

# Contemporary Shoreline Retreat Rates at Meshik in Port Heiden, Alaska

## *Executive Summary*

*by Alexander Gould and Lauren Southerland  
September 16, 2014*

Coastal erosion caused by large storm events is an ongoing hazard for Port Heiden (population 120), a community on the southern edge of Bristol Bay. Beginning in 1981, residents relocated homes and infrastructure away from the eroding coastline at Meshik, a former village site directly on the coast, to an inland location approximately 2.5 miles to the northeast. However, critical city resources remain at the original site (for example, the fuel header, fuel storage tanks, barge landing area, roadways, and boat haul-out), and continue to be threatened by the retreating shoreline.

To meet community planning needs, the Alaska Division of Geological & Geophysical Surveys (DGGS) completed a field-based investigation ([Preliminary Interpretive Report \[PIR\] 2014-4](#)) to measure recent rates of coastal erosion in Meshik and to understand the mechanisms driving these processes. In this study, changes to the shoreline were evaluated using both aerial images (dating back to 1957) and field measurements (2013) along a 2.4 mile segment of the Meshik coast.

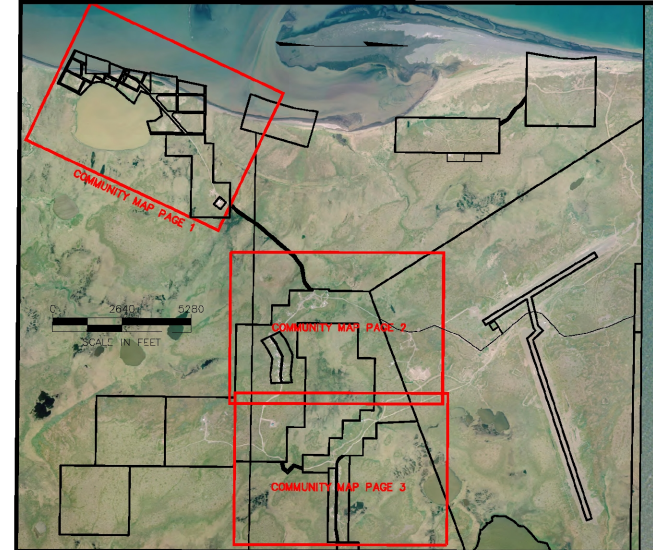
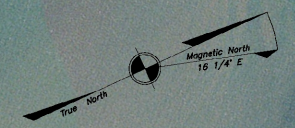
### **Key Findings**

1. Analysis of the Meshik segment of coastline revealed long-term erosion rates that range from stable to as high as  $24 \pm 6$  feet/year. *See PIR 2014-4, figure 12, for a map of erosion rates.*
2. The long-term rate of erosion at the bluff near the Port Heiden fuel header is approximately 15 feet/year; in 2013, the bluff edge retreated more than 19 feet inland at this location. *See PIR 2014-4, figure 13, for images.*
3. Chistiakof Island, a barrier island just offshore from Meshik, was completely removed by storm waves before 1983 and the sediments were reworked into a spit at the northern mouth of the Port Heiden embayment. This island once blocked direct wave attack at the erodible bluffs at Meshik, and recent rates of shoreline retreat (1980–present) indicate that erosion has accelerated in the absence of this protective barrier. Additionally, a ‘hotspot’ of erosion has developed where waves bend around the spit and this focused erosion has migrated south with the growth of the spit. *See PIR 2014-4, figure 15, for additional details.*
4. Proposed explanations for the coastal changes contributing to erosion at the Meshik site include a long-term increase in the relative amount of wave energy in this part of Bristol Bay associated with either meteorological shifts that cause more storms and/or a delay in annual sea ice arrival.

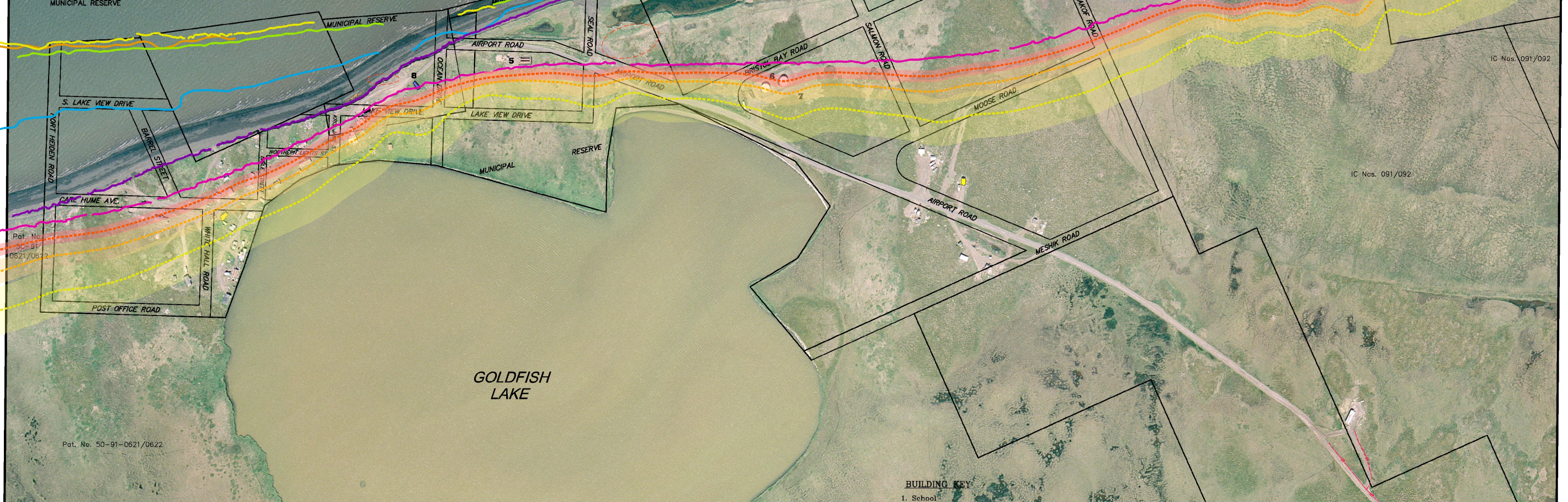
At the request of local community leadership, DGGS prepared a map of projected shoreline positions in 2018, 2023, and 2033 to accompany this executive summary. These projections are based on the best-available long-term rates of change and have been displayed over a Port Heiden Community Map for ease of use in planning decisions. These projections can be improved with the addition of new shoreline data in the future.

DGGS is planning future mapping efforts that will expand these investigations to 40 miles of coastline in the Port Heiden area and provide an interactive online tool for viewing shoreline change. We recommend that future work include additional assessment of shifts in storm frequency and intensity, with a focus on how this impacts local wave energy.





AREA MAP INSET 1"=2640'



**Community Map PORT HEIDEN**  
 56° 55' 00" N 156° 41' 00" W (NAD 83)  
 Approximate Elevation: 10'  
 Townships 37 and 38 South, Range 59 West, S.M., AK  
 U.S.G.S. Quadrangles "CHIGNIK D-2" and "CHIGNIK D-3", Alaska  
 KVICHAK RECORDING DISTRICT

**LEGEND**

Residential Building	Sewer Line
Commercial Building	Sewer Force Main
Public Building	Water Line
Edge of Water	Gas fill line
Electric Line w/pole	Fuel oil fill line
Telephone Line w/pole	Street Light
	Runway Marker

SCALE: 1"=200'  
 Date of Photography: June 17, 2002  
 Magnetic Declination computed by U.S.G.S. Geomag Program using AK-2000.COP model as of August 1, 2002.

**Alaska Division of Geological & Geophysical Surveys**  
 Preliminary Interpretive Report 2014-1  
**Contemporary Shoreline Change (1957-2013)**

**Historic Shoreline Positions**

- 2013
- 2002
- 1983
- 1973
- 1963

**Projected Shoreline Positions**

- 2018 (5 years)
- 2023 (10 years)
- 2033 (20 years)

*Highlighted collars around each projection indicate the 90% confidence zone.*

*All projections are based on long-term rates. This calculation assumes that the rate of change has not significantly accelerated or decreased since 1957.*

**MAP NOTES**  
 This map was prepared by the Lake and Peninsula Borough (LPB) in cooperation with the Alaska Department of Community and Economic Development (DCED) using funding from the Coastal Impact Assistance Program, Coastal Management Program, Bureau of Indian Affairs Transportation Planning and Funding from the Initiative for Accelerated Infrastructure Development (IAID). The IAID is supported by grants from the Detail Commission, USDA Rural Development, Alaska Department of Transportation and Public Facilities and DED. The Alaska Native Tribal Health Consortium provided assistance for facility records. The LPB contracted with Global Positioning Services Incorporated in June of 2002 to prepare the map. See Revision Notice.

This map should not be construed as a survey. On-site surveys should be conducted prior to engineering or construction.

Property and utility information has been generated from readily available sources with limited accuracy checks. Property information is not intended to represent a comprehensive title search of the Records Office record. Utility location is approximate and shows only the main lines as the service lines have been omitted for clarity. Generally, the information is current as of December 2002.

This map is based on photography acquired on June 17, 2002, at a nominal scale of 1 in = 2000 ft.

Horizontal and Vertical Control  
 This map was prepared in Alaska State Plane coordinates zone 6, using horizontal datum NAD83 and vertical datum NGVD29.

The control monument for the property information was N.G.S. "C". Published horizontal datum NAD 1983 coordinates for this monument are North 56° 56' 54.25228" and West 156° 37' 54.09864". The vertical datum NGVD 1929 for this monument is 121.4 feet above mean high water (MHW).

**Alaska Division of Geological & Geophysical Surveys**  
 Preliminary Interpretive Report 2014-1  
**Contemporary Shoreline Change (1957-2013)**

**MAP NOTES**  
 This map was prepared by the Lake and Peninsula Borough (LPB) in cooperation with the Alaska Department of Community and Economic Development (DCED) using funding from the Coastal Impact Assistance Program, Coastal Management Program, Bureau of Indian Affairs Transportation Planning and Funding from the Initiative for Accelerated Infrastructure Development (IAID). The IAID is supported by grants from the Detail Commission, USDA Rural Development, Alaska Department of Transportation and Public Facilities and DED. The Alaska Native Tribal Health Consortium provided assistance for facility records. The LPB contracted with Global Positioning Services Incorporated in June of 2002 to prepare the map. See Revision Notice.

This map should not be construed as a survey. On-site surveys should be conducted prior to engineering or construction.

Property and utility information has been generated from readily available sources with limited accuracy checks. Property information is not intended to represent a comprehensive title search of the Records Office record. Utility location is approximate and shows only the main lines as the service lines have been omitted for clarity. Generally, the information is current as of December 2002.

This map is based on photography acquired on June 17, 2002, at a nominal scale of 1 in = 2000 ft.

Horizontal and Vertical Control  
 This map was prepared in Alaska State Plane coordinates zone 6, using horizontal datum NAD83 and vertical datum NGVD29.

The control monument for the property information was N.G.S. "C". Published horizontal datum NAD 1983 coordinates for this monument are North 56° 56' 54.25228" and West 156° 37' 54.09864". The vertical datum NGVD 1929 for this monument is 121.4 feet above mean high water (MHW).

- BUILDING KEY**
1. School
  2. School Playground
  3. City Shop
  4. GCJ Building
  5. Old Tank Farm Site
  6. Old Tank Farm Moved from Village
  7. New Tank Farm
  8. St. Agafia Russian Orthodox Church Built in 1800's.