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ANNOTATED BIBLIOGRAPHY SERIES IN SUPPORT OF COASTAL COMMUNITY HAZARD PLANNING—NORTHWEST ALASKA

POINT LAY, ALASKA

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This annotated bibliography is part of a series created to facilitate access to documents useful for coastal geohazard evaluation and community planning in Northwest Alaska. Below is a comprehensive list of community-specific information sources, each with full bibliographic information and an informative-style annotation that highlights content pertaining to the community of Point Lay, Alaska. For a detailed description of the preparation and scope of this resource, please refer to this bibliography series' foreword. Any notable errors and/or omissions may be reported to the Coastal Hazards Program manager at the Alaska Division of Geological & Geophysical Surveys (DGGS).

Alaska Consultants, Inc., *for* North Slope Borough, June 1983, Background for planning, village of Point Lay: North Slope Borough, 88 p.

This report is a background for community planning of physical and social nature. The history of Point Lay's economy, physical setting, and community location are provided, as well as demographic and public facility information.

The village has moved twice due to erosion issues. First from beach erosion in 1977, and the second from erosion and flooding by the Kokolik River combined with a need to be located closer to the DEW line airport in 1981. The current location is immediately north of the DEW Line station, providing access to the airport and jobs and an environment more resistant to erosion.

Alaska Department of Commerce, Community & Economic Development (DCCED), accessed 2011, Division of Community & Regional Affairs (DCRA) Community Profiles [website]: State of Alaska Department of Commerce, Community & Economic Development.

http://www.commerce.state.ak.us/dca/profiles/profile-maps.htm

This website provides access to community profile maps for community-based planning. The maps are available in 24" by 36" and 30" by 42" formats. The Point Lay map was created in 1978 based on land surveys and/or interpretation of aerial imagery. Subsistence hunting grounds, habitat areas, community buildings, and public facilities are delineated. Shoreline position and potential erosion zones are included in the map content. All maps have been sponsored by the Alaska Division of Community & Regional Affairs and contracted to local agencies for production.

Alaska Department of Natural Resources Division of Coastal and Ocean Management (DCOM), accessed February 2011, Alaska Coastal Management Program [website]: Alaska Department of Natural Resources Division of Coastal and Ocean Management.

http://alaskacoast.state.ak.us/Explore/Tour.html

This website outlines the Alaska Coastal Management Plans for each coastal district. It provides stewardship plans "to ensure a healthy and vibrant Alaskan coast that efficiently sustains long-term economic and environmental productivity".

Brigham-Grette, Julie, and Hopkins, David M., 1995, Emergent marine record and paleoclimate of the last interglaciation along the northwest Alaskan coast: Quaternary Research, vol. 43, p. 159–173.

This paper describes the stratigraphy of deposits of the last interglaciation in the Beringian region of Alaska and summarizes biostratigraphic information used to infer past water-mass and sea-ice conditions during substage 5e in the Bering Strait and southern Arctic Ocean. The Pelukian shoreline is delineated for the communities of Barrow, Wainwright, Teller, and Brevig Mission.

Denali Commission, March 2011, Road and waterfront project selections, fiscal year 2006–2011: Denali Commission, 9 p.

This report contains an overview of all of the funding dispersed by the Denali Commission Transportation Program from 2006–2011. The document is organized by partner agency/project and includes a description of the project status. Point Lay was given $478,400 in 2011 for the construction of subdivision roads; this project is still under preliminary design.

Harper, John R., August 1978, The physical processes affecting the stability of tundra cliff coasts [PhD thesis]: Louisiana State University, Department of Marine Sciences, 212 p.

Underlying causes of rapid tundra cliff retreat are uncertain and there is little information on how this rapid cliff retreat interacts with the nearshore sediment budget. The purpose of this study is to further delineate the controlling processes of tundra cliff erosion on the North Slope, including Point Lay, Alaska. Specifically, the purpose is to determine the primary causes of the widespread and rapid coastal retreat, determine seasonal variation of retreat rates and erosional processes, determine the relation of these processes to seasonal variation of thaw and surface heat fluxes, assess the direct and indirect effects of permafrost on coastal retreat, develop a tundra cliff sediment budget to assess the contribution of subaerial processes and paths of sediment movement, and evaluate seawater effects on the thermal degradation of permafrost and the subsequent influence on tundra cliff erosion.

Kowalik, Z., *of* Institute of Marine Science, University of Alaska, Fairbanks, November 1984, Storm surges in the Beaufort and Chukchi seas: Journal of Geophysical Research, vol. 89, no. C6, p. 10,570–10,578.

This article describes a numerical model designed to determine storm-surge characteristics including sea level, mean currents, and ice motion on the Beaufort and Chukchi seas. The equations employed by the model proved to be effective in predicting sea ice edge locations during three modeled storm-surge events. Velocity was shown to parallel sea level contours in both the Beaufort and Chukchi seas, generating gyres around offshore storm-surge bulges.

Mahoney, Andy, Hajo Eicken, Allison Graves, Lew Shapiro, and Patrick Cotter, 2004, Landfast sea ice extent and variability in the Alaskan arctic derived from SAR imagery: IEEE, Fairbanks, AK, p. 2146–2149.

This report explains the use and reliability of a new technique using synthetic aperture radar (SAR) to derive seaward landfast ice edge positions as they migrate. The presented data spans the Alaskan Arctic coast, from east of Point Lay to the Mackenzie Delta.

Mason, Owen K., and James W. Jordan, 2002, Minimal late Holocene sea level rise in the Chukchi Sea—Arctic insensitivity to global change?: Global and Planetary Changes, vol. 32, p. 13–23.

In this article, Mason and Jordan outline the apparent disconnect between late Holocene global sea level rise and the moderate sea level rise observed in Northwest Alaska. Radiocarbon ages taken from peat and storm deposits in Seward Peninsula lagoons allowed for the reconstruction of a sea-level curve spanning the last 6,000 years. The results indicate that sea level in Northwest Alaska has risen an average 0.3 mm per year compared to the global average of 1–2 mm per year. The authors suggest several hypotheses for these differing rates including cold sea surface temperatures (limited steric expansion), geoid variation, and/or the development of permafrost. Although observed rates of sea level rise are moderate for the Chukchi Sea, the article cautions that the response of northern Alaska's coasts to future global climate change remains uncertain and requires continued investigation.

Overland, J.E., and A.T. Roach, June 1987, Northward flow in the Bering and Chukchi seas: Journal of Geophysical Research, vol. 92, no. C7, p. 7097–7105.

The Bering Strait is the only avenue for the exchange of ice, water, heat, and nutrients between the Pacific and Arctic Oceans. The authors use a two-dimensional, barotropic, numerical model for the Bering Sea and Chukchi Sea shelves to investigate the relationship between sea levels and regional transport patterns. This provides additional evidence that Bering Strait transport and regional circulation patterns are driven by Pacific Ocean–Arctic Ocean sea level difference. The authors also use the model to qualitatively critique previous subregional, observation-based studies.

Péwé, Troy L., David M. Hopkins, and Arthur H. Lachenbruch, *of* U.S. Geological Survey *for* U.S. Atomic Energy Commission, April 1958, Engineering geology bearing on harbor site selection along the northwest coast of Alaska from Nome to Point Barrow: U.S. Geological Survey Trace Elements Investigations report no. 678, 57 p.

This report provides geologic and oceanographic information from previous investigations, aerial imagery, and reconnaissance fieldwork regarding the optimal location of a deep-water harbor. The harbor was to be constructed using modern nuclear explosives and located at a point along the northwest coast of Alaska between Nome and Point Barrow. The project was not undertaken.

Schalk, Marshall, *of* Department of Geology, Smith College, June 1963, Study of nearshore bottom profiles east and southwest of Point Barrow, Alaska—Comparison of profiles and the barrier islands in the Point Lay and Plover Islands areas: Northampton, Massachusetts, Smith College, Department of Geology, 16 p.

This report includes nearshore bottom profiles and sediment-sample descriptions of coastal locations at Barrow, Wainwright, and Point Lay, Alaska. Repeat coastal surveys were conducted 1954–1962. Offshore of Barrow, a submerged bar that was relatively stable in the 1950s is shown to broaden and move inland in the 1962 survey data. A more complex bar system was observed in the 1950s surveys, believed to have developed following a large storm in 1954. Surveys of the barrier islands at Point Lay highlight areas of stability and instability in the barrier island system.

Short, A.D., and W. J. Wiseman, Jr., 1972, Freeze-up processes on arctic beaches: Baton Rouge, Louisiana, Coastal Studies Institute, Louisiana State University, p. 215–224.

This paper discusses the processes observed that modified beach topography at Point Lay and Pingok Island on the North Slope of Alaska during the freeze-up period. The sequence of events observed in 1972 were:

1. *Solidification of the upper beach face.*
2. *Formation of snow cover.*
3. *Deposition of ice cakes (single pieces of sea ice smaller than 10 m in diameter) on the beach.*
4. *Formation of ice slush in the lagoons.*
5. *Deposition of ice slush berms on the beach face.*
6. *Formation of interbedded layers of sediment and ice.*
7. *Formation of ice-foot features.*

U.S. Army Corps of Engineers, accessed 2011, Civil works floodplain management services [website]: U.S. Army Corps of Engineers, Alaska District.

http://www.poa.usace.army.mil/en/cw/fld_haz/floodplain_index.htm

This website provides flood-hazard data for communities throughout Alaska. A link is provided to a flood-hazard-specific bibliography maintained by the U.S. Army Corps of Engineers. Standard flood data are not available for Point Lay, but notes about the community are documented on this site.

U.S. Army Corps of Engineers, March 2009, Study findings and technical report—Alaska baseline erosion assessment: Elmendorf Air Force Base, Alaska, U.S. Army Corps of Engineers, Alaska District, 68 p.

http://www.poa.usace.army.mil/AKE/Home.html

This statewide assessment was conducted by the Corps of Engineers to coordinate, plan, and prioritize responses to erosion throughout Alaska. The report has designated 178 communities as having erosion issues, including Point Lay.

U.S. Government Accountability Office (GAO), June 2009, Report to congressional requestors—Alaska Native villages, limited progress has been made on relocating villages threatened by flooding and erosion: U.S. General Accountability Office Report GAO-040895T, 53 p.

http://www.gao.gov/products/GAO-09-551

This report is a follow up to the 2003 GAO report on flooding and erosion in Alaska Native villages, and was completed to identify climate-related concerns that have increased the urgency of federal and state efforts. The GAO developed recommendations for Congress that include:

1. *A flooding assessment to augment the erosion assessment completed by the Army Corps of Engineers.*
2. *An amendment to federal legislation that would allow 64 more villages to be eligible for grants.*
3. *The designation of a federal entity to oversee and coordinate village relocation efforts.*

This report recognizes Point Lay as one of 33 villages with a FEMA-approved hazards mitigation plan.

U.S. Government Accounting Office (GAO), 2003 [2004], Alaska Native villages—Most are affected by flooding and erosion, but few qualify for federal assistance: U.S. General Accounting Office Report GAO-04-142, 82 p.

http://www.gao.gov/products/GAO-04-142

This study was conducted to provide recommendations to Congress to improve how state and federal agencies respond to flooding and erosion in Alaska. This was done by:

1. *Determining the extent to which these villages were affected.*
2. *Identifying federal and state flooding and erosion programs.*
3. *Determining the current status of efforts to respond to flooding and erosion in nine villages.*
4. *Identifying alternatives that Congress may wish to consider when providing assistance for flooding and erosion (see "Highlights" section).*

The recommendations provide alternatives to current actions taken during flooding and erosion responses by including federal agencies and the Denali Commission. The adoption of policies by the Denali Commission would guide investments in infrastructure for Alaska Native villages affected by flooding and erosion. Point Lay is identified as one of 184 Alaska Native Villages affected by flooding and erosion.

Wise, James L., Albert L. Comiskey, and Richard Becker, 1981, Storm surge climatology and forecasting in Alaska: Anchorage, Alaska, Arctic Environmental Information and Data Center, University of Alaska, 26 p.

The objective of this study was to improve the quality of life and the security of property in flood-susceptible coastal areas by enhancing the decision-making process for human activities and development. This study compiles historical climatological data to develop a surge forecast regression equation. Storm profiles specific to Point Lay are recorded for 1963 and 1972.

Wiseman,William J., Jr., James M. Coleman, Anthony Gregory, Shih-Ang Hsu, and Andrew D. Short, July 1973, Alaskan arctic coastal processes and morphology: Baton Rouge, Louisiana, Coastal Studies Institute, Louisiana State University, Technical Report no. 149, 171 p.

This study was designed to examine the variability of coastal process environments and morphology along the entire Alaskan Arctic Coast (Point Hope to Demarcation Point), and to investigate specific nearshore processes and beach responses at two field sites, Point Lay and Pingok Island. The first phase of the study involved acquisition, generation, synthesis, and analysis of existing data from the North Slope. Aerial field reconnaissance trips were also made, along the coast during breakup, in open-water conditions, and during freezeup in 1971 and 1972. The study was broken up into the following processes:

Atmospheric Processes: Meteorological records were taken from Alaska's Distant Early Warning (DEW) Line stations, but many records weren't consistent or continuous. Two objectives were used to study the surface boundary-layer wind structure at Point Lay. One, to determine mean values of the aerodynamic roughness length and wind stress drag coefficient over varying surfaces, and two, to determine the effect of a sea-ice pressure ridge or hummock on the two-dimensional wind structure as the wind flows over the ridge.

Nearshore Hydrodynamic Processes: Four hydrodynamic phenomena were selected for study in the nearshore zone: Sea level variations from periods of a few hours to a few days; wave motion, both local wind-generated waves and swell; mesoscale currents; and mesoscale water-mass variability. Current literature was found to be

insufficient for characterizing these phenomena, so the goals of the study were to describe the mesoscale variability of sea level, nearshore currents, wave characteristics, and water-mass characteristics at the two field sites and to determine possible causative mechanisms.

<u>*Alaskan Arctic Coast Morphology*</u>*: The 1,441 km of arctic coast consists of 805 km of recent barrier islands and associated inlets backed by lagoons of various widths; 381 km of tundra bluffs fronted by narrow beaches, 135 km of delta shorelines, and 120 km of rock cliffs. Coastal geomorphic characteristics and variability were determined using hydrographic and topographic maps, aerial photographs, and several aerial photographic and reconnaissance flights. From this data, shoreline parameters were determined: coastline trend length, shoreline length, open water, ratio of shoreline length to open water, coastline crenulation, average shoreline crenulation, barrier length, barrier width, and barrier length/chord. Lagoon shape values determined were: Length, width, length/width, area, perimeter, alpha crenulation, and gamma crenulation.*

<u>*Beach Process–Response Interactions*</u>*: The results of this study are presented in the context of breakup, open water, and freezeup.*

The results are separated between the two study areas because of variability.This study required input from and investigations by scientists in multiple fields including meteorology, nearshore hydrodynamics, wave mechanics, morphodynamics, beach dynamics, and geomorphology.