		<i>\$3,979,190</i>
TOTAL COST (Year 3)		\$19,895,950

Table 5-1: Summary of Capital Requirements, Preliminary Costs, and Schedule - Alternative D

Year 4		
Physical Community Need	Capital Requirements	Preliminary Cost
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase II (60%).	\$16,283,400
Commercial and Industrial Buildings	Construct Tannery.	\$441,000
Public/Community Buildings	Construct, Church, Library, Friendship Center and storage.	\$4,005,000
Bulk Fuel Storage	Construct bulk fuel tank.	\$1,290,000
Electric Utility	Construct power distribution facilities phase I (40%).	\$272,640
Communication Facilities	Construct communication distribution facilities.	\$1,200,000
<i>Contingency (25%)</i>		\$5,873,010
TOTAL COST (Year 4)		\$29,365,050
Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Homes and Personal Storage Buildings	Relocate/construct homes and storage phase III (20%).	\$5,427,800
Public/Community Buildings	Expand School and relocate teacher housing	\$10,323,000
Sanitary Waste Collection and Treatment	Install indoor plumbing to unequipped homes.	\$2,700,000
<i>Contingency (25%)</i>		\$4,612,700
TOTAL COST (Year 5)		\$23,063,500
Beyond Year 5		
Physical Community Need	Capital Requirements	Preliminary Cost
Decommissioning and Closure	Decommissioning, closure, and clean up activities	\$3,820,000
<i>Contingency (25%)</i>		\$955,000
TOTAL COST (Beyond Year 5)		\$4,775,000
TOTAL COST (Collocating to Kotzebue)		\$140,626,350

5.4 Agencies Potentially Assisting in This Alternative

A preliminary inventory has been made of the agencies that could potentially assist in this alternative through a variety of means, including (a) funding, through programs, grants, and other opportunities; (b) planning, design, and construction support; and (c) relevant information and advice, based on experience gained from working with rural Alaska native communities. Table 5-2, below, presents a preliminary list of those agencies that may be able to offer assistance to Shishmaref in meeting some capital requirements identified for this alternative.

Table 5-2: Agencies Potentially Able to Assist with Capital Requirements in Alternative D

Capital Requirements	Agencies
Physical Area for Community	Shishmaref Native Corporation (SNC); Bering Straits Native Corporation (BSNC); U.S. Department of the Interior – Bureau of Indian Affairs (BIA).
Housing	Housing and Urban Development (HUD); Bering Straits Housing Authority (BSHA); Alaska Rural Cap; Alaska Housing Finance Corporation (AHFC); Association of Village Council Presidents (AVCP); Kikitagruk Inupiat Corporation (KIC).
Commercial and Industrial Buildings	DCED; Norton Sound Economic Development Council (NSEDC); U.S. Economic Development Administration (AEDA); KIC.
Public/Community Buildings	Kawerak; DCED; U.S. Department of Agriculture - Rural Development (USDA-RD); Norton Sound Health Corporation (NSHC); U.S. Public Health Service (USPHS); Indian Health Services (IHS); Bering Straits School District (BSSD).
Water Supply and Treatment Facilities	Alaska Native Tribal Health Consortium (ANTHC); Alaska Department of Environmental Conservation (ADEC); Environmental Protection Agency (EPA); USDA-RD; USPHS; IHS.
Sanitary Waste Collection and Treatment Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Solid Waste Collection and Disposal Facilities	ANTHC; ADEC; EPA; USDA-RD; USPHS; IHS.
Electric Utility	Alaska Villages Electric Cooperative (AVEC); Denali Commission; AIDEA/Alaska Energy Authority (AEA).
Bulk Fuel Storage	AVEC; Denali Commission; AIDEA/AEA.
Roads	Alaska Department of Transportation and Public Facilities (AK DOT-PF); Kawerak; U.S. DOT; BIA.
Small Boat Harbor and Storage Facility	USACE.

6. COST SUMMARY AND LIMITATIONS

6.1 Cost Summary

Table 6-1 summarizes the total estimated costs of capital requirements for meeting the physical community needs of Shishmaref for each of the four alternatives addressed in this study.

Table 6-1: Summary of Costs of Alternatives for Meeting Identified Community Needs

Identified Community Need	Alternative A Stay in Place	Alternative B New Mainland Site	Alternative C Collocate to Nome	Alternative D Collocate to Kotzebue
Erosion Protection Measures	\$4,234,480	\$3,356,480	\$3,356,480	\$3,356,480
Physical Area for Community	-	-	\$100,000	\$550,000
Homes and Storage Buildings	-	\$19,330,000	\$26,129,000	\$27,139,000
Commercial and Industrial Buildings	\$6,120,000	\$5,000,000	\$441,000	\$441,000
Public/Community Buildings	\$23,850,000	\$25,995,000	\$16,293,000	\$15,713,000
Water Supply and Treatment Facilities	\$31,412,000	\$9,275,000	\$5,862,500	\$22,950,000
Sanitary Waste Facilities	\$11,830,000	\$11,400,000	\$11,062,500	\$20,750,000
Solid Waste Facilities	-	\$3,700,000	\$250,000	\$1,500,000
Electric Utility	\$2,980,000	\$5,480,000	\$1,572,200	\$3,721,600
Bulk Fuel Storage	\$2,126,000	\$2,126,000	-	-
Roads	\$2,400,000	\$23,500,000	\$4,980,000	\$11,360,000
Airfield	\$2,500,000	\$25,000,000	-	-
Barge Landing Area	-	\$3,695,920	-	-
Small Boat Harbor	-	-	-	-
Communication Facilities	-	\$1,778,000	\$700,000	\$1,200,000
Summer Camps	-	-	-	-
Decommissioning and Closure	-	\$3,820,000	\$3,820,000	\$3,820,000
Contingency (25%)	\$21,863,120	\$35,864,100	\$18,641,670	\$28,125,270
TOTAL COST	\$109,315,600	\$179,320,500	\$93,208,350	\$140,626,350
<i>Annual Erosion Protection O&M*</i>	\$2,544,696	-	-	-
<i>Annual Barge Facilities O&M*</i>	-	\$493,970	-	-

**Not Included in the Total Cost*

6.2 Limitations

The study presented in this report was a “reconnaissance-level” effort undertaken to assist the Alaska District in identifying preliminary costs associated with the four alternative courses of action being considered by the District to help Shishmaref solve the ongoing erosion problem that threatens their community. The main objectives of this study have been to (a) identify physical needs of the Shishmaref community; (b) discern capital requirements for meeting these needs in each alternative; (c) develop preliminary estimated costs of these capital requirements; and (d) suggest a reasonable implementation schedule for each alternative.

This reconnaissance-level study has relied on information gathered mainly from readily available published information, interviews (phone and in-person) with knowledgeable individuals, information requested from key agencies, and limited site reconnaissance. The information compiled in this study may be subject to differing professional interpretation, and the validity of all the information cannot be guaranteed.

In conducting the study and preparing this report, many assumptions were necessary, in order to provide a preliminary framework and basis for identifying costs. It is acknowledged that with different assumptions, and with different interpretations of the information gathered, different conclusions may be reached.

The focus of this study in identifying capital costs for the alternatives under consideration has been on the physical needs of the Shishmaref community. It is acknowledged that for the people of Shishmaref, many of the decisions regarding where and how the community lives and functions is based to a large extent on social, cultural, and economic needs, as well as on physical needs. The study presented in this report is one piece of a larger and more comprehensive assessment of the alternatives that the District is undertaking as it prepares an Environmental Impact Statement for the Shishmaref Erosion Protection, Relocation, and Collocation Study.

APPENDICES

APPENDIX 1

- **COST TABLES – ALTERNATIVE A**
- **COST TABLES – ALTERNATIVE B**
- **COST TABLES – ALTERNATIVE C**
- **COST TABLES – ALTERNATIVE D**

APPENDIX 2

- **AGENCY CONTACT REPORTS**

APPENDIX 3

- **INDEPENDENT TECHNICAL REVIEW COMMENTS**

APPENDIX 4

- **INFORMATION FROM AK DOT-PF AND ANTHC**

APPENDIX 1

COST TABLES – ALTERNATIVE A

Alternative A - Shishmaref Staying in Place					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Erosion Protection Measures					
1	Sarichef Island Erosion Protection - 50 Year Design	1	LS	\$4,234,480	\$4,234,480
	Subtotal				\$4,234,480
	Contingency		25%		\$1,058,620
	Total				\$5,293,100
	<i>Erosion Protection Maintenance - 50 Year Design*</i>	50	YR	\$2,544,696	\$127,234,800
Commercial and Industrial Buildings					
1	Tannery	1	Structure	\$1,500,000	\$1,500,000
2	Shishmaref Native Store	3,600	Square Foot	\$300	\$1,080,000
3	Nayokpuk Trading Post	6,800	Square Foot	\$300	\$2,040,000
4	Washeteria	1	Structure	\$1,500,000	\$1,500,000
	Subtotal				\$6,120,000
	Contingency		25%		\$1,530,000
	Total				\$7,650,000
Public/Community and Storage Buildings					
1	Health Clinic	2,800	Square Foot	\$300	\$840,000
2	Shishmaref School	32,000	Square Foot	\$480	\$15,360,000
3	City Hall/Post Office	4,500	Square Foot	\$300	\$1,350,000
4	Fire/Rescue Station (Emergency Services)	2,500	Square Foot	\$300	\$750,000
5	City Heavy Machinery Shop	5,000	Square Foot	\$300	\$1,500,000
6	Church	6,500	Square Foot	\$300	\$1,950,000
7	Community Hall	4,500	Square Foot	\$300	\$1,350,000
8	Friendship Center	2,500	Square Foot	\$300	\$750,000
	Subtotal				\$23,850,000
	Contingency		25%		\$5,962,500
	Total				\$29,812,500
Fresh Water Supply, Treatment, and Distribution Facilities					
1	Catchment Areas	4	EA	\$3,000,000	\$12,000,000
2	Water Treatment Plant	1	LS	\$3,000,000	\$3,000,000
3	Water Storage Tank	7,460,000	GAL	\$2.20	\$16,412,000
	Subtotal				\$31,412,000
	Contingency		25%		\$7,853,000
	Total				\$39,265,000
Sanitary Waste Collection and Treatment Facilities					
1	Install Indoor Plumbing	135	Structure	\$30,000	\$4,050,000
2	Flush-Haul Sanitary Wastewater System	135	Structures	\$28,000	\$3,780,000
3	Haul Vehicles	1	LS	\$1,000,000	\$1,000,000
4	Waste Disposal Lagoon	1	LS	\$3,000,000	\$3,000,000
	Subtotal				\$11,830,000
	Contingency		25%		\$2,957,500
	Total				\$14,787,500

Alternative A - Shishmaref Staying in Place (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Electric Utility					
1	New Power Plant	1	LS	\$1,900,000	\$1,900,000
2	Fuel Tank Farm	216,000	GAL	\$5.00	\$1,080,000
	Subtotal				\$2,980,000
	Contingency		25%		\$745,000
	Total				\$3,725,000
Additional Bulk Fuel Storage					
1	Additional Bulk Fuel Storage	425,200	GAL	\$5.00	\$2,126,000
	Subtotal				\$2,126,000
	Contingency		25%		\$531,500
	Total				\$2,657,500
Roads					
1	Upgrade Landfill Road	1.2	MI	\$2,000,000	\$2,400,000
	Subtotal				\$2,400,000
	Contingency		25%		\$600,000
	Total				\$3,000,000
Airfield					
1	Repaving and Surface Rehabilitation	1	LS	\$2,500,000	\$2,500,000
	Subtotal				\$2,500,000
	Contingency		25%		\$625,000
	Total				\$3,125,000
Total Cost	Alternative A - Shishmaref Staying in Place				\$109,315,600

*Not Included in the Total Cost

APPENDIX 1

COST TABLES – ALTERNATIVE B

Alternative B - Shishmaref Relocating to a New Mainland Site					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Erosion Protection Measures					
1	Sarichef Island Erosion Protection - 10 Year Design	1	LS	\$3,356,480	\$3,356,480
	Subtotal				\$3,356,480
	Contingency		25%		\$839,120
	Total				\$4,195,600
Physical Area for Community					
1	Land for Real Estate and Easements	600	AC	Unknown	
	Subtotal				
	Contingency		25%		
	Total				
Homes and Personal Storage Buildings					
1	Movable Single Family, 1 story (w/o Triodetic Foundation)	93	Structure	\$80,000	\$7,440,000
2	Movable Single Family, 1 story (w/ Triodetic Foundation)	14	Structure	\$50,000	\$700,000
3	Movable Single Family, 1 story (w/ Pile Foundation)	20	Structure	\$50,000	\$1,000,000
4	Movable Single Family, 2 story (w/o Triodetic Foundation)	8	Structure	\$80,000	\$640,000
5	Movable Trailers/Mobile Homes	2	Structure	\$50,000	\$100,000
6	New Modular Single Family, 1 story (Pile foundations)	13	Structure	\$300,000	\$3,900,000
7	Personal Storage Buildings	150	Structure	\$2,000	\$300,000
8	Site Preparation (Utility Hook-up)	150	Structure	\$35,000	\$5,250,000
	Subtotal				\$19,330,000
	Contingency		25%		\$4,832,500
	Total				\$24,162,500
Commercial and Industrial Buildings					
1	Tannery	1	Structure	\$240,000	\$240,000
2	Shishmaref Native Store	3,600	Square Foot	\$300	\$1,080,000
3	Nayokpuk Trading Post	6,800	Square Foot	\$300	\$2,040,000
4	Washeteria	1	Structure	\$1,500,000	\$1,500,000
5	Site Preparation (Utility Hook-up)	4	Structure	\$35,000	\$140,000
	Subtotal				\$5,000,000
	Contingency		25%		\$1,250,000
	Total				\$6,250,000
Public/Community and Storage Buildings					
1	Health Clinic	2,800	Square Foot	\$300	\$840,000
2	Shishmaref School	32,000	Square Foot	\$480	\$15,360,000
3	Movable Teacher Housing (w/o Triodetic Foundation)	4	Structure	\$80,000	\$320,000
4	Movable Armory (w/ Triodetic Foundation)	2	Structure	\$50,000	\$100,000
5	City Hall/Post Office	4,500	Square Foot	\$300	\$1,350,000
6	Fire/Rescue Station (Emergency Services)	2,500	Square Foot	\$300	\$750,000
7	City Heavy Machinery Shop	5,000	Square Foot	\$300	\$1,500,000
8	Church	6,500	Square Foot	\$300	\$1,950,000
9	Library	2,000	Square Foot	\$300	\$600,000
10	Community Hall	4,500	Square Foot	\$300	\$1,350,000
11	Friendship Center	2,500	Square Foot	\$300	\$750,000
12	Storage Facilities	20	Structure	\$30,000	\$600,000
13	Site Preparation (Utility Hook-up)	15	Structure	\$35,000	\$525,000
	Subtotal				\$25,995,000
	Contingency		25%		\$6,498,750
	Total				\$32,493,750

Alternative B - Shishmaref Relocating to a New Mainland Site (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Fresh Water Supply, Treatment, and Distribution Facilities					
1	Water Source (Wells/Surface Water Intake)	1	LS	\$1,000,000	\$1,000,000
2	Raw Water Transmission Line	3,500	LF	\$250	\$875,000
3	Water Treatment Plant	1	LS	\$3,000,000	\$3,000,000
4	Water Storage Tank and Foundation	2,000,000	GAL	\$2.20	\$4,400,000
	Subtotal				\$9,275,000
	Contingency		25%		\$2,318,750
	Total				\$11,593,750
Sanitary Waste Collection and Treatment Facilities					
1	Install Indoor Plumbing	90	Structure	\$30,000	\$2,700,000
2	Flush-Haul Sanitary Wastewater System	150	Structures	\$28,000	\$4,200,000
3	Waste Disposal Lagoon	1	LS	\$3,500,000	\$3,500,000
4	Haul Vehicles	1	LS	\$1,000,000	\$1,000,000
	Subtotal				\$11,400,000
	Contingency		25%		\$2,850,000
	Total				\$14,250,000
Solid Waste Collection and Disposal					
1	In-Town Waste Collection/Recycling Center	1	LS	\$1,000,000	\$1,000,000
2	Solid/Hazardous Waste Transportation Equipment	1	LS	\$750,000	\$750,000
3	Solid Waste Disposal Facility and Maintenance Equipment	1	LS	\$1,950,000	\$1,950,000
	Subtotal				\$3,700,000
	Contingency		25%		\$925,000
	Total				\$4,625,000
Electric Utility					
1	Power Plant	1	LS	\$1,900,000	\$1,900,000
2	Power Distribution	8.50	MI	\$200,000	\$1,700,000
3	Fuel Tank	216,000	GAL	\$5.00	\$1,080,000
4	Fuel Pipeline	8,000	LF	\$100	\$800,000
	Subtotal				\$5,480,000
	Contingency		25%		\$1,370,000
	Total				\$6,850,000
Additional Bulk Fuel Storage					
1	Additional Bulk Fuel Storage	425,200	GAL	\$5.00	\$2,126,000
	Subtotal				\$2,126,000
	Contingency		25%		\$531,500
	Total				\$2,657,500
Roads					
1	Roads	11.0	MI	\$2,000,000	\$22,000,000
2	Bridge	1	LS	\$1,500,000	\$1,500,000
	Subtotal				\$23,500,000
	Contingency		25%		\$5,875,000
	Total				\$29,375,000

Alternative B - Shishmaref Relocating to a New Mainland Site (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Airfield					
1	Airport Runway and Facilities	1	LS	\$25,000,000	\$25,000,000
	Subtotal				\$25,000,000
	Contingency		25%		\$6,250,000
	Total				\$31,250,000
Barge Landing Facility					
1	Barge Landing	1	LS	\$3,695,920	\$3,695,920
	Subtotal				\$3,695,920
	Contingency		25%		\$923,980
	Total				\$4,619,900
	<i>Barge Landing Maintenance - 50 Year Design*</i>	50	YR	\$493,970	\$24,698,500
Communication Facilities					
1	Telecommunication Facilities	1	LS	\$1,142,000	\$1,142,000
2	Communication Utility Service Lines	26,500	LF	\$24	\$636,000
	Subtotal				\$1,778,000
	Contingency		25%		\$444,500
	Total				\$2,222,500
Decommissioning and Closure					
1	Fuel Tank Farm	1	LS	\$2,820,000	\$2,820,000
2	Sewage Lagoons	1	LS	\$600,000	\$600,000
3	Solid Waste Landfills	1	LS	\$400,000	\$400,000
	Subtotal				\$3,820,000
	Contingency		25%		\$955,000
	Total				\$4,775,000
Total Cost	Alternative B - Shishmaref Relocating to a New Mainland Site				\$179,320,500

*Not Included in the Total Cost

Alternative B - Incremental Costs to Provide Piped Water and Sewer Systems					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Fresh Water Supply, Treatment, and Distribution Facilities					
1	Water Distribution	16,000	LF	\$250	\$4,000,000
	Subtotal				\$4,000,000
	Contingency		25%		\$1,000,000
	Total				\$5,000,000
Sanitary Waste Collection and Treatment Facilities					
1	Wastewater Collection	16,000	LF	\$300	\$4,800,000
2	Vacuum Wastewater Collection Station	1	LS	\$1,500,000	\$1,500,000
3	Equipment and Support Facilities	1	LS	\$1,500,000	\$1,500,000
	Subtotal				\$7,800,000
	Contingency		25%		\$1,950,000
	Total				\$9,750,000
Total Cost	Alternative B - Incremental Costs to Provide Piped Water and Sewer Systems				\$14,750,000

APPENDIX 1

COST TABLES – ALTERNATIVE C

Alternative C - Shishmaref Collocating to Nome					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Erosion Protection Measures					
1	Sarichef Island Erosion Protection - 10 Year Design	1	LS	\$3,356,480	\$3,356,480
	Subtotal				\$3,356,480
	Contingency		25%		\$839,120
	Total				\$4,195,600
Physical Area for Community					
1	Land for Real Estate and Easements	100	AC	\$1,000	\$100,000
	Subtotal				\$100,000
	Contingency		25%		\$25,000
	Total				\$125,000
Homes and Personal Storage Buildings					
1	Movable Single Family, 1 story (w/o Triodetic Foundation)	93	Structure	\$137,000	\$12,741,000
2	Movable Single Family, 1 story (w/ Triodetic Foundation)	14	Structure	\$107,000	\$1,498,000
3	Movable Single Family, 1 story (w/ Pile Foundation)	20	Structure	\$107,000	\$2,140,000
4	Movable Single Family, 2 story (w/o Triodetic Foundation)	8	Structure	\$137,000	\$1,096,000
5	Movable Trailers/Mobile Homes	2	Structure	\$107,000	\$214,000
6	New Modular Single Family, 1 story (Pile foundations)	13	Structure	\$280,000	\$3,640,000
7	Personal Storage Buildings	150	Structure	\$2,000	\$300,000
8	Site Preparation (Utility Hook-up)	150	Structure	\$30,000	\$4,500,000
	Subtotal				\$26,129,000
	Contingency		25%		\$6,532,250
	Total				\$32,661,250
Commercial and Industrial Buildings					
1	Tannery	1	Structure	\$411,000	\$411,000
2	Site Preparation (Utility Hook-up)	1	Structure	\$30,000	\$30,000
	Subtotal				\$441,000
	Contingency		25%		\$110,250
	Total				\$551,250
Public/Community and Storage Buildings					
1	Expand the Existing School in Nome	32,000	Square Foot	\$350	\$11,200,000
2	Movable Teacher Housing (w/o Triodetic Foundation)	4	Structure	\$137,000	\$548,000
3	Church	6,500	Square Foot	\$250	\$1,625,000
4	Library	2,000	Square Foot	\$250	\$500,000
5	Community Hall	4,500	Square Foot	\$250	\$1,125,000
6	Friendship Center	2,500	Square Foot	\$250	\$625,000
7	Storage Facilities	20	Structure	\$20,000	\$400,000
8	Site Preparation (Utility Hook-up)	9	Structure	\$30,000	\$270,000
	Subtotal				\$16,293,000
	Contingency		25%		\$4,073,250
	Total				\$20,366,250
Fresh Water Supply, Treatment, and Distribution Facilities					
1	Watermain Piping	17,500	LF	\$335	\$5,862,500
	Subtotal				\$5,862,500
	Contingency		25%		\$1,465,625
	Total				\$7,328,125

Alternative C - Shishmaref Collocating to Nome (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Sanitary Waste Collection and Treatment Facilities					
1	Install Indoor Plumbing	90	Structure	\$30,000	\$2,700,000
2	Sewermain Piping	17,500	LF	\$435	\$7,612,500
3	Expand Sewage Lagoon	1	LS	\$750,000	\$750,000
	Subtotal				\$11,062,500
	Contingency		25%		\$2,765,625
	Total				\$13,828,125
Solid Waste Collection and Disposal					
1	Expand Landfill	1	LS	\$250,000	\$250,000
	Subtotal				\$250,000
	Contingency		25%		\$62,500
	Total				\$312,500
Electric Utility					
1	Power Distribution	3.32	MI	\$85,000	\$282,200
2	Fuel Tank	1,000,000	GAL	\$1.25	\$1,250,000
3	Fuel Pipeline	400	LF	\$100	\$40,000
	Subtotal				\$1,572,200
	Contingency		25%		\$393,050
	Total				\$1,965,250
Roads					
1	Roads	3.32	MI	\$1,500,000	\$4,980,000
	Subtotal				\$4,980,000
	Contingency		25%		\$1,245,000
	Total				\$6,225,000
Communication Facilities					
1	Telecommunication Utility Service Lines	17,500	LF	\$25	\$437,500
2	Communication Utility Service Lines	17,500	LF	\$15	\$262,500
	Subtotal				\$700,000
	Contingency		25%		\$175,000
	Total				\$875,000
Decommissioning and Closure					
1	Fuel Tank Farm	1	LS	\$2,820,000	\$2,820,000
2	Sewage Lagoons	1	LS	\$600,000	\$600,000
3	Solid Waste Landfills	1	LS	\$400,000	\$400,000
	Subtotal				\$3,820,000
	Contingency		25%		\$955,000
	Total				\$4,775,000
Total	Alternative C - Shishmaref Collocating to Nome				\$93,208,350

APPENDIX 1

COST TABLES – ALTERNATIVE D

Alternative D - Shishmaref Collocating to Kotzebue					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Erosion Protection Measures					
1	Sarichef Island Erosion Protection - 10 Year Design	1	LS	\$3,356,480	\$3,356,480
	Subtotal				\$3,356,480
	Contingency		25%		\$839,120
	Total				\$4,195,600
Physical Area for Community					
1	Land for Real Estate and Easements	100	AC	\$5,500	\$550,000
	Subtotal				\$550,000
	Contingency		25%		\$137,500
	Total				\$687,500
Homes and Personal Storage Buildings					
1	Movable Single Family, 1 story (w/o Triodetic Foundation)	93	Structure	\$137,000	\$12,741,000
2	Movable Single Family, 1 story (w/ Triodetic Foundation)	14	Structure	\$107,000	\$1,498,000
3	Movable Single Family, 1 story (w/ Pile Foundation)	20	Structure	\$107,000	\$2,140,000
4	Movable Single Family, 2 story (w/o Triodetic Foundation)	8	Structure	\$137,000	\$1,096,000
5	Movable Trailers/Mobile Homes	2	Structure	\$107,000	\$214,000
6	New Modular Single Family, 1 story (Pile foundations)	13	Structure	\$300,000	\$3,900,000
7	Personal Storage Buildings	150	Structure	\$2,000	\$300,000
8	Site Preparation (Utility Hook-up)	150	Structure	\$35,000	\$5,250,000
	Subtotal				\$27,139,000
	Contingency		25%		\$6,784,750
	Total				\$33,923,750
Commercial and Industrial Buildings					
1	Tannery	1	Structure	\$411,000	\$411,000
2	Site Preparation (Utility Hook-up)	1	Structure	\$30,000	\$30,000
	Subtotal				\$441,000
	Contingency		25%		\$110,250
	Total				\$551,250
Public/Community and Storage Buildings					
1	Expand the Existing School in Kotzebue	20,000	Square Foot	\$480	\$9,600,000
2	Movable Teacher Housing (w/o Triodetic Foundation)	4	Structure	\$137,000	\$548,000
3	Church	6,500	Square Foot	\$300	\$1,950,000
4	Library	2,000	Square Foot	\$300	\$600,000
5	Community Hall	4,500	Square Foot	\$300	\$1,350,000
6	Friendship Center	2,500	Square Foot	\$300	\$750,000
7	Storage Facilities	20	Structure	\$30,000	\$600,000
8	Site Preparation (Utility Hook-up)	9	Structure	\$35,000	\$315,000
	Subtotal				\$15,713,000
	Contingency		25%		\$3,928,250
	Total				\$19,641,250

Alternative D - Shishmaref Collocating to Kotzebue (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Fresh Water Supply, Treatment, and Distribution Facilities					
1	Water Source (Surface Water Intake)	1	LS	\$1,000,000	\$1,000,000
2	Raw Water Transmission Line	12,000	LF	\$250	\$3,000,000
3	Water Treatment Plant	1	LS	\$3,000,000	\$3,000,000
4	Pump Station	1	LS	\$1,500,000	\$1,500,000
5	Water Storage Tank and Foundation	2,000,000	GAL	\$2.20	\$4,400,000
6	Watermain Piping	30,000	LF	\$335	\$10,050,000
	Subtotal				\$22,950,000
	Contingency		25%		\$5,737,500
	Total				\$28,687,500
Sanitary Waste Collection and Treatment Facilities					
1	Install Indoor Plumbing	90	Structure	\$30,000	\$2,700,000
2	Sewermain Piping	30,000	LF	\$435	\$13,050,000
3	Pump Station	1	LS	\$1,500,000	\$1,500,000
4	Waste Disposal Lagoon	1	LS	\$3,500,000	\$3,500,000
	Subtotal				\$20,750,000
	Contingency		25%		\$5,187,500
	Total				\$25,937,500
Solid Waste Collection and Disposal					
1	Expand Landfill	1	LS	\$1,500,000	\$1,500,000
	Subtotal				\$1,500,000
	Contingency		25%		\$375,000
	Total				\$1,875,000
Electric Utility					
1	Upgrade Power Plant	1	LS	\$1,750,000	\$1,750,000
2	Power Distribution	5.68	MI	\$120,000	\$681,600
3	Fuel Tank	1,000,000	GAL	\$1.25	\$1,250,000
4	Fuel Pipeline	400	LF	\$100	\$40,000
	Subtotal				\$3,721,600
	Contingency		25%		\$930,400
	Total				\$4,652,000
Roads					
1	Roads	5.68	MI	\$2,000,000	\$11,360,000
	Subtotal				\$11,360,000
	Contingency		25%		\$2,840,000
	Total				\$14,200,000
Communication Facilities					
1	Telecommunication Utility Service Lines	30,000	LF	\$25	\$750,000
2	Communication Utility Service Lines	30,000	LF	\$15	\$450,000
	Subtotal				\$1,200,000
	Contingency		25%		\$300,000
	Total				\$1,500,000

Alternative D - Shishmaref Collocating to Kotzebue (cont.)					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
Decommissioning and Closure					
1	Fuel Tank Farm	1	LS	\$2,820,000	\$2,820,000
2	Sewage Lagoons	1	LS	\$600,000	\$600,000
3	Solid Waste Landfills	1	LS	\$400,000	\$400,000
	Subtotal				\$3,820,000
	Contingency		25%		\$955,000
	Total				\$4,775,000
Total	Alternative D - Shishmaref Collocating to Kotzebue				\$140,626,350

APPENDIX 2

AGENCY CONTACT REPORTS

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Resource Agencies

Contact Date: 5/3/04

Agency: Housing and Urban Development – Anchorage Field Office
3000 C Street, Suite 401, Anchorage, AK 99503

Personnel Met with and Contact Info:

Wayne Mundy, Administrator, Office of Native American Programs,
907-677-9860, wayne_mundy@hud.gov

David Vought, Native American Program Specialist,
907-677-9862, david_vought@hud.gov

Wayne was executive director of the Bering Straits Housing Authority for five years before joining HUD. David works on HUD projects in the Norton Sound area.

HUD provides money for housing to AK tribes. HUD distributes about \$100 million annually, through two channels: (a) “Current-Assisted Stock” funds, which focuses on existing housing; and (b) “Needs” funds, which is applied after the Current-Assisted funds are used up. HUD used to determine how each native community would use these funds (under 1937 Housing Act), now each community self-determines the usage (under 1976 National Housing and Self Determination Act; NAHASDA).

The Bering Straits Regional Housing Authority (BSRHA) is the owner of the HUD houses until ownership eventually transfers to an owner. Through an annual planning process, the BSRHA allocates \$6 million to the Bering Straits area, with about \$438,000 going to Shishmaref. HUD has built about 100 homes in Shishmaref over the years, with about 75 still administered by HUD through the BSRHA. Don Fancher is the executive director of BSRHA, located in Nome. The BSRHA has seven homes planned in Shishmaref for '05.

The allowable cost for each home is \$290,000, which is a modular home. HUD has contracted with an Anacortes, WA builder - Kelly-Ryan – to build many of the homes in Shishmaref. Transportation of the home accounts for 1/3 of the cost. HUD homes use what is called “Triadetik” frames in the house construction, which is a transport-friendly frame for the house that is made in Canada.

In addition to the HUD funding available to communities through NAHASDA, HUD also makes available: (1) Indian Community Development Block Grants, in the amount of \$500,000 per community each year; and (2) Rural Housing and Economic Development Grants, with \$25 million to make available nationally each year. There has been no federal appropriation for this second fund for FY '05.

On the question of HUD being able to administer funding for relocation or collocation, it is not typical for HUD to get large specific congressional grants. However, it would seem logical that the housing component of such a project would flow through HUD. In Wayne’s opinion, the Denali Commission could function as the facilitation agency for this type of project, since it exists as a coalition of all state and federal organizations operating in Alaska. Also, the Denali Commission has recently started an

Economic Development Committee for Rural Alaska, headed up by Julie Kitka, with the Alaska Federation of Natives.

Other agencies that Wayne suggested we contact for information and/or potential funding include: ANTHC; EPA; USDA; BIA; Norton Sound Economic Development Corp; Alaska Housing Finance Corporation (AHFC); Kawerak (Julie Boltar);

Other funds and grants Wayne suggested investigating include HUD's 184 Loan Program; the USDA Loan Program; the Title 6 Loan Program; and the Rural Community Action Program (home renovation). Also, the AHFC has a program called "New Development Alaska" that provides funds (up to 20% of cost) for energy facilities.

The BSRHA commissioned a housing relocation study for the HUD homes in Shishmaref, and determined that the cost of moving the homes would be \$75,000 per home. Alutec has also moved houses in AK, and may provide cost info.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Resource Agencies

Contact Date: 5/3/04

Agency: Alaska Department of Community and Economic Development, Community Advocacy Division, 550 W. 7th Avenue, Suite 1770, Anchorage AK, 99501

Personnel Met with and Contact Info: Gene Kane, Director, 907-269-4578,

gene_kane@dc.ed.state.ak.us

Christy Miller, Planner, Flood Insurance Program Coordinator, 907-269-4567,

christy_miller@dc.ed.state.ak.us

Christy is concerned that the homes that have already and are being relocated are being located on flood-prone lands.

The water supply Shishmaref now has is inadequate, according to Alaska Native Tribal Health Corporation (ANTHC). The AK Department of Environmental Quality (ADEQ) could team with DECD under its “Village Safe Water” program to plan for a new system at Shish.

Other aspects of DECD: (a) Alaska Energy Association (AEA) brings in electrical systems; (b) Ak Housing Finance Corporation (AHFC) has Community Development Block Grants (CDBG), for planning and infrastructure, that could be used for community site planning, on a one-time basis.

Christy has a library of relocation studies that have costing, cultural, and agency information.

Ques. How DECD could fit into a relocation or collocation project? DCED could take the state lead, if the governor’s office declares this. DCED also suggests that the Denali Commission could oversee the project, if congressionally authorized. The Congress could also designate the Corps to oversee.

Other agencies that could be involved: (a) Alaska Department of Transportation and Public Facilities (ADOT-PF) could get involved with a new airport; (b) Department of Education.

DOWL Engineers built the school, and Kumin Assoc. Architects designed the school.

Other suggested contacts include: FEMA, in Bothel, WA, Debbie Key and Bob Cook (Mitigation Division Chief), 425-487-4717; State Emergency Services, Bob Sltewart (on Fort Richardson), 907-428-7000 (or 4000?).

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Resource Agencies

Contact Date: 5/3/04

Agency: Alaska Industrial Development and Export Authority/Alaska Energy Authority, 813 West Northern Lights Blvd, Anchorage, AK, 99503.

Personnel Met with and Contact Info:

Ron Miller, Executive Director, 907-269-3000, rmiller@aidea.org

Chris Mello, Program Manager, 907-269-3000, cmello@aidea.org

AEA is working with the Denali Commission on power projects, including subsidization, training, and village management initiatives. AIDEA is the finance arm of the state corporation. They can provide funds as (a) 25-yr loans, up to 20% of capital cost, to a cap of \$20 million; (b) Investment financing, including floating AIDEA bonds.

Ron has experience with developing a new village in that he built a village in Russia for about 400 native people. Ron purchased northern construction modular homes from a company called Skagit-Pacific, and from Universal Services-Sakhalin (in Russia), which was formerly Ferguson-Semi-Clarke in Canada.

Ron and Chris agreed to provide costs for us if we provide specifications on sizes of housing and infrastructure. They suggested that the company Davis-Bacon would provide a cost basis for trades.

AEA is superseded in Shishmaref by AVEC. Brent Petrie is the person at AVEC to contact. AVEC and AIDEA/AEA serve communities under 2,000 population. AVEC has 51, AIDEA-AEA has 120.

On question of how AIDEA/AEA could be involved in a relocation or collocation of Shishmaref, AVEC would preclude AIDEA/AEA. We could look to AVEC for electrical generation, distribution, and fuel storage. Ron suggested having discussions with the Denali Commission. The commission started out as a coordinator of bulk fuel, added electrical, and now are continually expanding. The person to contact at Denali Commission is Al Ewing, Chief of Staff, at 907-271-1426.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Resource Agencies

Contact Date:

Event: Norton Sound Housing and Infrastructure Conference, May 5-6, 2004, Nome, Alaska
Personnel Met with and Contact Info: SEE NOTES BELOW

The two-day Norton Sound Housing and Infrastructure Conference, May 5-6, 2004, in Nome, Alaska was attended by more than 50 representatives from the major communities in the Norton Sound area, and many from the key agencies that provide funding and other services associated with housing and infrastructure in these communities. Leo Rasmussen, the local Nome USDA representative who chaired the conference, will be contacted for a list of attendees.

The conference provided the Corps/Tetra Tech Relocation Study Team with a valuable opportunity to meet and get familiar with a number of the key people that have interest in the relocation / collocation of Shishmaref. During the course of the conference, more than 20 presentations were made by some of the key attendees. Some of the relevant highlights from the majority of these presentations are presented below.

1. Leo Rassmussen, USDA Rural Development, Nome, and conference chairman. Gave a welcoming introduction to the conference.
2. Deborah Davis, USDA Rural Development, Palmer. This group makes loans to homeowners. Deborah thinks that mortgage caps and income limits for loans should be raised. The average house price in the Norton Sound area is \$240,000. The USDA appraisers are now agreeing to use a “cost” approach to valuing a home, rather than the traditional “comparables” approach. They use Marshall-Swift database, but they need to change their inputs to more accurately reflect the Norton Sound communities.
3. Randy Romanesko, City Manager, City of Nome. Randy discussed the two-year, \$36 Million harbor project that is presently underway. Randy feels that the cost per lineal foot of infrastructure is quite high, compared with other areas.
4. Ed Ward, Michael Moore, Maniilaq Association, Nome. Ed believes that the median family income that is published by DECD is inaccurate, e.g., in Kotzebue it is too high.
5. Wes Goodwin, Kotzebue Community Planner. No notes recorded.
6. Mike Frasier, Housing Improvement Program, Kotzebue. Mike says there is a big problem in Kotzebue finding dry land for housing, and when find dry land, the soils are usually very poor. This year there are two new homes being funded in Kotzebue through the H.I.P. Program, which Mike feels is under-funded. Mike said that HUD is a prominent player in the housing at Kotzebue. **ASIDE:** During the break we asked Mike about costing raw land and construction in Kotzebue for a new subdivision of 600 people if Shishmaref collocated to Kotzebue. Mike suggested contacting Bish-Gallahorn in

Kotzebue, who is doing a subdivision, working for the KIC Corporation, which is an 8-A group.

7. _____, Village of Shaktoolik. No notes recorded.
8. Gene Dobrynski, Program Specialist with HUD. Gene discussed the programs for housing that are overseen by HUD, including the provision of single and multi-family homes, NAHAZDA Funds, and Section 184; the Native American Homeownership Program.
9. Julie Baltar, planner with Kawerak. Julie showed a video of the effects of a storm on Shishmaref shoreline shot by Tony Weyauanna during the storm in 2002. Julie said that at present, it takes about three years for the process of bringing in any new housing project.
10. Steve Callison, First National Bank of Alaska. Steve reviewed the mortgage lending programs that his bank has for rural Alaskan communities.
11. Bruce Sexauer, Alaska District U.S Army Corps of Engineers. Bruce briefly discussed the City of Nome Harbor Project and the Shishmaref Erosion Control and Relocation Studies presently under way.
12. Kelly Hegarty, Community Planning Consultant, working for Alaska Gold. Kelly discussed the proposed 135-lot subdivision in Nome that would accompany the development of a hard rock mine in the valley. Kelly reinforced the big disparity between the assessed value of a home, and the purchase cost of a home. Kelly said that Alaska Gold has some questions for Nome, including (a) do local folks want to work at the new jobs that will be provided by the mine, or would people come in to work on them?; (b) are the local builders interested in working with Alaska Gold in providing homes? The mayor of Nome, who was present, said "Yes!" The mayor's husband is a local house-builder. **ASIDE:** During a break Kelly said she would help the Corps/TT Shishmaref Study Team in obtaining permission from Alaska Gold to get copies of the relevant planning and engineering reports being prepared for the new subdivision.
13. Clara Langton, with the Bering Straits Native Corporation. No notes recorded.
14. Paul Saunders, Bureau of Indian Affairs, Housing Improvement Program, Nome. Paul said that Kawerak is the main client of the HIP in the Norton Sound area. He said they are working to perfect a modular dwelling on a Triadetik foundation that has an overall rating of R-40. Paul recommended reading "Renewable Energy Sources" by Andrea Sulu, and "The Diameda Story", and both documents can be obtained from Paul.
15. Steven Christopher, Norton Sound Health Corporation (NSHC), Nome. Steven reported on plans for a new health facility in Nome. A 38-acre site has been chosen, and environmental studies are completed. Site development will commence towards the end of '05, on a 5-yr building plan. The overall cost is in the range of \$60-70 Million. Steven said that the NSHC is working closely with the Denali Commission.
16. Lt. Col. Craig Schreiber, U.S. Army National Guard, Nome, AK. Col. Schreiber said that the Guard is planning to develop a new National Guard Facility on a new 10-acre site in Nome. The Guard will donate the existing facility to the City. The funding has not yet been achieved for the new facility, because the plan has not yet made it into the "Future Year Development Plan" (FYDP) on the Army National Guard future construction list. However, Col Schreiber thinks it is only a matter of time.
17. Jim Stimfle, realtor in Nome, AK. Jim appears to be well connected in the area and knows a lot about what is happening in Nome regarding development, construction, and

housing. Jim is working with Alaska Gold on the proposed 135-lot Rock Creek Subdivision. Jim said that the cost of new construction in Nome is \$200 per square foot. He projected for this summer that cost of materials alone will be \$165 per square foot. He further projected that new construction in Kotzebue would be higher; up to \$195 per square foot for materials, or perhaps as much as twice Nome's cost. Jim conjectured that there could be as much as a 1,000-percent markup. Jim introduced Renee Patten, the Fairbanks Director of a Neighbor and Housing group, who is also acting as a consultant to Alaska Gold. He also introduced Dean Stewart, USDA Rural Development, who oversees financing for rural infrastructure and services in rural Alaska communities.

18. Tony Weyiouanna, Transportation Planner, Shishmaref. Tony is presently coordinating with HUD and the Denali Commission to address teacher housing. He and others in Shish have been working on water, sewer, health, and housing problems. In '94 Tony built his dad's home, and tried to add on to his home, but it was very expensive.
19. Doug Nickolson, Director of Operations, Alaska Gold, Fairbanks. Doug gave a power point presentation describing the proposed Rock Creek mining operation and 135-lot subdivision in Nome. **ASIDE:** The study team joined Doug for dinner and was able to establish a connection. Doug agreed to release to the team all relevant information about construction costs and housing that has been compiled in support of the new proposed subdivision.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Resource Agencies

Contact Date: 5/5/04

Agency: City of Nome, P.O. Box 281, Nome, Alaska, 99762

Personnel Met with and Contact Info: Randy Romanesko, City Manager, 907-443-6600,
manager@ci.nome.ak.us

John Handeland, General Manager, Chief Operating Officer, 907-443-6302,
johnh@njus.org

The City website www.nomealaska.org has planning documents and a comprehensive plan.

The new 135-lot subdivision being proposed by Alaska Gold requires a new on-site disposal system, because is too far away from existing city lagoon system.

A new electric power plant is being designed, and will have the capacity to adequately serve the 600+ people from Shishmaref. The present wastewater treatment system permit allows present capacity limits to be increased, although the disposal lagoons would need upgrading to accommodate an increase of 600+ people. The existing drinking water system, from Anvil Mt. wells, has plenty of capacity for additional residents.

Of the three cities being reviewed (Shish, Kotz, Nome), only Nome is a 1st Class City. See Dan Brockhurst at DCED for the implications of these differences. Also, Kotzebue is in the NW Arctic Borough, and the others are in unincorporated territory.

Chuck Eggener an Anchorage consulting engineer works for the city and would have knowledge of the utility systems. Chuck's phone is 907-349-1000. Eilene Bechtal, a planning consultant to the city from Homer, is a source of information. Her number is 907-235-4246.

We would have to research the other services at Nome (e.g., social, educational) to determine capacities. The school superintendent is Stan Lugan, at 907-443-2231.

A new hospital is being planned, and Joe Cladouhos is the CEO, at 907-443-3226.

There has already been a precedent of collocation at Nome, with the addition of the King Island community a number of years ago. Suggest we talk to Sister Alice Anne, who is an anthropologist, at 907-443-2094.

Agencies to see to get information on the King Island collocation and etc, include: (a) King Island Native Corporation / Tribal Council, Barbara Gray is coordinator; (b) Sitnasuak Native

Corporation, a Nome for-profit native corp; (c) Nome Eskimo Council, the IRA for Nome; (d) Bering Strait Native Corporation (BSNC), the regional for-profit native corp.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: AVEC

4831 Eagle Street, Anchorage, AK 99503

Personnel Met with and Contact Info:

Mark Teitzel, P.E. Vice President and Manager, Engineering
907-565-5337

mteitzel@avec.org

Eric Marchegiani, P.E. Project Development Engineer
907-565-5680

emarchegiani@avec.org

Contact Date: 7/6/04

AVEC (Alaska Villages Electrical Coop) is the current provider of electrical service to Shishmaref. Mark and Eric provided the Shishmaref Study team with the following relevant information about the existing electrical system in Shishmaref, and cost information regarding providing electrical service to a new location (e.g. Tin Creek):

- There are presently 188 service connections at Shishmaref (2003).
- Cost of providing new service is \$5428. per meter. This could apply to a new site as well.
- The existing system has one 500-kw, one 300-kw, and one 200-kw oil-fired generators, which can be run separately or in combination.
- A new power plant would cost about \$1.9 million.
- Re: fuel, about 270 gal per capita and 30,000 gal/industry would be required each year. There would be about 200,000 gal required at startup. Cost of around \$2 million. Also, fuel delivery would require development of a port site and lightering service. AVEC would want the generating plant to be within about 200 feet from the bulk fuel storage. The cost of fuel pipelines is about \$100 per foot
- We can send a letter or email to Mark or Brent with future questions and AVEC would respond.
- In the new system, AVEC suggests that heat recovery from the generators can be sent to the school and water system, with a savings realized on fuel consumption (up to 20%). The cost of installing such a system would be about \$300,000.
- AVEC suggests supplementing diesel generation with wind turbines. They suggest two turbines would be required, one 66-kw and one 100-kw, at a cost of about \$1 million. With the cost of fuel up to \$5 per gallon, wind energy can discount up to 30% of ongoing fuel costs.
- If the relocation was to be spread over several years, an incremental approach to providing a new electrical system would have a lower initial capital cost to start, but over the duration of the re-settlement would likely cost more because economy of scale achievable in a complete system would be lost. The resultant cost per kw-hour for electrical power could be double what it is today (.50 per kwhr).

- Re: Transmission lines, the cost would be about \$200,000 per mile, including conductors, and pile-driven based poles.
- Re: a new airport, the FAA would be involved in permitting the new tower. We should contact Robert Van Haastert at FAA in Anchorage to discuss further. Phone: 907-271-5863, email: Robert.van-haastert@faa.gov. The Airports Division of ADOT would build the new airport. We need to check out which region covers Shishmaref, Fairbanks or Anchorage.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: DENALI COMMISSION

Contact Date: 7/6/04

510 L Street, suite 410, Peterson Tower, Anchorage, AK 99501

Personnel Met with and Contact Info:

Krag Johnsen, Deputy Chief-of-Staff

907-271-1414

Kjohnsen@denali.gov

Cindy Roberts, Program Manager

907-271-1414

croberts@denali.gov

The Commission helps provide infrastructure in rural settlements. So far, the Commission's emphasis has been on energy and health. They are targeting 172 rural communities, so there is much still to do. The Commission is an independent federal agency that gets funding from DHCS, EPA, U.S. Rural Utilities, and USDA. The Commission provided the following relevant information:

- The Commission would likely be able to help the new Shishmaref location with facilities associated with fuel, electrical generation, and health care.
- The Commission has recently built some new fuel facilities on Shishmaref.
- Re: Washeteria, the commission estimates a new facility would cost about \$1.25 million.
- The Commission asked about what would be done about the cemetery and the solid waste that has been accumulating on Sarichef Island. They suggest that an incinerator may be a good facility to install. Cindy mentioned that perhaps the Commission could do a pilot solid waste management project at Shishmaref.
- The Commission suggested we talk to the AK Economic Development Administration. Contact is Bernie Richert, the Alaska Director. He would be able to provide the cost of relocating the tannery, and what the state has invested in the tannery.
- The Commission suggested we talk to the following groups to get some cost information: (a) STG Construction in Anchorage, Jim St. George, to get costs for infrastructure; (b) CE2 Inc also in Anchorage, Chuck Eggers, also for infrastructure; and (c) AK DOT, for cost of roads.
- The Commission mentioned that the Army Reserve Training (National Guard) in Anchorage is interested in undertaking projects for rural communities. Contact: Mike Grunst, 907-428-6358, mike.grunst@ak.ngb.army.mil

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: (a) MANIILAQ

P.O. Box 256, Kotzebue, AK 99752.

(b) TRC CONSTRUCTION

P.O. Box 813, Kotzebue, AK

Contact Date: 7/6/04

Personnel Met with and Contact Info:

(a) Mike Frasier, Planner, 907-442-7763, mafrasier@maniilaq.org

(b) Ken Usben, Tony Richardson, co-owners, 907-442-2594

Mike Frasier introduced the study team to Ken Usben and Tony Richardson, co-owners of TRC Construction P.O. Box 813 Kotzebue, AK, 907-442-2594. TRC is a small construction company that pursues local projects up to ~\$100,000. Larger projects in the area usually go to 8-A firms and TRC will sub to them when possible. TRC provided the following information:

- TRC likes to do standard construction of residential and commercial buildings because it supports the local economy more so than bringing in modular buildings.
- TRC stated that standard construction was approximately \$175 per square foot.
- Post and pad foundations are least cost but require continual adjustment of the post height by turning the adjustable screws
- Pile foundations deep into the permafrost provide good foundations, but are more costly. Usually only 3 piles are used for the average house.
- Permafrost is typically at 7-9 feet bgs. Mostly beach gravel deposits occur from the existing ground surface down to permafrost.
- Concrete this year is running at \$500 per cubic yard.
- The use of foam under concrete works well if enough depth is used per the given conditions, however it is quite expensive.
- Riprap is barged in from Nome. No cost information was given. Gravel is either barged in or comes from across the Kotzebue Sound by Drake. Gravel is around \$33 per cubic yard.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group:

Contact Date: 7/7/04

- (a) **CITY OF KOTZEBUE**, 258A Third Avenue, P.O. Box 46, Kotzebue, AK 99752
- (b) **NWAB Planning**, P.O. Box 1110, Kotzebue, AK 99752
- (c) **NANA Regional Corp**, P.O. Box 49, Kotzebue, AK 99752
- (d) **NWAB School District**, P.O. Box 51, Kotzebue, AK 99752
- (e) **KIC**, 373A Second Avenue, P.O. Box 1050, Kotzebue, AK 99752; and
- (f) **KOTZEBUE ELDERS COUNCIL (Kotzebue IRA)**, P.O.Box 296, Kotzebue, AK, 99752

Personnel Met with and Contact Info:

- (a) **Herman Reich**, City Manager, 907-442-3401; **Gayle Ralston**, Mayor; **Noah Naylor**, Water System.
- (b) **Tom Bolen**, Planner, 907-442-2500; **Walter Porter**, Planner.
- (c) **Charlie Gregg**, 907-442-3301.
- (d) **Carl Chamblee**, 907-442-3472 (xt 235), cchamblee@nwarctic.org
- (e) **Bish Gallahorn**, 907-442-6105.
- (f) **Willie Goodwin**, 907-442-2500

Bruce Sexauer introduced everyone to the Shishmaref Relocation Study and invited comment from those present. The following are relevant highlights from those who wished to speak:

Gayle Ralston, Kotzebue Mayor.

- Perhaps we should consider letting Shishmaref split to both Kotzebue and Nome, as they saw fit.
- In order to accommodate the influx of new people, Kotzebue would likely have to: (a) upsize the water line; (b) add a treatment plant; (c) provide water distribution and sewage collection systems; construct one or more roads; and (d) add classrooms to the school. The present enrollment in Shishmaref schools is 170, and it would take a several million \$ addition to accommodate them in Kotzebue.
- We need to consider the time frame for collocation with Kotzebue. The 600 new people would be 18% of Kotzebue's population, which is about double what Kotzebue is planning for now.

Willie Goodwin, Kotzebue Elders Council.

- The influx of new people would put pressure on the subsistence resources.
- The spare capacity and future expansions of utility systems in Kotzebue should be for Kotzebue residents first.
- Kotzebue should not be burdened with any of the costs of relocating the Shishmaref people to Kotzebue.
- The Kotzebue health facilities would have to be expanded.

Walter Porter, NWAB.

- Suggested that Cape Blossom could be considered as a relocation area, since it is only some 12 miles away from Kotzebue, and on the coast.
- Consideration should be given to developing a new port; it costs more to lighter here than the shipping from Seattle.
- Consider also a new airport in the Cape Blossom area and a connecting road.
- Walter is from Yakutat, which has a fully self-contained system.

Herman Reich, Manager, City of Kotzebue.

- This collocation would be a big change in their lifestyle, and in ours as well.
- Shishmaref people would never fit into the Kotzebue lifestyle.
- It seems wrong to do costing before Shishmaref has chosen. They should give their choice first, then do costing.

Charlie Gregg, NANA.

- There would be competition for jobs.
- The cost of providing servicing for individuals and the City could pose a problem

Walter Porter, NWAB.

- There is a general exodus from the villages, with most people going to Anchorage. There are 29,000 natives in Anchorage. Many people want to become part of the American lifestyle, including income.
- If we look at the planning at Kivalina, we can conclude that the costs of relocation are huge.
- Alaska villages are suffering from climate changes.
- Perhaps for Shishmaref the situation could be similar after a relocation to what takes place in Noatak; where they live on higher ground, and come down to lower elevations for subsistence hunting.

Noah Naylor, City of Kotzebue Water System.

- The city's water system would need about \$4 million in upgrades to accommodate the additional Shishmaref people. This would include water line, lift stations, and water tank.
- The East Lake Development cost about \$34,000 to bring servicing to each lot.

Carl Chamblee, NWABSD.

- It is hard to put a price on the cultural impact of relocating Shishmaref.
- We should get a copy of Kotzebue's Long Range Plan.

Bish Gallahorn, KIC.

- The Corps study will likely show that it is best for Shishmaref to stay, so let's help put some numbers together. We are looking at providing 100-120 homes and associated infrastructure.

Tom Bolen, NWAB.

- The idea of "trade-offs" should be an essential part of the process of Shishmaref coming to a decision, because the cost issue is such a big factor.
- The concept of developing a new community as a "satellite community" that transitions into being the main community, with the old community becoming the satellite should be considered, to bring reality into the equation.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group:

Contact Date: 7/7/04

- (a) **KIC, 373A Second Avenue, P.O. Box 1050, Kotzebue, AK 99752;**
(b) **NWAB, P.O. Box 1110, Kotzebue, AK 99752.**

Personnel Met with and Contact Info:

- (a) **Bish Gallahorn**, 907-442-6105.
(b) **Tom Bolen**, 907-442-2500

The study team met over lunch with Bish and Tom; here are some highlights:

- If the entire community of Shishmaref moved to Kotzebue and wanted to stay together they would have to locate on the upper bench just east of the city.
- Cost of raw land is approximately \$4 per square foot.
- Standard lot sizes in Kotzebue are approximately 6000 – 8000 square feet.
- Development in Kotzebue typically use 500 cubic yards of gravel per lot. Gravel is approximately \$30 per cubic yard. Concrete is \$625 per yard (barged).
- Assuming the main utilities are installed in the streets it typically costs \$35,000 - \$40,000 to hook-up each household.
- Total lot improvement cost (excluding the house structure) is approximately \$100,000 per lot.
- Standard construction for residential house construction is approximately \$250 per square foot.
- The community could be developed along the main road (The Loop) and would only require new roads and driveways to access each of the lots.
- The existing water supply is nearly at capacity. The East Lake Development (a future water source) would have to be tapped into to handle the community from Shishmaref. The City of Kotzebue is currently constructing a new 1.5 million gallon water tank to handle the needs for the current storage capacity. An additional water tank and a new water treatment system will be required to handle the community from Shishmaref. (\$30 million?).
- A new sewer lagoon system would be required to handle the community from Shishmaref. A new sewer lagoon may cost around \$3 - \$5 million.
- Additional costs to run the main sewer, water, power, cable, telephone and other utility lines to and throughout the new community need to be quantified.
- The existing school would need to be expanded to handle the additional students from Shishmaref. Construction costs for schools is approximately \$300 - \$350 per square foot. Also, additional teachers would need to be hired and housed.
- Kotzebue has a new medical clinic/hospital.
- The electrical power generation needs in Kotzebue may require a new generator and fuel tank to handle the community from Shishmaref. Construction of a new fuel tank is approximately \$1.25 per gallon. Generator would be \$500,000.
- The existing landfill has a 7-year capacity. The last landfill cell was built 4 years ago and now gravel is double the price. A new landfill cell would be required to handle the community from Shishmaref. Ask Noah (Public Works) the cost of the last cell, and double it.
- New small boat harbor likely required, at a cost of around \$10 million.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: KOTZEBUE ELECTRIC ASSOCIATION, **Contact Date:** 7/7/04
P.O.Box 44, Kotzebue, AK 99752

Personnel Met with and Contact Info:

Matt Bergan, P.E., Power Generation Plant Engineer
907-442-

The study team met briefly with Matt Bergan who is the project engineer at the power generation plant. The meeting also included a teleconference with Craig Thompson P.E. who is the engineer of record for the electrical system in Kotzebue.

- The existing electricity power plant has the capacity to accommodate Kotzebue and its growth (2% - 3%) for the next 10 – 15 years.
- The current capacity of the power plant is 11.2 MW. The existing peak demand is approximately 4 MW.
- The power plant has 6 generators/engines. 3 CAT engines (2@800KW and 1@1000KW) and 3 EMD (1@3400KW and 2@2800KW).
- The community from Shishmaref (600 people) would add approximately 1 MW of demand.
- The demand from the community from Shishmaref would require a new generator/engine. The new generator/engine would cost \$1.5 – \$1.75 million.
- Adding to the existing capacity would require a new (PSD) permit for air from ADEC or EPA and would cost approximately \$0.5 - \$0.75 million.
- Cost to run new overhead power lines out to a community is approximately \$120,000 per mile.
- There is a one-time membership fee of \$100 per hook-up.
- A new 1 million gallon fuel tank would be required to handle the capacity of the community from Shishmaref. The cost to build a new fuel tank is approximately \$1.25 per gallon (includes pad, piping, diking etc)

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: NOME JOINT UTILITY SYSTEM,
P.O. Box 70, Nome, AK 99762

Contact Date: 7/8/04

Personnel Met with and Contact Info:

Toby Shield, Water and Sewer System Manager, 907-443-NJUS

Doug Johnson, Power Plant Foreman, 907-443-NJUS

Bruce McDaniel, Power Distribution Manager, 907-443-NJUS

The Study Team met with Toby, Doug, and Bruce. Here are highlights of the information they provided:

Water System (Toby Shield)

- The water system source is comprised of (3) wells with a capacity of approximately 750 gpm.
- Current usage is approximately 250 gpm, with peak demands at around 350,000 – 400,000 gallons per day.
- Water is treated with Floride and is Chlorinated.
- Nome has (2) 1 million gallon water tanks that provide adequate storage capacity even if the community of Shishmaref were to collocate.
- The water is heated with waste heat from the power plant. All water mains and connections are continuously circulated.
- There are approximately 1,700 residential connections with total connections approaching 1900.
- Water and sewer lines have been upgraded from utilidors to direct bury throughout the city.
- Cost of running water lines from main to new house is \$145 per foot up to 60 feet then \$100 per foot there after.

Sewer System (Toby Shield)

- The existing sewers empty into (2) sewage pond cells. The cells are equipped with a blower house and aeration lines to reduce the smell.
- The treated sewage exits the ponds through a pipe that runs approximately 2700 feet off shore.
- Currently the sewage system is permitted for 770,000 gallon per day. City states the sewer system could handle up to 1 million gallons per day.
- The current actual sewage treatment is approximately 400,000 gallon per day.
- A new sewage pond cell may be required to handle the increase population from the community from Shishmaref
- Cost of running sewer lines from main to new house is \$135 per foot up to 60 feet then \$100 per foot there after.

Electric Generating Plant (Doug Johnson)

- The current actual electricity power demand is approximately 3400KW with peaks approaching 5000KW.
- The current plant has a capacity of 10.9MW. After the future upgrade to the system it will have a capacity of 15MW. Production costs are approximately 14 cents per KW.
- Excess heat is used to heat the water. In the future this excess heat could heat the post office or any other structures within close proximity.
- Existing bulk fuel storage for power is 3.4 million gallons. A new fuel tank of 1 million gallons may be required to handle the increase population from the community from Shishmaref.

Power Distribution (Bruce McDaniel)

- The cost to run 3-phase overhead power to a new development is approximately \$85,000 per mile.
- Cost includes \$3,000 per pole for 3-phase power.
- There would be no charge for service hook-ups

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

Agency/Individual/Group: NEW FRONTIER REALTY,
P.O. Box 971, Nome AK 99762

Contact Date: 7/8/04

Personnel Met with and Contact Info:

Jim Stimpfle, Owner, 907-443-2002, jim@nook.net

Jim is a local real estate agent in Nome. Jim provided the following information:

- There is a lot of private land in Nome from the mining claims.
- Raw un-serviced land is approximately \$1,000 per acre.
- The nearest small boat landing is approximately 30 miles away.
- Standard construction for residential house construction in Nome is approximately \$150 per square foot.
- Modular homes in Nome transported from Anchorage cost approximately \$280,000 for a 1,100 square foot house.
- Nome is currently getting a new \$51 million hospital with 15 beds. Contact Joe Claduou for more information.
- Nome's fire department is a 50 person volunteer fire department. The city's goal is to have a fire hydrant within 300 feet from any structure.
- Contact Stan Lukan, Superintendent of Schools for information.

Contact Report

U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders

**Agency/Individual/Group: SHISHMAREF EROSION
AND RELOCATION COALITION,**
P.O. Box 72100, Shishmaref, AK 99772

Contact Date: 7/9/04

Personnel Met with and Contact Info:

Tony Weviouanna, Chairman, Shishmaref Erosion and Relocation Coalition, 907-649-2289
Fred Goodhope, Planner

The Study Team met with Tony and Fred, who provide the following information:

- Tony is looking for funding to construct some non-HUD homes.
- Tony is pursuing several different avenues to obtain funding to develop mining gravel commercially at Ear Mountain.
- Funding for constructing a gravel haul-road from Ear Mountain could come from BIA, or Tony Young. This would likely be a significant regional project because of the minerals in Ear Mountain, and the gravel could supply the region. Check with the Bering Straits Native Corporation.
- Fred is searching for funding to start looking at the implementation of an emergency evacuation building that could be located at the new relocation site.
- Tony and Fred thought most of the houses in Shishmaref could be moved to the new location.
- Tony feels it would be good to have several projects underway that are building up towards the relocation. For example, the gravel operation and haul road, construction of a multi-purpose building at the new site.
- Tony suggests looking for examples at other communities to see how the relocation could be done.
- Tony is hoping that much of the relocation be accomplished by local people, giving them employment.

U.S. Army Corps of Engineers – Alaska District

SHISHMAREF PARTNERSHIP

Meeting with ANTHC, August 30, 2004

Distribution Date: 9/13/04

Present: Helena Attakai, ANTHC; David Broadfoot, Tetra Tech.

Helena provided a 4-page text document and two drawings of useful information about the existing Shishmaref water supply and treatment system. She also provided a 2-page copy of an aerial photo of Shishmaref, and with color added to those homes with existing flush-haul sanitary sewer systems. These documents are available from Helena on request.

Highlights of the relevant points discussed during the meeting are as follows:

General

- ANTHC provides technical assistance to the City of Shishmaref for the water, sewer, and solid waste facilities. Assistance is provided through various funding agencies for management of sanitation facilities construction programs to create a safe and a healthy community.
- Tetra Tech has been tasked by the Corps of Engineers obtain rough costs associated with the following: (a) upgrading and expansion of the water, sewer, and solid waste systems in the hypothetical case of Shishmaref staying in place and not relocating, and assuming the erosion is controlled; (b) Shishmaref relocating to the West Tin Creek Hills Site; and (c) Shishmaref collocating to either Nome or Kotzebue. Tetra Tech has a deadline of Sept 24th to compile this information into a logical report. ANTHC has agreed to help provide information on planning and costing for (a) and (b) of this exercise.
- The ongoing success of the water and sewer systems in the village existing and new site) depends on having properly trained staff operating and maintaining these systems.

Existing Village Site

- A flush-haul system has been in the process of being implemented in the existing village since the early 90's. At present there are 47 homes with flush-haul systems installed, and 31 of the 47 home have working systems (16 not working).
- No piped water distribution and sewage collection systems are planned for Shishmaref, but the Village has expressed the desire to have these types of systems in the future.
- The existing water system at Shishmaref was developed in the 80's, and is reaching its design life. It is in need of improvements. The Village does not drink the water because of taste and color due high organics, which leads to harmful residual-chlorine complexes. The present plans

are to spend \$800,000 (provided by “Safe Drinking Water Program” – EPA) to accomplish the following: (a) upgrade the water catchment area in summer ’05; and (b) upgrade treatment plant in winter ’05. These are in the design phase at ANTHC.

- There are at present two treated water storage tanks in the Village, a 1.3 million-gal tank next to the Washeteria, and a 400,000-gal tank near the school, and these tanks are looped together with piping.
- The existing three lagoons near the washeteria are used for treating gray water from the washeteria. The village presently hauls individual honey buckets to a lagoon at the far end of the runway.
- CRW Engineering is presently doing a “Utility Business Plan” for operating the washeteria. It should be available in December 2004.
- The community currently has a fenced solid waste site and a honey bucket lagoon. The honey bucket are disposed by the city haul system at the homeowners request for a fee set by the city utility department. There are currently no plans for upgrades or improvement, if the community were to stay a proposal for expansion would be necessary. However, the space available for expansion is very limited.

New Village Site (e.g., Tin Creek)

- For a new site, ANTHC recommended that a feasibility study be completed at the new site for sanitation facilities, and to determine the design parameters for treatment, storage, distribution and disposal. A site investigation should be completed for soils, gravel availability, wind analysis, landfill location, and additional items necessary for development. Environmental effects on the site such erosion, storm surges should be considered.
- A solid waste management plan and design would also be required for a new landfill and solid waste collection system for the village at the new site.
- The new site would also need a community layout plan for relocation and development, complete with real estate easements and rights-of-way clearly and legally denoted so that the village could be eventually serviced with piped water delivery and sewage collection systems. There is also the need for a utilities master plan for the new site.
- It would be most helpful if ANTHC (Helena) could develop rough costs at the new site for the following: (a) a new water source to serve 589 people; (b) a water treatment system for same; (c) two water storage tanks, each at 1.5 mg, one at treatment plant, the other near school, looped together; (d) an initial watering point at each water tank, and later a complete piped water delivery system for 150 homes and all community buildings; (e) an initial flush and haul system serving 150 homes, with community buildings hooked up to sewage treatment lagoons, and later a complete piped sewage collection and treatment system; and (f) a new landfill.

Contact Report

**U.S. Army Corps of Engineers – Alaska District
SHISHMAREF PARTNERSHIP
Relocation and Collocation – Stakeholders**

Activity: WALK-THROUGH OF THE CITY OF SHISHMAREF

Date: 7/9/04

The Shishmaref Study Team walked through the city to assess the existing infrastructure, houses, and commercial structures. Houses were only given a cursory visual inspection to determine whether or not they could be moved to a new village site. The following information was gathered:

- The number of 1 story houses that are assumed to be movable, but do not have a triodetic foundation was estimated to be 113.
- The number of 1 story houses that are assumed to be movable, and have a triodetic foundation was estimated to be 14.
- The number of 2 story houses that are assumed to be movable, but do not have a triodetic foundation was estimated to be 8.
- The number of 1 story school teacher houses that are assumed to be movable, but do not have a triodetic foundation was estimated to be 4.
- The Armory includes 2 structures with triodetic foundations and will be assumed to be movable.
- There were many small storage shacks throughout the village. It is assumed that these shacks will not be move to the new village site.
- The school is built on pile foundations and will be assumed to be a permanent structure that cannot be moved to the new village site. The school will also need to be utilized at the existing village location throughout the relocation time period.
- The Native Store, the Nayokpuk Trading Post, and the Tannery are assumed to be permanent structures that cannot be moved to the new village site. These facilities will also need to be utilized at the existing village location throughout the relocation time period.
- The washeteria will be assumed to be a permanent structure that cannot be moved to the new village site. The washeteria will also need to be utilized at the existing village location throughout the relocation time period.
- The Fire Hall, City Hall/Post Office, Clinic, Community Hall, Friendship Center, Airport Building, Church and Patronage buildings are assumed to be permanent structures that cannot be moved to the new village site. These facilities will also need to be utilized at the existing village location throughout the relocation time period.
- The Water Tanks are assumed to be permanent structures that cannot be moved to the new village site. These facilities will also need to be utilized at the existing village location throughout the relocation time period.
- The power generation system and AVEC buildings are assumed to be permanent structures that cannot be moved to the new village site. These facilities will also need to be utilized at the existing village location throughout the relocation time period.

- While most of the bulk fuel tanks are not permanent it is assumed that they will not be moved to the new village site. These facilities will need to be utilized at the existing village location throughout the relocation time period.
- The existing honeybucket haul and sewage lagoon systems were observed by the study team. It is assumed that at a minimum a new honeybucket and sewage lagoon system will be constructed at the new village site.
- The existing landfill was not observed due to its location and the study team's limited transportation availability. It is assumed that a new landfill will be constructed at the new village site.
- The existing underground cold storage area was not observed by the study team.

APPENDIX 3

INDEPENDENT TECHNICAL REVIEW COMMENTS

Technical Review Comments		Project: Shishmaref Relocation and Collocation Study		Location: Shishmaref, Alaska	
Date: 09.23.04		Reviewer: Chris Lee	Tel: (949) 250-6788		Back Check By: (initials)
<u>Office</u> Irvine, California		<u>Type of Document</u> Preliminary Report	<u>Discipline</u> Planning		
Item No.	Page/Sheet	6.2.1 COMMENTS		Action Taken:	By:
6.2.1.1 GENERAL					
1	Entire Report	See marked-up document (electronic – track changes) on editorial (i.e. punctuations, sentence structure, heading formatting) comments.		Changes made to text, edits accepted.	DB
2	Entire Report	Check spelling		Checked	DB
6.2.1.2 SPECIFIC					
1	Pg. 5, Bullet item 4	Is the community moving to another location on the mainland site? The sentence is a bit confusing. Suggest to rewrite to clarify.		Sentence rewritten.	DB
2	Pg. 7, 1 st par.	1 st sentence – “community listed below” Please clarify where this sentence points to in the document. There is no discussion of a community in the sections following this sentence.		Refers to community elements. Sentence rewritten.	DB
3	Pg. 11, Bullet item 2	Shouldn’t opportunities be included?		“opportunities” added to bullet item 1.	DB
4	Pg. 12, Sec. 2.3, 1 st par	Last sentence – What do you mean by “a normal way?”		“in a normal way” deleted from sentence.	DB
5	Pg. 12, Sec. 2.3, 3 rd par.	Last sentence – incomplete.		Sentence completed.	DB
6	Pg. 14, after 2 nd par.	There is no discussion on the Storage Buildings. Please include.		Information added.	DB
7	Pg. 15, 2 nd full par.	1 st sentence – add at the end – to collect sanitary waste.		Added.	DB
8	Pg. 27, Table 3-1	In the copy I have, the last row of the table is on the next page. Move table to combine all rows.		Table adjusted in final version.	DB
9	Pg. 28, 2 nd par.	2 nd sentence – confusing. Rewrite.		Sentence rewritten.	DB
10	Pg. 28, 2 nd par.	Last sentence – would this be constructed? Or is this describing the distribution system? Clarify.		A looped distribution system would be constructed. Sentence rewritten.	DB
11	Pg. 38, last par.	10 feet (high) by 20 feet (long)? Please clarify.		20 feet long by 10 feet wide. Sentence clarified.	DB

Technical Review Comments		Project: Shishmaref Relocation and Collocation Study		Location: Shishmaref, Alaska	
Date: 09.23.04		Reviewer: Chris Lee	Tel: (949) 250-6788		Back Check By: (initials)
Office Irvine, California		Type of Document Preliminary Report	Discipline Planning		
Item No.	Page/Sheet	6.2.1 COMMENTS		Action Taken:	By:
12	Pg. 50, 1 st par.	10 feet (high) by 20 feet (long)? Please clarify.		20 feet long by 10 feet wide. Sentence clarified.	DB
13	Entire Report	Sections on “Agencies Potentially Assisting in this Alternative” were not available at the time of this ITR.		Sections added to final version.	DB

APPENDIX 4

INFORMATION FROM AK DOT-PF AND ANTHC

U.S. Army Corps of Engineers – Alaska District

SHISHMAREF PARTNERSHIP

Shishmaref Relocation Cost Assessment

Information from AK DOT-PF

9/7/04

As was discussed briefly in a phone call between Dave Broadfoot of Tetra Tech, and Donna Gardino and Dave Sanches of Northern Region of AK DOT-PF, Tetra Tech is currently assisting the Alaska District, U.S. Army Corps of Engineers in determining the approximate costs of four alternative courses of action in response to the ongoing seaward erosion of Sarichef Island and the City of Shishmaref; an Alaskan Native Community wholly located on the island.

The following four alternatives are being addressed:

- Alternative A - Shishmaref Staying in Place
- Alternative B - Shishmaref Relocating to a New Mainland Site
- Alternative C - Shishmaref Collocating to Nome
- Alternative D - Shishmaref Collocating to Kotzebue

The basic approach taken in determining the costs associated with the above alternatives involves gathering information from (a) research of existing published information; (b) contact with city officials, appropriate agencies, developers, trades, contractors, and others knowledgeable on the subject; and (c) limited site reconnaissance.

In this process, relevant information is being gathered on the following:

- The basic needs of the Shishmaref community
- The development constraints and opportunities associated with each of the four alternatives
- The specific requirements associated with meeting each of the identified needs of the Shishmaref community for each alternative.

Tetra Tech is in the process of contacting key members of the Shishmaref community and agencies (such as DOT-PF) to obtain input and answers to the questions below. We greatly appreciate your help in helping us to obtain this information.

INFORMATION FROM AK DOT-PF ABOUT SHISHMAREF

Tetra Tech greatly appreciates the assistance of AK DOT-PF in developing answers to the questions below, regarding Alternative A (Shishmaref Staying in Place), and Alternative B (Shishmaref Relocating to a New Mainland Site, e.g., Tin Creek).

Re: Alternative A – Shishmaref Staying in Place

1. What are the approximate dimensions of the existing runway and other service areas?
5,000 x 70'
2. When were the airport runway and facilities built?
1986 – approximately \$4.7 million
3. How thick is the gravel section of the runway?
There is no gravel. There is a 2-5' sand embankment with geogrid.
4. What have been the major improvements made to the airport and when?
Constructed a snow equipment removal building and obtained snow removal equipment around 1994. Rehabilitated runway, taxiway and apron and installed fencing around 1996. Rehabilitated the snow removal equipment building around 2000. Total cost of improvements to date is \$2.07 million. 2004 – new painted markings applied at airport.
5. What is the expected remaining service life of the existing airport facilities?
5 – 8 years with routine maintenance only
6. What would be the approximate replacement cost and/or major refurbishment cost for the airport facilities?
\$20-30 million
7. If Shishmaref were to remain at present site, what future plans for upgrading and refurbishment would there be for the airport?
Repaving and surface rehabilitation only
8. Were there ever gravel roads through the existing community? If so, how thick was the gravel section?
The State built the landfill and airport roads and maintains the airport road only.
9. What is the length of the new gravel road to the landfill on Sarichef Island? How thick was the gravel section? Where did the gravel come from? How much did it cost?

Re: Alternative B – Shishmaref Relocating to New Mainland Site (e.g., Tin Creek)

1. How much would a new airport runway and facilities cost for the new site?
\$20 – 30 million
2. How long and wide would the new runway be?
Up to 5,000' x 100'
3. How much area would be required to construct and operate a new airport?
50 acres (Was later revised to 250-300 acres)
4. About how much gravel would be required for the airport?
Up to 1,000,000 cys depending on the depth of the embankment

5. How long would it take to plan for and construct a new airport?

At least 5 – 7 years

6. General site conditions at the new site include a 6–12 inch layer of vegetative mat underlain by 10–16 inches of gray silt, underlain with permafrost composed of silt and high amounts of ice. How thick would the required gravel section of community and haul roads need to be?

It depends on whether or not insulation is used; without insulation, 9 – 10' for road and airport; homes would be built on piles

7. What are the sources of gravel in the area?

Ear Mountain – 10 miles southwest of the preferred relocation site

8. Our preliminary estimates are that about 33 miles of roadways would be required to serve the new site and community. This includes a 2-mile road to a barge landing site; a 2-mile road to the airport; about 4 miles of internal roads; a 21-mile material source road; a 1-mile road to the lagoon; a 1-mile road to the water source; and a 2-mile road to the landfill. About how much would it cost for this new road system?

Estimate new roads at \$2 million/mile and the community would be required to sponsor the project and commit a 10% match and own and maintain the new roads. Match would be required on all roads except the airport, lagoon and landfill roads. Local ownership and maintenance would be required on all roads except the airport road.

9. How long would it take to plan, design, and construct a new road system?

These projects would be evaluated and scored and compete on a statewide basis to be included in the Statewide Transportation Improvement Program (STIP). Once FHWA funds became available, estimate 2-3 years for design and one year for construction. So, timing is unknown.

10. How much would it cost for a new bridge across Tin Creek?

\$250,000 sf – assume 30' wide x length (Was later revised to \$250 sf)

11. How long would it take to construct this new Tin Creek bridge?

Again, this project would be evaluated and scored and compete on a statewide basis to be included in the Statewide Transportation Improvement Program (STIP). Once FHWA funds became available, estimate 2-3 years for design and one year for construction. So, timing is unknown.

12. Assuming the relocation plans call for the Shishmaref community to occupy both the Sarichef Island (existing) site, and the new mainland site for a 5-year period during relocation, what, if any, additional transportation-related costs and structures would be required?

Needed infrastructure would include a road to the old site, maintained summer and winter, long bridges across the channel (over 8,000'), or a ferry system or flight service back and forth. Costs for these are unknown at this time but anticipate very high.



ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

*Division of Environmental
Health and Engineering*

1901 South Bragaw Street, Suite 200
Anchorage, Alaska 99508-3440
Telephone: 907-729-3600
Facsimile: 907-729-4090

October 21, 2004

David Broadfoot
Senior Environmental Planner
Tetra Tech Inc.
1925 Post Alley, Suite 4
Seattle, Washington 98101

Dear Mr. Broadfoot:

Re: Typical Utility System Costs – Shishmaref, Alaska

Per your request during an August 30, 2004 meeting with Alaska Native Tribal Health Consortium Project Engineer Helena Attakai, I am providing to you several options for providing water and sewer utilities to the residents of Shishmaref, Alaska at their present location or at a new community location. For each option, I have provided a list of assumptions, conceptual level costs and any concerns (see the enclosed conceptual level cost estimates).

The options that I reviewed include:

- ☐ Expansion of the existing Shishmaref water and wastewater utility haul system to serve all occupied homes.
- ☐ Replacement of the existing Shishmaref haul system with piped water distribution and wastewater collection.
- ☐ Construction of a new arctic utility system to serve the residents of Shishmaref with piped water distribution and gravity wastewater collection at a new town site.
- ☐ Construction of a new arctic utility system to serve the residents of Shishmaref with piped water distribution and vacuum wastewater collection at a new town site.

Costs associated with construction of a typical arctic “class 3” solid waste collection and disposal system in rural Alaska is also provided.

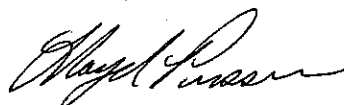
The estimates provided for a new community town site were based on the underlying assumption that: space for proper community layout (i.e., up to 10,000 linear foot landfill/sewage lagoon and runway separation requirements, compact utility system coverage area); proximity to a good water source, borrow site and barge and boat landing area; acceptable soils; and suitable wastewater disposal area are addressed in the selection process. Any important feature like those just listed could greatly affect the cost of the utility system. Therefore, additional more detailed estimates should be completed as additional information about any proposed site is obtained.

A summary of the costs associated with the options investigated are provided in the following table:

Item	Description	Design Life	Estimated Cost
1.	Existing Shishmaref Site with all-season water and wastewater haul service	25-Years	\$40,592,000
2.	Existing Shishmaref Site with piped water and sewer utilities	N/A	Not Feasible
3.	Typical piped water and sewer utility system with year-round water source and gravity wastewater collection	30-Years	\$37,435,000
4.	Typical piped water and sewer utility system with year-round water source and vacuum wastewater collection	30-Years	\$38,935,000
5.	Typical arctic Class 3 Landfill with community haul from a central transfer station, burn box, and salvage and hazardous waste disposal areas.	40-Years	\$ 5,200,000

If you have any questions regarding the estimates that I have provided, please contact me via phone: 1-800-560-8637, extension 3529 or (907) 729-3529, FAX: (907) 729-4048 or E-mail: lpersson@anthc.org.

Sincerely,



Lloyd Persson, P.E.
Senior Engineer

Enclosure
Assumptions and Cost Estimates

cc: Curtis Nayokpuk, Mayor, City of Shishmaref
Reuben Weyiouanna, President, Native Village of Shishmaref
Bruce Sexauer, Project Manager, U.S. Army COE, Elmendorf AFB Alaska
Kevin Zweifel, Director, OEH, NSHC, Nome
Chuck Simon, RMW, NSHC, Nome
Leroy Seppilu, RUBA, Nome
DEHE - Darryl Alleman/Helena Attakai/
Brad Rea

Conceptual Level Cost Estimate

Location: Existing Community Site

Type of Service: Flush Tank and Haul System

Design Life: 25 Years

Purpose: Determine the cost to provide flush tank and haul service to all of the homes at the existing townsite location.

Assumptions:

1. Others shall complete filling of low-lying areas to create suitable land for future housing and utilities. New areas shall be located adjacent to the existing townsite.
2. The initial population is 590.
3. 4 people per household or approximately 148 existing homes.
4. The design population is 800 and there will be 200 homes to serve.
5. All estimated costs shall be in 2004 dollars.
6. Water use shall be 30 Gallons per Capita Day (GPCD).
7. The existing water catchment area is 12-acres in size and can produce 2.2 million gallons of water annually.
8. Future water catchment areas shall be located within a reasonable distance from the existing water treatment plant.
9. Only 15 of the existing flush tank and haul units have a 25-year life expectancy. All others require replacement.
10. Approximately 66% of the water required annually will be stored in water storage tanks.
11. The existing 1.3 million gallon water storage tank shall last an additional 25-years.
12. Required design annual water supply shall be (800 People x 30 GPCD x 365 Days/Year) 8,760,000 gallons.
13. Area required for four (4) new catchment areas is (8.76 MG/2.2 MG x 12 Acres) 48-Acres.
14. The wastewater disposal will require 6-Acres.
15. Existing beach erosion will be halted

Estimate:

Item	Description	Estimated Cost
1.	Catchment Areas (4 each @ \$3,000,000)	\$12,000,000
2.	Water Treatment Plant (1 each @ \$3,000,000)	\$3,000,000
3.	Residential Flush Tank and Haul Improvements (185 each @ \$28,000)	\$5,180,000
4.	Water Storage ((8,760,000 – 1,300,000) @ \$2.20)	\$16,412,000
5.	Haul Vehicles	\$1,000,000
6.	Waste Disposal Lagoon	\$3,000,000
	Total	\$40,592,000.00

Concerns:

1. Creation of addition land will be cost prohibitive and will not be completed.
2. Approximately 42 to 45-acres of land will be required for the utility system.
3. Erosion of the oceanfront property will not be successfully stopped.

Conceptual Level Cost Estimate

Location: Existing Community Site

Type of Service: Piped Utility System

Design Life: 25 Years

Purpose: Determine the cost to provide piped water distribution and wastewater collection service to all of the homes at the existing townsite location.

Assumptions:

1. The initial population is 590.
2. 4 people per household or approximately 148 existing homes.
3. The design population is 800 and there will be 200 homes to serve.
4. All estimated costs shall be in 2004 dollars.
5. Water use shall be 80 Gallons per Capita Day (GPCD).
6. Suitable land for future housing and utilities shall be created by filling in low-lying areas adjacent to the existing townsite by others.
7. The existing water catchment area is 12-acres in size and can produce 2.2 million gallons of water annually.
8. Future water catchment areas shall be located within a reasonable distance from the existing water treatment plant.
9. Approximately 66% of the water required annually will be stored in water storage tanks.
10. The existing 1.3 million gallon water storage tank shall last an additional 25-years.
11. Required design annual water supply shall be $(800 \text{ People} \times 80 \text{ GPCD} \times 365 \text{ Days/Year})$ 23,360,000 gallons.
12. Area required for four (4) new catchment areas is $(23.36 \text{ MG}/2.2 \text{ MG} \times 12 \text{ Acres})$ 128-Acres.
13. The wastewater disposal will require 6-Acres.
14. Existing beach erosion will be halted.
15. New construction equipment would be required to complete this work.

Estimate: N/A

Concerns:

Piped water and sewer utilities at the existing community site are not feasible. The required 128-acres catchment area and the required 15.6 million-gallon water storage volume are too great and the cost of operation would be too high for the community to support.

Conceptual Level Cost Estimate

Location: Typical Piped Community in the Northwest Arctic Area

Type of Service: Piped Water Distribution and Gravity Wastewater Collection Utility System

Design Life: 30 Years

Purpose: Determine the cost to provide piped water distribution and wastewater collection service to all of the homes at a new townsite location with a reliable year-round water supply.

Assumptions:

1. The initial population is 590.
2. 4 people per household with moderate to high-density housing.
3. The design population is 824 and there will be 206 homes to serve.
4. All estimated costs shall be in 2004 dollars.
5. Water use shall be 80 Gallons per Capita Day (GPCD).
6. Gravel fill (pit run and "Non-Frost Susceptible") shall be available locally for not greater than \$4 per bank cubic yard.
7. A year-round groundwater or surface water source capable of continuously producing 70 GPM shall be located within 3,500 feet of the community.
8. Approximately 1-month (2 MG) of water storage will be provided. (824 People x 80 GPCD x 30 Days/Mon.)
9. Soils shall be suitable for direct bury gravity wastewater collection system.
10. The wastewater disposal area will require 8-Acres.
11. The community will have road access to a barge-landing site.
12. New construction equipment and support facilities will be required to complete this work and maintain the utility system.

Estimate:

Item	Description	Estimated Cost
1.	Comprehensive Master Plan and Design	\$500,000
2.	Water Source (Wells/Surface Water Intake)	\$1,000,000
3.	Raw Water Transmission Line (3500 LF @ \$250)	\$875,000
4.	Water Treatment Plant (1 each @ \$3,000,000)	\$3,000,000
5.	Water Storage (2,000,000 Gal. @ \$2.20)	\$4,400,000
6.	Washeteria	\$1,500,000
7.	Water Distribution (16,000 LF @ \$250)	\$4,000,000
8.	Water and Sewer Services (206 EA @ \$30,000)	\$6,180,000
9.	House Plumbing (206 Ea. @ \$30,000)	\$6,180,000
10.	Wastewater Collection (16,000 LF @ \$300)	\$4,800,000
11.	Waste Disposal Lagoon	\$3,500,000
12.	Construction Equipment and Support Facilities	\$1,500,000
	Total	\$37,435,000.00

Concerns:

1. Site selection and community planning would have to provide for proper setback requirements from a landfill/sewage lagoon and an airport runway.
2. Development of a groundwater source with sufficient quantity and quality would greatly reduce the complexity of the water treatment process and long-term O&M costs.

Conceptual Level Cost Estimate

Location: Typical Piped Community in the Northwest Arctic Area

Type of Service: Piped Water Distribution and Vacuum Wastewater Collection Utility System

Design Life: 30 Years

Purpose: Determine the cost to provide piped water distribution and wastewater collection service to all of the homes at a new townsite location with a reliable year-round water supply.

Assumptions:

1. The initial population is 590.
2. 4 people per household with moderate to high-density housing.
3. The design population is 824 and there will be 206 homes to serve.
4. All estimated costs shall be in 2004 dollars.
5. Water use shall be 80 Gallons per Capita Day (GPCD).
6. Gravel fill (pit run and "Non-Frost Susceptible") shall be available locally for not greater than \$4 per bank cubic yard.
7. A year-round groundwater or surface water source capable of continuously producing 70 GPM shall be located within 3,500 feet of the community.
8. Approximately 1-month (2 MG) of water storage will be provided. (824 People x 80 GPCD x 30 Days/Mon.)
9. Aboveground vacuum wastewater collection system.
10. The wastewater disposal area will require 8-Acres.
11. The community will have road access to a barge-landing site.
12. New construction equipment and support facilities will be required to complete this work and maintain the utility system.

Estimate:

Item	Description	Estimated Cost
1.	Comprehensive Master Plan and Design	\$500,000
2.	Water Source (Wells/Surface Water Intake)	\$1,000,000
3.	Raw Water Transmission Line (3500 LF @ \$250)	\$875,000
4.	Water Treatment Plant (1 each @ \$3,000,000)	\$3,000,000
5.	Water Storage (2,000,000 Gal. @ \$2.20)	\$4,400,000
6.	Washeteria	\$1,500,000
7.	Water Distribution (16,000 LF @ \$250)	\$4,000,000
8.	Water and Sewer Services (206 EA @ \$30,000)	\$6,180,000
9.	House Plumbing (206 Ea. @ \$30,000)	\$6,180,000
10.	Wastewater Collection (16,000 LF @ \$300)	\$4,800,000
11.	Vacuum Wastewater Collection Station	\$1,500,000
12.	Waste Disposal Lagoon	\$3,500,000
13.	Construction Equipment and Support Facilities	\$1,500,000
	Total	\$38,935,000.00

Concerns:

1. Site selection and community planning would have to provide for proper setback requirements from a landfill/sewage lagoon and an airport runway.
2. Development of a groundwater source with sufficient quantity and quality would greatly reduce the complexity of the water treatment process and long-term O&M costs.

Conceptual Level Cost Estimate

Location: Future Townsite Location

Type of Service: Typical Arctic Class 3 Solid Waste Collection and Disposal System

Design Life: 40 Years

Purpose: Determine the cost to provide a central solid waste collection station, community haul system, and landfill facility with a salvage area, burn-box and hazardous waste collection.

Assumptions:

1. The initial population is 590.
2. The design population is 824.
3. All estimated costs shall be in 2004 dollars.
4. Solid waste generation shall be 7 lbs per Capita Day.
5. 800 pounds per cubic foot compacted garbage density.
6. Gravel fill (pit run and "Non-Frost Susceptible") shall be available locally for not greater than \$4 per bank cubic yard.
7. Suitable area shall be provided for a waste collection station in town and landfill area (approximately 15-Acres) that is a sufficient distance away from the airport runway to meet FAA requirements.
8. Landfill access road shall be less than 1-mile and within 2.5 mile of the core of the community.
9. The community will have road access to a barge-landing site for disposal of hazardous waste.
10. New waste collection facility and transport and construction equipment will be required.
11. Recycling and incineration of refuse shall be utilized to the greatest extent practical to reduce the volume of solid waste landfilled.
12. Others will provide protection from any floodwaters or erosion.
13. Heavy Equipment used to construct the water and sewer utility system would be utilized to construct the landfill access road and disposal area.

Estimate:

Item	Description	Estimated Cost
1.	In-town waste collection/recycling center	\$1,000,000
2.	Solid/hazardous waste transportation equipment	\$750,000
3.	Landfill Access Road	\$1,500,000
4.	Solid Waste Disposal Facility and Maintenance Equipment	\$1,950,000
	Total	\$5,200,000.00

Concerns:

1. Site selection and community planning would have to provide for proper setback requirements from a landfill/sewage lagoon and an airport runway.