Report of Investigation 2021-3 Hooper Bay

EROSION EXPOSURE ASSESSMENT—HOOPER BAY

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Hooper Bay, Alaska, in 2014. Photo: ShoreZone, shorezone.org.

Published by
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
2021

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State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys

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Suggested citation:
Buzard, R.M., Turner, M.M., Miller, K.Y., Antrobus, D.C., and Overbeck, J.R., 2021, Erosion Exposure Assessment of Infrastructure in Alaska Coastal Communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2021-3.https://doi.org/10.14509/30672

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EROSION EXPOSURE ASSESSMENT—HOOPER BAY

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HOOPER BAY EROSION EXPOSURE ASSESSMENT

This is a summary of erosion forecast results near infrastructure at Hooper Bay, Alaska. We conduct a shoreline change analysis, forecast 60 years of erosion, and estimate the replacement cost of infrastructure in the forecast area. Buzard and others (2021a) describe the method and guidance for interpreting tables and maps.

Source data for this summary include the following:

- Delineated vegetation lines and change assessment by Buzard and others (2021a) following the methods of Overbeck and others (2020).
- Infrastructure AutoCAD outlines and metadata from Division of Community & Regional Affairs (2007) Community Profile Map series.
- Added infrastructure such as roads, water and sanitation facilities, and outbuildings, delineated if visible in the most up-to-date high resolution (≤ 0.66 ft [20 cm] ground sample distance) aerial orthoimagery (Overbeck and others, 2016).
- Computed infrastructure cost of replacement based on square or linear footage from Buzard and others (2021a).

Hooper Bay is located on the western edge of the Yukon-Kuskokwim Delta. Most of the community is protected from ocean waves by a broad spit called Dall Point. The airport is built north of Dall Point, on the Bering Sea coast, and has undergone

faster coastal erosion than the rest of the community (up to 4.6 feet per year; Overbeck and others, 2020). Erosion protection is installed at the north end of the runway, so forecasts are not made in that section of shoreline.

We forecast erosion 60 years from the most recent shoreline (2015) at 20-year intervals to identify the exposure of infrastructure to erosion. From 2015 to 2075, the erosion forecast area extends along almost 1000 feet of runway and over 300 feet of roadway near the boat docking area on the Napareayak Slough (table 1). The greatest cost comes from the runway between 2035 and 2055 (table 2; fig. 1). The roadway is the greatest cost in the period up to 2035. No buildings were found in the erosion forecast area. The total replacement cost of infrastructure exposed to erosion is $9.9 million (± $3.0 million) by 2075 (table 2; fig. 1).

This study only quantifies exposure of shoreline erosion. Infrastructure in low-lying areas (like the airport road, fuel lines, and gravel pads) are at risk from sediment scouring during storm surge flood events. Refer to Buzard and others (2021b) for more information about flood exposure in Hooper Bay.

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Table 1. Quantity of infrastructure with estimated erosion exposure by linear footage (LF), or count (n).

Quantity of Exposed Infrastructure						
Erosion Forecast Date Range	**Buildings & Tank Facilities (n)**	**Power Lines (LF)**	**Fuel Lines (LF)**	**Water Lines (LF)**	**Roads (LF)**	**Airport (LF)**
2015 to 2035	0	0	0	0	9	0
2035 to 2055	0	0	0	0	209	463
2055 to 2075	0	0	7	0	116	505
Combined Total	0	0	7	0	334	968

Table 2. Replacement cost of infrastructure exposed to erosion per 20-year interval.

Cost to Replace Exposed Infrastructure							
Erosion Forecast Date Range	**Buildings & Tank Facilities**	**Power Lines**	**Fuel Lines**	**Water Lines**	**Roads**	**Airport**	**Sum**
2015 to 2035	$0	$0	$0	$0	$200,000	$0	$200,000
2035 to 2055	$0	$0	$0	$0	$0	$4,630,000	$4,630,000
2055 to 2075	$0	$0	$20,000	$0	$0	$5,050,000	$5,070,000
Combined Total	$0	$0	$20,000	$0	$200,000	$9,680,000	$9,900,000

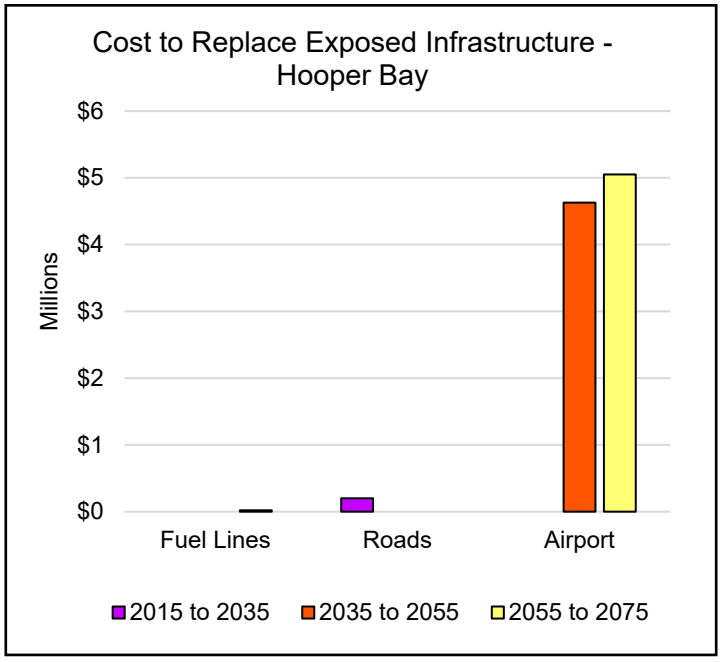

Figure 1. This figure summarizes the replacement cost of all infrastructure in the erosion forecast area. Twenty-year intervals are symbolized by color: purple represents the time interval 2015 to 2035, red represents 2035 to 2055, and yellow represents 2055 to 2075. The greatest cost is the airport from 2035 to 2075.

ACKNOWLEDGMENTS

This work was funded by the Denali Commission Village Infrastructure Protection Program through the project "Systematic Approach to Assessing the Vulnerability of Alaska's Coastal Infrastructure to Erosion." The community of Hooper Bay was not consulted for this report.

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Buzard, R.M., Turner, M.M., Miller, K.Y., Antrobus, D.C., and Overbeck, J.R., 2021, Erosion exposure assessment of infrastructure in Alaska coastal communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2021-3. https://doi.org/10.14509/30672

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Erosion Forecast
Hooper Bay, Alaska

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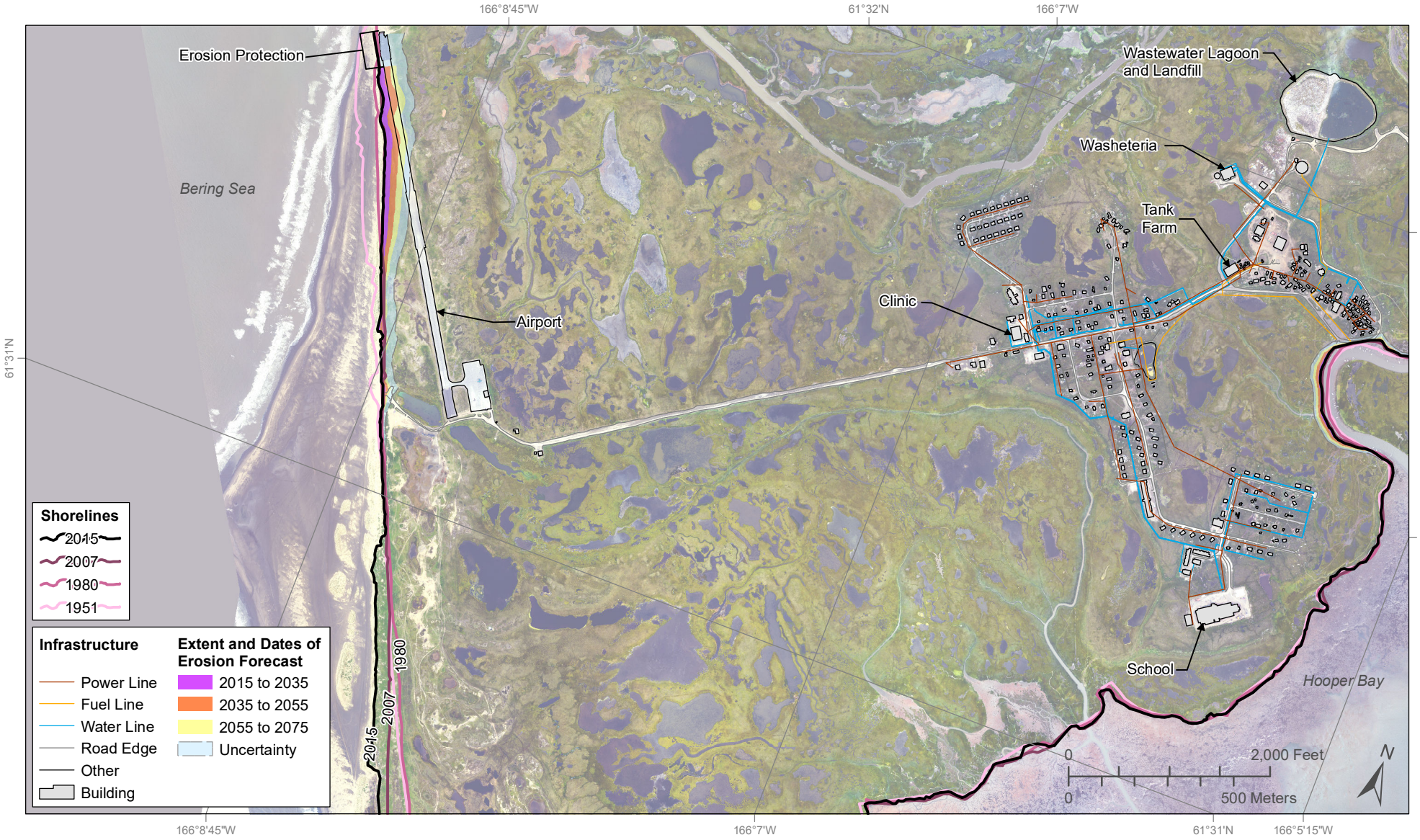

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Projection: NAD83 UTM Zone 3N. Orthoimagery year: 2015. Orthoimagery available from elevation.alaska.gov

Erosion and accretion of coasts and rivers result in shoreline change. These rates of shoreline change at Alaska communities are calculated from historical and modern shorelines (shorelines shown as lines in pinkscale and labeled by year). The long-term (1951 to 2015) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to reach the colored areas by specified time intervals: 2015 to 2035 (purple), 2035 to 2055 (orange), and 2055 to 2075 (yellow). The area of uncertainty of the 2075 shoreline at a 90 percent confidence interval is light blue. Areas that are not colored by time interval are not forecast to erode by 2075 based on the historical shoreline change rate. For more detailed information about the impacts to infrastructure from erosion at Hooper Bay, refer to the Hooper Bay erosion exposure assessment report.

This work is part of the Coastal Infrastructure Erosion Vulnerability Assessment project funded by the Denali Commission Environmentally Threatened Communities Grant Program. Components of this map were prepared by the Alaska Department of Commerce, Community, and Economic Development (DCCED) using funding from multiple municipal, state, federal, and tribal partners. The original AutoCAD drawing of the infrastructure data layers was converted to ArcGIS.