

EROSION EXPOSURE ASSESSMENT—SOUTH NAKNEK

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South Naknek, Alaska, in 2006. ShoreZone, shorezone.org.



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Report of Investigation 2021-3 South Naknek

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EROSION EXPOSURE ASSESSMENT—SOUTH NAKNEK

Richard M. Buzard¹, Mark M. Turner¹, Katie Y. Miller¹, Donald C. Antrobus², and Jacquelyn R. Overbeck¹

SOUTH NAKNEK EROSION EXPOSURE ASSESSMENT

This is a summary of erosion forecast results near infrastructure at South Naknek, 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 (2021) 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 (2021) following the methods of Overbeck and others (2020).
- Infrastructure AutoCAD outlines and meta-data from the Division of Community & Regional Affairs (2006) 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 (Quantum Spatial, 2019).
- Computed infrastructure cost of replacement based on square or linear footage from Buzard and others (2021).

South Naknek is located at the head of Bristol Bay and the mouth of the Naknek River as it empties into Kvichak Bay. The coastline is macrotidal, making it primarily tidally influenced with tides ranging greater than 20 feet. The community of South Naknek is perched on coastal bluffs



that experience undercutting from waves and high water events as well as slumping and failure from runoff (Ecology & Environment, Inc. and LeMay Engineering & Consulting, Inc., 2017). Overbeck and others (2020) show that erosion rates range between 1 and 2 feet per year near Kvichak Bay and are near stable along the Naknek River.

We forecast erosion 60 years from the most recent shoreline (2018) at 20-year intervals to identify the exposure of infrastructure to erosion. The analysis is carried out on the southern bank of the Naknek River in areas that do not have docks as well as along the western portion of South Naknek on Kvichak Bay. Nearly 8,800 feet of the coastline in our study area has docks and other coastal infrastructure that does not allow us to forecast erosion because we cannot determine the effects dock infrastructure will have on erosion rates. The erosion forecast shows one unspecified building and 106 feet of road throughout the community are exposed to erosion in South Naknek (tables 1–3). The total replacement cost of infrastructure is \$600 thousand (\pm \$180 thousand) through 2078 (table 2; fig. 1). We do not estimate erosion exposure for power, fuel, and water lines because the data are not available.

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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 (n)	Roads (LF)
2018 to 2038	0	22
2038 to 2058	0	39
2058 to 2078	1	45
Combined Total	1	106

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

Cost to Replace Exposed Infrastructure			
Erosion Forecast Date Range	Buildings	Roads	Sum
2018 to 2038	\$0	\$200,000	\$600,000
2038 to 2058	\$0	\$0	\$0
2058 to 2078	\$400,000	\$0	\$0
Combined Total	\$400,000	\$200,000	\$600,000

Table 3. Cost estimate of erosion exposure to buildings and tank facilities by 20-year time interval. The count of exposed residential or unspecified buildings is denoted in parentheses.

Cost to Replace Buildings and Tank Facilities		
Erosion Forecast Date Range	Building Type	Cost of Replacement
2018 to 2038	None	\$0
2038 to 2058	None	\$0
2058 to 2078	Unspecified (1)	\$400,000

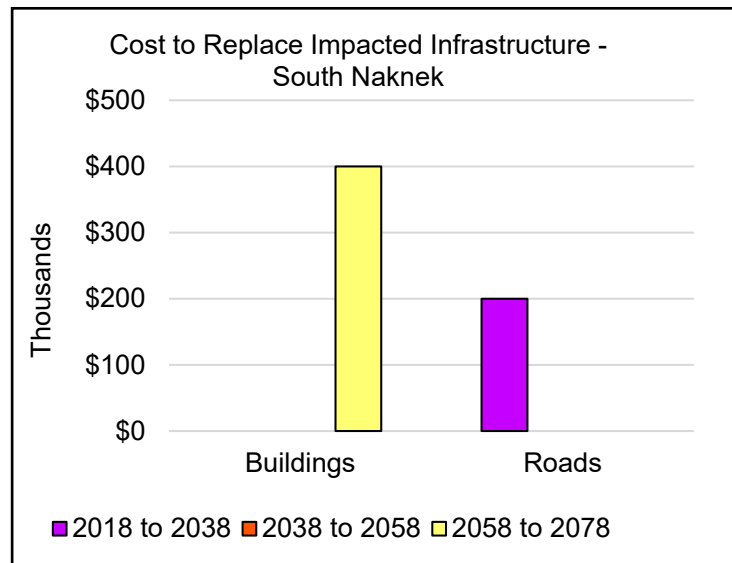


Figure 1. This figure shows the replacement cost of all utilities and transportation. The greatest cost is erosion of buildings and roads from 2018 to 2038.

ACKNOWLEDGMENTS

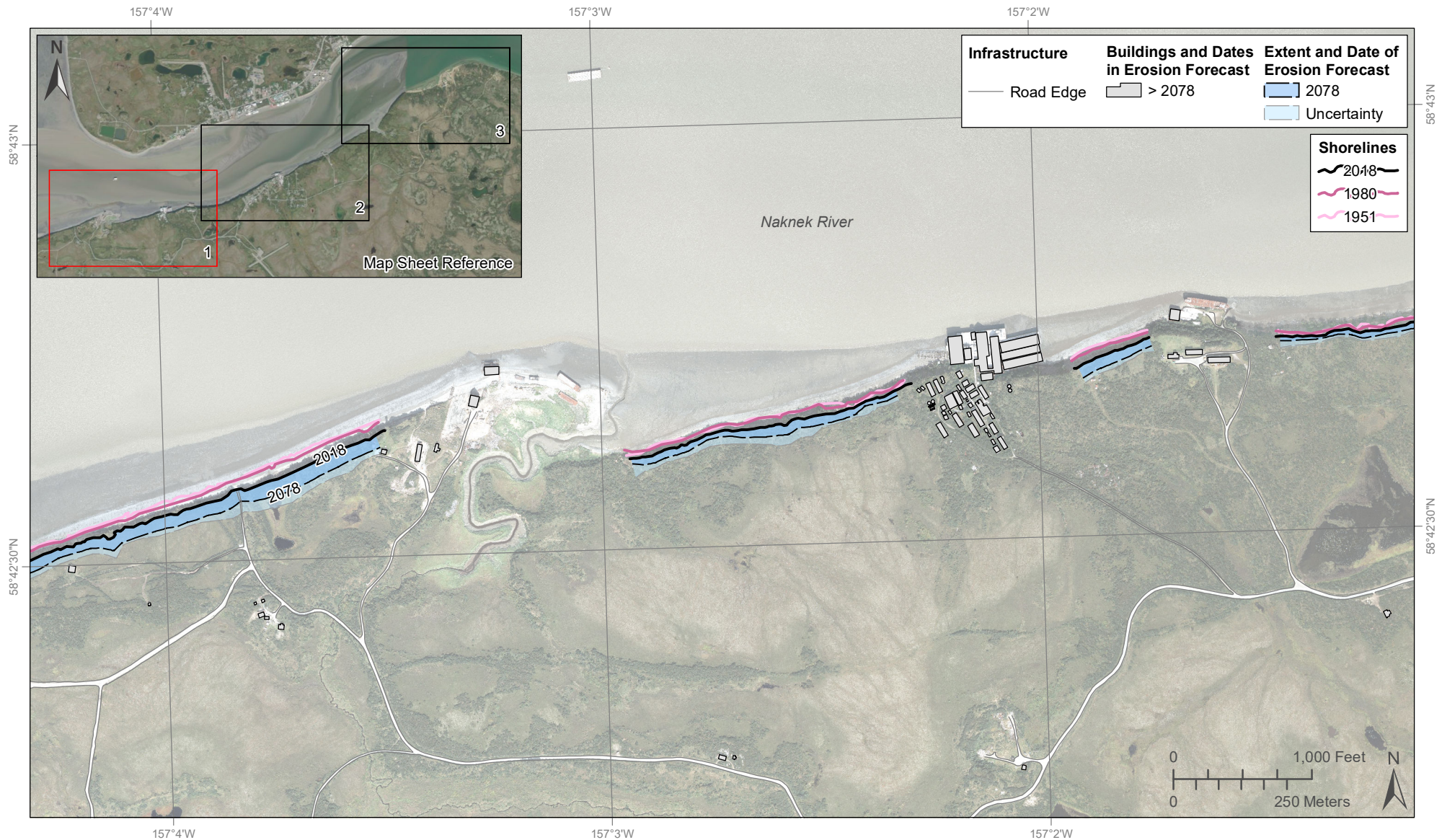
This work was funded by the Denali Commission Village Infrastructure Protection Program through the project “Systematic Approach to Assessing the Vulnerability of Alaska’s Coastal Infrastructure to Erosion.” The community of South Naknek was not consulted for this report.

REFERENCES

- 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 South Naknek, Alaska

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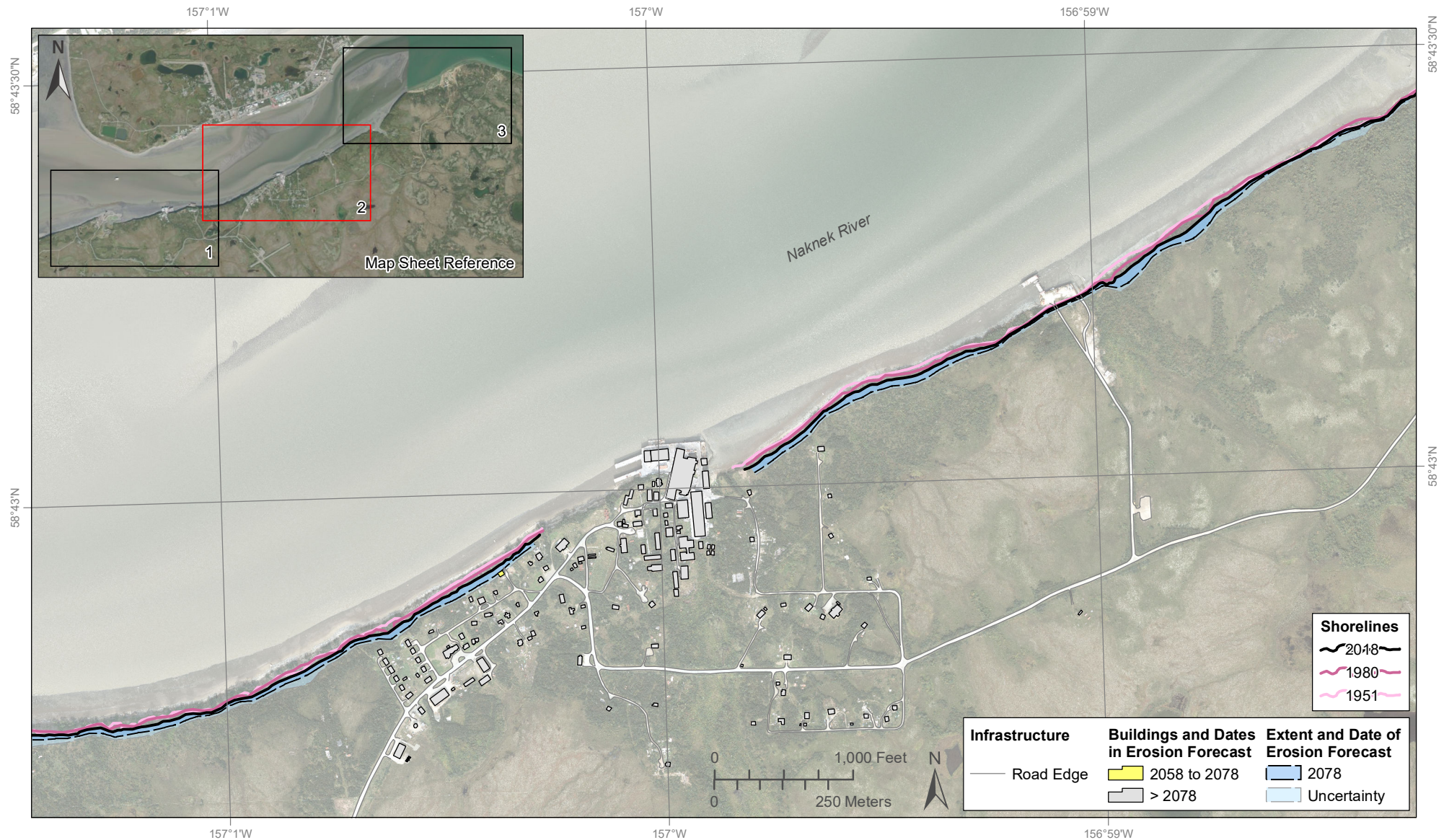
Erosion and accretion of coasts and rivers result in shoreline change. These rates of shoreline change at Alaska communities are calculated from historical and modern shorelines (shorelines shown as lines in pinkscale and labeled by year). The long-term (1951 to 2018) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to year 2078 (dark blue) with a 90 percent confidence interval area of uncertainty (light blue). Buildings forecast to be impacted by erosion are colored by the range of years when the impact is forecast to occur: 2018 to 2038 (purple), 2038 to 2058 (orange), 2058 to 2078 (yellow), and no impacts expected by 2078 (gray). For more detailed information about the impacts to infrastructure from erosion at South Naknek, refer to the South Naknek 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.



Erosion Exposure South Naknek, Alaska

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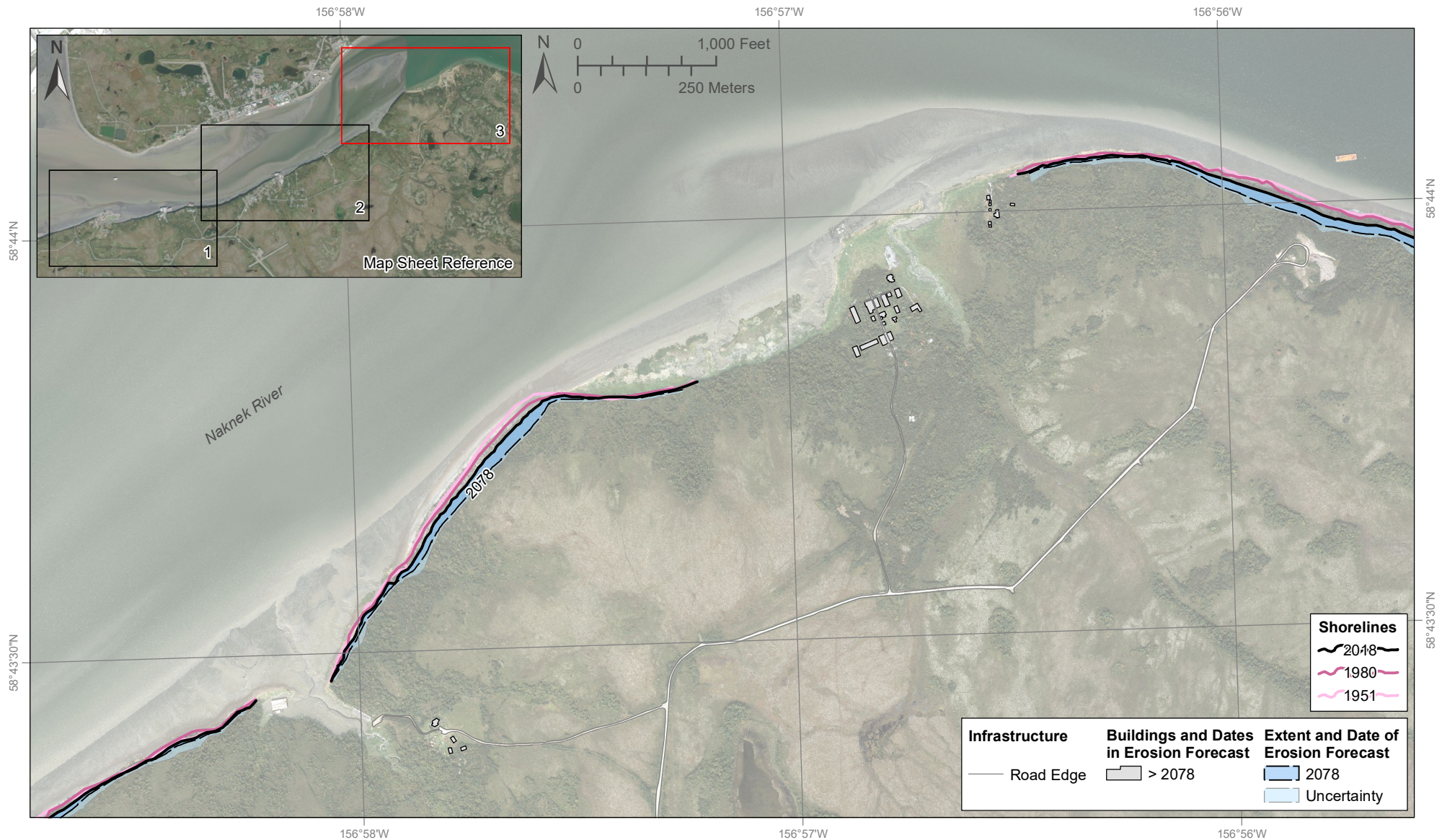
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