

## EROSION EXPOSURE ASSESSMENT—WALES

Richard M. Buzard, Mark M. Turner, Katie Y. Miller, Donald C. Antrobus, and Jacquelyn R. Overbeck



Wales, Alaska, in 2012. Photo: Alaska Division of Geological & Geophysical Surveys.



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





# **EROSION EXPOSURE ASSESSMENT—WALES**

Richard M. Buzard, Mark M. Turner, Katie Y. Miller, Donald C. Antrobus, and Jacquelyn R. Overbeck

Report of Investigation 2021-3 Wales

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

## STATE OF ALASKA

Mike Dunleavy, Governor

## DEPARTMENT OF NATURAL RESOURCES

Corri A. Feige, Commissioner

## DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

Steve Masterman, State Geologist and Director

Publications produced by the Division of Geological & Geophysical Surveys (DGGS) are available to download from the DGGS website ([dggs.alaska.gov](https://dggs.alaska.gov)). Publications on hard-copy or digital media can be examined or purchased in the Fairbanks office:

Alaska Division of Geological & Geophysical Surveys  
3354 College Rd., Fairbanks, Alaska 99709-3707  
Phone: (907) 451-5010 Fax (907) 451-5050  
[dggspubs@alaska.gov](mailto:dggspubs@alaska.gov) | [dggs.alaska.gov](https://dggs.alaska.gov)

### DGGS publications are also available at:

Alaska State Library,  
Historical Collections & Talking Book Center  
395 Whittier Street  
Juneau, Alaska 99811

Alaska Resource Library and Information Services (ARLIS)  
3150 C Street, Suite 100  
Anchorage, Alaska 99503

### 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>



**Contents**

Wales Erosion Exposure Assessment.....1

Acknowledgments .....2

References .....2



# EROSION EXPOSURE ASSESSMENT—WALES

Richard M. Buzard<sup>1</sup>, Mark M. Turner<sup>1</sup>, Katie Y. Miller<sup>1</sup>, Donald C. Antrobus<sup>2</sup>, and Jacquelyn R. Overbeck<sup>1</sup>

## WALES EROSION EXPOSURE ASSESSMENT

This is a summary of results from an erosion forecast near infrastructure at Wales, 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:

- Shoreline change assessment ArcGIS shapefiles from Overbeck and others (2020) updated to the vegetation line if appropriate.
- Infrastructure AutoCAD outlines and metadata from Division of Community & Regional Affairs (2004) 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 ( $\leq 0.66$  ft [20 cm] ground sample distance) aerial orthoimagery (Overbeck and others, 2016).

Wales is located on the western tip of the Seward Peninsula, between the Bering Strait and the Chukchi Sea. The community is constructed on vegetated and non-vegetated sand dunes. Erosion in Wales occurs in the form of scouring during high water events such as storm surge that redistribute sand across the beach and dunes (U.S. Army Corps of Engineers [USACE], 2007). This coastal erosion process is non-linear because dunes can recover after storm events; sand transported to the near-shore during a storm is redistributed to the beach,



and vegetation grows back. Dune and beach erosion disturb the land surface and can damage or undercut structures. Wales is exposed to erosion that may undermine infrastructure in the following 60 years, but we cannot forecast beach and dune erosion in Wales using the method by Buzard and others (2021) because the model depends on linear erosion of a clearly identified shoreline. The shorelines delineated from aerial imagery show erosion could be up to 5.6 feet per year, but there is great uncertainty because the shorelines are not easy to identify due to wave action (Overbeck and others, 2020).

Beach erosion and storm damage can be monitored with repeat beach elevation measurements using GPS or digital elevation models. DGGS extracted elevation profiles from a 2004 lidar digital elevation model at transects along the beach. DGGS also conducted GPS surveys in 2012 and 2015 along the same transects. At least three storms impacted Wales during this time: October 2004, September 2005, and November 2011 (USACE, 2009; Kawerak, 2012). Continued monitoring and a longer record of beach elevation can help identify whether and when infrastructure may become exposed to erosion.

<sup>1</sup> Alaska Division of Geological & Geophysical Surveys, 3354 College Rd., Fairbanks, Alaska 99709-3707

<sup>2</sup> Alaska Native Tribal Health Consortium, 4000 Ambassador Drive, Anchorage, Alaska 99508

## 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 Wales 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>
- Division of Community & Regional Affairs, 2004, Community profile map, Wales: Department of Commerce, Community, and Economic Development. <https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/CommunityProfileMaps.aspx>
- Kawerak, 2012, Wales local economic development plan 2011-2016: Community Services Division Kawerak, Inc., 100 p.
- Overbeck, J.R., Buzard, R.M., Turner, M.M., Miller, K.Y., and Glenn, R.J., 2020, Shoreline change at Alaska coastal communities: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2020-10, 29 p., 45 sheets. <https://doi.org/10.14509/30552>
- Overbeck, J.R., Hendricks, M.D., and Kinsman, N.E.M., 2016, Photogrammetric digital surface models and orthoimagery for 26 coastal communities of western Alaska: Alaska Division of Geological & Geophysical Surveys Raw Data File 2016-1, 3 p. <https://doi.org/10.14509/29548>
- U.S. Army Corps of Engineers (USACE), 2007, Alaska baseline erosion assessment report summary—Wales, Alaska: U.S. Army Corps of Engineers Alaska District, 4 p.