

# SHISHMAREF

## POTENTIAL RELOCATION SITES

### FIELD INVESTIGATION REPORT

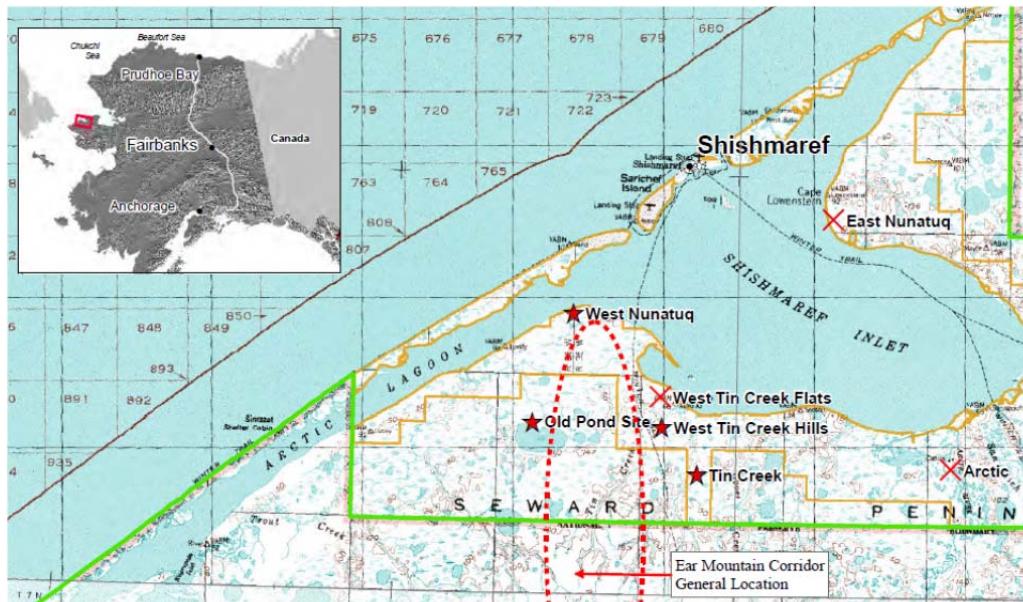


Figure 1

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## Introduction

Shishmaref, a rural Alaskan community located on Sareichef Island (see Figure 1), is facing an ongoing erosion problem. The north shore is eroding away approximately 3 feet per year and during a major storm event as much as 100 feet of shore has been lost to sea. R&M's Matt Morrow and Sadat Aliu were assigned the task of photographing the community and field investigating four proposed potential relocation sites (Old Pond Site, West Nunatuq, West Tin Creek Hills, and Tin Creek). Information gathered from this field investigation will be used to assist with locating a possible relocation site for Shishmaref and for estimating the cost associated with a relocation.

The community of Shishmaref is located on Sareichef Island on the northwest side of the Seward Peninsula and has a population of approximately 600 people, mostly Native Inupiaq Eskimos. The island is approximately a quarter mile wide and 3 miles long. The predominate soil consists of a wind- and water-sorted fine sand. Surface vegetation is minimal, consisting mainly grasses and small willow bushes. Permafrost is present, but discontinuous. Several of the older homes that were at risk of falling to sea have been abandoned or relocated to a safe place. Many older homes and buildings are built directly on the ground, most of the newer buildings are primarily built upon triodetic foundations. Snow machines and four wheelers are mainly used for transportation around the island but there are a few pickup trucks as well. The majority of the community is protected by a recently constructed rock sea wall. The northeast end of the seawall terminates just east of the old tannery building. The southwest end of the seawall transitions from a standalone seawall into rock slope protection in the vicinity of the teacher housing, and terminates just west of the teacher housing.



### **Old Pond Site**

The Old Pond Site is marked on the mainland southwest of Sarichef Island (see Figure 1). The site was reached by traveling southeast for approximately 13 miles from Shishmaref by skiff, up a small tidally influenced creek ("Kuaruk", meaning "little creek" according to our guide and boat operator, Fred Weyoiuanna) for approximately 2 miles, then walking cross country approximately 3 miles inland across low tundra-covered hills and shallow valleys, and finally walking another mile across the lake bed to the south shore of the lake. Standing water, generally one foot or less in depth, was present in most of the lower areas north of the lake. A local elder, Fred Goodhope, Jr., said the Old Pond site is a lake that is mostly dry and made of solid ground. This was confirmed by the site visit; there is a crescent of water along the north shore of the lake, but the majority of the lake to the south was solid ground. Primary vegetation observed consisted of cattails and "cotton" grass. The ground surface was moist, but generally firm.

A hand driven probe with a sample barrel at the bottom (see photos) was used to measure the depth to which the ground was thawed, and to obtain soil samples. The first probe hole was obtained just north of the dry lake on the tundra bank and consisted of surface organics underlain with silt. The top of the bank is 6 to 7 feet above the lake bed. Frozen ground was encountered 1.5 feet below the surface. The second probe hole was obtained in the north portion of the lake bed itself and consisted of a surface layer of organics underlain with approximately 3 feet of sandy silt. Frozen ground was encountered 3 feet below the surface. The unfrozen sandy silt was wet to moist. The third borehole was obtained in the lake bed about 100 yards north of the south bank. Frozen ground was encountered 5 feet below the surface. Soil encountered consisted of sandy silt, wet to moist.



#### **West Nunatuq Site**

The West Nunatuq Site was also accessed by skiff. The site is on the mainland approximately 8 miles southwest of Sarichef Island (see Figure 1). The boat was unable to make it directly to shore due to shallow water, so the investigators walked in the last 100 yards (in knee high boots). This area would not be possible to access via barge without dredging. The site is on top of a twenty foot high bank of sandy silt/silty sand. A probe hole was sampled on the top of the bank. Soil profile consisted of a surface layer of 6 inches of organics and 1.5 feet of silt. Frozen ground was encountered 2 feet below the surface. The terrain is characterized by mounds 3 to 6 feet high, 20 to 30 feet in diameter, surrounded by interconnected lower areas. This terrain is thought to be indicative of thermally degrading polygonal ground, where the low areas are thawing ice wedges. There are a number of ravines running from the beach up to the top of the bank which connect with the low areas; many of the ravines exhibit a small but steady flow of cold water, which is thought to be further evidence of melting ice.



### West Tin Creek Hills Site

The West Tin Creek Hills Site was accessed by boat via Tin Creek. The proposed site is on the mainland approximately 11 miles south of Sarichef Island (see Figure 1). In order to access the site by skiff, the route from Shishmaref consists of a wide 17 mile long arc to the east to avoid shallow water and reach the mouth of Tin Creek. The proposed site is approximately 1 mile from the mouth of Tin Creek, on the western fork. Tin Creek is tidally influenced in this section and numerous seals were observed resting on the stream banks. An unusual feature noted was the presence of numerous shallow ponds connected to the creek channel. The far side of each pond always abutted on a small hill, the pond face of which appeared over steepened to the point of collapse. The northern edge of the hill that is the West Tin Creek Hills site revealed what is believed to be the reason for the ponds connected to the creek. This hill displayed the same pond and over steepened slope, but it also revealed over 8 feet of massive ice lens that extended below the water line of the pond (see pictures). Based on these observations, the investigators theorize that many, if not all the low hills in the lower portions of the Tin Creek drainage are underlain by massive ice. The surface of the low hills showed the same type of topography observed at West Nunatuq; the conclusion being that the hills in this area have thermally degrading polygonal ground on top of massive ice lens. The extensive presence of massive ice is noted in a number of the borings taken by DOT along the alignment for the proposed Ear Mountain materials source road. No probing was done at this site.



### Tin Creek Site

The Tin Creek Site was also accessed by skiff via Tin Creek. The proposed site is on east fork of Tin Creek, about 2-1/2 miles upstream of the creek mouth. The east fork is considerably narrower at the Tin Creek site than the west fork at the West Tin Creek Hills site, and appears to still be tidally influenced at the Tin Creek site. This is the higher of the two sites in the Tin Creek area; the topographic maps indicate the hill top is about 100 feet above sea level. Grass tussocks and low willow bushes are present on the higher mounds, with grasses prevailing in the surrounding lower swales. The same kind of hummocky topography was present on top of the hill as was observed at Nunatuq and West Tin Creek Hills. A single probe hole was obtained at the top of the hill, revealing approximately 3 inches of organics underlain by 1 foot of sandy silt. Frozen ground was encountered 1.25 feet below the surface.



### **Conclusion**

None of the four sites visited during this investigation are recommended as a relocation alternative. Ice wedges and lens are present at the Nunatuq, West Tin Creek Hills, and Tin Creek sites. The Old Pond site does not appear to have massive ice near the surface, but that would have to be confirmed with drilling. The Old Pond site is not easily accessible, and is relatively far from the water. There are significant access problems associated with all four sites, both for personal water craft and for barging. Fresh water is not readily available at any of the sites as Tin Creek is tidally influenced in the vicinity of the proposed relocation sites.

### **Recommendations**

Recommendations are to consider having the community of Shishamref remain on Sarichef Island and increase the seawall height, width and length as required to provide permanent protection to the community. A desalinization plant is suggested to provide potable water.