Scammon Bay Airport Feasibility Study

August 2025

Alternatives

CFAPT01005 / AIP 3-02-0255-005-2023

Prepared for:

State of Alaska
Department of Transportation & Public Facilities, Central Region
4111 Aviation Ave.
Anchorage, Alaska 99516-6900

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EXECUTIVE SUMMARY

The Central Region of the Alaska Department of Transportation and Public Facilities (DOT&PF) conducted an airport feasibility study for the Scammon Bay Airport (SCM). The feasibility study is Phase I of a multi-phased planning process that was initiated to improve the safety of aviation infrastructure in Scammon Bay and is federally funded through a Federal Aviation Administration (FAA) AIP grant. The planning study is anticipated to include three planning phases: Phase I feasibility study, Phase II, reconnaissance study, and Phase III Airport Layout Plan (ALP)

Scammon Bay is located adjacent to the Kun River, one mile from the Bearing Sea, north of the Askinuk Mountains in the Yukon-Kuskokwim Deta, approximately 150 miles northwest of Bethel, Alaska. The community of Scammon Bay has a population of nearly 600 people. There are two governing bodies: the municipality and the traditional council. The city is classified as a second-class city, within the Kusilvak Census Area.

The Scammon Bay Airport (SCM) is a rural General Aviation (GA) airport with no on-site management. The major issue facing the Scammon Bay Airport is flooding, which is destabilizing the airport surface and embankment, submerging the lighting system and navigational aids, and resulting in airport closures. The closures prevent residents from being able to evacuate during emergencies, access emergency medical services, send or receive mail, or have food and fuel delivered.

The purpose of the Phase I feasibility study was to develop and evaluate preliminary alternatives that could mitigate airport safety and reliability in for the community of Scammon Bay. Phase II is anticipated to be an in-depth reconnaissance study that will build on the findings of the feasibility study. Phase III may include the development of an ALP that will be used for the design of an Airport Capital Improvement Program (ACIP) project for the preferred alternative. The emphasis of the evaluation was to compare maintaining the airport in its current location, shifting the runway and operational surfaces inland, or constructing a new airport further inland away from Kun River.

The Phase I study evaluated five alternatives based on the following criteria:

- Safety and Resiliency
- Land Status
- Environmental Conditions
- Public Access Convenience
- Constructability

- Solid Waste Disposal Sites
- Materials
- Utilities
- Cost
- Public Opinion

The Alternatives include:

- Alternative 1 ("No Action") is used for comparison purposes and does not resolve the erosion and flooding threats.
- Alternative 2 ("Shift & Raise") would shift the runway 340 feet inland along its current alignment as protection from river movement. This alternative includes raising the surface elevation of the edge of the embankment 3-10.5feet to +19.5 feet MHHW NAVD and installing erosion protection.
    a. DOT&PF Aviation Design recommended this elevation raise based on the analysis and recommendations from the 2022 HDR Coastal Report (Appendix C). To prevent overtopping from storm surges, the HDR report recommended +18.5 feet NAVD88 for a 50-year design life and +20.5 feet NAVD88 for a 100-year design life.
- Alternative 3 ("Near") would relocate the Airport onto the transitional area between lowlands and the Askinuk Mountains, near the community of Scammon Bay.
- Alternative 4 ("Castle Hill") would relocate the Airport to the valley between Castle Hill and the Askinuk Mountains.
- Alternative 5 ("Ridgeline") would relocate the Airport to the ridgeline south of Scammon Bay in the Askinuk Mountains.

The Phase I feasibility study included public involvement, an aviation forecast, alternatives evaluation, and incorporated two technical studies that were developed for the Scammon Bay airport; a Coastal Report (HDR, 2022) and a Hydrology and Hydraulics Report (HDR, 2022). The aviation forecast was approved in March 2024. Much of this study focused on exiting data and records for the airport and surrounding area. No field site investigations occurred at potential relocation sites.

Public involvement for the feasibility study included mass public notification emails, flyers, one in-person public meeting with a virtual option, regular website updates, and three requests for public comments. During the public meeting, community members expressed strong support Alternative 2 (Shift & Raise). A tri-party community resolution was passed by the City of Scammon Bay, Native Village of Scammon

Bay, and Askinuk Corporation in support of Alternative 2. The Calista Corporation also submitted a letter of support for Alternative 2.

Findings

Based on the findings in this study, DOT&PF has selected the following alternatives for further analysis: Alternative 1 (No Action), Alternative 2 (Shift & Raise), and Alternative 4 (Castle Hill).

DOT&PF selected Alternative 1 because it is the "No Action" alternative and must be further evaluated to include engineering level estimated costs for repeated rehabilitation projects after catastrophic flooding events. Evaluation of the "No Action" alternative is consistent with the National Environmental Policy Act (NEPA). Alternative 2 (Shift & Raise) was selected for further evaluation because it provides a beneficial mix of operational safety, public access convenience, planning level cost effectiveness, land acquisition probability, and less environmental impact because much of the potentially impacted land has experienced ground disturbance, and it received local support. Alternative 4 (Castle Hill) was selected out of the three relocation alternatives because it is located above the floodplain, within five miles of the Scammon Bay community center, and the planning level estimate indicates it may be less expensive to construct than the "Shift & Raise" alternative. Both Alternatives 2 and 4 require further in-depth analysis of cost, constructability, geotechnical conditions, wind conditions, material resources, and cultural resources prior to final selection.

The other alternatives were considered but deemed not feasible. Alternative 3 (Near) would have relocated the airport further from the river, but it would still have been within the floodplain. Alternative 5 (Ridgeline) had many risks associated with the cost estimate, constructability of an access road, and unlikely land acquisition.

The scope of a Phase II study may include, but not necessarily be limited to: public involvement, wind studies, geotechnical investigation and engineering (including material site investigation), environmental engineering (including cultural resource analysis), civil engineering (including preliminary airport and access road configurations and diagrams), hydrology and hydraulic engineering services (including floodplain and wetlands analysis), economic analysis and cost estimating (including life cycle cost analysis and previous formulated costs), Right-of-Way impacts, an alternatives summary, and analysis of construction phasing for the Alternative 2 (Shift & Raise) and Alternative 4 (Castle Hill). Phase II may also include procuring aerial and/or Light Detection and Ranging (LIDAR) imaging to further guide the selection of a preferred alternative, particularly in evaluating access and alignment options. DOT&PF

anticipates the preferred alternative from the reconnaissance study will advance to a Phase III ALP and design project.

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LIST OF ACRONYMS

%	Percent
AC	Advisory Circular
ACIP	Airport Capital Improvement Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADG	Aircraft Design Group
ADNR	Alaska Department of Natural Resources
AHRS	Alaska Heritage Resources Survey
AIP	Airport Improvement Program
ALP	Airport Layout Plan
AWOS	Automated Weather Observing System
BLM	Bureau of Land Management
CASC	Crushed Aggregate Surface Course
CISA	Climate Informed Science Approach
CSPP	Construction Site Phasing Plan
CY	Cubic Yards
DOT&PF	Alaska Department of Transportation and Public Facilities
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GA	General Aviation
HEC	Hydraulic Engineering Circular
HW/D	Headwater Depth to Culvert Diameter Ratio
Kcgc	Calcareous Graywacke and Conglomerate
Klgr	Intermediate Granitic Rocks
LIDAR	Light Detection and Ranging
LP	Localizer Precision
MHHW	Mean Higher High Watermark
MMPA	Marine Mammal Protection Act
NAVAID	Navigational Aids
NAVD	North American Vertical Datum 88
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOTAM	Notice to Airmen
PD&E	Preliminary Design & Engineering
Qs	Unconsolidated Surficial Deposits, Undivided
RNAV	Area Navigation
RNP	Required Navigation Performance
ROFA	Runway Object Free Area
RSLR	Relative Sea Level Rise
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RSLR	Relative Sea Level Rise
SCM	Scammon Bay Airport
SREB	Snow Removal Equipment Building
USACE	U.S. Army Corps of Engineers
USBTS	U.S. Bureau of Transportation Statistics
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

The Central Region of the Alaska Department of Transportation and Public Facilities (DOT&PF) conducted an airport feasibility study for the Scammon Bay Airport (SCM) (Figure 1-1, 1-2, 1-3).

Scammon Bay is located adjacent to the Kun River, one mile from the Bearing Sea, north of the Askinuk Mountains in the Yukon-Kuskokwim Deta, approximately 150 miles northwest of Bethel, Alaska, in the Kusilvak Census Area. The community of Scammon Bay has a population of nearly 600 people. The city has a dual government by both the Native Village of Scammon Bay and the City of Scammon Bay, which was incorporated in 1967. There are two governing bodies: the municipality and the traditional council.

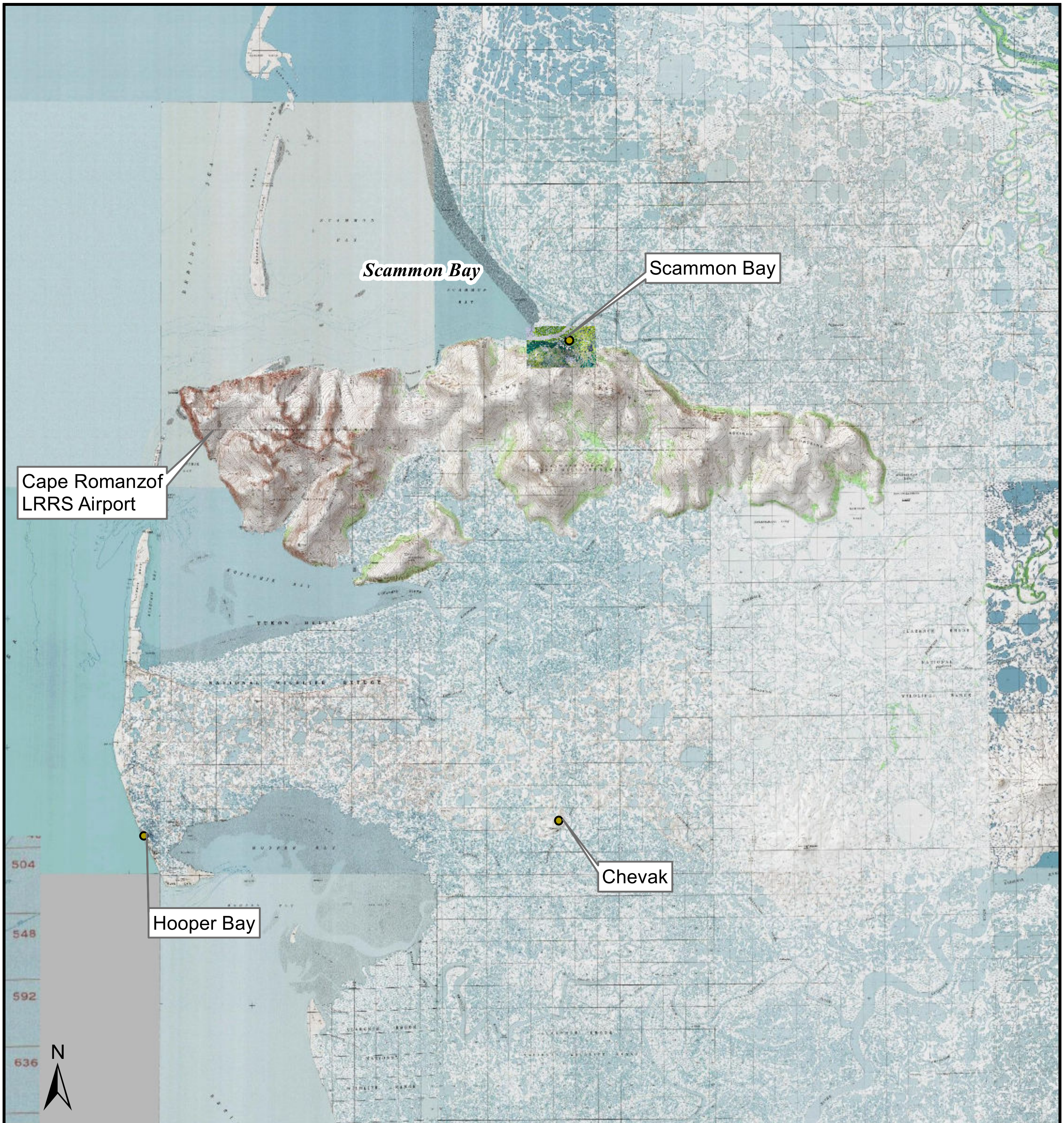
Figure 1-1 Scammon Bay Location

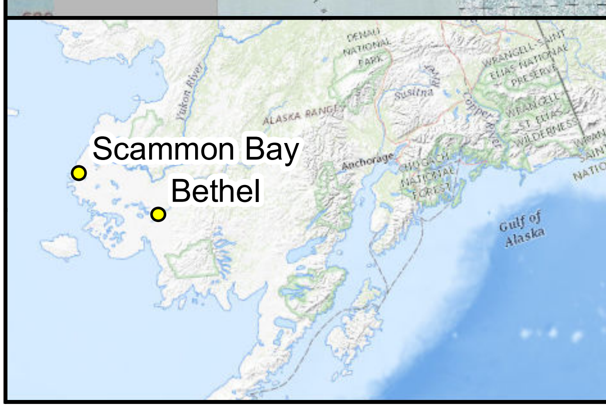
SCM is a public DOT&PF-owned Commercial Service – Non-Primary, Community Off-Road, General Aviation (GA) airport. SCM has a single, gravel, 3,000-foot-long, 75-foot-wide runway, with medium-intensity runway edge lights.

The major issues facing the Scammon Bay Airport are severe flooding and coastal erosion. Disaster level flooding occurs every five to ten years. The flooding is destabilizing the airport surface and embankment, submerging the lighting system and navigational aids, and resulting in airport closures. The closures prevent residents from being able to evacuate during emergencies, access emergency medical services, send or receive mail, or have food and fuel delivered. The airport was declared a Federal Emergency Management Agency (FEMA) disaster area in 2016 and as a state disaster area in 2022.

The Scammon Bay Airport provides the only year-round access to other communities and emergency health care infrastructure. There are no roads connecting Scammon Bay to other communities. During the summer, Scammon Bay is accessible by air and water. Barge service remains an important transportation mode for goods during the summer. During the winter, transportation can occur via air or over snow/ice. Air travel is the only way to reach the hub community of Bethel (150 miles away), where the nearest trauma rated hospital is located, throughout most of the year.

To coordinate the community's planning for building resilient aviation infrastructure, the need exists for an airport planning study to review the feasibility of potential alternative locations of an airport, improvements such as shifting the runway away from the river, and comparison to the current site. This report evaluates potential five alternatives for improving the Airport.





SCAMMON BAY
AIRPORT PLANNING STUDY

August 2024

STATE OF ALASKA
Department of Transportation and Public Facilities
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Figure 1-2: Project Location and Vicinity Map

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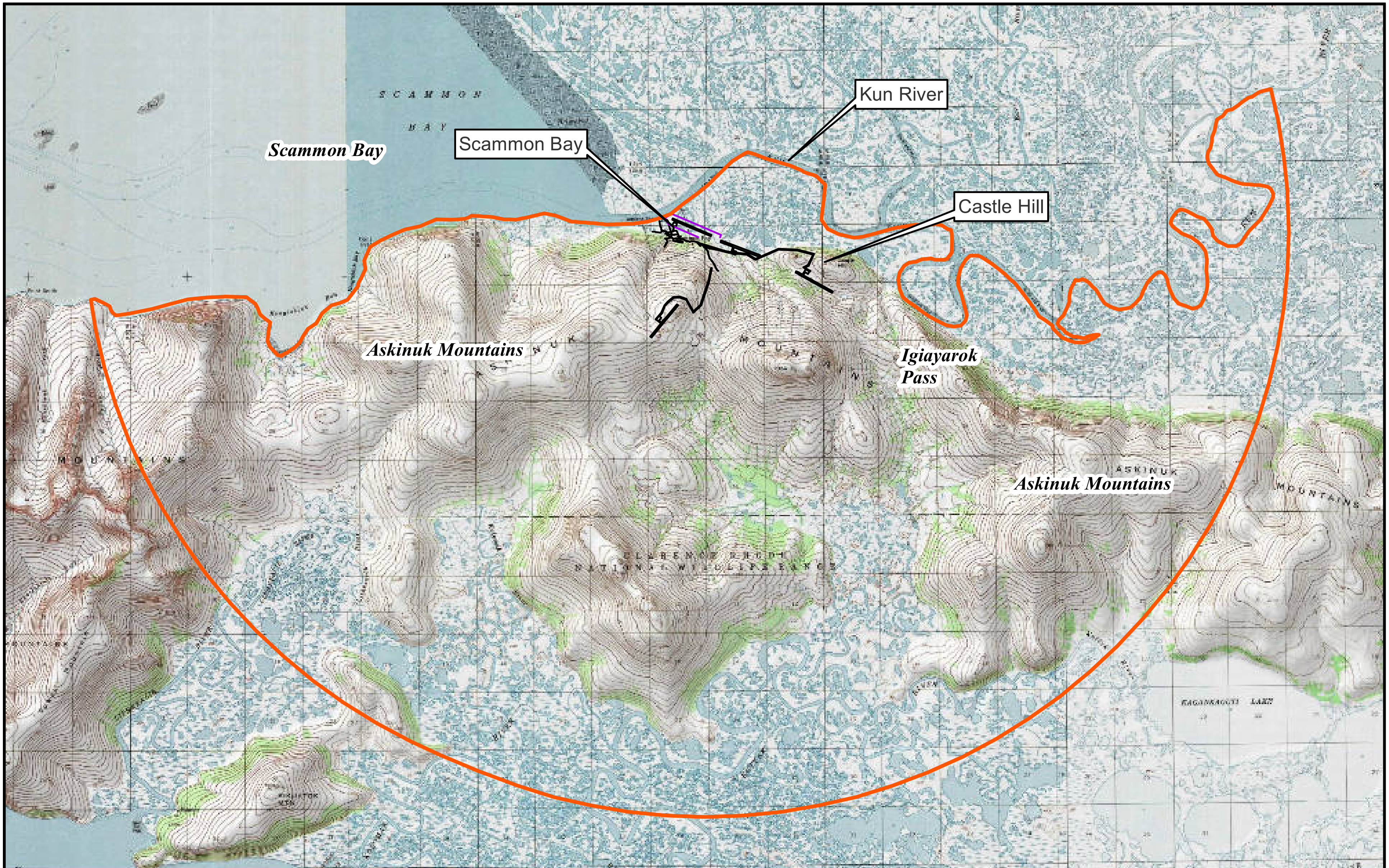

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1:150,000 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area
Airport Boundary
Alternatives (2024)
Road

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
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April 2025

Figure 1-3: Study Area

2 EVALUATION CRITERIA

The evaluation criteria were developed to analyze the suitability of each alternative. These criteria were selected because they reflect challenges that are encountered during airport construction and maintenance of rural Alaskan airports in areas that are impacted by rising sea levels and melting permafrost. They also reflect the challenges faced by rural Alaskan communities that are not connected to the road system and have no other means of year-round transportation.

2.1 Safety and Airport Resiliency

The construction and long-term maintenance of a rural Alaskan airports must be resilient and sustainable for long-term maintenance and meet the community needs for year-round accessibility. This criteria was evaluated based on the following conditions: flooding and erosion, fog and low visibility, wind, geology and potential material sites, and 14 CFR Part 77 surface penetrations.

2.1.1 Flooding and Erosion

The runway has experienced disaster flooding events in addition to flooding after heavy rains and remains as the largest threat to the Airport. The surface elevation of the current runway ranges from 10 to 17.5 feet. HDR published a Coastal Report in 2022 (HDR, 2022 and Appendix C) which recommended that the runway have a surface elevation of 18.5 feet NAVD88 to meet a 50-year storm return period, with a 2 percent (%) Annual Exceedance Probability.

Return Period	Recommended Airport Surface Elevation	Overtopping Discharge (m^3/s per m)
50-Year (2% AEP)	**+18.5 feet NAVD88**	0.02 Avg; 0.05 Max
100-Year (1% AEP)	+20.5 feet NAVD88	0.01 Avg; 0.04 Max

Note: m^3/s per m = cubic meters per second per meter; AEP = Annual Exceedance Probability; NAVD88 = North American Vertical Datum.

Figure 2-1 Recommended Airport Surface Elevations and Associated Overtopping Discharges (HDR Coastal Report, 2022)

HDR also published a Hydrology and Hydraulics Report in 2022 (HDR, 2022 and Appendix D) which recommended that the runway be shifted inland, by 340 feet along its current alignment, to account for river movement over a 50-year period. This report also recommended construction of a variety of erosion protection measures required to protect the airstrip.

2.1.2 Fog and Low Visibility

Fog and low visibility on the runway limit a pilot's ability to operate an aircraft and may result in flight delays or cancellations at the Scammon Bay airport in its current location. Interviews with air carriers and local community members indicated qualitative evidence that the tops of the 1,000-foot Askinuk Mountain ridgelines that surround the community can have lower visibility than the current Airport, located lower and in the river valley.

Similar observations have been reported at Newtok, where the old airport has more fog-free days than the relocated airport.

In an attempt to provide quantitative evidence for the elevation differences, weather data at SCM was obtained from the SCM Automated Weather Observing System (AWOS). The weather station provides visibility measurements at ground level, as well as cloud coverage elevation data. The AWOS does not provide visibility measurements at other elevations beyond ground level, however the cloud coverage elevation data can be used to make inferences about visibility at elevation. A total of 121,295 hours of AWOS data was analyzed for the period of 2010 through 2023. Weather was reported as fog or low visibility (less than 0.5 miles of visibility) at SCM 0.3% of the time. Weather was reported as overcast or broken conditions 6.7% of the time at 500 feet, and 17% of the time at 1,000 feet (Table 2-1). As a reference, the community of Scammon Bay is about 14 feet in elevation, Castle Hill is about 437 feet in elevation, and the ridges of the Askinuk Mountains are about 1,000 feet in elevation.

Table 2-1 Fog and Low Visibility: SCM 2010 - 2023

Weather	Hours	%
Hours rated as with fog or low visibility (<0.5 miles)	371	0.3%
Hours rated as Overcast or Broken at 100 feet	87	0.1%
Hours rated as Overcast or Broken at 500 feet (Top of Castle Hill)	8,134	6.7%
Hours rated as Overcast or Broken at 1,000 feet (Askinuk Mt. ridges)	20,606	17.0%
Other	92,097	75.9%
Total	121,295	100%

Key:
< – less than
% – percent
AWOS – Automated Weather Observing System
SCM – Scammon Bay Airport

Source: Observations between January 1, 2010, to November 1, 2023, at the SCM AWOS (https://www.mesonet.agron.iastate.edu/sites/locate.php?network=AK_ASOS)

It is important to note the possibility for error in interpreting these data. AWOS reports the bottom of the cloud layer but does not report the cloud layer thickness. In coastal Alaska, thin layers of broken or overcast clouds are common. Such layers may obscure visibility at the reported level but only be tens of feet thick. This situation can lead to conditions where an overcast cloud layer exists at a lower level (e.g., 200 feet) while clear visibility is present at 250 feet or higher (e.g., Castle Hill or Askinuk Mountains). Depending on the frequency of such situations, a higher-elevation alternative may be more feasible than the weather data would lead one to believe, as it is not possible to separate these situations from the rest of the dataset.

Despite these data limitations, the AWOS data does provide some level of quantitative support for the qualitative interview responses. There may be more low-visibility conditions at higher elevation airport alternatives than at lower-elevation airport alternatives.

2.1.3 Wind

It is important to evaluate wind conditions when determining the location and orientation for an airport. Wind data from AWOS is available for SCM for the period of 2013 through 2022. Wind data shows that the current runway has All Weather 90.4% wind coverage for a 13-knot crosswind, and Instrument Weather 87.54% coverage for 13-knot crosswinds. Wind analysis revealed that no orientation of a single runway at the current location of SCM can meet the 95% crosswind criterion. The current orientation provides the maximum crosswind coverage that a single runway can obtain at SCM that meets the needs of the current critical aircraft, a Cessna 208 Caravan A-II.

For wind coverages where a single runway cannot meet 95% coverage, the Federal Aviation Administration (FAA) recommends development of a crosswind runway or, when terrain does not allow, increasing the runway dimensions to the next-largest set of aircraft design requirements. At SCM, terrain makes creation of a crosswind runway cost-prohibitive. This report recommends construction of the runway to meet the next-largest aircraft design group requirements for runway width for all alternatives where necessary to meet requirements because the availability of constructable land is limited.

Wind data is highly localized, and it is difficult to predict wind coverage for locations distant from where the data were collected (i.e., the current runway). In the lowlands, the primary winds are from the east, along the current runway alignment. As elevation increases, the primary winds are from the north.

The topography of the Askinuk Mountains and Kun River valley likely directs wind. Local community members report that winds are dramatic and generally follow the drainages coming off the Askinuk Mountains and blow very strongly along the ridgetops.

For mid-elevation alternatives, wind data is available for the Scammon Bay area from a third party. In 2017, a wind turbine analysis was completed at Scammon Bay that included wind direction and strength predictions (V3 Energy LLC, 2017). This data was collected at about 200 feet in elevation, next to the solid waste site. The wind turbine analysis report states that there are higher velocity winds at these elevations, and that the predominant wind direction at higher elevations is different than those found at the current Airport.

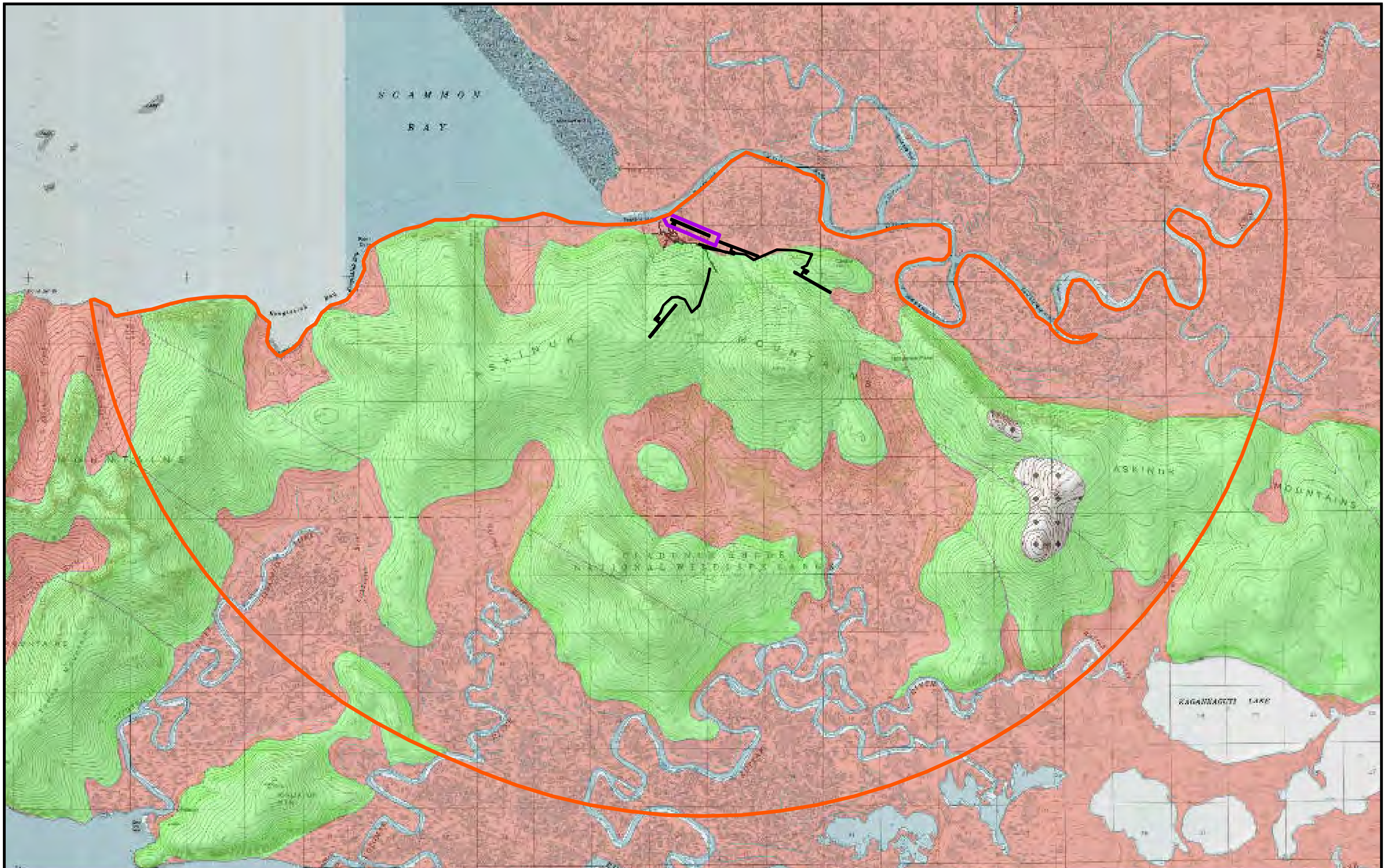
At higher elevations, the pattern of northerly winds creates a fundamental divergence between topography and wind direction for the purposes of airport planning. For medium- and high-elevation runway alternatives, the primary winds are from the north, but the topography rises steeply in that direction. Topography dictates an east/west-oriented runway in most locations, whereas crosswinds dictate a north/south-oriented runway. High-elevation alternatives (e.g., Askinuk Mountains) are located along the tops of ridges, where topography allows for a north/south oriented runway.

2.1.4 Geology and Potential Material Sites

It is important to review the geology and potential material sites at the current airport location and alternatives to determine if a location is feasible. If material sites are located near the community, the materials will not have to be barged in, which will reduce overall project costs. The State of Alaska has mapped the geology of the study area. There are three types of formations in the study area (Figure 2-2, Wilson et al., 2015):

- Kcgc: Calcareous graywacke and conglomerate:
    - Kcgc deposits are located on an isolated location in the eastern part of the study area, likely too far from Scammon Bay to be efficiently developed.
- Klgr: Intermediate granitic rocks:
    - Klgr deposits occur on most of the hills in the study area and have a greater likelihood of being suitable as a material source.
    - Qs: Unconsolidated surficial deposits, undivided:
    - Qs deposits occur on the low river valleys and are unlikely to be suitable for material source development.

The suitability of "Klgr: Intermediate granitic rocks" for production of suitable material, including erosion protection armor stone, is unknown. Field verified geotechnical studies haven't been conducted. The potential exists that local material sources could be used to develop the required erosion protection material, or their functional equivalents. This deserves additional analysis to refine the costs.



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Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area

Airport Boundary

Alternatives (2024)

Road

AK Geologic Map

Kcgc: Calcareous graywacke and conglomerate

Klgr: Intermediate granitic rocks

Qs: Unconsolidated surficial deposits, undivided

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August 2024

Figure 2-2: Geotechnical Conditions

2.1.5 14 CFR Part 77 Surface Penetration

14 CFR Part 77 is the federal regulation for the Safe, Efficient Use, and Preservation of the Navigable Airspace. Evaluating potential penetrations for the airspace around each alternative is important to ensure the airport will be compliant with federal requirements. Topographic penetration of protected airspace surrounding the airport (Part 77 surfaces) was calculated for each alternative. This provides a visual representation of the potential hazards to navigation surrounding the airport alternatives.

2.2 Land Status

2.2.1 Land Use/Ownership

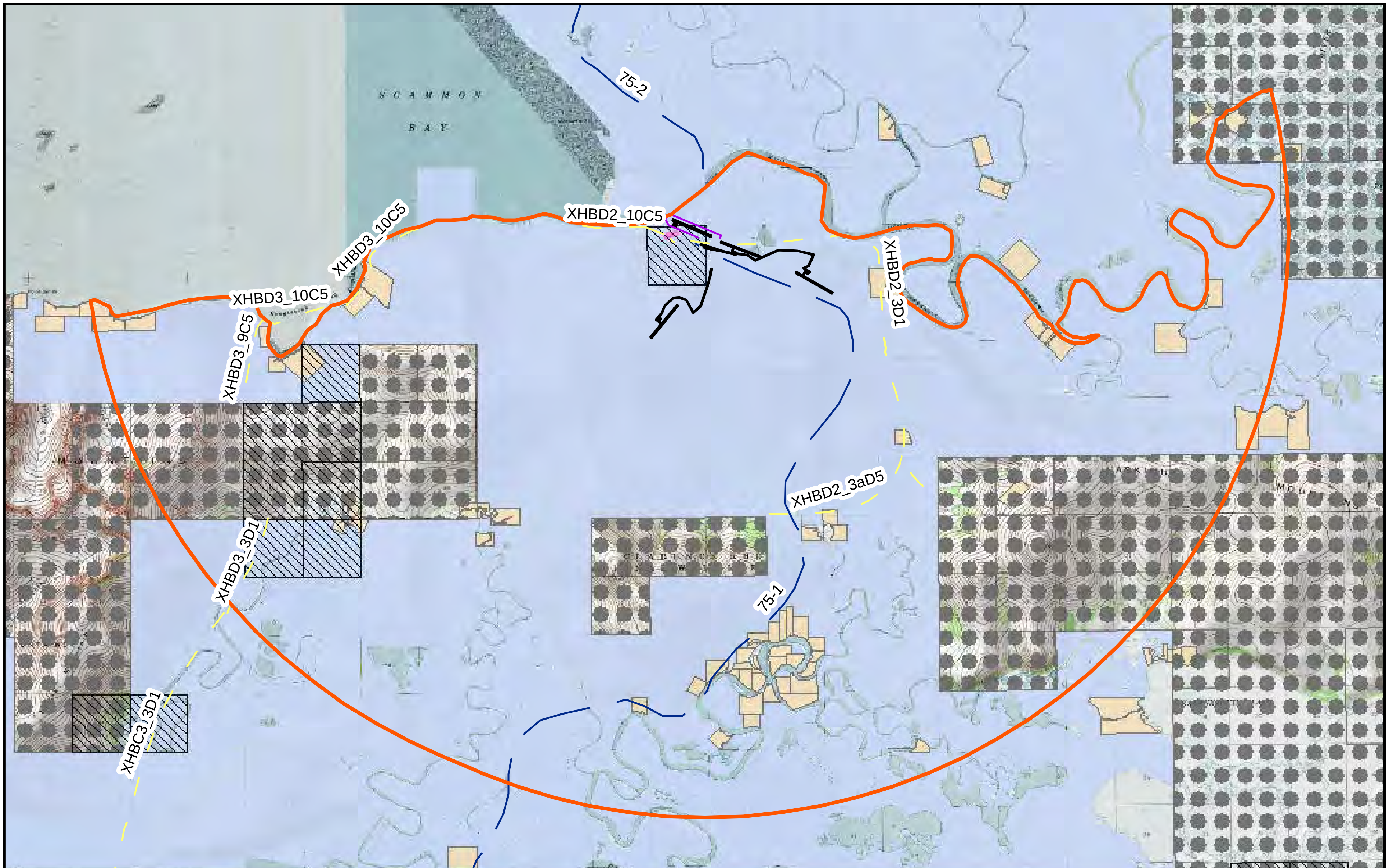
Land status is a very important factor to consider for Scammon Bay. Constructable, vacant land is limited, and the population is growing. Land acquisition may be time intensive if the landowner does not support a capital improvement project or they are unwilling to accept fair market value for their property. Land acquisition issues delay projects and result in litigation or cancellation.

Land analysis in this study is based on publicly available Bureau of Land Management (BLM, 2023) and State of Alaska databases (ADNR, 2023). Further research is warranted to confirm title and boundaries, and no on-the-ground survey has been conducted.

The majority of the study area is owned by Alaska Native organizations (Figure 2-3), including Askinuk Corporation (surface), and Calista Corporation (subsurface). Alaska Native allotments, which are private lands owned by individuals or their heirs, are interspersed throughout the area. The federal National Wildlife Refuge also owns a significant portion of land. National Wildlife Refuge and Alaska Native allotments were removed from consideration in this report, as they are unlikely to be suitable for airport development.

Multiple RS2477 trails and 17(b) easements exist throughout the area. These easements provide overland access between lands of different ownership types. The project can take advantage of these easements to build access roads (if needed), but the project cannot obstruct overland access for other users. For example, public access to a runway is typically restricted. For runways intersecting RS2477 trails or 17(b) easements, the airport can provide functionally equivalent public access by constructing a public trail around the airport.

Inside of the existing community of Scammon Bay, land use is split between Alaska Native organizations, the State of Alaska, and private lands. There are no local or borough zoning areas.



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Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area	ANCSA Selected
Airport Boundary	National Wildlife Refuge
Alternatives (2024)	Native Allotments
17(b) Easement	Private Lands
RS2477 Trails	Conveyed Native Lands

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Department of Transportation and Public Facilities
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Figure 2-3: Land Ownership

Alternatives which involve relocation of the airport would require land acquisition from parties willing to sell the land. Those landowners are the Askinuk Corporation (surface) and Calista Corporation (subsurface). Alternatives that these organizations do not support are potentially not feasible, because landowners may contest the acquisition.

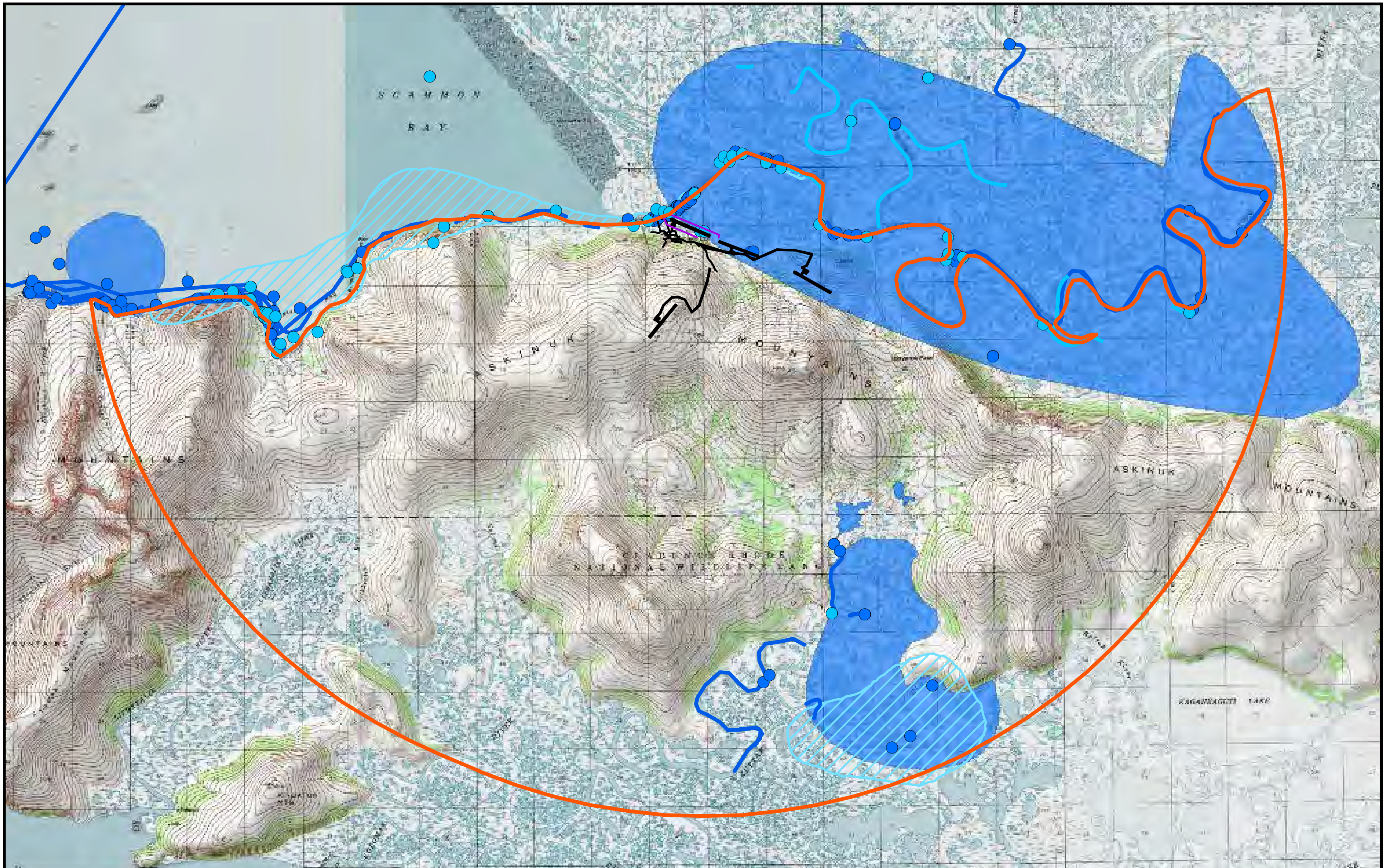
Previous planning efforts with the community have revealed that the community would be interested in acquiring the land for the local dock and dock access road, which are currently on Airport property owned by Alaska DOT&PF. These facilities were relocated and reconstructed by DOT&PF, using non-FAA funding, during previous airport improvement projects. In the past, they were not technically located within the Runway Protection Zone (RPZ). The dimensions of the RPZ have changed over time due to changes in critical aircraft utilizing the airport and revisions to FAA safety recommendations.

Homer Hunter is the City of Scammon Bay Land Planner and is also working for the Askinuk Corporation. He is working on the transfer of lands from the Askinuk Corporation to the City (lands from Castle Hill to west side of community); and expects that process to be completed in 2.5 years (~2028). He has established an advisory board that is working on the process.

2.2.2 Subsistence Use (Fish, Marine Mammals, Ptarmigan, Migratory Birds, Moose, Bear, Berries)

In addition to land ownership, it is important to review the subsistence uses that are currently occurring on the land that could be impacted by an airport improvement project or relocation. Local subsistence use information comes from three main sources and is summarized on Figures 2-4 through 2-6. Alaska Department of Fish and Game (ADF&G) provides subsistence harvest and use data for Scammon Bay in two studies from 2013 and 2017 (Ikuta et al., 2016; Godduhn et al., 2020). Huntington, Nelson, and Quakenbush (2017) also provide information from traditional knowledge interviews held with Scammon Bay residents in January 2017 on marine mammals. (The Donlin Mine Environmental Impact Statement [USACE, 2018] also discusses Scammon Bay subsistence based on Ikuta et al., 2016.)

Fish and marine mammals have subsistence activity in areas around waterways such as Scammon Bay, Kun River, and Kuttak River (Figures 2-4, 2-5, and 2-6). The Kun River is also noted summer habitat for young, bearded seal (Huntington et al., 2017). Airport alternative development is not anticipated to significantly impact fish and marine mammals, although some alternatives may require crossing fish bearing streams or the placement of fill in the Kun River.



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1:150,000 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- Road
- 2013 Subsistence Study
- 2017 Subsistence Study
- 2013 Subsistence Study
- 2017 Subsistence Study
- 2013 Study (Fish)
- 2017 Study

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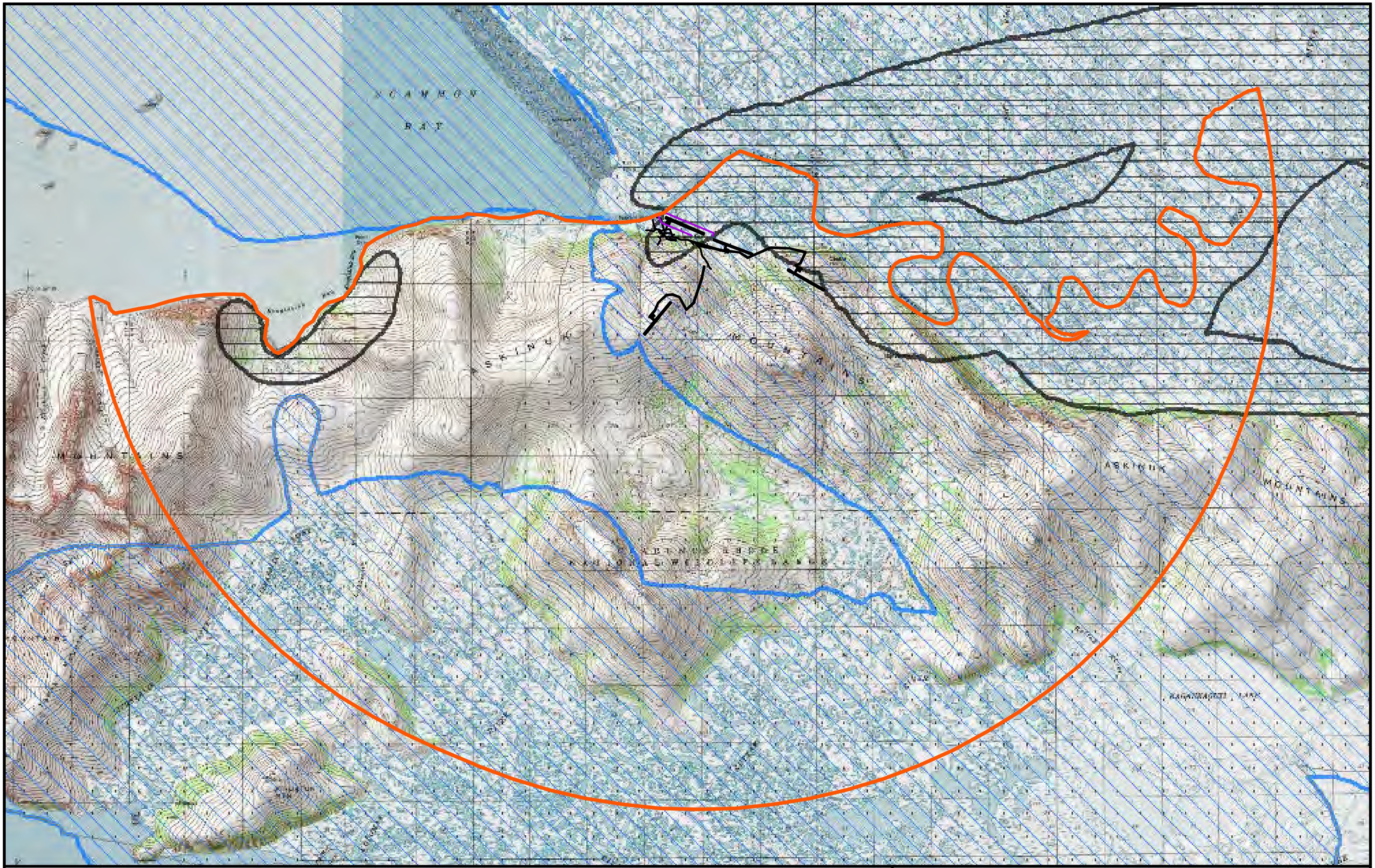
Figure 2-4: Subsistence: Fishing



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Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- Road

2013 Subsistence Study

- Ptarmigan & Grouse
- Ducks & Geese
- Moose

SCAMMON BAY
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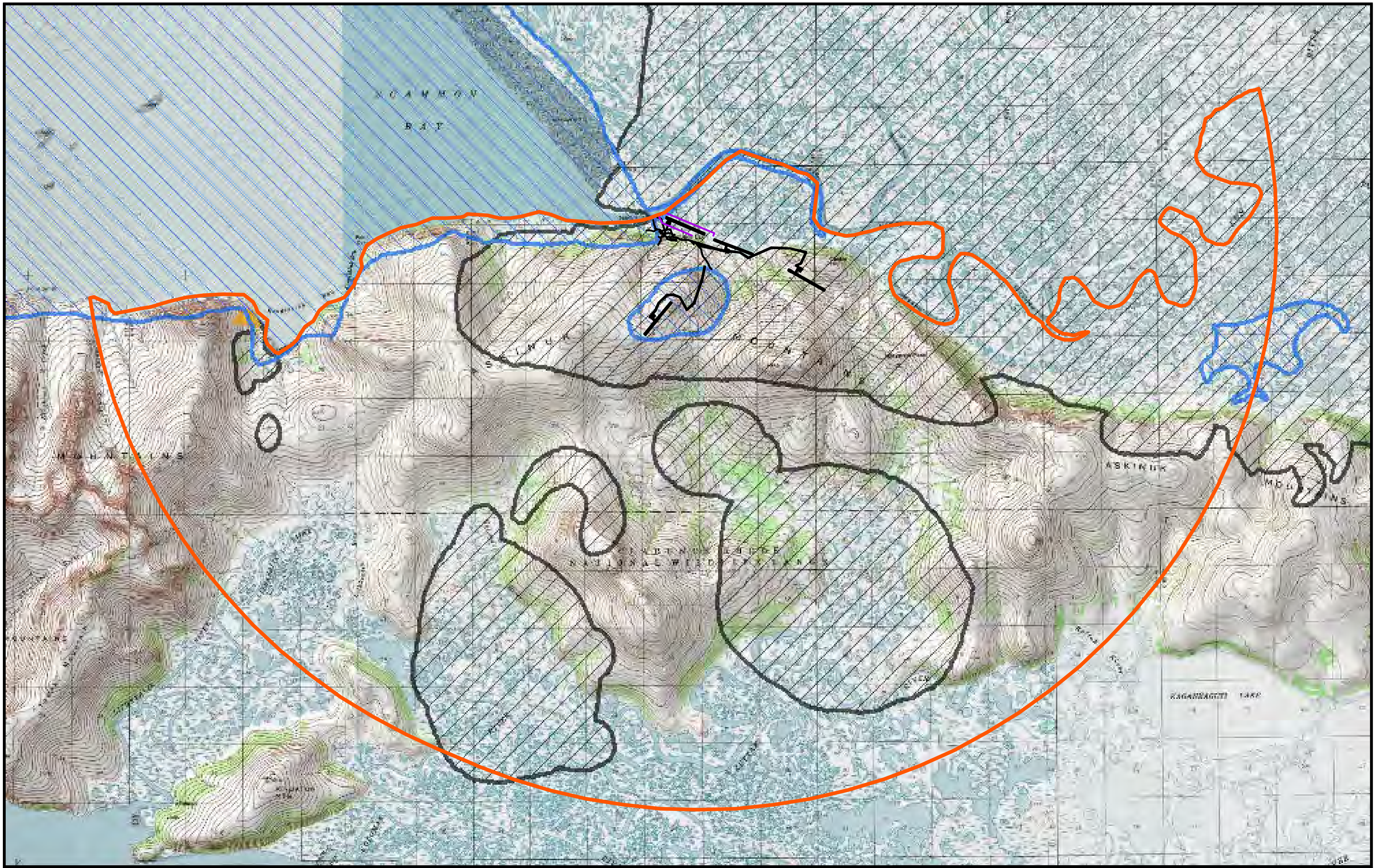
August 2024	Figure 2-5: Subsistence: Birds, Moose



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Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. High areas are used for spotting seals in the water

Study Area
Airport Boundary
Alternatives (2024)
Road

2013 Subsistence Study
Black Bear
Berries & Greens
Seals

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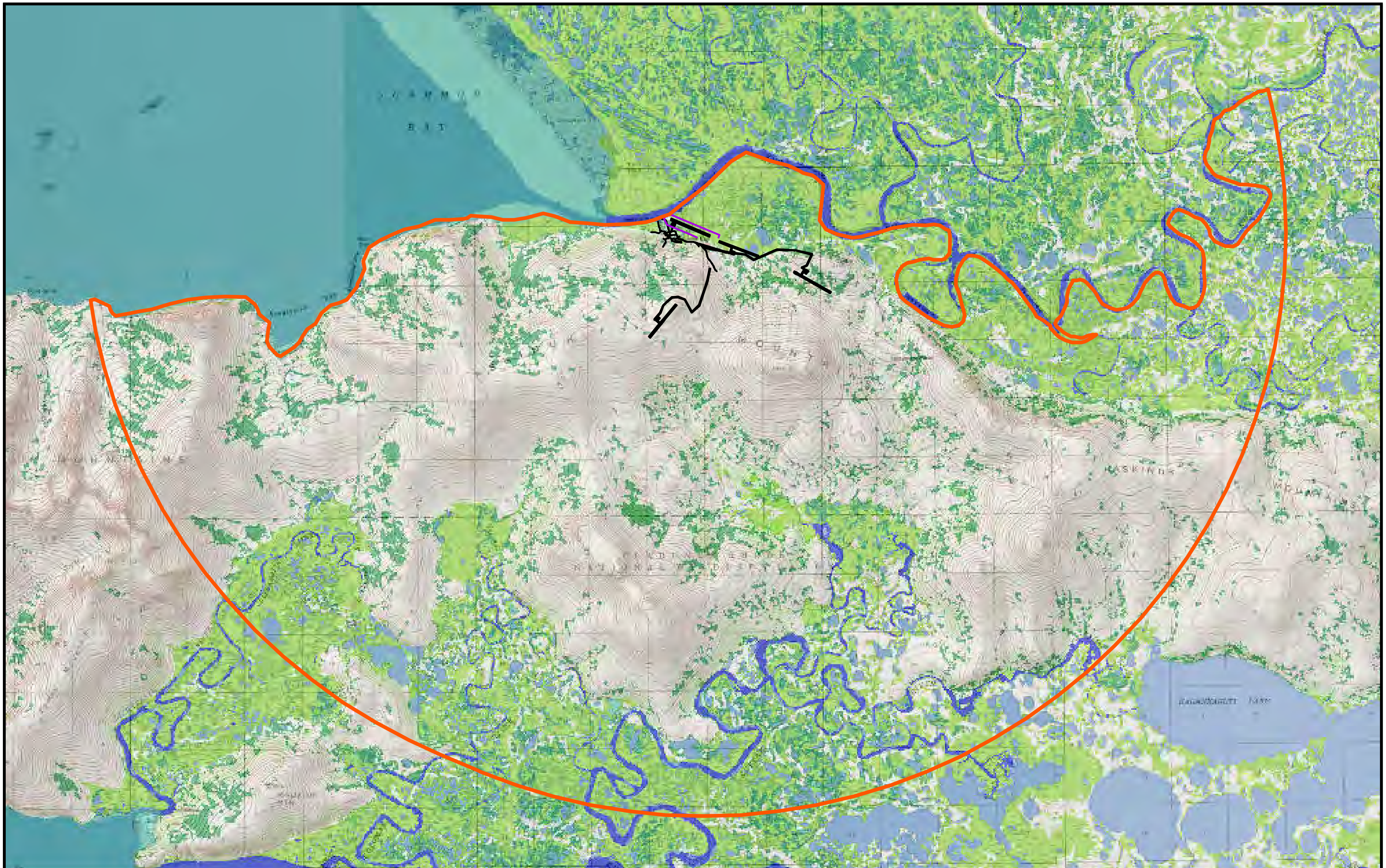
August 2024

Figure 2-6: Subsistence: Bears, Berries, Seals



N

0 1 2 Miles

1:150,000 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Road
- Airport Boundary
- Alternatives (2024)

Vegetation Map

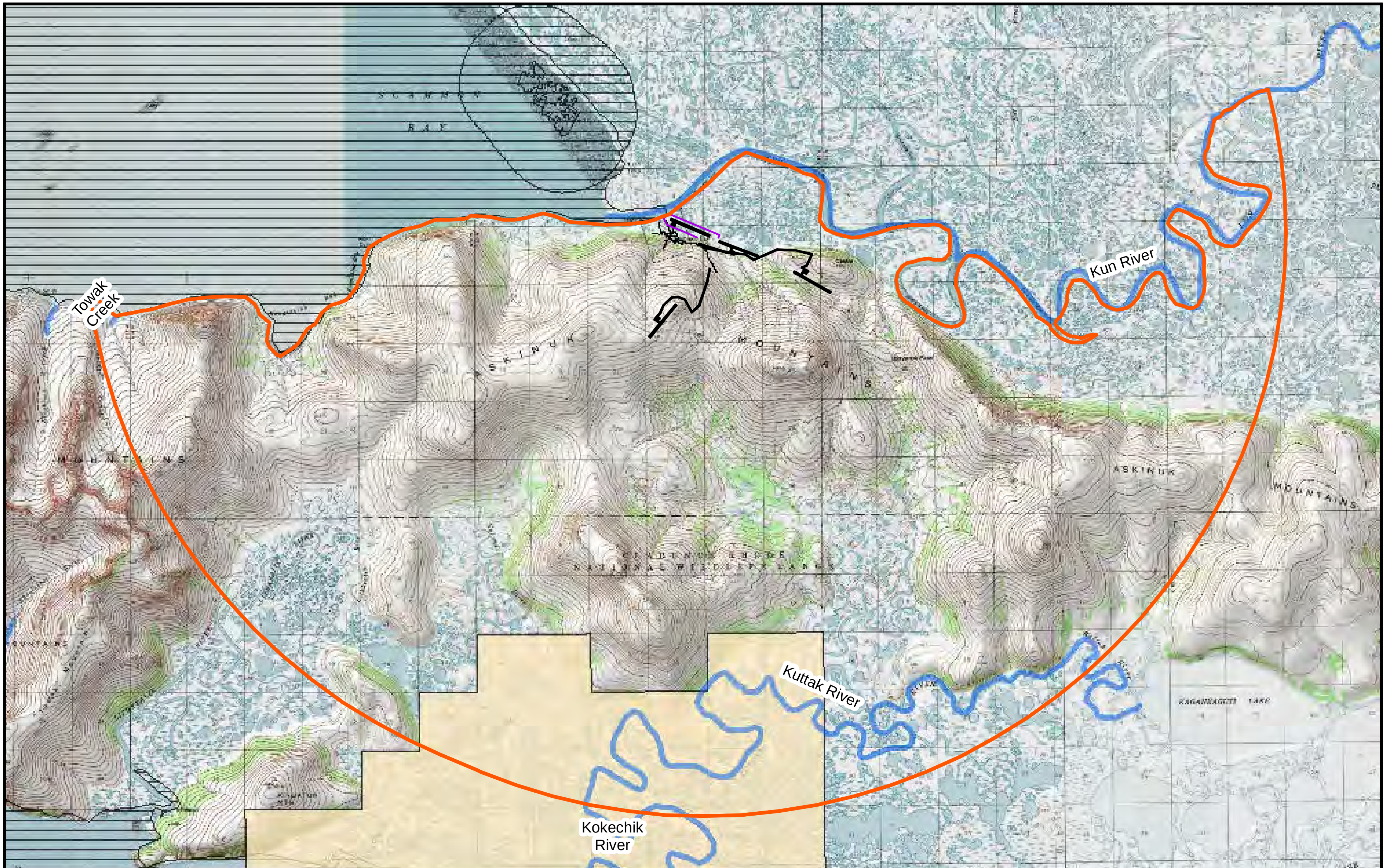
- Marine
- Marine Wetland
- Bryophyte
- Emergent Wetland
- Forested/Shrub Wetland
- Pond; Lake
- Riverine
- Upland

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

August 2024

Figure 2-7: Wetlands



N

0 1 2 Miles

1:150,000 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- Road
- Anadromous Waters
- Spectacled & Steller's eider Critical Habitat
- Polar Bear Critical Habitat

SCAMMON BAY
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Figure 2-8: Protected Species

For land resources, subsistence users report high use of moose, migratory and resident birds, berries, and vegetation (Figures 2-4, 2-5, 2-6). Bird species include ptarmigan, grouse, ducks, and geese. Land mammals include moose and black bear. Berries and greens are also important subsistence resources.

2.3 Environmental

It is important to evaluate preliminary environmental issues in anticipation of NEPA document that will be prepared for a future capital improvement project. The environmental criteria is analyzed based on the following potential impacts: noise, wetlands, endangered species, marine mammals, fish, birds, cultural resources, contaminated sites, and public access.

2.3.1 Noise

The potential for increased noise or displaced noise was analyzed to determine potential impacts on the community. Aircraft approach and depart from the Airport directly adjacent to the community of Scammon Bay. This subjects the community to aircraft noise. Noise levels are not anticipated to substantially increase above the 65 decibels and recommended limit for the day night average sound level with any of the proposed alternatives.

In many rural Alaskan communities, aircraft noise is not necessarily seen as a negative impact, but rather as a welcome reminder of the connection to larger hub communities and infrastructure. Rural airports are unmanned, so the noise of incoming aircraft acts as an announcement to community members who are awaiting a departure flight or a delivery to the community.

Wildlife such as birds, marine mammals, and fish are also subject to potential impacts from aircraft noise. These impacts are likely greater in habitats that attract these species (near the river for marine mammals and fish, or near migratory bird concentration areas [which may include wetlands and riverine habitats]).

2.3.2 Wetlands

The potential impacts to wetlands and mitigation efforts were evaluated for the alternatives from a planning level. The Scammon Bay Airport is located in the lowlands between the community and the Kun River, which is surrounded by wetlands. Alternatives that are located above the floodplain would not be as likely to require wetland mitigation efforts. Field-verified wetland mapping is not available for the area, but desktop mapping is provided by Flagstad et al. (2018: Figure 2-7). The quality of this mapping when compared to more recent aerial imagery indicates that areas mapped as uplands may be wetlands.

Since this is the most current available information, it was used to calculate acreages from access road and airport footprints; but mapping should be updated.

2.3.3 Endangered Species Act

Endangered species should be considered for all capital improvement projects. The waterways in the Scammon Bay area are listed by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) as potential habitat for species listed under the Endangered Species Act (ESA). These species include the: fin whale, North Pacific right whale, humpback whale, bearded seal, ringed seal, short-tailed albatross, polar bear, wood bison, spectacled eider, and Steller's eider. Of those species, critical habitat is listed in the area of analysis for polar bear, spectacled eider, and Steller's eider (USFWS, 2023).

2.3.4 Marine Mammal Protection Act

The impacts to marine mammals should be considered for all capital improvement projects in Scammon Bay because the residents harvest marine mammals and an airport construction and activity may impact their habitat. Most marine mammals protected under the Marine Mammal Protection Act (MMPA) are also protected under the ESA. The species that are not protected under the ESA but that are protected under the MMPA, and that NMFS indicates have habitat adjacent to the Airport, consist of the spotted seal (NMFS, 2023).

Huntington, Nelson, and Quakenbush (2017) report on traditional knowledge interviews held with Scammon Bay residents in January 2017. Interviewees reported the importance and presence of ringed seals, spotted seals, bearded seals, walrus, and beluga whales in the area. The Kun River was reported as important for young, bearded seal summer habitat. Other species reported by interviewees in the region include ribbon seals, sea lions, killer whales, porpoises, and sea otters.

2.3.5 Fish

Fish were generally analyzed in this study because the Kun River is listed as an Anadromous Water body by the ADF&G for chum salmon, inconnu/sheefish, and whitefishes (Figure 2-4; Giefer and Graziano, 2023). No on-site field studies were performed to verify their presence during this study.

The cross-runway culvert has not recently been sampled to determine if it provides fish habitat. The 1991 Environmental Assessment for the Airport reports that blackfish inhabit the creek flowing under the runway (DOT&PF, 1991). The ADF&G also considers the culvert habitat for blackfish, ninespine stickleback, and northern pike (See Appendix E Public Involvement comment letter from ADF&G).

2.3.6 Birds

Birds were analyzed for Scammon Bay because they are known to be present near the current airport and in the surrounding area. The FAA's Alaska Supplement warns pilots that the runway hosts birds.

The USFWS does not map the locations of vulnerable bird habitat but does provide some generalized area descriptions. This information lists the immediate area around the Airport as being occupied by Black Turnstones, a Bird of Conservation Concern, which is most likely present in May, June, and July (USFWS, 2023).

The USFWS lists the larger Study Area as also hosting birds identified by the USFWS as vulnerable. Species include the Common Eider, Long-tailed Duck, Red-breasted Merganser, and Red-throated Loon (USFWS, 2023).

The USFWS recommends time periods during which to avoid vegetation clearing to reduce consequent impacts to migratory birds (USFWS, 2024). The time period to avoid is most migratory bird nesting is from May 5 through July 25. In areas with Black Scoter, the time period is from May 20 through August 10, and in areas with Canada Geese, the time period is from April 20 to July 25.

2.3.7 Cultural Resources

Scammon Bay is a predominantly Yup'ik community with a population of nearly 600 people that relies on fishing and subsistence activities. The Yup'ik people have been in the state of Alaska for thousands of years. Historically, Scammon Bay was known in Cup'ik as Maraayaq, and its residents were called Maraayarmiut, which means 'please near the mud flats'. The nearby bay was renamed in 1951 when the Scammon Bay Post Office was established. It was named after Captain Charles Scammon, who served as the marine chief of the Western Union Telegraph Expedition from 1856 to 1867. The city government was incorporated in 1967 as a second class city. The city has a dual government by both the Native Village of Scammon Bay and the City of Scammon Bay.

No cultural resource fieldwork was conducted for this feasibility study. This study was categorically excluded from a National Environmental Policy Act (NEPA) process on January 27, 2022. The DOT&PF Preliminary Design & Engineering Section (PD&E) developed a Cultural Resource Evaluation for FAA in June 2025 (Appendix H). Further cultural resource evaluation and a Section 106 analysis will also be conducted during that Phase II study. A complete NEPA process will be conducted during the Design Phase of any future airport capital improvement project.

The presence of cultural resources was reviewed through the State of Alaska maintains the Alaska Heritage Resources Survey (AHRS), a database of cultural resource information. Importantly, this is a listing of known sites. Most of the state is un-surveyed, and the available data does not prove an absence of cultural resources. There may be cultural resources that have yet to be identified across Scammon Bay and the surrounding area given the long history of the Yup'ik people in the area.

AHRS data is confidential; therefore, the data are not presented on the maps in this report but are discussed in general terms relating to their influence on future studies.

Cultural resources are reported within the vicinity of the current Airport and the entire Village of Scammon Bay and may be significant based on the size of the area indicated in the AHRS. The "No Action" and "Shift & Raise" alternatives may adversely impact cultural resources. Development of these alternatives would need to incorporate cultural resource considerations, including consultation, recording, protection, and mitigation as part of the National Historic Preservation Act (NHPA) Section 106 process and incorporated into the NEPA process.

There are no listings in the AHRS database for cultural resources located near the three airport relocation alternatives; Alternative 3 (Near), Alternative 4 (Castle Hill) and Alternative 5 (Ridgeline), at the time of this review. Additional archaeological field work, consultation, and literature review would be needed to ensure the proper recording and protection for all potentially adversely impacted cultural resources. Cultural resource surveys, including a 106 process and 4F finding are anticipated to occur during the NEPA process during the Design Phase of the selected alternative.

2.3.8 Contaminated Sites

The presence of contaminated sites in Scammon Bay was evaluated because of the potential impacts on airport improvements or relocation alternatives. The Alaska Department of Environmental Conservation contaminated sites atlas reports two Active and one Cleanup Complete contaminated sites off Airport property (ADEC, 2023). None are located in an area with potential for airport development. While potential contamination plumes are unknown, it is assumed from their topographic position that contamination does not impact the current airport, or proposed alternatives. Any airport operations will help prevent contamination of water and soil by following current regulations, including on fuel storage and handling.

2.3.9 Public Access Convenience

The ability for the local community to access an airport was analyzed because public access convenience is greatly increased for an airport located near the community. Most residents in Scammon Bay do not own automobiles. All of the buildings in the current community are less than 0.7 miles from SCM, as measured from the airport apron to the farthest residential building. This proximity is important, because most residents arrive at the airport by walking, or in open-air, off-road vehicles. There is no public transportation or shuttle service to the airport. There is no passenger shelter at SCM; during inclement weather, residents listen for the aircraft prior to travelling to the Airport.

Flights also arrive at unexpected times, and residents value the close proximity of the Airport to be able to adapt to flight schedules. The air carrier-reported data for 2022 indicate that Grant Aviation and Ryan Air completed 89% and 70% of their scheduled flights, respectively (USBTS, 2023). Flight radar tracking data indicate that only 19% of scheduled flights to Scammon Bay were completed between October 7 and December 7, 2023 (FlightRadar24.com). This disparity may come from different data collection methods. The U.S. Bureau of Transportation Statistics data (USBTS) is an air carrier self-reported system whereby Flight Radar data is from third party air traffic monitoring. The discrepancy illustrates uncertainty regarding the reliability of air service at SCM. Interviews with local residents revealed that they rely on FlightRadar24.com and have found that it most accurately tracks the flights serving the community.

SCM is also a center for a large quantity of freight and mail. These are unloaded onto the apron, often by local residents, who transport the freight and mail directly to the community. A distant airport is likely to create additional hurdles to mail and freight handling, as fewer residents will be present to offload the aircraft and transport the materials into town because most residents do not own motor vehicles.

2.4 Constructability

Construction and its potential impacts on the residents in Scammon Bay was evaluated in this study because the airport provides the only year-round access to other communities and emergency health care infrastructure and plays a vital role in the daily life of the residents of Scammon Bay. Closure of the Airport due to construction prevents residents from being able to access emergency medical services, and prohibits the delivery of food, medical supplies, and fuel.

Consequently, air service must remain uninterrupted during construction to the extent possible. For alternatives located on, or adjacent to, the current runway, this may include partial runway closures, nightly closures, half-width runway operations, and reduced-length runway operations. The different elevations of partially-raised runways must be considered during project design, as they may prevent safe runway operations (aircraft cannot land immediately adjacent to a large topographic change in the runway).

Construction for all of the build alternatives; Alternative 2 (Shift & Raise), Alternative 3 (Near), Alternative 4 (Castle Hill), and Alternative 5 (Ridgeline), would take place during the summer months, consistent with regular construction season in the Yukon-Kuskokwim Region and rural Alaska generally. The timeline for the construction of any of the build alternatives is highly dependent on land acquisition, the environmental process, and weather conditions. However, construction is unlikely to be completed in one season for any of the build alternatives.

Detailed construction phasing analysis will be performed under the Phase II reconnaissance study for the selected alternatives and is beyond the scope of this Phase I feasibility study. Although Construction Site Phasing Plan's (CSPP's) are not required for planning studies, the project will examine construction phasing in a broader planning level analysis.

Construction practices for any airport improvement project or relocation would be compliant with all federal requirements, including but not limited to, AC 150-5370-2G for Operational Safety on Airports and AC 150/5370-10H for Standard Specifications for Construction of Airports. Additionally, 14 CFR Part 77 for the Safe, Efficient Use, and Preservation of the Navigable Airspace and Notices to Airmen (NOTAMs) would be filed to alert the pilots about the construction.

2.4.1 Airport Operations During Construction

Implementation of runway improvements to the existing airport has the potential to cause impacts to the community of Scammon Bay during construction under Alternative 1 (No Action) and Alternative 2 (Shift & Raise). The community relies on the airport as a reliable means of transportation. There are no all-season non-aviation means of connecting to the medical care available in Bethel. Medevac operations could be supported via helicopter from Bethel, but the distance between Scammon Bay and Bethel makes this a less desirable alternative.

If airport improvements do not incorporate implementation plans to provide for operations with acceptable alternatives to the FAA, the airport will be required to close during the duration of construction according to FAA AC 150/5370-2G, Operational Safety on Airports During Construction and AC 150-5370-10H Standard Specifications for Construction of Airports. As a result, DOT&PF would plan to conduct airport improvements in a manner that does not close the airport. Potential construction methodology includes half-width runway operations and night fills.

If Alternative 1 (No Action) were pursued, the airport would be subject to regular airport maintenance and rehabilitation, every five to ten years respectively. Additionally, the airport may be closed and undergo major reconstruction projects in the intervening years if heavy flooding destabilizes the airport surfaces.

If Alternative 2 (Shift & Raise) were pursued, much of the existing runway would remain operational. This alternative would in essence extend the runway. After the initial extension is completed, the runway elevation will be raised incrementally. Upon completion, the portion of the runway adjacent to the Kun River (RWY10) would be armored and closed through a NOTAM and declared distances would be implemented.

If a new airport and access road are constructed, the existing airport would remain open and available for public use until the new facilities are completed. After the new airport and access road were put into service, the existing airport would be permanently closed and no longer maintained by DOT&PF.

2.4.2 Estimated Construction Timelines

The construction timeline varies for each Alternative. Construction may take up to four years for Alternative 2 (Shift & Raise). The public voiced support for either land acquisition or a land trade to allow Alternative 2 to use the land depicted on the 2019 ALP. For reference, construction on the Atmautluak and Kasigluk projects took approximately 2 seasons to resurface the runways and safety areas with 9 inches of fill. A project of this scale will likely take 4 seasons to complete. Alternative 2 (Shift & Raise) has the benefit of completed preliminary studies and DOT&PF engineering cost estimates so constructions may begin sooner than the other build alternatives.

The other build alternatives would require additional technical analysis, wind, and engineering efforts before construction could begin, potentially one to two years later than Alternative 2 (Shift & Raise). The relocation alternatives; Alternatives 3 (Near), 4 (Castle Hill), and 5 (Ridgeline), all require road and airport embankment construction, so are likely to take at least one or two more years to construct. However, timeline for construction initiation is more difficult to estimate because the success of the relocation alternatives would be highly dependent on land acquisition. Without landowner and public support, it may be years before the project is construction, similar to the Kwigillingok Airport Improvement Project, and/or result in project cancellation, similar to the Stony River Airport Relocation project.

2.4.3 Barged Materials Delivery and Stockpiling

The length of time and methodology for barged materials varies by alternative. For Alternative 2 (Shift & Raise), to raise the runway and RSA the recommended 5.5 feet, it will require approximately 160,000 cubic yards of fill material including for the embankment extension for the runway shift. There is little available room for material and equipment staging at the barge landing site but there is some open area near the school. Trucking large quantities of material through the narrow city streets to the school site will likely severely degrade them. A barge landing site can be established at the RW 11 embankment end and a temporary haul road on the RSA around the RW 29 end and across a reestablished road from the airport to the school site. Barged materials will likely be only stockpiled for what can be placed in one season. It may take two to four weeks to deliver the materials each season, depending on whether the materials are obtained locally.

Relocation Alternatives (Alternative 3 [Near], Alternative 4 [Castle Hill], and Alternative 5 [Ridgeline]) do not have completed technical reports available. Detailed estimation of material fill for all sites is beyond the scope of the Phase I Feasibility Study. Additional analysis will be performed for the selected alternatives under the Phase II study. Since the public has not expressed support these alternatives, it is likely that local landowners and community residents may oppose the project and resist DOT&PF survey permission requests and land acquisition. If the community does not support the alternative, construction could be delayed significantly or result in project cancellation.

2.4.4 FAA Standards for the Critical Aircraft

All alternatives evaluated in the Feasibility Study would be designed and constructed to meet FAA standards for the forecasted critical aircraft, which is a Cessna 208 Caravan A-II.

2.4.5 Airport Construction Protection During Flooding Events

Although Design, Airport Layout Plan, and CSPP's are beyond the scope of this Phase I feasibility study, several strategies have been evaluated at a high level. For Alternative 2 (Shift & Raise), a strategy that could be deployed to protect the airport from flooding during construction is to harden the existing embankment with riprap/armor stone under the first phase of construction. This would entail initially widening the RSA embankment to accommodate the 5.5 foot grade raise and placing the riprap. Alternative 3 (Near) would require the same level of protection as Alternative 2 (Shift & Raise), whereby Alternative 4 (Castle Hill) and Alternative 5 (Ridgeline) would require less protection because both potential airport sites are above the floodplain.

2.4.6 Floodplains

As a federally funded project, DOT&PF is required to design and construct airport improvements consistent with all relevant state, local, and federal requirements for construction within a floodplain. The analysis typically occurs during the NEPA phase of a capital improvement project and includes, but is not limited to, those requirements identified under NEPA and FAA Order 1050.1G for *FAA National Environmental Policy Act Implementing Procedures* and the associated FAA Desk Reference, which lists:

- National Flood Insurance Act, implemented as 44 CFR part 60
- Executive Order 11988, Floodplain Management
- DOT Order 5650.2, Floodplain Management and Protection
- State and local statutes protecting floodplains

Although it was beyond the scope of this feasibility study to conduct floodplain analysis for all of the alternatives, there is preliminary floodplain analysis available for Alternative 1 (No Action) and Alternative 2 (Shift & Raise) because DOT&PF evaluated the Shift & Raise Alternative under the 2022 HDR Coastal Report (Appendix C) and Hydrology & Hydraulics Report (Appendix D) as part of the Scammon Bay Airport Improvement Project. The HDR report based the evaluation, in part, on the Federal Highway Administration (FHWA) 2016 Hydraulic Engineering Circular (HEC) No. 17, 2nd Edition: Highways in the River Environment. The analysis of FHWA HEC-17 can be found in the HDR Hydrology & Hydraulics Report (Appendix D), Pages 10-12.

The HDR studies found that the existing airport configuration, in its current location, would not withstand the 50-year flood due to the runway elevation and inadequate drainage. The HDR study focused on a project that would raise and shift the runway, which is the basis for Alternative 2 (Shift & Raise). The recommendation for a shift and raise approach is further supported under the Floodplain Management section of the Hydrology & Hydraulics Study (Appendix D) on page 17 that states, in part: *"As a federally funded project, this project is subject to the requirements of Executive Order 11988, which stipulates avoidance and mitigation of potential impacts to the 100-year floodplain (FEMA 1977)."*

The Shift & Raise alternative uses HDR's 50-year storm return period, with a 2 percent (%) Annual Exceedance Probability, as described in the Coastal Report (Appendix C). This calculation was selected to match the FAA Grant Assurance and anticipated design life. There is concern about the FAA's participation in funding for design that may not meet these standards.

- HDR's model results for the 100-year (1% Annual Exceedance Probability) storm surge event is 18.4 feet.
- HDR recommended an airport surface elevation of 20.5 feet for the 100-year (1% Annual Exceedance Probability) storm surge event in the Coastal report (Page 13).

DOT&PF Aviation Design recommended an elevation raise to 19.5' to meet and exceed the 50-year floodplain requirement and ensure AIP minimum useful life and grant assurance requirements are met. Alternatives 3 (Near), 4 (Castle Hill), and 5 (Ridgeline) would require additional floodplain analysis. However, DOT&PF is responsible for construction and/or rehabilitation all airports to ensure compliance with FAA standards to be eligible for FAA AIP funding, regardless of which alternative is selected.

2.5 Solid Waste Disposal Sites

Solid waste disposal sites were evaluated in this study to ensure compliance with FAA requirements. The FAA recommends solid waste facilities be located 5,000 feet from a runway. The current Airport is 3,560 feet from a solid waste facility and 550 feet from the sewage lagoon. The current airport location does not meet this recommendation; however, the airport relocation alternatives do.

2.6 Materials

The cost and availability of materials were evaluated as part of this study because material sources and their delivery are one of the primary cost drivers of construction. The relative cost of material is lower if a local material site is developed because the material does not have to be barged to the construction site.

2.6.1 Material Source

The exact location and quality of a local material site is currently unknown, as coordination will need to take place to understand local preferences. The alternative to a local material source is barging in material from outside of Scammon Bay, which has higher relative costs. Planning level cost estimates for local and barged-in material are incorporated into the cost estimate for comparison.

Land surface and subsurface ownership in the area is primarily by Alaska Native organizations. The community strongly supports the use of local material. In the past, local residents in Scammon Bay have been against the use of their current existing material source for large projects, because they do not want their current, nearby, developed material source to be depleted. During public involvement, the community had a similar sentiment and strongly supported the project developing their own local material sources (while avoiding the current community material source). Development of a local material site would decrease the cost and increase the likelihood for the project to proceed.

If a local material source were developed, material source location would be important. Typically, material sources close to the proposed development are less expensive than material sources distant from proposed development. Material sources would most likely be developed in *Klgr: Intermediate granitic rocks*, because *Qs: Unconsolidated surficial deposits* are likely to be low-quality material (Figure 2-2).

HDL and Alaska Energy Authority are currently evaluating locations for establishing new material sources, to serve other projects they are completing in the community. The U.S. Army Corps of Engineers may submit a grant application to assist in the development of new local material sources. Coordinating with these efforts would be valuable in determining the suitability of local materials. Initial conversations indicate that the first testing of material at a local site is silty, but further investigations are ongoing. One possibility may be the use of local material for the bulk of fill, with import of a topcoat of finishing material. Local residents also indicated that the other side of the mountain from the community may have different types of rock.

2.7 Utilities

The availability of utilities was evaluated for the alternatives because the Airport requires power to operate the runway lights and lights along the access road. An Airport also utilizes local telecommunications to provide weather reporting and other information. Both of these utilities are based in Scammon Bay. There is no refueling that occurs at the airport currently, and none is anticipated for the future. An airport in close proximity to Scammon Bay will have minimal utility expense, while a distant airport will need to build utilities from Scammon Bay to the airport.

2.8 Cost

A planning level cost estimate was developed to estimate the cost to build each alternative. The primary driver of cost is the cubic yards of material required to build the infrastructure. The quantity of material required is directly related to the topographic elevation changes that must be leveled to develop a suitable airport, access road, and similar infrastructure. Detailed cost estimates are not typically prepared until the Design and construction phases of a project after likely material sites have been assessed.

2.8.1 Cost Assumptions

The cost for each cubic yard of material is directly related to the development of local material, or barged material (Table 2-2). Excavated materials will be used to build the embankment (as suitable). The cost for excavation, borrow, subbase, and crushed aggregate was developed from research into other project pricing. The price for armor stone and underlayer stone came from estimates at Nome of between $150 – 175/ton, not including barging. The price for barging materials was developed from contractors who have worked in Scammon Bay, and estimated barging of materials to Scammon Bay as $90-100/ton.

Table 2-2 Cost Assumptions

Factor	Cost
Local Material	
Unclassified Excavation	$20/cy
Borrow	$40/cy
Subbase	$75/cy
Crushed Aggregate Surface Course	$70/ton
Primary Armor Stone, Class I	$186/ton
Underlayer Stone, Class I	$164/ton
Barged Material	
Unclassified Excavation	$20/cy
Borrow	$133/cy
Subbase	$175/cy
Crushed Aggregate Surface Course	$140/ton
Primary Armor Stone, Class I	$286/ton
Underlayer Stone, Class I	$264/ton

Access roads are assumed to be 24 feet top width, 4:1 side slopes, and 4 – 6 feet for ditches for a total of an 80 feet wide for a disturbance footprint.

A 25% design contingency was added for each estimate, which includes drainage improvements and muck excavation.

The estimates include 22% Construction Engineering and 7% Indirect Cost Allocation Plan.

Erosion protection is originally detailed in HDR (2022a). HDR provided a range of alternatives, the medium price alternatives ranged between $15 - $33 million. The least expensive option, the marine mattress embankment armor, was discarded due to risk of use in icing conditions. Stantec estimated the cost for embankment armor using primary armor stone and underlaying stone.

The purchase of new land was estimated by DOT&PF to be $1,000 per acre, with the assumption that the existing airport land of (87.5 acres) will be exchanged at a 1:1 ratio for new acreage, if the old airport land is not required for the new alternative.

2.8.2 Maintenance Costs

Maintenance of the airport access road to the community road network is the responsibility of DOT&PF. Acquisition of land for the construction of a new access road may be problematic. There are also many streams and wetlands that may complicate the construction of a long access road away from the community. The cost to maintain long airport access roads in rural Alaska is very difficult to estimate. DOT&PF uses individual local contractors to maintain rural airports. Based on recent contracts, an average cost for 8 airports in the region is $26,822/year. Airports with access roads up to 2 miles are about $40,000/year. DOT&PF prefers not to construct long access roads from the airport to the community due to cost, feasibility, and difficulty maintaining year-long contracting services.

2.8.3 Project Funding

The project would be included in the State Airport Capital Improvement Program and funded when project funding is available. Projects related to public safety and inoperable airports are typically prioritized. It is likely that the design and construction of any project in Scammon Bay would be phased over time. The cost for all of the airport build alternatives (Alternative 2 [Shift & Raise], Alternative 3 [Near], Alternative 4 [Castle Hill] and Alternative 5 [Ridgeline]) are all very expensive. However, as the airport sponsor, DOT&PF is obligated to maintain the airport regardless of the feasibility.

2.9 Public Opinion

Public opinion for each alternative was evaluated because a project is more likely to be successful if it receives support from the local community. A public meeting was held on June 18, 2024, in Scammon Bay, with additional teleconference attendees. The meeting was an interactive town hall, with an active discussion about the community's plans, local preferences, and valuable insights. Local residents have a strong understanding of similar types of construction, and a strong vision for the future. There are multiple development projects taking place in the community. Local individuals contributed their practical knowledge based on their experience working on construction projects similar to the proposed airport improvements at Scammon Bay and throughout the region. Local stakeholder opinions for each alternative are described in Section 3.0; but local stakeholders have an overwhelmingly strong preference for Alternative 2 (Shift & Raise).

The local meeting revealed several important factors to consider when evaluating the alternatives:

- Access roads across the mountain need to incorporate erosion from seasonal runoff. Every spring the current roads need reconstruction or rehabilitation because runoff from the mountain causes substantial erosion.
- Alternatives with longer access roads would be difficult to access in the winter. Additional, industrial, snow removal equipment may be necessary to maintain a longer access road and may also require the construction of an additional Snow Removal Equipment Building (SREB). The access road would be impassable if DOT&PF, or their contractor, are unable to access and maintain it in the winter or after it has been impacted by snow runoff.
- Alternatives further from the community would increase costs for DOT&PF and the community. DOT&PF would face increased contracting costs for road maintenance. The community would need to purchase additional fuel for their off-road transportation or need to purchase vehicles.
- A long access road would also be a major inconvenience to community members.
    - Residents emphasized that the reliability of flights is low. Many rely on hearing the aircraft approach, or receiving a call on the local radio about the aircraft arrival.
    - The local commuter service has very short turnaround times on the ground. The public involvement team was boarding and starting up their aircraft. In that short time, the local commuter airlines landed, offloaded, reloaded, and took off.

During the public meeting, the local residents also touched on these items:

- The local community expressed interest in acquiring some current airport land to build or improve community infrastructure, such as a tank farm, fueling infrastructure, barge landing, or dock if the runway is shifted.
- The current road to the barge landing, barge landing itself, and the fuel header on the barge landing, is located on land owned by DOT&PF. The community would like to build a new road west of the current road and also fill in the areas of land adjacent to either road to provide storage. The City would be willing to lease, own, or develop some other type of agreement to move these projects forward. The City needs to demonstrate some degree of control to obtain funding to help improve these facilities. The City would like to work with DOT&PF on an agreement.
- A new tank farm is anticipated to be constructed at the location indicated on Figure 2-9.
    - The tank farm does not have a fuel pipeline to the barge header. It would be served by trucking from the barge.
- A pipeline is desired from the barge landing to the new fuel tank farm. A preferred path may be through airport property. This path is preferred, because any other path would place the pipeline

upslope of the community. If a leak occurred, it would flow down into the community; providing a health hazard. The City would like to work with DOT&PF on safe project development.

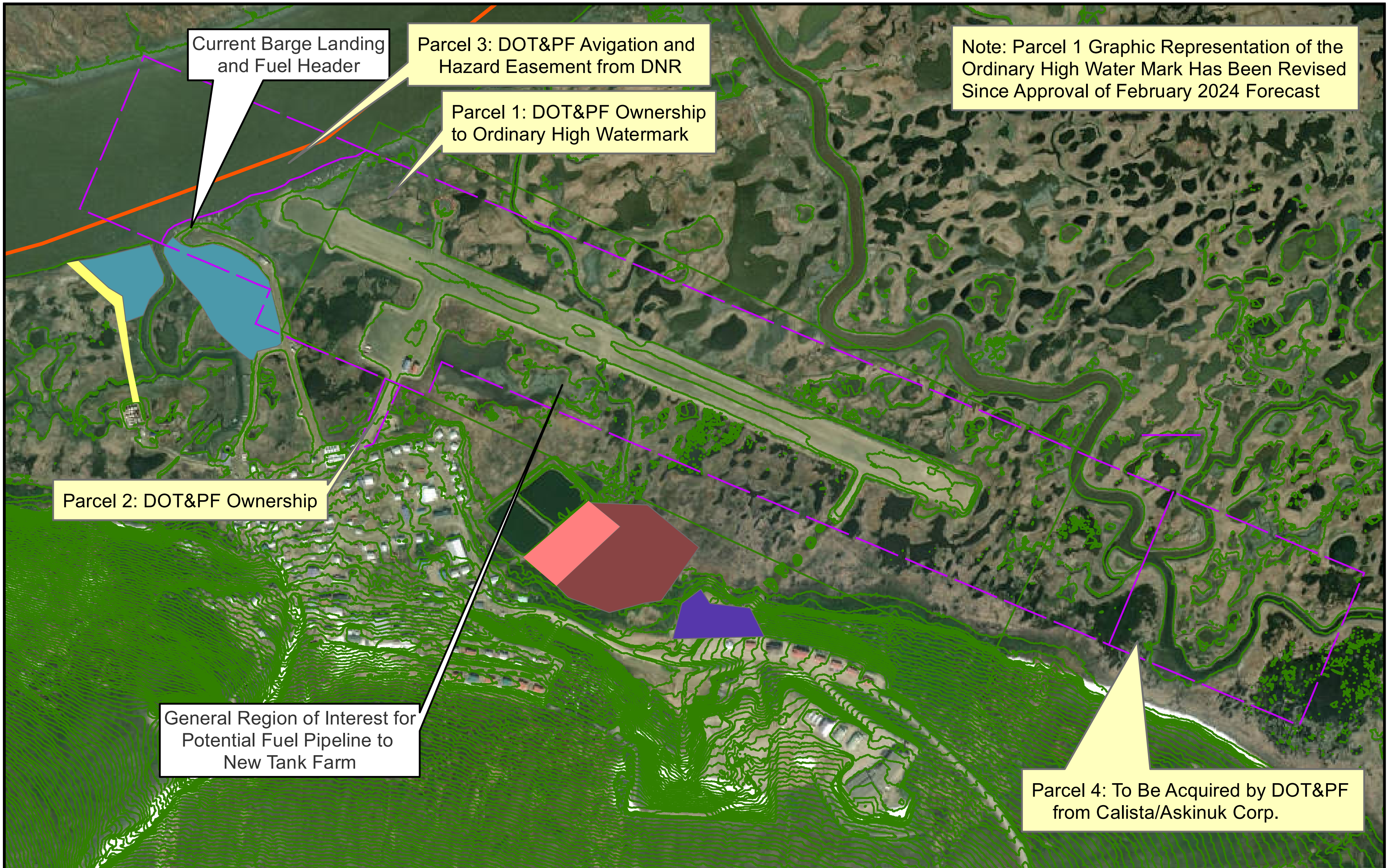
- An expansion of the wastewater treatment plant is expected at the location indicated on Figure 2-9. Phase 1 of the expansion is likely to be built in the near term, with Phase 2 in the longer term.

A request for public comments on the alternatives was redistributed on February 19, 2025, which resulted in additional agency and landowner comments.

- The ADF&G provided a comment that a Fish Habitat Permit would be required for work involving the Kun River, culvert, and other side channels. ADF&G reports that chum salmon, inconnu and whitefish are in the Kun River, and Alaska blackfish, ninespine stickleback, and northern pike are reported in the culvert (and similar side channel) habitats.
- The Calista Corporation is a major landowner in the Scammon Bay area that would be impacted by land acquisition. The corporation provided a letter of support for Alternative 2 (Shift & Raise) on March 26, 2025. Their primary concern was public access to the airport.
- The City of Scammon Bay, Native Village of Scammon Bay, and Askinuk Corporation passed a tri-party resolution on February 24, 2025, stating in part:

> ***"WHEREAS**, the community supports Alternative 2; and,*
>
> ***WHEREAS**, the community specifically does not support Alternatives 1, 3, 4 and 5. These alternatives will have significant impacts on Scammon Bay's ability to use the airport and the safety of aviation service to Scammon Bay; and,*
>
> ***THEREFORE**, the City of Scammon Bay, Native Village of Scammon Bay, and Askinuk Corporation agree on and request that the FAA move forward with the engineering design of Alternative 2 (shift and raise), and its evaluation under NEPA to support construction of an airport improvement project."*

Public Involvement Materials, including comments and the resolution, are located in Appendix E.



N

0 0.075 0.15 Miles

1:8,000 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area
Airport Boundary
Contour (1m)

Airport Parcel Ownership

Community Plans
- New Tank Farm
- ATV Trail into Road
- Place Fill for New Storage
- Wastewater Treatment Phase 1
- Wastewater Treatment Phase 2

SCAMMON BAY
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March 2025

Figure 2-9: Community Projects

3 ALTERNATIVES EVALUATION

Five alternatives were evaluated.

Alternative 1 is the No Action Alternative. Under this alternative, DOT&PF would maintain the airport in its current location, repair, rehabilitate, and reconstruct the airport as needed for regular maintenance and after heavy flooding.

Alternative 2 (Shift & Raise) would shift the runway longitudinally 340 feet inland to provide additional protection from river flooding, raise the Runway Safety Area (RSA) embankment edge elevation to +19.5 feet above Mean Higher High Watermark (MHHW) and North American Vertical Datum 88 (NAVD), and install erosion protection.

Alternative 3 (Near) would move the Airport onto the transitional area between lowlands and the Askinuk Mountains, near the community of Scammon Bay.

Alternative 4 (Castle Hill) would move the Airport into the valley between Castle Hill and the Askinuk Mountains.

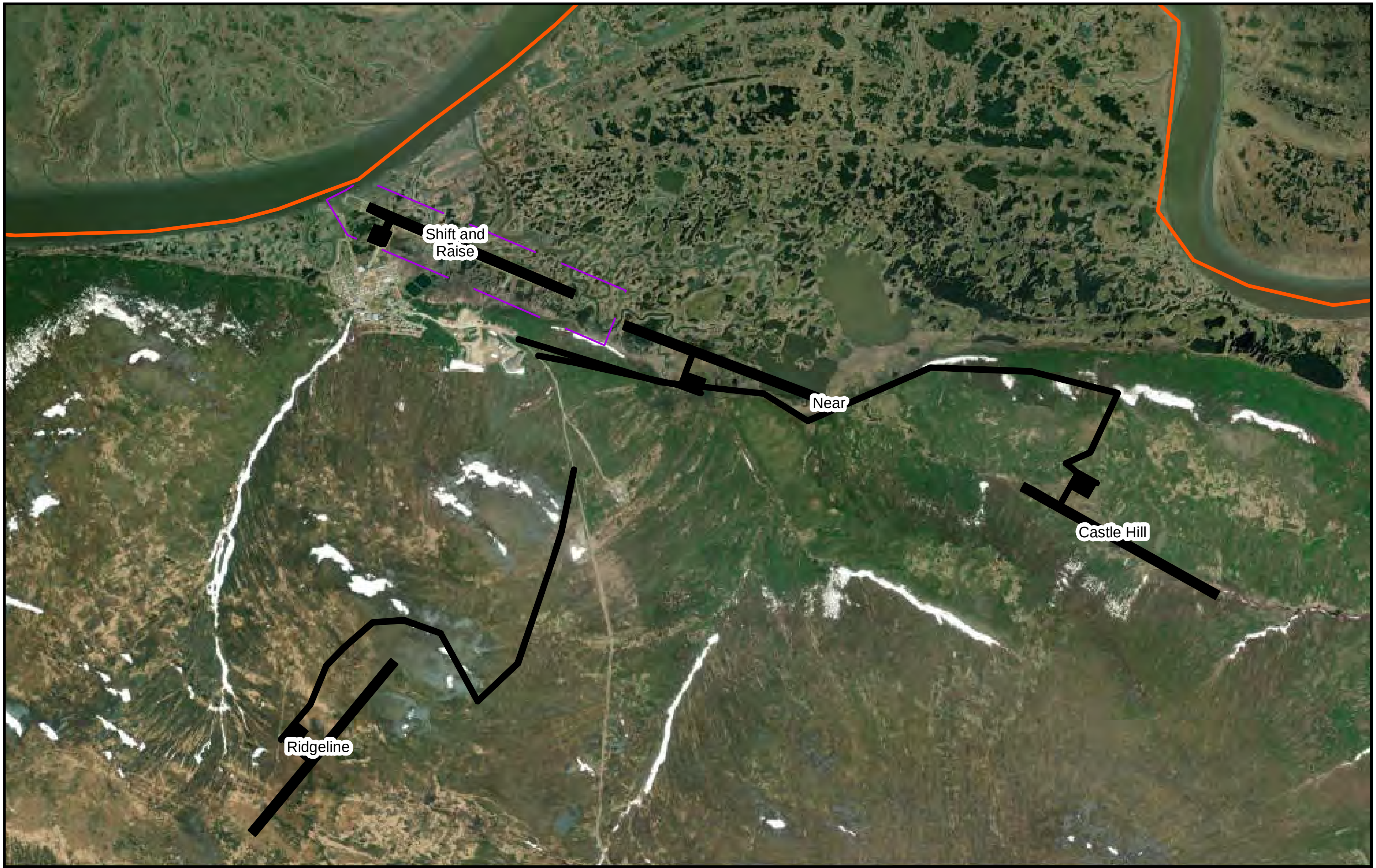
Alternative 5 (Ridgeline) would move the Airport on to the ridgeline above Scammon Bay in the Askinuk Mountains.

3.1 Engineering Analysis, Figures, and Tables

In-depth engineering analysis for all potential alternative sites was beyond the scope of this phase of the planning study. Detailed engineering analysis exists for Alternative 2 (Shift & Raise) because a Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D) were initially completed in December 2022 as part of an airport improvement project in Scammon Bay, which was paused due to cost. Local and privately owned land that were not potentially necessary for that airport improvement project were not studied under the HDR reports.

Figures 3-1 and 3-2 depict the alternatives and preliminary alternative design. Table 3-1 summarizes each alternative and analyzes the evaluation criteria.

Planning level cost estimates are in Appendix A. Maps for each of the alternatives are provided for each screening criteria where the previous maps were at too large of a scale to provide detailed analysis (Figure 3-3 to 3-10).



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Study Area

Airport Boundary

Alternatives (2024)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

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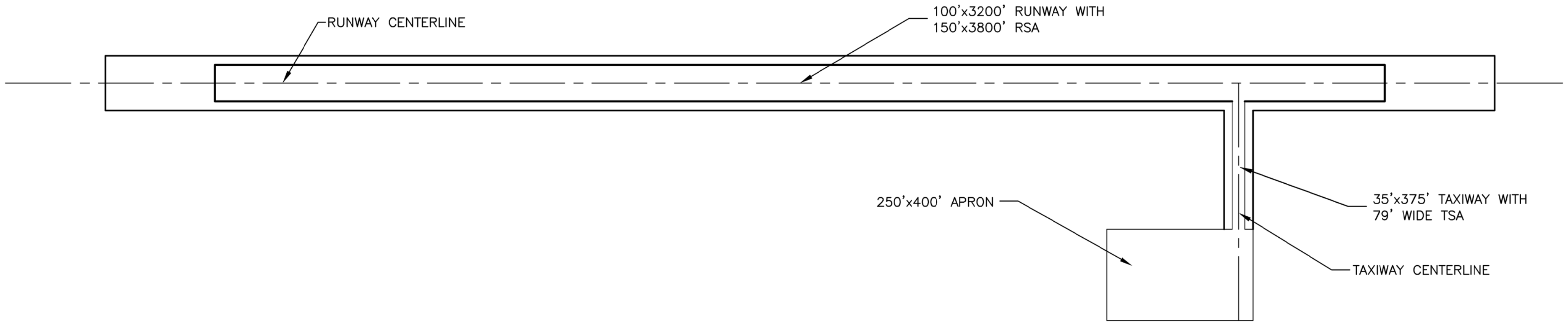
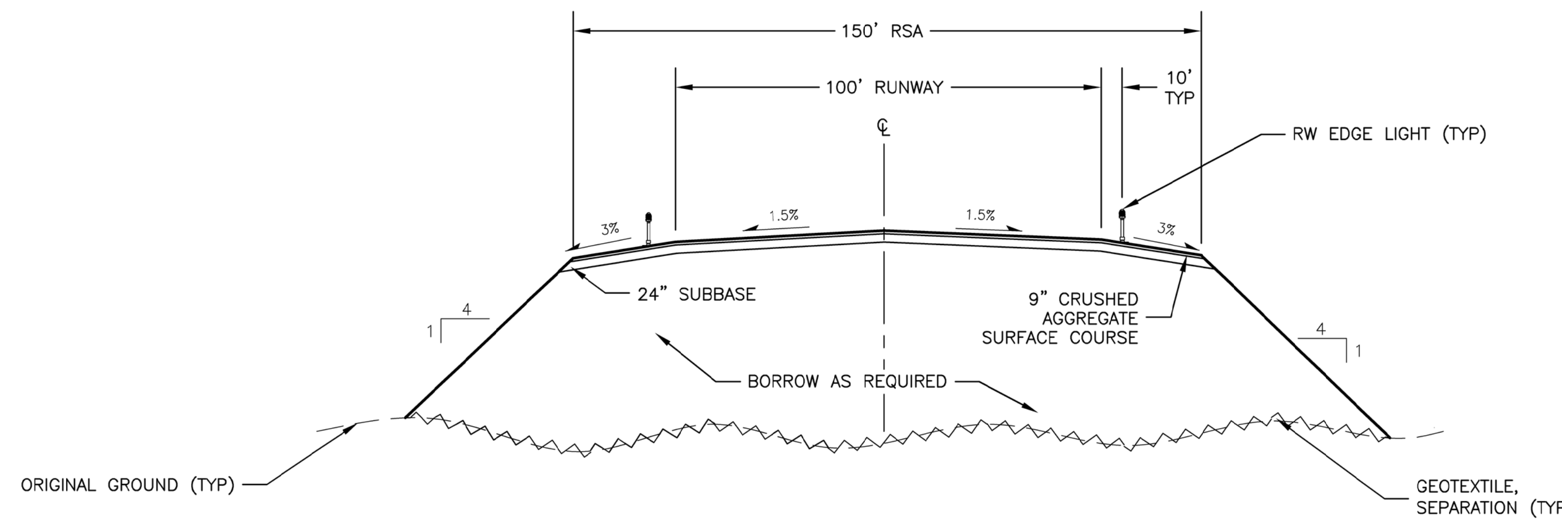
Figure 3-1: Alternatives



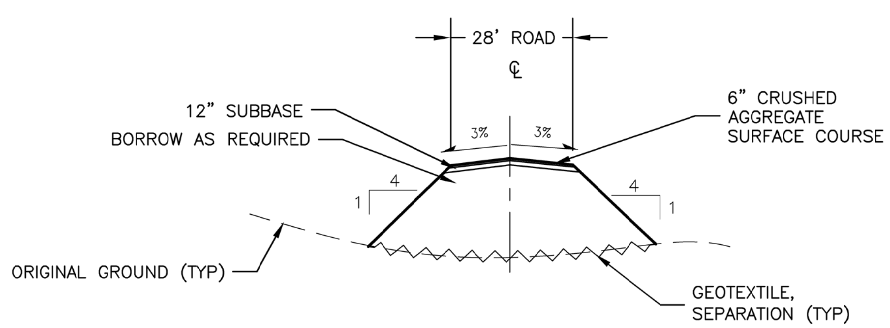
1 SCAMMON BAY AIRPORT ALTERNATIVES – AIRPORT PLAN

SCALE: NTS



2 RUNWAY SECTION

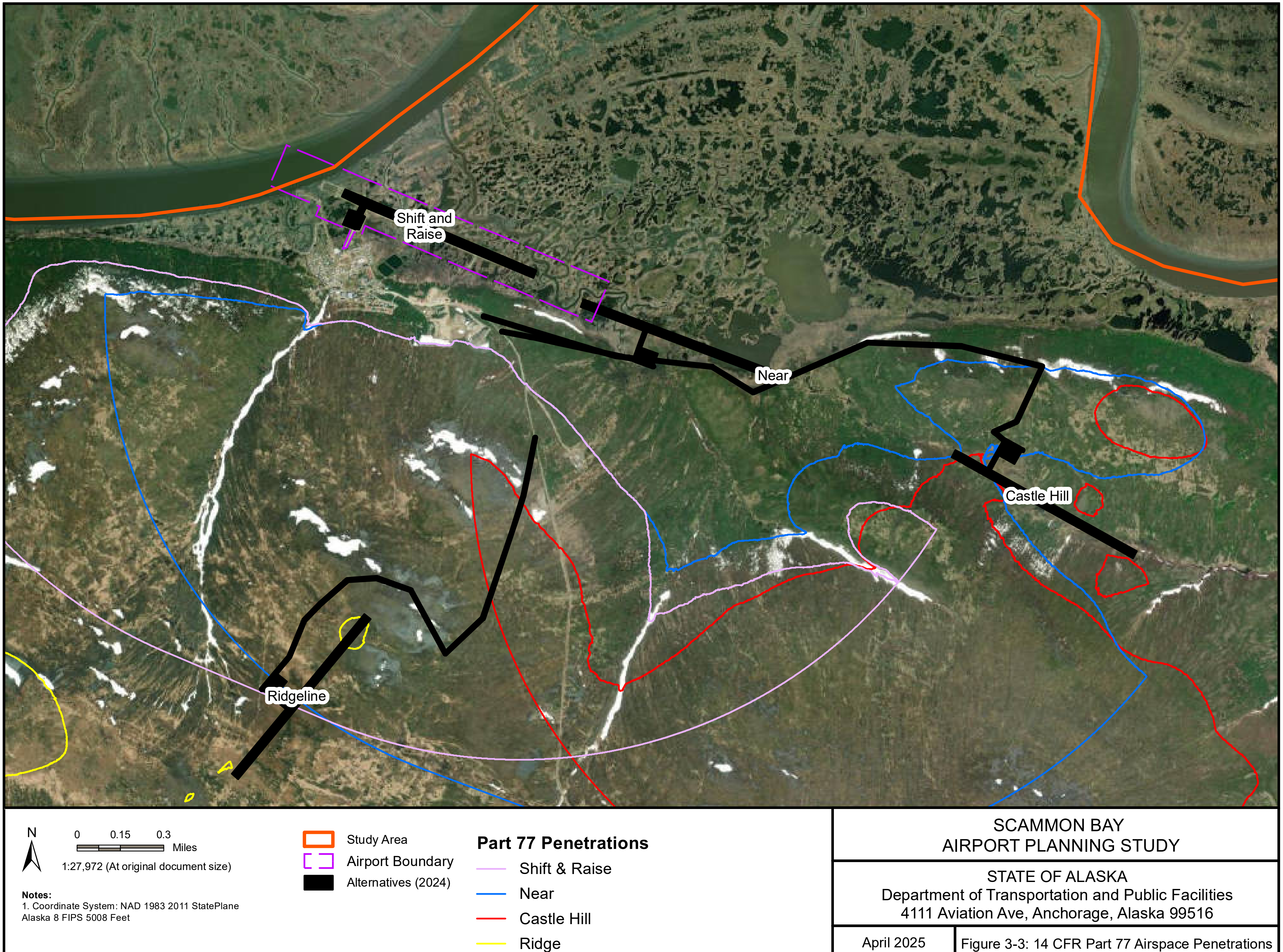
SCALE: NTS



3 ROAD SECTION

SCALE: NTS

Figure 3-2 Alternative Design



Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

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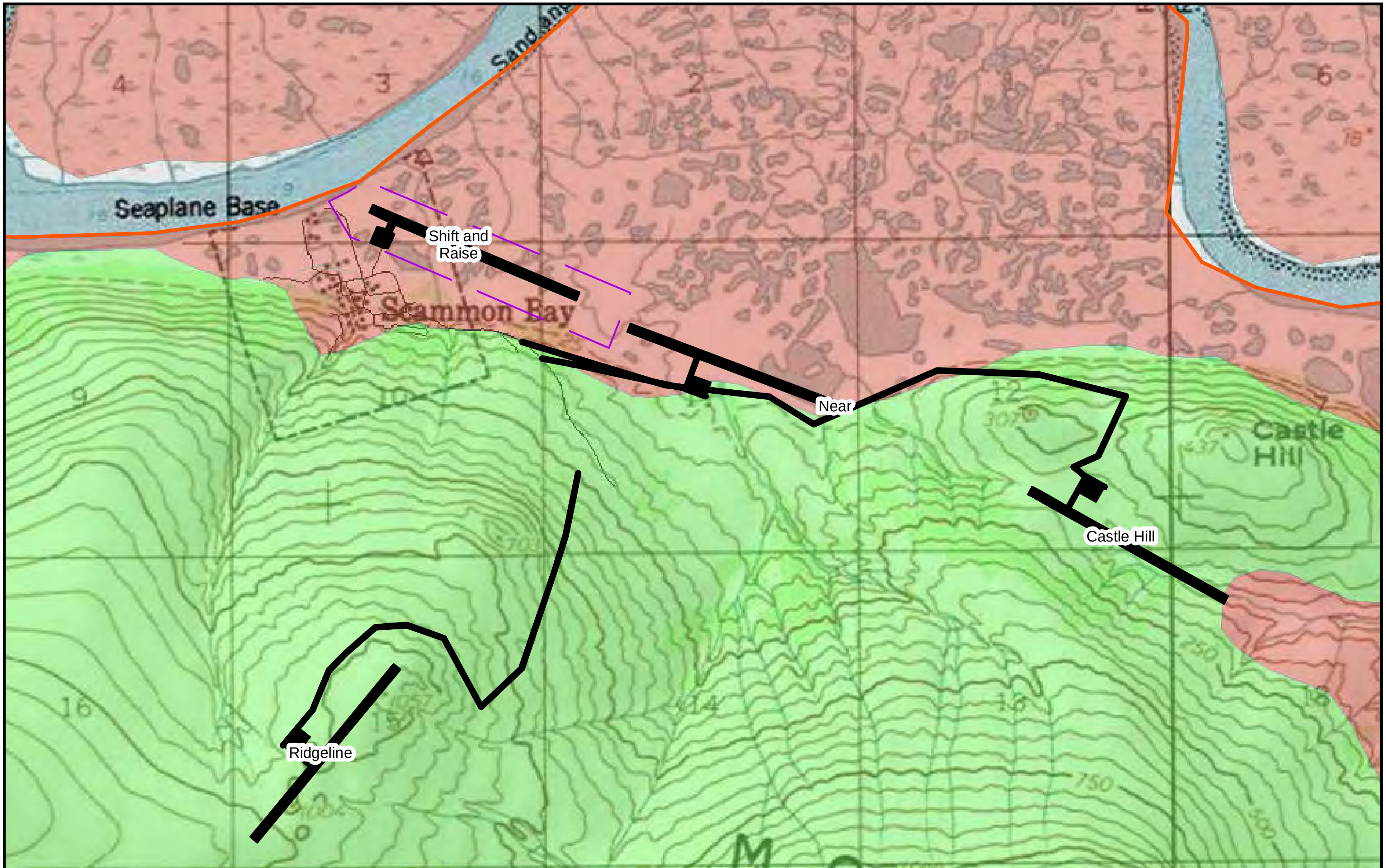
Figure 3-3: 14 CFR Part 77 Airspace Penetrations



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area
Airport Boundary
Alternatives (2024)
Road

AK Geologic Map
Klgr: Intermediate granitic rocks
Qs: Unconsolidated surficial deposits, undivided

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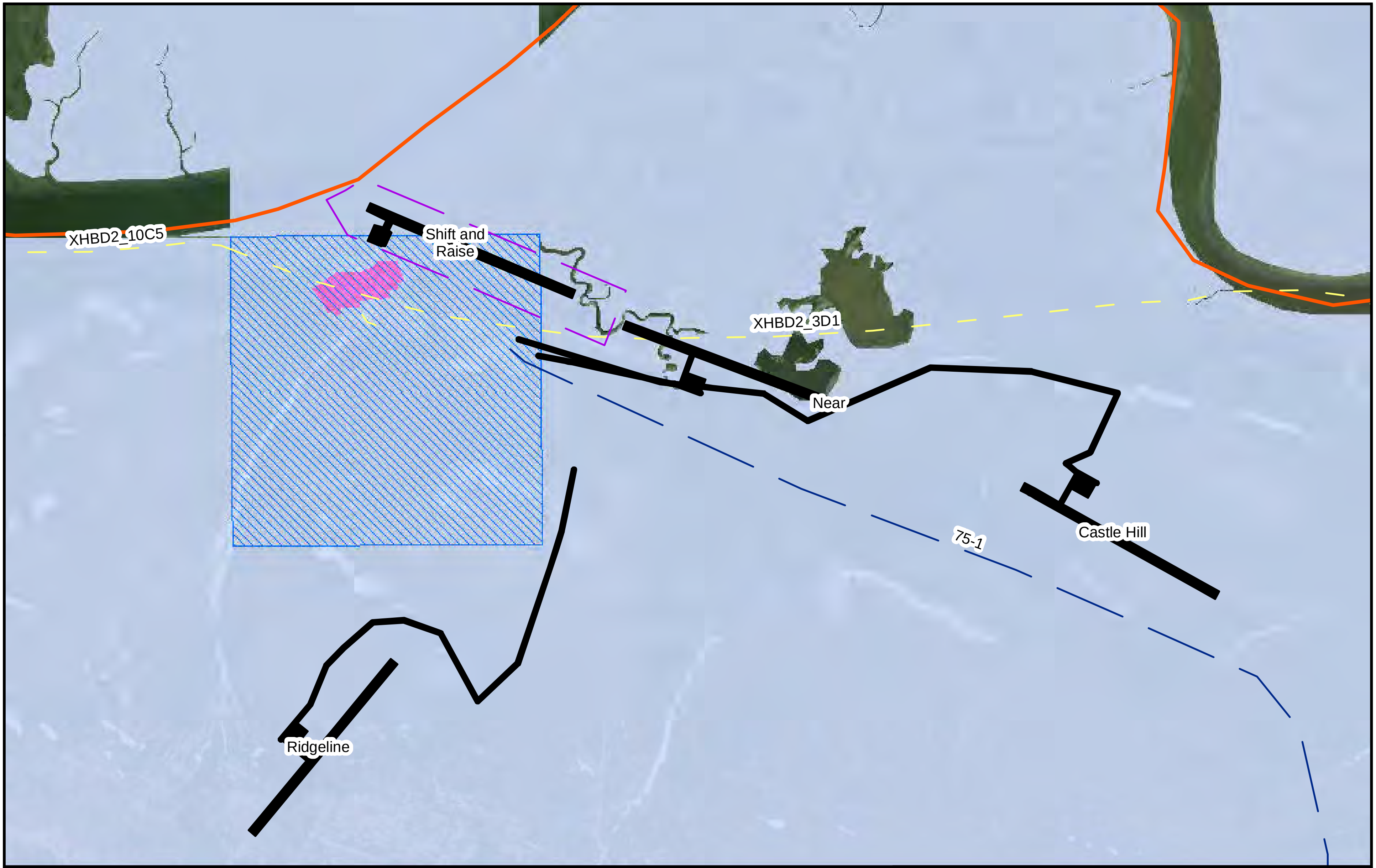
Figure 3-4: Alternatives: Geotechnical Conditions



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- 17(b) Easement
- RS2477 Trails
- ANCSA Selected
- Private Lands
- Conveyed Native Lands

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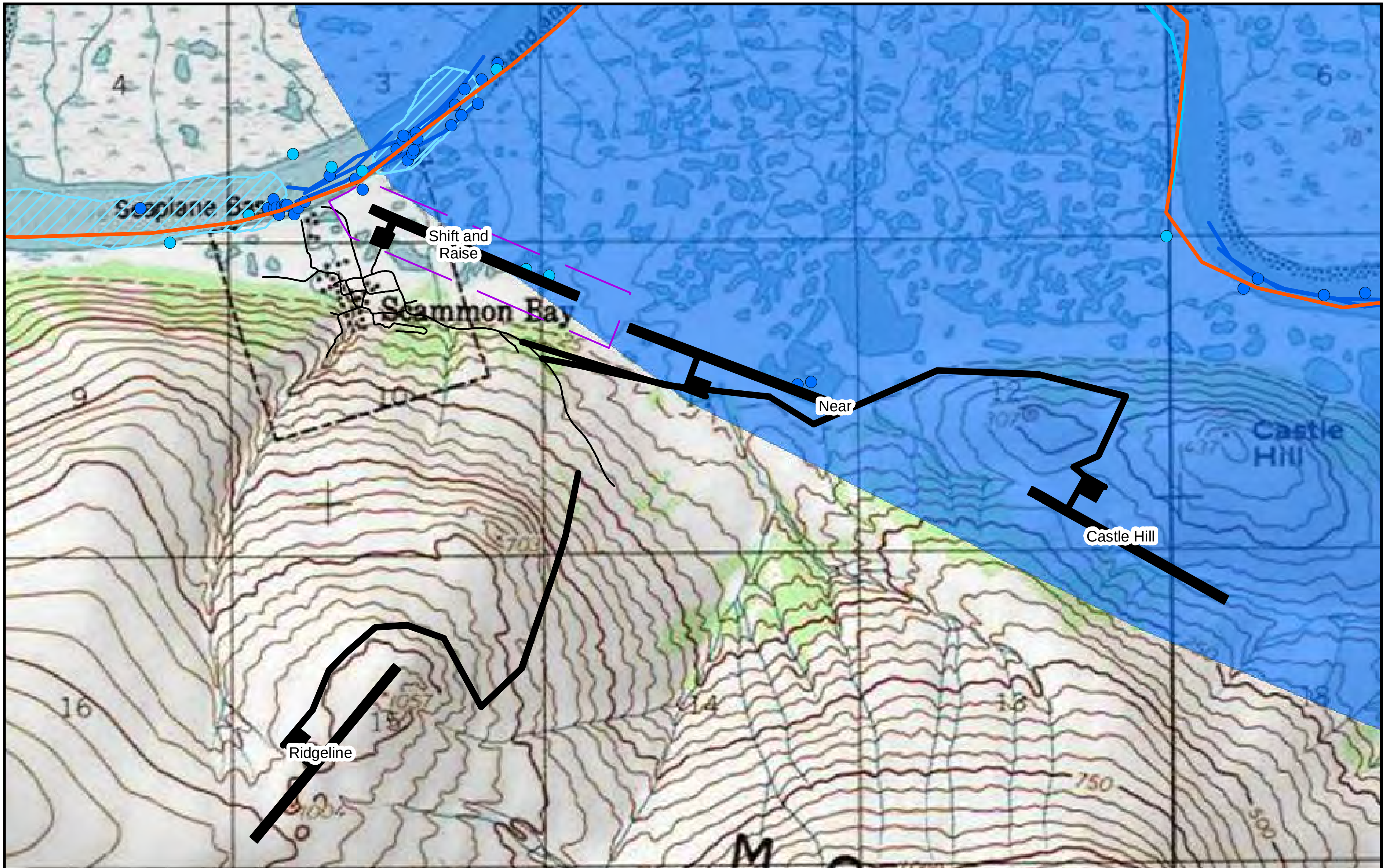
Figure 3-5: Alternatives: Land Ownership



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- Road
- 2013 Subsistence Study
- 2017 Subsistence Study
- 2013 Subsistence Study
- 2017 Subsistence Study
- 2013 Study (Fish)
- 2017 Study

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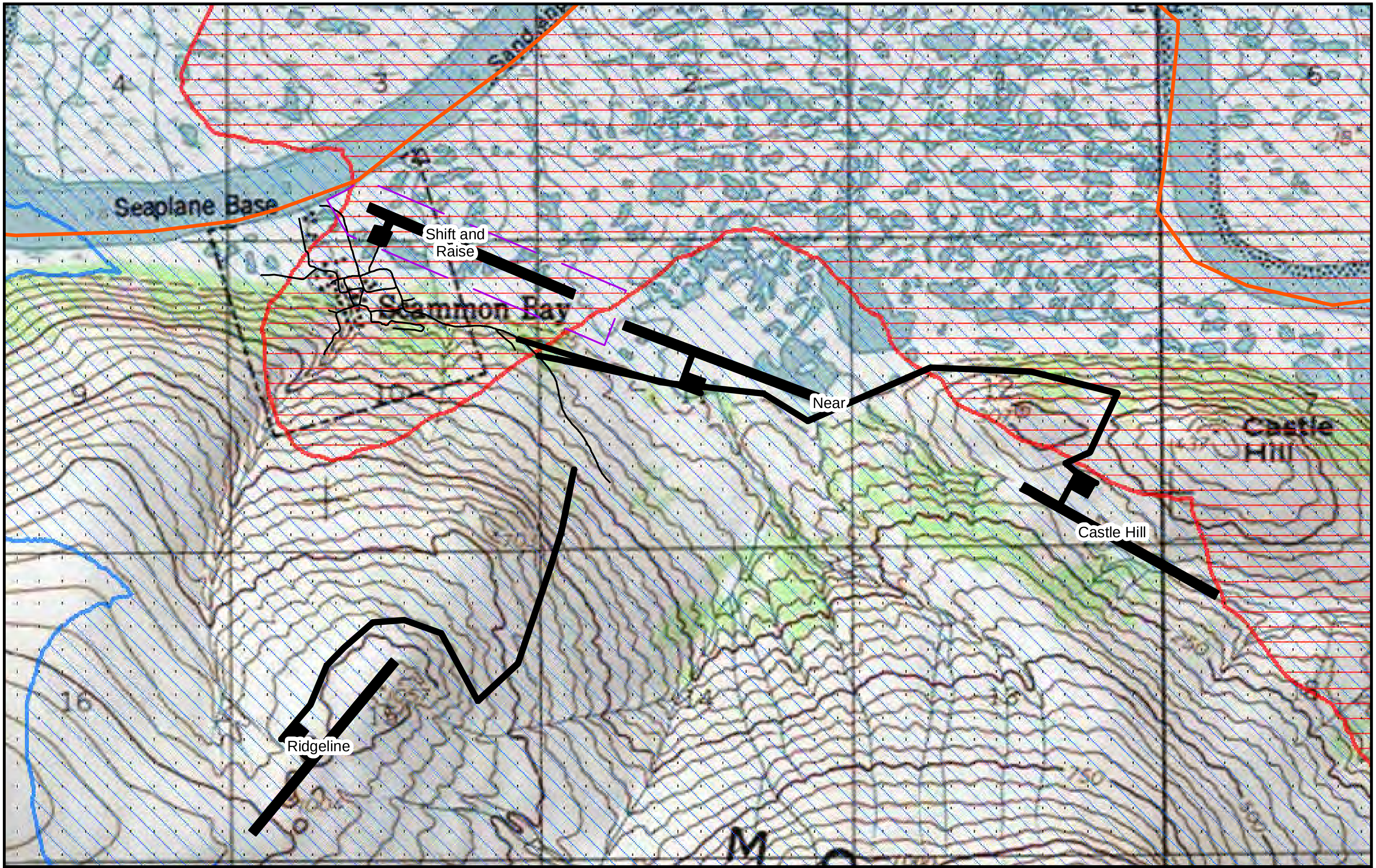
Figure 3-6: Alternatives: Subsistence: Fishing



N

0 0.15 0.3 Miles

1:27,999 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area
Airport Boundary
Alternatives (2024)
Road

2013 Subsistence Study
Ptarmigan & Grouse
Ducks & Geese
Moose

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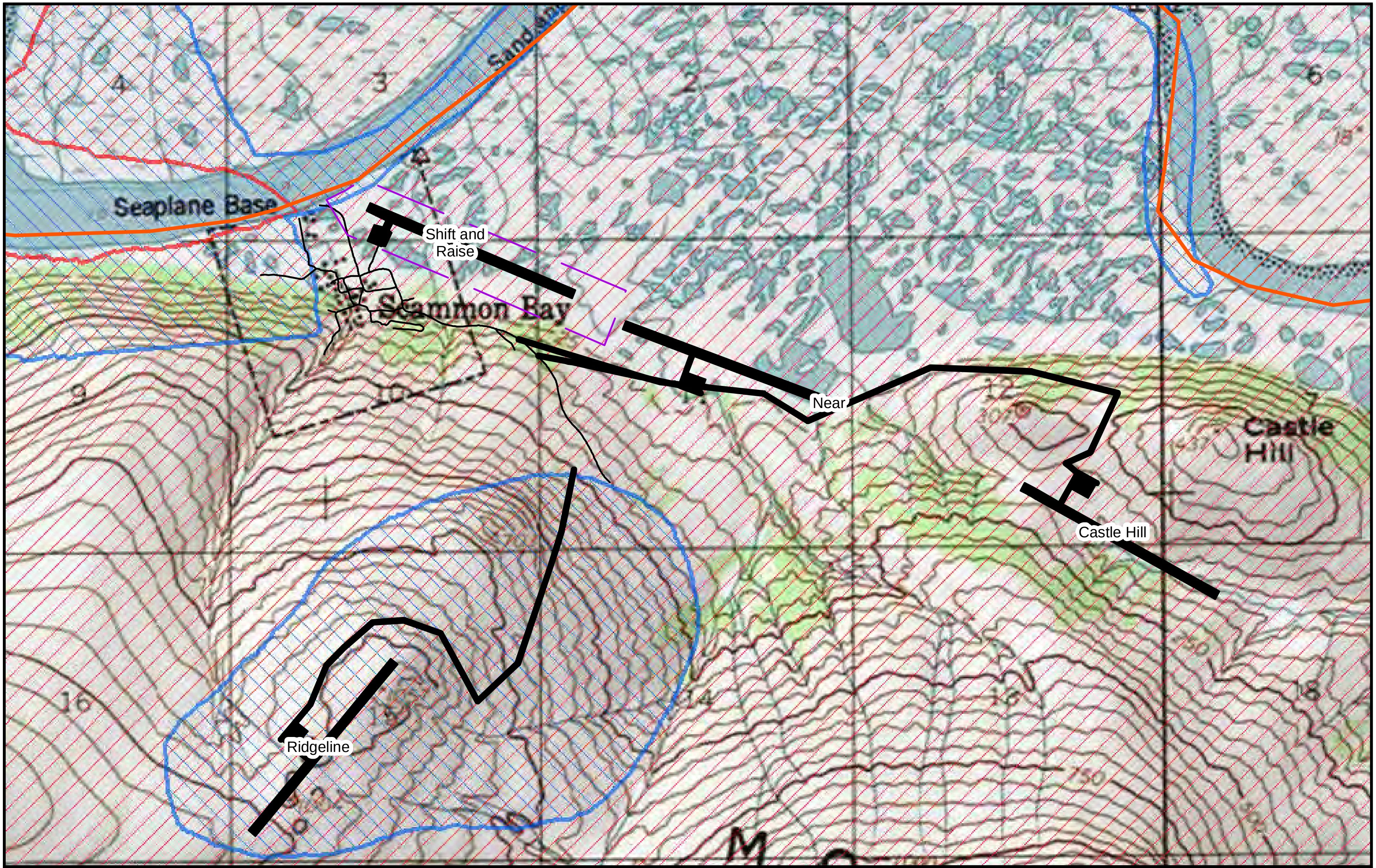
Figure 3-7: Alternatives: Subsistence: Birds, Moose



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. High areas are used for spotting seals in the water

Study Area
Airport Boundary
Alternatives (2024)
Road

2013 Subsistence Study
Berries & Greens
Seals

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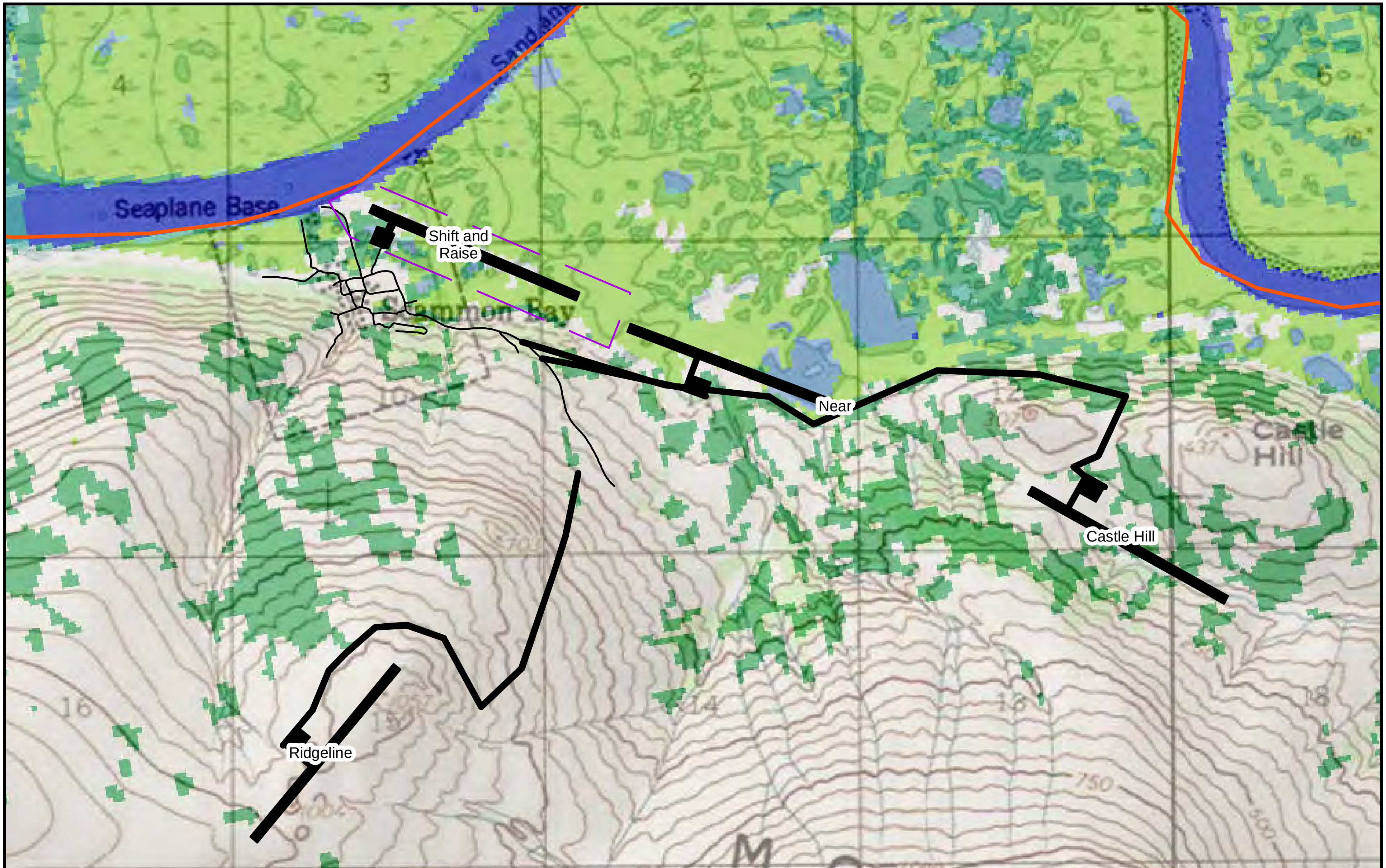
Figure 3-8: Alternatives: Subsistence: Bears, Berries, Seals



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Road
- Airport Boundary
- Alternatives (2024)

Vegetation Map

- Marine
- Marine Wetland
- Emergent Wetland
- Forested/Shrub Wetland
- Pond; Lake
- Riverine
- Upland

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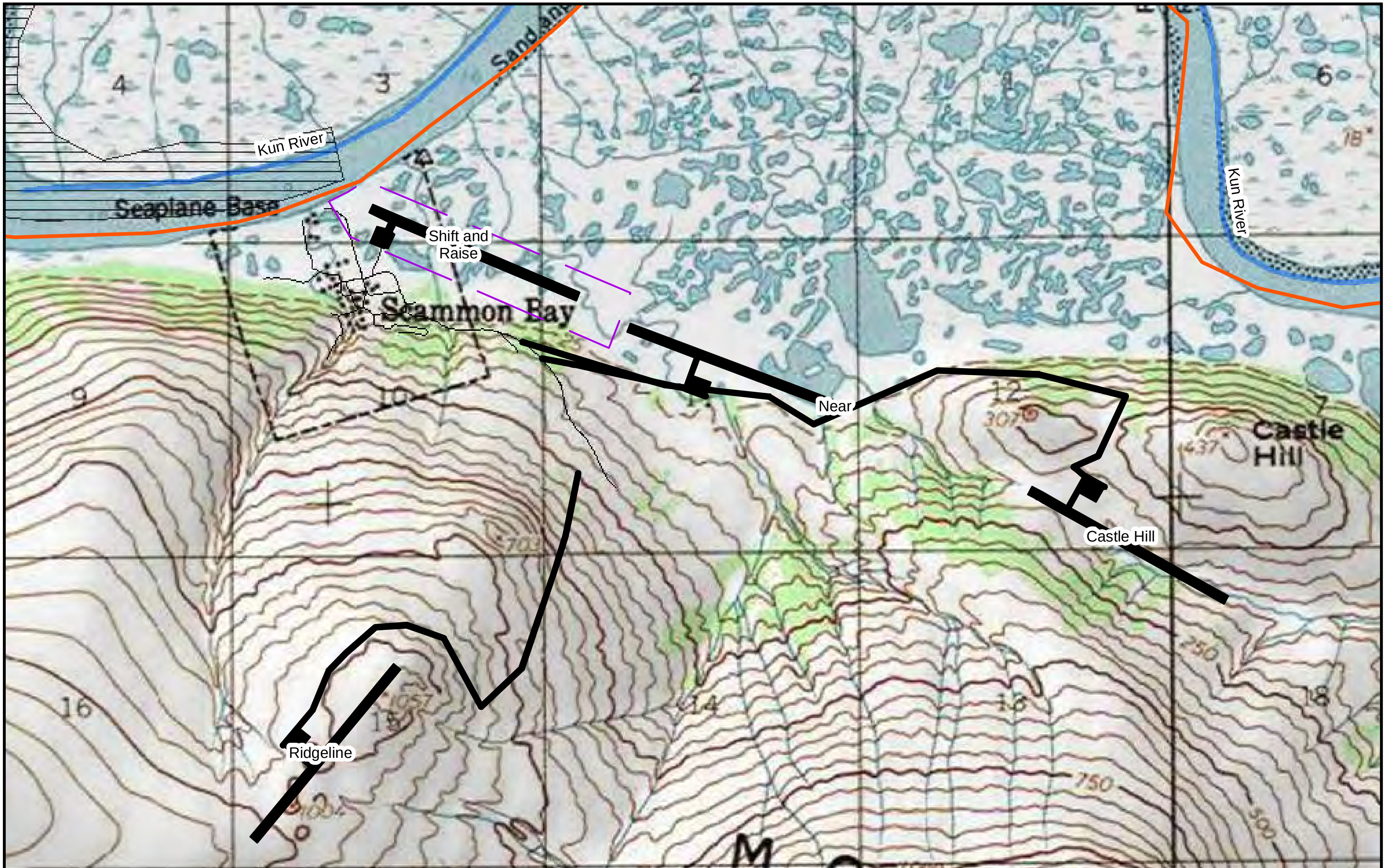
Figure 3-9: Alternatives: Wetlands



N

0 0.15 0.3 Miles

1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- Alternatives (2024)
- Road
- Anadromous Waters
- Polar Bear Critical Habitat

SCAMMON BAY
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Figure 3-10: Alternatives: Protected Species

Table 3-1 Alternative Evaluation

Evaluation Factor	1: No Action	2: Shift & Raise	3: Near	4: Castle Hill	5: Ridgeline
Safety and Airport Resiliency					
Elevation (Embankment Edge)	+10 - +17.5 feet	+19.5 feet	+19.5 feet	+138 feet	+1,013 feet
Distance from river	0 feet	340 feet	11,000 feet	5,000 feet	4,000 feet
Fog and Low Visibility	0.3%	0.3%	0.3%	~0.3 - 6.7%	17.0%
Wind Coverage	90.4%	90.4%	Unknown	Unknown	Unknown
Wind Strength (Elevation)	N/A	Similar to SCM	Unknown	Unknown	Worst
Airport Geology	Good (Established pad)	Poor (Qs)	Poor (Qs)	Good (klgr)	Good (klgr)
Land Status					
Land Ownership	DOT&PF	DOT&PF & Calista and Askinuk	Calista and Askinuk	Calista and Askinuk	Calista and Askinuk
Likelihood of Acquisition	N/A	Likely, and already on approved Airport Layout Plan	Unlikely	Unlikely	Unlikely
Subsistence Resources	No significant	Low (Fish, Moose, Grouse, Waterfowl, Berries)	Medium (Fish, Moose, Grouse, Waterfowl, Berries)	Medium (Fish, Grouse, Waterfowl, Berries)	Medium (Grouse, Waterfowl, Berries)
Environmental					
Noise (Impacts to Residents)	Medium	Medium	Low	Low	Low
Wetlands (Unverified NWI)	0	2.5 acres	11.4 acres	9.5 acres	0.3 acres
Endangered Species	No significant	No significant	No significant	No significant	No significant
Marine Mammal Protection Act	No significant	No significant	No significant	No significant	No significant
Fish	No significant	Runway culvert	No significant	No significant	No significant
Birds & Other Wildlife Habitat	No significant	16.6 acres	20.9 acres	39.7 acres	33.2 acres
Contaminated Sites	No significant	No significant	No significant	No significant	No significant
Public Access Convenience	Best	Best	Medium	Low	Very Low
Distance to Community Center	0.3 miles	0.3 miles	2.2 miles	4.5 miles	6 miles
Cultural Resources					
AHRS Cultural Resources	Potential impacts to known area	Potential impacts to known area	No known areas	No known areas	No known areas

Constructability					
Constructability	Feasible	Challenge	Challenge	Feasible	Feasible
Distance to Solid Waste	3,560 feet	3,260 feet	3,800 feet	14,000 feet	10,900 feet
Distance to Sewage Lagoon	550 feet	550 feet	7,000 feet	9,500 feet	6,000 feet
Maintenance of Access Road	Easy	Easy	Difficult	Very Difficult	Very Difficult
Floodplain	Within Floodplain	Partially Within Floodplain	Within Floodplain	Above Floodplain	Above Floodplain
Materials					
Unclassified Excavation	0	15,440 cy	40,306 cy	166,594 cy	47,991 cy
Borrow	2,333 cy ** (2016)	161,330 cy	370,691 cy	284,495 cy	224,174 cy
Subbase	3,646 cy ** (2016)	51,215 cy	58,313 cy	72,222 cy	67,426 cy
Crushed Aggregate Surface Course	5,035 ton ** (2016)	38,515 ton	41,369 ton	52,797 ton	47,539 ton
Primary Armor Stone, Class I	0	61,353 ton	61,353 ton	0	0
Underlayer Stone, Class I	0	53,731 ton	53,731 ton	0	0
Material Source Distance (Local)	0	7,300 feet	2,000 feet	600 feet	2,000 feet
Utilities					
Utilities (Cost)	No significant	$237,000	$1,838,500	$3,677,000	$4,911,000
Erosion Protection Materials*	$0	$20,223,492 Local, $31,731,868 Barged	$20,223,492 Local, $31,731,868 Barged	$0	$0
Land Purchase	No significant	$17,000	$5,000	$23,000	$17,000
Cost Summary					
Total Cost (Local Option)	$6,990,353 ** (2016)	$75,656,172.51	$94,588,701.28	$66,714,222.21	$59,398,368.40
Total Cost (Barged Option)	$9,099,607 (2025) (estimated current cost)	$130,444,801.50	$182,828,675.60	$126,997,026.70	$109,266,097.40
Public Opinion	Against	In Favor	Against	Against	Against

*HDR 2022a estimated a variety of erosion protection measures to implement with Alternative 2; ranging in cost from $11 million to $67.7 million. Stantec provided an updated cost estimate.

** "No Action" Materials is from the 2016 FEMA repair project to rehabilitate the airport after the last major flood. The original 2016 FEMA project cost $6,990,353 (Appendix F). The 2025 estimate was adjusted for the current inflation (30.2% - The average annual inflation rate has been 3.8%). Future project estimates would be cumulatively adjusted for increasing inflation each time a similar flood impacts the airport, potentially every 5 – 10 years

3.2 Alternative 1: No Action

The No Action alternative is included as a comparison for the other alternatives. Under this alternative, DOT&PF would continue to maintain the airport in its current location and provide regular maintenance as required for safety and repairs after heavy flooding. This alternative does not meet the purpose and long-term need of addressing the flooding and erosion threats to the airport.

Safety and Airport Resiliency

Alternative 1 (No Action) would not provide long-term safety, resiliency, and reliability for the community due to unplanned emergency maintenance after heavy flooding. The fog and visibility characteristics would remain favorable (only 0.3% of the time less than 0.5 miles).

Wind coverage at the current airport is known at 90.4%, below the recommended 95%, but more certain than other alternatives.

Land Status

The airport is located on DOT&PF owned land. No property acquisition would be needed for this alternative.

Environmental

Environmental and subsistence concerns are the least for this alternative because no new ground would be disturbed. Habitats that may support wildlife (such as fish and birds), and the development of areas that may be used for subsistence use would remain consistent with current conditions. Disruptions may occur during maintenance, rehabilitation, and emergency reconstruction projects. Public access convenience is very high due because to the close proximity of the existing airport to the community.

Cultural Resources

Scammon Bay is a Yup'ik community that has been settled for over one hundred years. Based on a review of the AHRS data for Scammon Bay, cultural resources are reported within the vicinity of the current airport and the entire village of Scammon Bay. These cultural resources could be adversely impacted by any development of the existing Scammon Bay airport. Additional consultation with the local community, literature review, and cultural resource surveys would be needed to verify the location and types of cultural resources there and determine necessary mitigation efforts. A NHPA Section 106 and NEPA process would be required as part of any Design project that would occur on or around the existing airport. Please see the DOT&PF PD&E Cultural Resource Evaluation (Appendix H) for more in-depth review of cultural resources.

Constructability

Although it is possible to continue to maintain, rehabilitate, and reconstruct the airport as needed, it is unlikely to be the most prudent long-term management solution based on the HDR Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D). The airport is located completely within the floodplain and the runway embankment elevation is below the 50-year flood level, and the culverts are insufficient for drainage at the airport.

This alternative would not meet the 50-year floodplain requirement or ensure AIP minimum useful life and grant assurance requirements are met for a rehabilitation project that maintains the current embankment elevation. Additionally, airport rehabilitation projects are subject to AIP grant funding availability, timeline eligibilities, and it may not be possible to obtain funding for disaster relief if the airport is severely flooded. Overtime, repeated submergence of the lighting system and runway embankment will result in failure.

Hydrology / Geology

Based on the HDR Coastal Study (2022) (Appendix C) and the HDR Hydrology & Hydraulics Study (2022) (Appendix D), the airport will continue to be impacted by rising sea levels and major flooding events in the future.

Water Displacement & Mitigation

Water displacement and potential flooding deterioration will continue under the current conditions and be severe after heavy flooding. The HDR Hydrology & Hydraulics Report (2022) stated the 48” culvert is inadequate for the flooding that impacts the airport.

Figure 3-11 2016 Flooding

Figure 3-12 2024 Flooding

Potential Flood Deterioration

Flooding will continue to deteriorate the airport embankment without erosion mitigation based on the findings of the HDR Coastal Report (2022) and Hydrology & Hydraulics Report 2022) due to the low elevation level of the runway.

Figure 3-13 Airport Conditions (2023)

Geotechnical Investigation

Further geotechnical investigation may demonstrate the impact of repeated flooding on the integrity of the airport embankment.

Materials

Material costs were not estimated as part of the "No Action" alternative because the number of major floods that will require major repairs are unpredictable. However, at a minimum, erosion protection should be installed to protect the existing embankment. The estimated material needs during the 2016 FEMA project were: 5,035 of Surface Course, 3,646 for the Subbase, and 2,333 of Borrow to bring the airport back to pre-disaster conditions.

Public Opinion

No public comments were received in support of this alternative.

Cost

The cost for regular maintenance, rehabilitation, and reconstruction after flooding are difficult to assess based on fluctuating material costs and the ongoing impacts of flooding, but they will increase over time. The cost of the FEMA grant to restore the Scammon Bay airport to pre-flood conditions was $6,990,353 after the major flood in 2016. If the average inflation rate remained 3.8%, by 2050, a similar project may cost $23,118,331 (Table 3-2).

Table 3-2 Inflation Adjusted Cost Estimates for 2016 Airport Repairs

Year	Inflation Adjusted Estimates
2025	$9,099,607
2030	$10,965,019
2035	$13,212,840
2040	$15,921,462
2045	$19,185,349
2050	$23,118,331

A surface maintenance grant was awarded in 2009 for $532,000. The next surface maintenance grant was awarded in 2022 for $1,505,811, which included replacement of crushed aggregate surface course (CASC). Intensive airport surface rehabilitation projects in the Yukon-Kuskokwim region consistently cost over $30,000,000. The extent of flood damage and repairs is unpredictable.

Available Engineering Analysis

This alternative was previously evaluated by DOT&PF through HDR, Inc. A Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D) were completed in December 2022, initially as part of a pending construction project. Based on the findings and recommendations of these studies, a No Action alternative is not feasible in the long term. The level of flooding and erosion rate are too significant to not armor and shift the runway or relocate the airport entirely.

3.3 Alternative 2 (Shift & Raise)

Alternative 2 (Shift & Raise) would shift the runway longitudinally 340 feet inland to provide additional protection from river movement, raise the Runway Safety Area (RSA) embankment edge elevation to +19.5 feet, and install embankment armor. This alternative has the most information available because it was initially evaluated by DOT&PF as part of a construction project and two technical reports were developed, which have been incorporated into this feasibility study.

The HDR Coastal Report (Appendix C) focused recommendations based on relative sea-level-rise (RSLR) calculations and storm surge events for a 50-year period and 100-year period. The 50-year period recommended 18.5 feet above MHHW and the 100-year period recommended 21.5 feet above MHHW. DOT&PF engineers selected 19.5 feet based on 1 foot freeboard above the forecasted flood level and to ensure the height would be sufficient upon completion of construction of the project.

Below are diagrams (Figure 3-14, 3-15, 3-16, 3-17) from the Coastal Report that depict the various types of erosion protection methods that will be considered during the Design Phase for this alternative if it is the preferred alternative upon completion of the Phase II reconnaissance study. Please review Appendix C for further details about each erosion mitigation strategy.

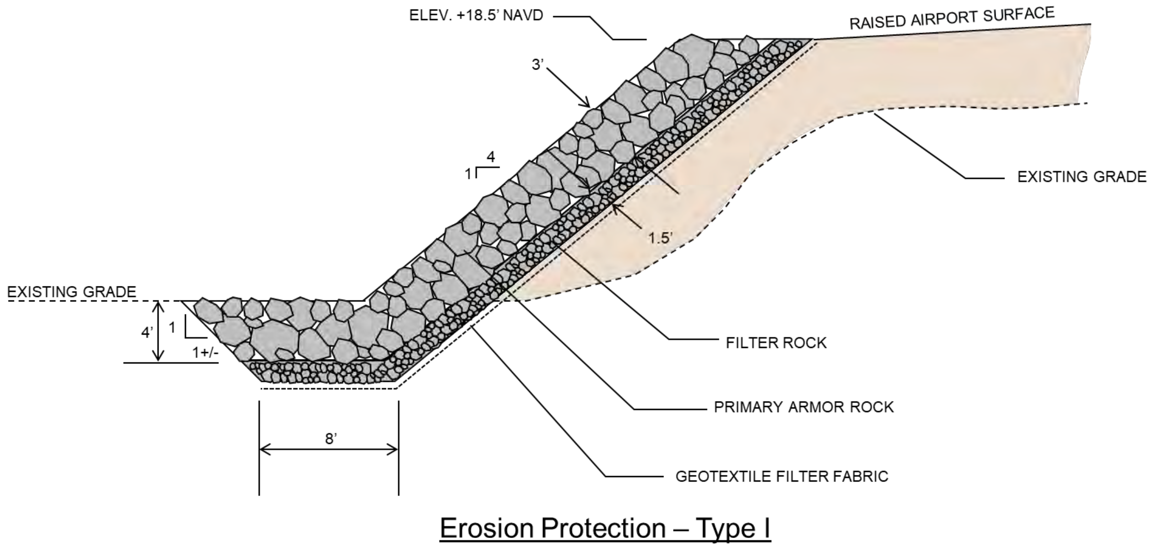


Figure 3-14 Runway Embankment Profile for Erosion Protection Type I (HDR Coastal Report, 2022)

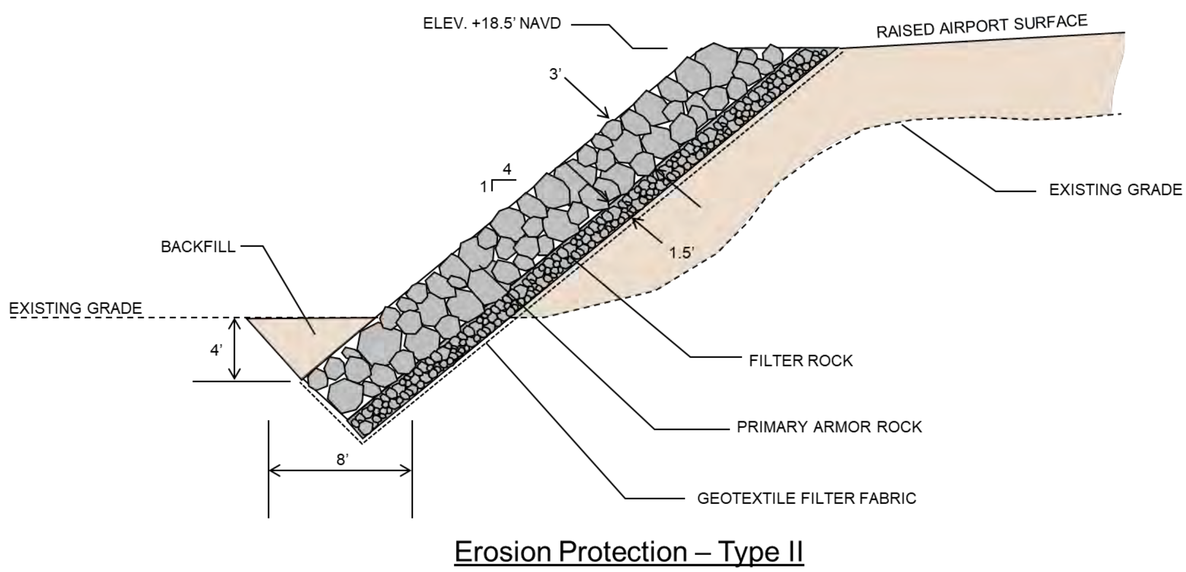


Figure 3-15 Runway Embankment Profile for Erosion Protection Type II (HDR Coastal Report, 2022)

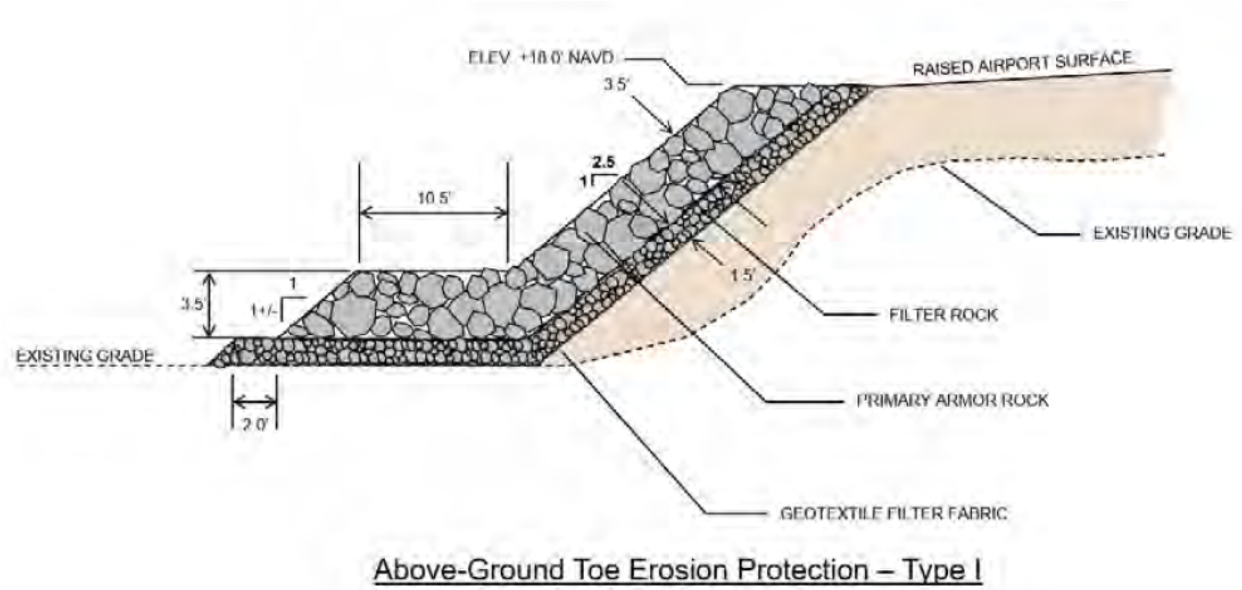


Figure 3-16 Runway Embankment Profile for Above-Ground Toe Erosion Protection – Type 1 (HDR Coastal Report, 2022)

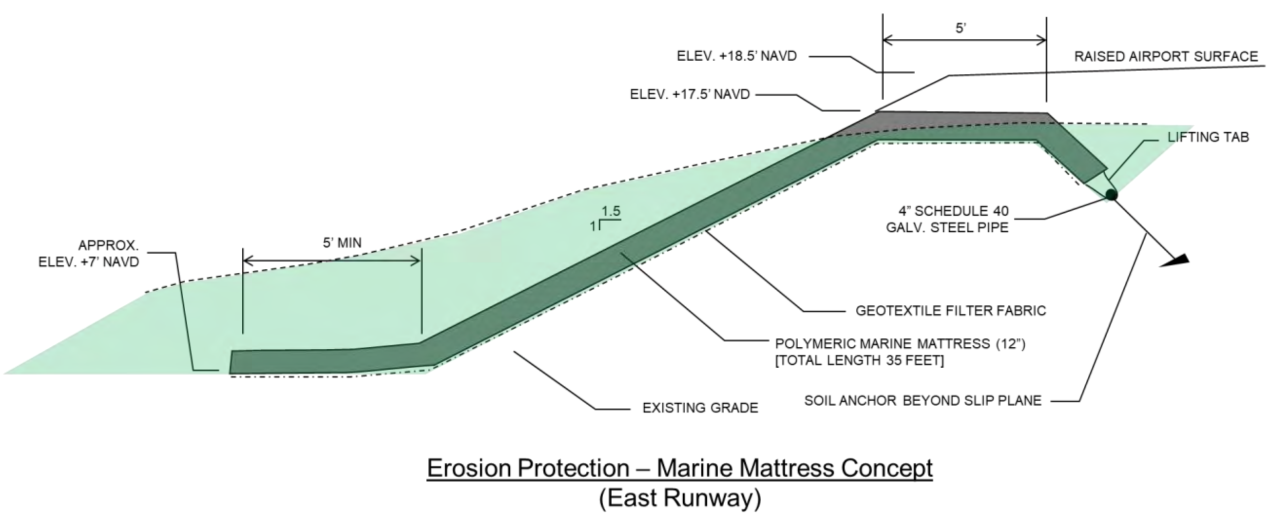


Figure 3-17 Runway Embankment Profile for Marine Mattress Erosion Protection (HDR Coastal Report, 2022)

Alternative 2 (Shift & Raise) would require the culvert to be replaced, with a 72” or 96” diameter culvert, that would be designed to accommodate fish passage. The exact diameter would be determined during the design and engineering phase of the project. However, the HDR Hydrology and Hydraulics Report (Appendix D) proposes a 270 foot long, 96”, 8-gage aluminum structural plate culvert at a 0.2 percent slope because it would pass both a 50-year and 100-year design discharge with a headwater depth to culvert diameter (HW/D) ratio less than one.

Fish passage shall be accommodated and structural design would follow the guidelines set forth by the *Memorandum of Agreement* between ADF&G and DOT&PF for the *Design, Permitting, and Construction of Culverts for Fish Passage* (DOT&PF 2025). The Hydrology and Hydraulics study provides additional discussion diagrams and further analysis of a fish passage, which is available in Appendix D.

Safety and Airport Resiliency

Alternative 2 (Shift & Raise) would provide safety and reliability for the community. By shifting the airport 340 feet and raising the edge of the embankment to 19.5 feet above the MHHW and NAVD to protect the airport from forecasted floods and erosion and increase airport resiliency. (An elevation of 19.5 feet, with approximately 6 – 8 feet of material fill, and erosion mitigation at the edge of the embankment was selected to provide 1 foot of freeboard above the forecasted flood level of 18.5 feet above MHHW. The actual runway elevation would be higher, since the center of the runway is designed higher than the embankment edge. To ensure the runway center is sufficiently higher, DOT&PF recommended height is 19.5 feet above MHHW based best on professional judgement. Please see the HDR Coastal Report (Appendix C) and the Hydrology and Hydraulics Report (Appendix D) for complete analysis.

The fog and visibility characteristics would match the current airport and be favorable (only 0.3% of the time less than 0.5 miles).

Wind coverage is known at 90.4%, below the recommended 95%, but more certain than other alternatives.

The area of the alternative that requires new development is considered poor geology because it is comprised of wetlands. This area is limited to the extension of the current infrastructure though, which was also constructed on similar poor geology.

There would be penetrations to Part 77 surfaces including the hills to the south of the runway.

Land Status

This alternative requires land acquisition for the RPZ. This acquisition would need to be negotiated with local and regional native corporations, at an estimated price of $17,000. The current Airport Layout Plan Property Map (Appendix G) includes planned property acquisition for Parcel 4, that would be required for this alternative. Parcel 4 was initially anticipated for a runway extension, which is no longer supported by the critical aircraft.

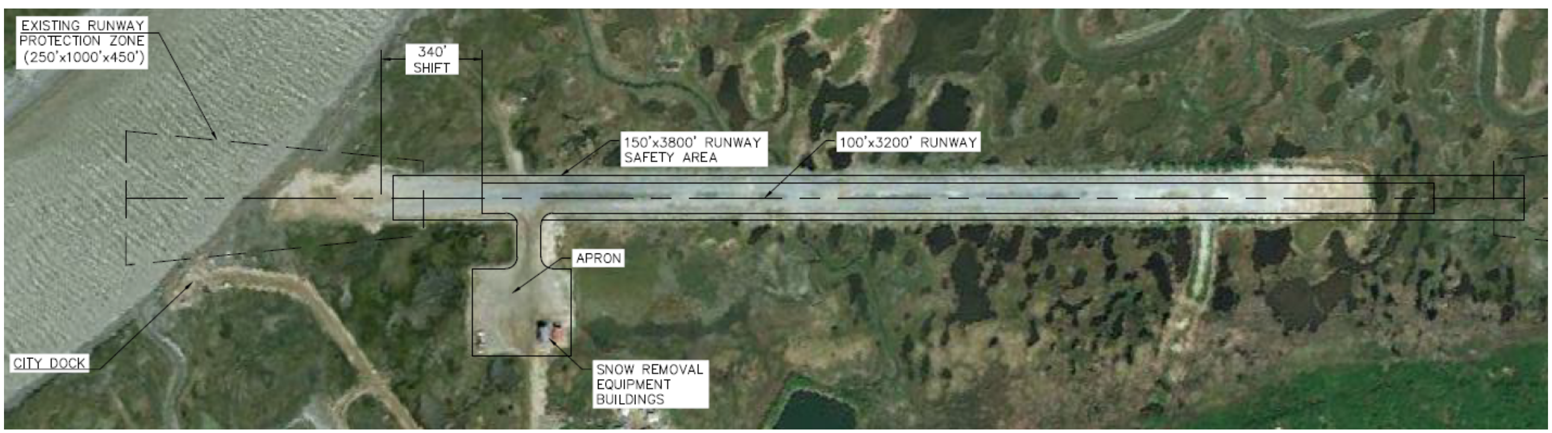
Members of the public asked about whether the “Shift & Raise” alternative may allow a portion of the land to be sold. However, it is likely that DOT&PF, FAA, and the community will need to coordinate a land use authorization and avigation easement over the RPZ. The FAA is unlikely to authorize disposal of airport property due to potential shifts in the size of the RPZ. Figure 3-18 depicts the protected land for the existing runway and the “Shift & Raise” alternative. Protecting the land along the approach and departure of the runway is an important safety measure for low flying aircraft, passengers, and the public on the ground. The “Shift & Raise” alternative would expand and shift the protected land to meet current safety standards. Both the “No Action” and the “Shift & Raise” alternatives would discourage the vertical improvement and/or sale of land from the airport to other parties due to these safety concerns. Improvements that don’t involve safety concerns can be investigated on an individual basis.

Environmental

Environmental and subsistence concerns are the least, except for the No Action alternative. Public access convenience is very high due to the close proximity to the community and that much of the construction will be on previously disturbed ground. Alternative 2 (Shift & Raise) takes advantage of existing infrastructure, but some new infrastructure is required for the extended runway. This would include filling wetlands, converting habitats that may support wildlife (such as birds), and development of areas that may be used for subsistence use.

Figure 3-18 Protected land adjacent to the Kun River

Existing Runway (above)



Alternative 2: Shift & Raise

Cultural Resources

Scammon Bay is a Yup'ik community that has been settled over one hundred years. Based on a review of the AHRS data for Scammon Bay, cultural resources are reported within the vicinity of the current airport and the entire village of Scammon Bay. These cultural resources could be adversely impacted development under this alternative. Additional consultation with the local community, literature review, and cultural resource surveys would be needed to verify the location and types of cultural resources there and determine necessary mitigation efforts. Please see the DOT&PF PD&E Cultural Resource Evaluation (Appendix H) for more in-depth review of cultural resources. A NHPA Section 106 process and NEPA process would be required as part of any Design project that would occur on or around the existing airport.

Constructability

Constructability is a challenge for the alternative. Construction may take up to four years for Alternative 2 (Shift & Raise). For reference, construction on the Atmautluak and Kasigluk projects took approximately 2 seasons to resurface the runways and safety areas with 9 inches of fill. Due to the need for additional technical studies, NEPA, and design, it is unlikely that construction would begin before 2030.

Air service to the community cannot be shut down for extended periods of time since the Airport is the community's connection to medical facilities and other essential services. The community relies on the airport as a reliable means of transportation. There are no other all-season non-aviation means of connecting to the medical care available in Bethel. Medevac operations could be supported via helicopter from Bethel, but the distance between Scammon Bay and Bethel makes this mode of transport undesirable.

If airport improvements do not incorporate implementation plans to provide for operations with acceptable alternatives to the FAA, the airport will be required to close during the duration of construction according to FAA AC 150/5370-2G, Operational Safety on Airports During Construction.

Replacement of the culvert will require shutting the runway down for a period of time, to excavate, replace the existing culvert, and replace the required fill. This time could be minimized through staging of materials, and preparation to work 24 hours a day during the culvert replacement.

As a result, the project would conduct airport improvements in a manner that does not close the airport for extended periods of time. More detailed design and engineering analysis is required to evaluate feasible construction methods. Some alternatives may include:

- **Temporary Runway Closures:** The contractor could have set periods of time to close the Airport and do sequential lifts of the runway. These can be alternated with periods of the Airport being open, during which the contractor can create the material needed for the next lift.
- **Long, gradual night fills:** Another strategy could include placing fill at night, with the runway reopening during the day to allow flights. The grade transitions would be kept below 3%, and the contactor would feather the grade out longitudinally along the runway so there is no bump in the runway. Project phasing would focus on raising the runway grade incrementally, lift by lift, in the first phase. Once the runway work is completed, then the second phase would concentrate on filling the RSA to grade. This would require the use of a quality source of material, which can support aircraft operations during construction. DOT&PF has had to overcome similar construction challenges for other similar communities, where we have had to keep the runway operational including at Atmautluak, Kasigluk, and Nunapitchuk. The Kasigluk and Atmautluak airport improvement projects were recently completed for Alaska DOT&PF to resurface the runways with crushed aggregate surface course and to correct grades issues on the runways.
- **Halfwidth Operations:** These operations would be difficult given the narrow dimensions of the runway and significant elevation increase. In Alaska, implementation of half-width runway operations for airports undergoing construction projects are considered by the FAA on a case-by-case basis. Half-width runway operations are governed by guidance issued by the FAA (2012) in response to the following questions:
    - Does the airport have another runway with sufficient capability?
        - No for Scammon Bay.
    - Does the Airport have a taxiway of sufficient length and configuration to be used as a temporary runway?
        - No for Scammon Bay.
    - Are there any other viable transportation modes available (year-round road or frequent ferries)?
        - No for Scammon Bay.

  If the answer is no to all three questions, alternative strategies are generally warranted. If the answer is yes to any of the questions, further considerations (below) are required to determine if half-width operations are an acceptable means to maintaining airport operations.

    - Does closing the runway have unacceptable impacts on the community?

    - Yes, this is the primary mode of transportation in and out of the community as well as for the delivery of goods to the city.
  - Can emergency medevac flights be accommodated?
    - Medevac operations could be handled by helicopter but the distance from Bethel can severely limit these operations.
  - Are there published terminal procedures or Required Navigation Performance (RNP) procedures that would be impacted?
    - Scammon Bay has Localizer Precision (LP) Area Navigation (RNAV) procedures for both RW 11 and RW 29.

If Alternative 2 (Shift & Raise) was selected as the preferred Alternative under the Phase II reconnaissance study, the design process for the initial construction project would resume. All design documents and calculations would be compliant with AC 150-5300 13B (2022) for Airport Design, including transverse grade requirements, in the runway, Runways Safety Area (RSA), the Runway Object Free Area (ROFA) to ensure wingtip clearance and aircraft safety consistent with FAA requirements, particularly in the event of aircraft excursions from the runway.

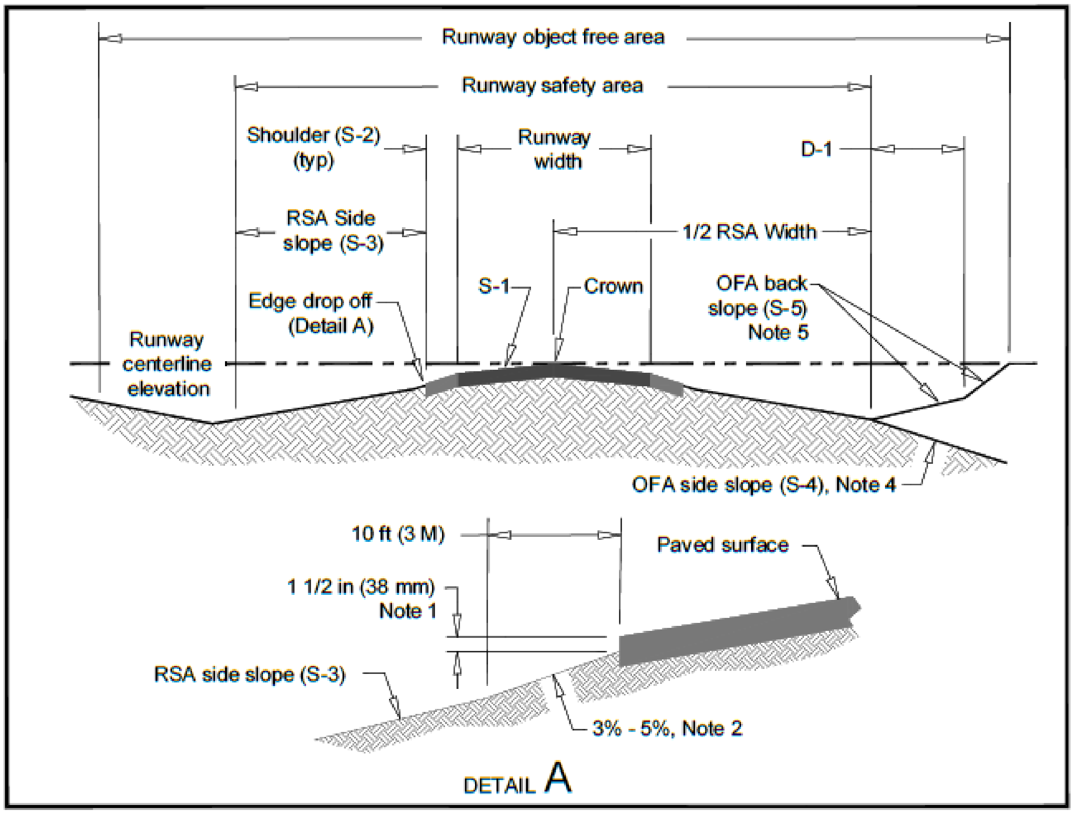


Figure 3-19 AC 150/5300-13B Transverse Grade Limitations

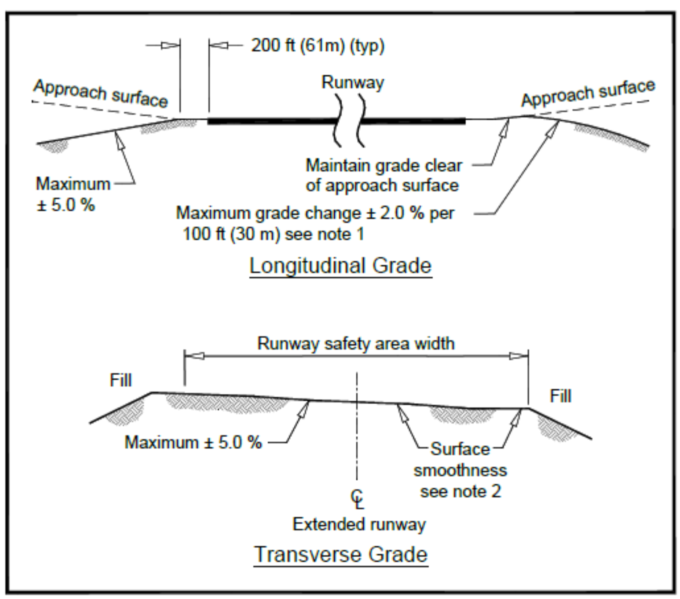


Figure 3-20 AC 150/5300-13B RSA Grade Limitations Beyond 200 feet (61 m) from the Runway End

If the FAA concurs that half-width operations are warranted, the runway embankment will be split into halves. Grade raises would need to be limited to about 6 inches, and 3% differences. The portion of the runway to be in operation in off-work periods will be required to have temporary runway lights. Further analysis of construction phasing for feasibility will occur during the Phase II study, including identifying which navigational aids (NAVAIDs) can remain in service during construction.

At 75 feet wide, Scammon Bay is a relatively narrow runway to accommodate safe half-width operations. This would require pilots to land on a narrow 37.5-foot-wide runway next to a raised embankment during the first phase of work. Additionally, the crosswinds would leave little margin of safety for aircraft operations. A disadvantage to the half-width runway strategy is that flights would be restricted to good visibility and wind conditions.

If required, the runway could be widened, allowing half-width operations and simultaneous construction. Elevation grades would need to be controlled, because steep embankments are not allowed immediately adjacent to active runways. Although design was beyond the scope of this Phase I feasibility study, diagrams of recommended runway improvements consistent with Alternative 2 (Shift & Raise) can be found in the HDR Coastal Report (Appendix C).

Connection to community infrastructure

The taxiway and apron would have to be raised and graded to tie into the community infrastructure. The existing taxiway could likely be widened in 1 night. The apron could be split in half for construction to occur in shifts. The grade of the access road would be raised gradually to meet the airport operational surfaces and meet surrounding community infrastructure. These improvements would occur in phases and there may be short period of time when the access road connection has a dip or hump that would necessitate slower traffic speeds.

Floodplain

Although much of the airport location would remain within the floodplain, this alternative would shift the runway and raise the elevation of the operational surfaces above the floodplain. Based on the analysis of the HDR Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D), this alternative would meet or exceed the 50-year floodplain requirement and ensure AIP minimum useful life and grant assurance requirements are met. Construction may be impacted by flooding.

Hydrology / Geology

Based on the information from the HDR reports, the increased elevation of the airport and drainage improvements should not adversely impact adjacent landowners. The HDR Hydrology and Hydraulics Report (2022) states a project consistent with Alternative 2 would not alter the 100-year floodplain. The increased elevation would be to at least 19.5 North American Vertical Datum (NAVD), not an additional 19.5 feet of materials.

Water Displacement and Mitigation

The elevation of the runway would be raised above the flood zone but is not expected to cause increased water displacement around the new runway any more significantly than current conditions. The final proposed culvert width was 96" diameter in the HDR Hydrology and Hydraulics Report (2022), page 18 for a 100-year design. Although 72" was sufficient, the report determined the cost for the larger culvert was negligible. Water displacement is less clear for Alternative 3 (Near). Water displacement will be less of a concern for Alternative 4 (Castle Hill) and Alternative 5 (Ridgeline).

Potential for Flood Deterioration

The Hydrology & Hydraulics Report (Appendix D) based estimations on a 100-year flood analysis for this alternative. The HDR Coastal Report (2022) (Appendix C) describes the coastal modeling for the project. It assumes a 50-year design life for the modeling of the sea level rise of the runway, which would meet the FAA grant assurance requirements.

The HDR report does provide a table of Storm Surge Probability of Occurring at Least One Time over the Project Life Duration (Table 3-3). The report does not provide a deterioration rate of the armor rock.

Table 3-3 Storm Surge Probability of Occurring at Least One Time over the Project Life Duration

Project Life Duration (years)	50-Year Storm Surge (2% AEP)	100-Year Storm Surge (1% AEP)
25	40%	22%
30	45%	26%
50	64%	40%
75	78%	53%
100	86%	63%

Geotechnical Investigations

Geotechnical investigations are required to design the fill and armoring in the current locations. These are planned for the next phase of the study. These results will allow more accurate characterization of the geotechnical conditions and required engineering design.

The useful life of infrastructure in the Yukon-Kuskokwim Region is difficult to estimate because many communities are located in coastal and riverine areas, wetlands, and permafrost. The soil in those types of topography are typically difficult for construction due to erosion, subsidence, and frost heave.

Climate change and rising water levels are impacting many communities in the Yukon-Kuskokwim Region and coastal Alaska. The recommendations in this study are based on available analysis from the 2022 HDR Coastal Analysis (Appendix C) and Hydrology and Hydraulics reports (Appendix D).

Materials

Required quantities of material are relatively low for the airport improvements, but high for the erosion protection, including riprap materials.

The source of erosion protection materials is unknown. Barging in armor stone is very expensive, and field verified geotechnical studies haven't been conducted yet. The potential exists that local material sources could be used to develop the required erosion protection material, or their functional equivalents. This deserves additional analysis to refine the costs.

A strategy that could be deployed to protect the airport from flooding during construction is to harden the existing embankment with riprap/armor stone under the first phase of construction. This would entail initially widening the RSA embankment to accommodate the raise and placing the riprap.

Under this alternative, materials may not have to be hauled on the community's gravel roads. Trucking of materials in community residential areas can be a concern in small communities. Haul trucks pose a safety and aesthetics impact to the community and increase dust. These impacts differ for barged material and locally developed material depending on the source location. Barged material would require limited trucking in the community since the alternative is very close to the river barge landing. Locally developed material sources east of town would have the potential to increase trucking in the community as they haul material to the airport. These impacts would be reduced if the haul route along the eastern side of the runway is reopened – allowing trucks to avoid trips through town.

Public Opinion

Public support for this alternative was received. A tri-party community resolution was passed by the City of Scammon Bay, Native Village of Scammon Bay, and Askinuk Corporation in support of Alternative 2 on February 24, 2025. The Calista Corporation also submitted a letter of support for Alternative 2 on March 26, 2025.

During the public meeting, the local stakeholders vocalized support for land acquisition for this alternative as well. All residents who spoke at the public preferred this alternative. Stakeholders repeatably stated the other alternatives had inherent weaknesses (detailed in each alternative respectively). This alternative was discussed as having the best airport safety, operations, land status, environmental, maintenance, and convenience to local stakeholders.

Cost

The cost for Alternative 2 (Shift & Raise) is high, because it requires the construction a runway extension and erosion protection (due to its low elevation). The cost for this alternative is estimated to be $75,656,172 for the option using local material, and $130,444,801 for the option using barged material.

Available Engineering Analysis

This alternative was previously evaluated by DOT&PF through HDR, Inc. A Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D) were completed in December 2022, initially as part of a pending construction project. Based on the findings and recommendations studies, this alternative is constructable. However, due to the significant cost, the project was paused for further evaluation, which led to the current study.

Based on the information from the HDR reports, the increased elevation of the airport and drainage improvements should not adversely impact adjacent landowners. The Hydrology & Hydraulics Report (2022) is based estimations on a 100-year flood analysis. It states a project consistent with Alternative 2 (Shift & Raise) would not alter the 100-year floodplain.

The HDR Coastal Report (2022) describes the coastal modeling for a project consistent with Alternative 2 (Shift & Raise). It assumes a 50-year design life for the modeling of the sea level rise of the runway, which would meet the FAA grant assurance requirements.

The recommendations in the HDR reports and associated cost estimates provide in-depth information related to this alternative. The Hydrology Report indicates at least a 72" Diameter Culvert on page 13 based on a 100-year model but recommends a 96” diameter culvert on pages 13 and 18. The Coastal Report provide the following recommendations on pages 31 – 32:

1. To reduce potential for flood inundation, damage from current flow due to breaching, and damage from flooding and wave overtopping, it is recommended to increase the elevation of the Airport Surfaces. For a 2 percent AEP, an elevation of +18.5 feet NAVD88 is recommended in the HDR Coastal Report (Appendix C). However, to ensure the runway height is sufficiently higher than the MHHW for more than 50 years, DOT&PF engineers recommend 19.5 feet above the MHHW based on 1 foot freeboard and best professional practices.

2. Relocating the runway along its current alignment at 340 feet is recommended for a project life duration of 50 years.

3. Erosion protection (armor rock revetment or marine mattress) is recommended around the perimeter of the runway, taxiway, and access road is recommended to mitigate potential erosion and scour due to waves and currents during a flood event.

4. In areas expected to sustain larger wave condition, a section with a toe designed for moderate to severe scour is recommended.

5. Different sections that utilize smaller typical sections should be considered in areas of the airport perimeter that experience smaller wave action.

6. Erosion protection utilizing marine mattresses (or other alternatives to armor rock revetment) should be given consideration, given the infrequent and moderate wave conditions expected to reduce overall construction cost.

3.4 Alternative 3 (Near)

Alternative 3 (Near) would construct a new airport on the transitional area between lowlands and the Askinuk Mountains, near the community of Scammon Bay. A new airport access road, approximately two miles long would need to be constructed. This alternative would require building the Airport embankment edge to +19.5 feet elevation (to provide 1 foot of freeboard above the forecasted flood level of 18.5 feet) and installing the embankment armor. The existing airport would be closed after the construction of the new airport and access road.

Safety and Airport Resiliency

Alternative 3 (Near) provides safety and reliability for the community in a similar manner as Alternative 2 (Shift & Raise), by building the RSA embankment edge up to an elevation of 19.5 feet and installing the embankment armor. This alternative would include an entirely new runway rather than strengthen an existing embankment.

The fog and visibility characteristics and wind characteristics are unknown for this alternative. The V3 Energy (2017) report provides some insights, indicating winds may predominate cross runway but was taken at a higher elevation, and so the local accuracy is unknown. The local topography likely has a large impact on weather.

This alternative does not increase resiliency because it would require new development of an airport and access road in an area of poor geology, similar to the existing airport. The airport access road would be difficult to maintain during inclement weather conditions; heavy rain or snowfall. Flooding may impact the lighting system and embankment.

There would be penetrations to Part 77 surfaces including the hills to the south of the runway and Castle Hill, which would restrict pilot navigation under this alternative.

Additionally, there is a strong correlation between the level of vandalism at a rural airport and its distance from the local community. Airports near the community are less likely to be vandalized. Replacement of lights, cones, and markers over time adds significant costs to overall airport maintenance.

Land Status

This alternative requires acquisition of land for the access road and airport. The current airport may be available for land exchange with the local community after the current airport is closed. This alternative has a relatively short access road off of the existing public access road, minimizing the land acquisition hurdles. However, the project may face delays or cancellation if the landowners and community do not support this alternative.

Environmental

Environmental and subsistence concerns are the least of the relocation alternatives, because less new land would be disturbed for an access road. However, this alternative would require new infrastructure, including filling wetlands, converting habitat that may support wildlife (such as birds), and development of areas that may be used for subsistence use. The level of public access convenience is medium compared to the other relocation alternatives because the distance is less than three miles from the community.

Cultural Resources

Scammon Bay is a Yup'ik community that has been settled over one hundred years. Based on a review of the AHRS data for Scammon Bay, there are no recorded cultural resources within the vicinity of this Alternative. It is unknown whether there may be adversely impacted cultural resources. Additional consultation with the local community, literature review, and cultural resource surveys would be needed to verify the location and types of cultural resources there and determine necessary mitigation efforts. Please see the DOT&PF PD&E Cultural Resource Evaluation (Appendix H) for more in-depth review of cultural resources. A NHPA Section 106 and NEPA process would be required as part of any Design project that would occur on or around the existing airport.

Constructability

Constructability challenges for this alternative focus on the new access road construction and leveling of the site to allow for the transition between the hill and lowland wetlands and material fill for the operating surface embankment. Due to the need for additional technical studies, NEPA, design, and land acquisition it is unlikely that construction would begin before 2032. Construction would take at least two seasons to complete.

Since this alternative would construct a new airport, further away from the community, construction could occur during the day or night and half-width runway operations would not be necessary because the airport would not be put into service until it was completed and inspected.

Utilities would be challenging because they would need to be expanded into the area. Alaska Village Electric Cooperative provides electricity to the city of Scammon Bay.

A new airport access road would need to be constructed primarily across wetlands. After construction, DOT&PF would be required to maintain the airport access road. DOT&PF and their contractors maintain airport access roads using FAA airport equipment. Under FAA Order 5100.38D, airport access road maintenance is only eligible for AIP funding to the nearest non-aeronautical use access point. This means, if a road connection or driveway is constructed off of the airport access road, that portion of the road will no longer be eligible for maintenance using FAA funds. Communities such as Scammon Bay do not typically own local heavy maintenance road equipment or regular road clearing services and would be unable to establish a maintenance agreement for the ineligible portions of the road.

Floodplain

This alternative would relocate the airport entirely within the floodplain. Although the embankment and operational surfaces could be designed and constructed to withstand flooding, the costs are significantly higher than the other alternatives. Construction of a new airport in this location is likely to be more impacted by flooding than the other alternatives.

Hydrology / Geology

No hydrological or coastal erosion studies specific to this alternative have been conducted. The location of this alternative is within the floodplain, similar to the existing airport, and would be expected to experience the same impacts of flooding and erosion as the “No Action” and “Shift & Raise” alternatives.

Water Displacement & Mitigation

This alternative is not expected to cause increased water displacement beyond the amount of the “No Action” alternative because of the distance of the airport site from the community within the flood zone.

Potential Flood Deterioration

Due to the location within the flood zone, this alternative is expected to experience the same level of flooding and deterioration as the “No Action” and “Shift & Raise” alternatives. Since the location is further away from the surrounding highlands, it may be worse.

Geological Investigations

No geotechnical evaluation for this alternative has occurred. This alternative would be constructed on similar geology as the existing airport.

Materials

Required quantities of material are relatively high for this alternative, including riprap materials because the airport would be located in the floodplain.

Trucking impacts differ for differ for barged material and locally developed material. Barged material would require extensive trucking through the community. A haul road may need to be developed to avoid trucking through town. Locally developed material sources would reduce the trucking in the community, since construction traffic could be largely located east of town. Material hauled on the local gravel roads would also destabilize the local road embankment and increase dust.

Public Opinion

Public opinion was against this alternative. No public comments were received in support of this alternative.

During the public meeting, the local stakeholders stated that winds would be very bad for this alternative, as suggested by the V3 Energy study. The stakeholders stated winds flow down the mountain and would be directly crosswind to this runway. Drainage also flows down the mountain in the spring toward this location.

Local stakeholders stated that the wetlands and bodies of water would take far more fill than would be expected, because of poor geotechnical conditions in the lowlands.

Local stakeholders were also concerned about the accessibility of the alternative for community members (who have no vehicles for transportation), and maintenance of the access road. There is no public transportation system or shuttle service available for travel to the airport.

Local stakeholders emphasized that land acquisition or potential land transfer required for this alternative is unlikely, given the lack of community support. If the landowners do not support the project, land acquisition could be delayed due to litigation and may ultimately result in the delay or cancellation of the project or re-evaluation of other alternatives.

Cost

The cost for Alternative 3 (Near) is the highest, because it requires the construction of a new airport, erosion protection (due to its low elevation), and an airport access road, primarily on wetlands. The cost is estimated to be $94,588,701 for the option using local material, and $182,828,675 for the option using barged material. Additional costs would include construction and maintenance of the airport access road, which is subject to local contractor agreements and availability.

Available Engineering Analysis

This alternative has not been evaluated through a formal engineering report by DOT&PF. An additional engineering study would be needed to evaluate relocation of the airport to this site.

3.5 Alternative 4 (Castle Hill)

Alternative 4 (Castle Hill) would construct a new airport on the valley between Castle Hill and the Askinuk Mountains. A new access road of approximately 4 miles long would need to be constructed. The existing airport would be closed after the completion of the new airport.

Safety and Airport Resiliency

Alternative 4 (Castle Hill) addresses potential erosion and flooding by constructing a new Airport at a higher elevation that would be more resilient because it would be protected from impacts of future river erosion or flooding.

The fog and visibility characteristics are more uncertain but is assumed to be between 0.3 – 6.7% below 0.5 miles of visibility (based on the data available from the current Scammon Bay Airport weather observations).

Wind coverage is uncertain. The V3 Energy LLC, (2017) wind rose is from a similar elevation (~200 feet) but was positioned in a pass, and the indicators are for different winds at 10m and 50m heights. Complicating matters, the runway would be placed in a valley, surrounded by hills which may change the direction of wind. A weather station and current wind study would need to be installed to confirm local conditions prior to the selection of this alternative to determine the runway alignment.

Geotechnical conditions are expected to be higher quality than the low-laying wetland areas.

A new airport access road, over 4 miles long, would need to be constructed. The airport access road would be difficult to maintain during inclement weather conditions such as heavy rain or snowfall. There isn’t an example of an airport access road this long being successfully maintained in other similar communities in Alaska. Inclement weather conditions may impact access to the airport alternative being unusable during the winter.

After construction, DOT&PF would be required to maintain the airport access road. DOT&PF and their contractors maintain airport access roads using FAA airport equipment. Under FAA Order 5100.38D, airport access road maintenance is only eligible for AIP funding to the nearest non-aeronautical use access point. This means, if a road connection or driveway is constructed off of the airport access road, that portion of the road will no longer be eligible for maintenance using FAA funds. Communities such as Scammon Bay do not typically own local heavy maintenance road equipment or regular road clearing services and would be unable to establish a maintenance agreement for the ineligible portions of the road.

Penetrations to Part 77 surfaces include the hills to the south of the runway and Castle Hill, which restricts the freedom of pilots to navigate to this alternative.

Additionally, there is a strong correlation between the level of vandalism at a rural airport and its distance from the local community. Airports near the community are less likely to be vandalized. Replacement of lights, cones, and markers over time adds significant costs to overall airport maintenance.

Land Status

This alternative requires land acquisition similar to Alternative 3 (Near). Acquisition would need to be negotiated with local and regional native corporations.

Environmental

Potential environmental and subsistence concerns are mixed for this alternative. Wetland impacts are potentially lower than Alternative 3 (Near), due to the favorable topography and elevation. Subsistence and wildlife impacts may be increased due to the larger overall footprint of disturbance. Public access convenience is low for this alternative. It is not close to the community and would require travel by vehicle to the Airport. Residents would be unlikely to see or hear airport activity, making timing of arrivals and departures more difficult. Drainage channels would be constructed as appropriate and it is assumed to be included in the 25% design contingency fee estimate.

Cultural Resources

Scammon Bay is a Yup’ik community that has been settled over one hundred years. Based on a review of the AHRS data for Scammon Bay, there are no recorded cultural resources within the vicinity of this Alternative. It is unknown whether there may be adversely impacted cultural resources. Elevated areas have an increased likelihood for hosting cultural resources, so this alternative may have undiscovered cultural resources. Additional consultation with the local community, literature review, and cultural resource surveys would be needed to verify the location and types of cultural resources there and determine necessary mitigation efforts. Please see the DOT&PF PD&E Cultural Resource Evaluation (Appendix H) for more in-depth review of cultural resources. A NHPA Section 106 and NEPA process would be required as part of any Design project that would occur on or around the existing airport.

Constructability

Constructability challenges for this alternative focus on the longer distance from the community, requiring improvements in access roads and new infrastructure. Due to the need for additional technical studies, NEPA, and design, it is unlikely that construction would begin before 2032. Construction would take at least two seasons to complete.

Since this alternative would construct a new airport, further away from the community, construction could occur during the day or night and half-width runway operations would not be necessary because the airport would not be put into service until it was completed and inspected.

Utilities would be challenging because they would need to be expanded into the area. Alaska Village Electric Cooperative provides electricity to the city of Scammon Bay.

A new access road would need to be constructed and maintained that may be over 4 miles in length and could impact local creeks and streams. Small bridges and culverts may be needed. The road would also be subject to spring thaw runoff and potentially wash out in some areas and difficult to maintain in the winter.

Floodplain

This alternative would relocate the airport above the floodplain. Construction of a new airport in this location is less likely to be impacted by flooding than Alternatives 1, 2, and 3. Additional floodplain analysis would be required to fully analyze potential flooding impacts on design and construction.

Hydrology / Geology

No hydrological or coastal erosion studies specific to this alternative have been conducted. The location of this alternative is above the floodplain so impacts from erosion and flooding are expected to be less than Alternatives 1 (No Action), Alternative 2 (Shift & Raise), and Alternative 3 (Near).

Water Displacement & Mitigation

This alternative is not expected to cause increased water displacement because it is located above the flood zone over four miles from the community.

Potential Flood Deterioration

This alternative is not expected to experience flood deterioration because it would be located above the flood zone.

Geological Investigations

No geotechnical evaluation for this alternative has occurred. This alternative would be constructed above the flood zone so the soil and geology may be more stable. Further analysis is needed to determine the geological composition of the site.

Materials

This alternative avoids the need for erosion protection materials; but still requires significant materials to build the access road and new airport.

Similar to other alternatives, there is a difference in the potential impacts from barged material and local material. Local material sources are likely available to be developed near the alternative, which reduces the cost and impact to the community.

Barged material and equipment would need to travel through the community, which is a potential safety hazard and negative community impact. Material hauled on the local gravel roads would also destabilize the local road embankment and increase dust. A haul road may need to be constructed around the community.

Public Opinion

Public opinion was against this alternative. No comments were received in support of this alternative.

At the public meeting, the local stakeholders stated that winds would be bad for this alternative, and that the winds are funneled by the topography to the north side, resulting in a lot of turbulence, wind shear, and cross winds at this location. The only alternative with worse winds would be the Ridgeline Alternative.

Local stakeholders were also concerned about the accessibility of the alternative for community members (who have no vehicles for transportation), and maintenance of the access road. There is no public transportation system or shuttle service available for travel to the airport.

Local stakeholders emphasized that the land acquisition or land transfer required for this alternative is unlikely, given the lack of community support. If the landowners do not support the project, land acquisition could be delayed due to litigation and may ultimately result in the delay or cancellation of the project or re-evaluation of other alternatives.

Cost

The cost for Alternative 4 is high because of the long new access road and the construction of a new airport. Prior to selecting this particular location on Castle Hill, other locations were evaluated around Castle Hill, and all of them have high degrees of topography change. The best location was selected and is situated in a flat pass between Castle Hill and the Askinuk Mountains. The cost is estimated to be $66,714,222 for the option using local material, and $126,997,026 for the option using barged material. Additional costs would include construction and maintenance of the airport access road, which is subject to local contractor agreements and availability.

Available Engineering Analysis

This alternative has not been evaluated through a formal engineering report by DOT&PF. An additional engineering study would be needed to evaluate relocation of the airport to this site.

3.6 Alternative 5 (Ridgeline)

Alternative 5 (Ridgeline) would construct a new Airport on the ridgeline south of Scammon Bay in the Askinuk Mountains. A 6-mile airport access road would also need to be constructed. The existing airport would be closed after the completion of the new airport.

Safety and Airport Resiliency

Alternative 5 (Ridgeline) addresses lowland riverine erosion and flooding by moving the Airport to the top of the Askinuk Mountains. Although the airport would be at a higher elevation and more resilient to erosion and flooding, the overall weather conditions may make this airport less reliable than the other alternatives.

The impact of weather on airport operations is the most uncertain for this alternative. The V3 Energy LLC wind studies indicate winds come from the north (rather than the east) and are at a higher velocity than the existing airport. This requires rotation of the runway. A current wind study will be required to determine the best runway alignment. Runway alignment to provide wind coverage is particularly important for this alternative, because the winds run opposite to the topography, so that even small alignment shifts requiring large additional costs in materials to compensate for the steep hillside.

Fog and visibility also appear to be worse for this alternative, with up to 17% of the time being below 0.5 miles, as estimated from the current Scammon Bay airport weather data.

Geology for this alternative is expected to be favorable.

A new airport access road, over 4 miles long, would need to be constructed. The airport access road would be difficult to maintain during inclement weather conditions such as heavy rain or snowfall. There isn't an example of an airport access road this long being successfully maintained in other similar communities in Alaska. Inclement weather conditions may impact access to the airport alternative being unusable during the winter.

After construction, DOT&PF would be required to maintain the airport access road. DOT&PF and their contractors maintain airport access roads using FAA airport equipment. Under FAA Order 5100.38D, airport access road maintenance is only eligible for AIP funding to the nearest non-aeronautical use access point. This means, if a road connection or driveway is constructed off of the airport access road, that portion of the road will no longer be eligible for maintenance using FAA funds. Communities such as Scammon Bay do not typically own local heavy maintenance road equipment or regular road clearing services and would be unable to establish a maintenance agreement for the ineligible portions of the road.

Penetrations to Part 77 surfaces include the peaks to the southwest of the runway.

Additionally, there is a strong correlation between the level of vandalism at a rural airport and its distance from the local community. Airports near the community are less likely to be vandalized. Replacement of lights, cones, and markers over time adds significant costs to overall airport maintenance.

Land Status

This alternative requires land acquisition, including improvements of the access road, and construction of an extension of the access road, including acquisition of title for these improvements. These would need to be negotiated with local and regional native corporations.

The access road will also need to be to be regularly maintained, which has proven to be a large burden for other communities with small populations.

Environmental

Potential environmental and subsistence concerns are mixed for this alternative. Preliminary indications of wetlands impacts are less than Alternative 3 (Near) and 4 (Castle Hill) but the mapping is of low quality in this area. Subsistence and wildlife impacts may be increased due to the use of the ridgelines for subsistence activities. Public access convenience is very low for this alternative. It is not close to the community and would require travel up to the ridgelines. Access in winter would be particularly difficult and require road maintenance that may not be feasible with current local maintenance. This could result in an airport that is not useable for the local community.

Cultural Resources

Scammon Bay is a Yup'ik community that has been settled over one hundred years. Based on a review of the AHRS data for Scammon Bay, there are no recorded cultural resources within the vicinity of this Alternative. It is unknown whether there may be adversely impacted cultural resources. Elevated areas have an increased likelihood for hosting cultural resources, so this alternative may have undiscovered cultural resources. This is supported by the subsistence mapping, which reports using ridgelines for spotting seals. This activity can lead to high levels of cultural resources since the same locations have often been used to spot marine mammals for generations. Additional consultation with the local community, literature review, and cultural resource surveys are needed to verify the location and types of cultural resources there and determine necessary mitigation efforts. Please see the DOT&PF PD&E Cultural Resource Evaluation (Appendix H) for more in-depth review of cultural resources. A NHPA Section 106 and NEPA process would be required as part of any Design project that would occur on or around the existing airport.

Constructability

Constructability challenges are focused on the long distance from the community. Access roads, utilities, and new infrastructure will be required. Due to the need for additional technical studies, NEPA, and design, it is unlikely that construction would begin before 2032. Construction would take at least two seasons to complete.

Since this alternative would construct a new airport, further away from the community, construction could occur during the day or night and half-width runway operations would not be necessary because the airport would not be put into service until it was completed and inspected.

Utilities would be challenging because they would need to be expanded into the area. Alaska Village Electric Cooperative provides electricity to the city of Scammon Bay.

A new access road would need to be constructed and maintained that may be over 6 miles in length and could impact local creeks and streams. Small bridges and culverts may be needed. The road would also be subject to spring thaw runoff and potentially wash out in some areas and difficult to maintain in the winter.

Floodplain

This alternative would relocate the airport above the floodplain. Construction of a new airport in this location is less likely to be impacted by flooding than Alternatives 1, 2, and 3. Additional floodplain analysis would be required to fully analyze potential flooding impacts on design and construction.

Hydrology / Geology

No hydrological or coastal erosion studies specific to this alternative have been conducted. The location of this alternative is above the floodplain so impacts from erosion and flooding are expected to be less than Alternatives 1 (No Action), Alternative 2 (Shift & Raise), and Alternative 3 (Near).

Water Displacement & Mitigation

This alternative is not expected to cause increased water displacement because it is located above the flood zone over six miles from the community.

Potential Flood Deterioration

This alternative is not expected to experience flood deterioration because it would be located above the flood zone. However, it may be impacted by to spring runoff from the surrounding mountains.

Geological Investigations

No geotechnical evaluation for this alternative has occurred. This alternative would be constructed above the flood zone so the soil and geology may be more stable. Further analysis is needed to determine the geological composition of the site.

Materials

This alternative avoids the need for erosion protection materials; but requires a lot of material to build the access road and new airport.

Similar to other alternatives, there is a difference in the potential impacts from barged material and local material. Local material sources are likely available to be developed near the alternative, which reduces the cost and impacts to the community.

Barged material and equipment would need to travel through the community, which is a potential safety hazard and negative community impact. Material hauled on the local gravel roads would also destabilize the local road embankment and increase dust. A new haul road may need to be constructed around the community.

Public Opinion

Public opinion was strongly against this alternative.

The local stakeholders stated that winds would be bad for this alternative. The winds have lots of turbulence and high speeds in this area.

At the public meeting, a local resident spoke of his experience maintaining the telecommunication tower near this alternative. He stated that he maintains this telecommunication tower, and many other towers in communities throughout the region, and the Scammon Bay tower experiences the most wind damage because the winds are so bad. He stated that the warm sea air and cold land air mix, creating bad winds and bad visibility.

Local stakeholders stated the visibility is the worst on the ridgelines. They stated that while the valley bottoms are often clear, the ridgelines are often filled with fog and clouds.

Local stakeholders were also concerned about the accessibility of the alternative for community members (who have no vehicles for transportation), and maintenance of the access road. There is no public transportation system or shuttle service available for travel to the airport.

Local stakeholders emphasized that the transfer of lands required for this alternative is unlikely, given the lack of community support. If the landowners do not support the project, land acquisition could be delayed due to litigation and may ultimately result in the delay or cancellation of the project or re-evaluation of other alternatives.

Cost

The cost for Alternative 5 (Ridgeline) must balance the uncertainty about wind direction and the excavation and fill required to reshape the topography into a flat runway. The current orientation takes advantage of the natural ridge to minimize cost. The Alternative also requires an extension of the access road. The cost is estimated to be $59,398,368 for the option using local material, and $109,266,097 for the option using barged material. Additional costs would include construction and maintenance of the airport access road, which is subject to local contractor agreements and availability.

Available Engineering Analysis

This alternative has not been evaluated through a formal engineering report by DOT&PF. An additional engineering study would be needed to evaluate relocation of the airport to this site.

3.7 Alternatives Considered and Deemed Not Feasible

Three alternatives were considered at a high level, but rejected from further analysis:

- North of the Kun River: An airport could be constructed on the north side of the Kun River. This alternative was rejected because the extensive lowlands in this area would subject the airport to the same floodwaters threatening the current location. The airport location would require the construction and maintenance of an access road and bridge across the Kun River, which would likely be more expensive than the evaluated relocation alternatives; Alternative 3 (Near), Alternative 4 (Castle Hill) and Alternative 5 (Ridgeline).

- Lowlands South of the Kun River: An airport could be constructed south of the Kun River, in the large wetland complex northeast of the existing community of Scammon Bay. This alternative was rejected because the lowlands would subject the airport to the same floodwaters threatening the current location. In addition, moving the airport from the Kun River does not remove the need to provide costly erosion protection. The erosion modeling (HDR, 2022a) indicated that erosion takes places during flooding at all locations of the airport, not just along the Kun River. This location would also require the construction and maintenance of a new access road.

- Raise: The current airport could be raised and armored, without shifting it away from the Kun River. This alternative would subject the airport embankment to the continued erosion threat and repeated erosion mitigation rehabilitation after heavy flooding events. The primary benefit is that this alternative would not require new land acquisition, airport relocation, or a new access road.

4 ALTERNATIVES SUMMARY

Five alternatives were reviewed that considered maintaining the airport in its current location, shifting the runway and operational surfaces inland, or constructing a new airport further inland. Two of those alternatives, Alternative 1 (No Action) and Alternative 2 (Raise & Shift), were previously evaluated by DOT&PF as part of an airport improvement project that was paused due to funding and viability concerns. Two technical studies were produced by HDR in 2022 that were incorporated into this study: Coastal Report (Appendix C) and Hydrology and Hydraulics Report (Appendix D). It was beyond the scope of this feasibility study to develop engineering designs and diagrams for the relocation alternatives.

Alternative 1 (No Action) does not address the flooding and erosion threats to the airport. This alternative does not offer operational safety because the airport may be periodically closed due to flooding and repairs. This alternative offers public access convenience and there would be no environmental impact beyond periodic improvements to the existing embankment. This alternative also does not meet FAA standards for wind and widening the runway should be considered.

Based on the information provided in the 2022 HDR Coastal Report and Hydrology and Hydraulics Report, (Appendix C and Appendix D), a "No Action" alternative is not feasible as a long-term solution for the Scammon Bay airport.

Alternative 2 (Shift & Raise) raises and shifts the runway embankment allowing for greater armoring of the runway and shifting the remainder of the runway away from the river.

This alternative offers operational safety, public access convenience, and much of the environmental impact is within the existing footprint of the airport. There are known cultural resources in the AHRS located in the vicinity of this alternative that require further consultation and analysis for adverse effects and mitigation are needed. This alternative requires land acquisition near the current airport that the community provided verbal support for at the public meeting and a community resolution, so there would be a low risk for delays in design and construction related to land acquisition opposition.

Preliminary engineering concepts and diagrams of the runway profile for this alternative can be found in the 2022 HDR Coastal Report and Hydrology and Hydraulics Report, (Appendix C and Appendix D). Based on the information in those reports, this alternative is feasible.

Alternative 3 (Near) requires both erosion protection and construction on poor topography and wetlands, which negatively impacts wind and Part 77 surfaces. This alternative also does not offer the same level of operational safety and public access convenience as Alternative 2 (Shift & Raise). There are no known cultural resources in the AHRS located in the vicinity of this alternative. Further consultation and analysis for adverse impacts and mitigation are needed. This alternative would require land acquisition and construction of a new 2 mile access road, which the landowner and community are opposed to. The acquisition process may delay much needed airport improvements for the community. Maintenance of the access road would be difficult for the community and DOT&PF. The development of engineering diagrams for this alternative were beyond the scope of this Phase I feasibility study. This alternative is not considered feasible.

Alternative 4 (Castle Hill) avoids the cost of erosion protection in Alternative 3 (Near), but it does not offer the same level of operational safety, public access convenience, as Alternative 2 (Shift & Raise), and will cause significant environmental and wetlands disturbance. There are no known cultural resources in the AHRS located in the vicinity of this alternative. However, the location is at a higher elevation and there is a likelihood of cultural resources. Further consultation and analysis for adverse impacts and mitigation are needed. Based on existing wind data, it is unclear what the ultimate runway and crosswind configuration would be for the Castle Hill alternative. This alternative would require land acquisition and construction of a new 4 mile access road, which the landowner and community are opposed to. The acquisition process may delay much needed airport improvements for the community, if not result in cancellation. Maintenance of the access road would be difficult for the community and DOT&PF. The development of engineering diagrams for this alternative were beyond the scope of this Phase I feasibility study. This alternative may be considered feasible if additional studies demonstrate the further support this alternative and public support is provided.

Alternative 5 (Ridgeline) has the lowest cost estimate because it does not require the additional flooding and erosion protection of lowland alternatives. Due to lack of data for wind and visibility, this may be the least feasible option, or most uncertain. It is unclear what the ultimate runway and crosswind configuration would be for the Ridgeline alternative. Installation of a weather station and further analysis would be needed to determine the feasibility of this alternative. If the alignment is significantly different, the cost of excavation and fill will increase and potentially eliminate the overall cost savings.

Alternative 5 (Ridgeline) would not allow for public access convenience and would cause significant environmental impact. There are no known cultural resources in the AHRS located in the vicinity of this alternative. However, the location is at a higher elevation and there is a likelihood of cultural resources. Further consultation and analysis for adverse impacts and mitigation are needed. This alternative would require land acquisition and construction of a new 6 mile access road, which the landowner and community are opposed to. The acquisition process may delay much needed airport improvements for the community. Maintenance of the access road would be difficult for the community and DOT&PF. The development of engineering diagrams for this alternative were beyond the scope of this Phase I feasibility study. This alternative is unlikely to be feasible due the distance from the community and significant environmental impact.

4.1 Preferred Alternative

DOT&PF recommends Alternative 2 (Shift & Raise) as the preferred alternative based on this Phase I feasibility study because it provides the best combination of operational safety, public access convenience, and limited environmental impacts than the other alternatives, other than the "No Action" alternative. The "Shift & Raise" alternative has preliminary coastal and hydrology analysis and design recommendations completed.

This alternative is also the only one with a practicable land acquisition based on verbal support during the public meeting. The community passed a tri-party resolution in support of this alternative. The Calista Corporation also submitted a letter of support for this alternative. This support may allow for project design and construction to begin without undue delay. This alternative's cost can be better estimated with the results from future geotechnical studies for local material sources.

DOT&PF believes the importance of community and landowner support cannot be underestimated. DOT&PF needs cooperation and permission from the potentially impacted landowners to gain access to their private land for cultural resource information, wind studies, and geotechnical studies. There have been many examples of rural construction projects that were delayed or ultimately cancelled due to landowner resistance and lack of public support. Landowner resistance may also result in litigation and condemnation, leading to community resentment. Some examples of land acquisition issues delaying or cancelling a project include the Stony River Airport Relocation, Bethel Tundra Ridge Road, Kwigillingok Runway Shift Project, and the Port Graham/Nanwalek Airport Improvement Project.

Alternative 2 (Shift & Raise) has been formally evaluated by DOT&PF and was in the Design phase, but was paused due to funding concerns, and led to this Phase 1 feasibility study. The Design and Environmental process could be completed within three to five years. Additional Right of Way analysis would also be required for the community housing and community utility (fueling, wastewater treatment) due to increased edge of airport. Additional public involvement will also be required, including cultural resource consultation and review, consistent with the NHPA Section 106 and NEPA process. A life cycle cost analysis would need to be developed under a Phase II study or during the Design Phase.

The relocation alternatives would require additional multi-year technical studies prior to beginning the Design and Environmental phases, followed by contentious land acquisition, which could delay much needed airport improvements for Scammon Bay indefinitely.

4.2 Alternatives Selected for Analysis under the Phase II Reconnaissance Study

The primary goal of this federally funded Phase I feasibility study was to evaluate the feasibility of maintaining the airport in its current location, shifting the runway and operational surfaces inland, or constructing a new airport further inland. Based on this analysis, DOT&PF selected the "Shift & Raise" alternative as the preferred alternative. However, additional in-depth analysis is needed to make a final determination due to the high cost and potential environmental risks associated with each alternative evaluated under this study. Federally funded studies are required to evaluate a reasonable range of alternatives when assessing the potential environmental impacts and costs of proposed projects.

Three potentially feasible alternatives were selected for in-depth analysis under a Phase II reconnaissance study: Alternative 1 (No Action), Alternative 2 (Shift & Raise), and Alternative 4 (Castle Hill).

Alternative 1 (No Action) was selected because FAA advised that under a NEPA process, a "No Action" alternative must be analyzed and compared to "Action" alternatives. Based on DOT&PF's findings of this feasibility study, this alternative does not meet the safety and airport resiliency needs for the community though because flooding will not be mitigated and repeated construction projects will be necessary based on this study. A life cycle cost analysis, construction phasing, and cultural resource information will be necessary to further evaluate the feasibility of this alternative for further comparison with the "Shift & Raise" and "Castle Hill" alternatives.

Alternative 2 (Shift & Raise) was selected because it provides the best combination of operational safety, public access convenience, and less environmental impacts than the other alternatives, except the "No Action" alternative based on this study. This alternative is also the only one with a practicable land acquisition because landowners have submitted a resolution and letter of support. It was also verbally supported at the public meeting. Since coastal and hydrology studies have already been completed for this alternative, the project could reinitiate the Design Phase without delay. If the improvements were constructed consistently with coastal report and hydrology and hydraulics studies, the airport embankment would be resilient to flooding and erosion and meet federal grant assurance requirements. This alternative's cost can be better estimated with the results from future geotechnical studies for local material sources. A life cycle cost analysis, construction phasing analysis, and cultural resource evaluation are also required for this alternative for further comparison with the "No Action" and "Castle Hill" alternative.

Alternative 4 (Castle Hill) was selected as the relocation alternative to be considered for additional analysis because it is at a higher elevation than the current airport and would be resilient to flooding and erosion. Alternative 4 is estimated to cost less than Alternative 2 (Shift & Raise) to construct because erosion mitigation would not be needed. This alternative still requires additional geotechnical analysis, material source investigation (including location, quality, material transport, and material stockpiling), wind study, and airport access road constructability and maintenance evaluation. A life cycle cost analysis, construction phasing analysis, and cultural resource information are also required for this alternative compared for further comparison with the "No Action" and "Shift and Raise" alternatives. The Right of Way for this potential airport site must also be evaluated for a 4-mile access road route. The potential cost of electricity and sources for lighting along the access road must also be estimated in a Phase II study and are likely to be higher than Alternatives 1 and 2, due to the distance from the community. Maintenance of a new airport road would be difficult during inclement weather conditions and be subject to costs for a local contractor, which may vary due to limited availability of qualified contractors in Scammon Bay. Traveling at least 4 miles to the airport would be difficult for Scammon Bay residents since many of them do not own motor vehicles. They will be traveling to and from the airport via the ATV, snow machine, and on foot. Landowners and the local community do not support this alternative based on the public comments and the resolution, which may lead to resistance for DOT&PF to study and acquire land to construct this alternative.

However, DOT&PF is required to evaluate a reasonable number of alternatives, including the "No Action" alternative to ensure compliance with NEPA. Alternative 4 (Castle Hill) appears to be the most feasible of the relocation alternatives.

4.3 Alternatives Not Selected for Additional Analysis

Alternative 3 (Near) was not selected to advance for additional analysis because it is the most expensive, and perhaps the least feasible due to requiring erosion protection and construction on poor topography including wetlands and likely unstable geology. Although a new access road for this alternative is shorter than the other relocation alternatives, it would be on wetlands, unlike Alternative 4 (Castle Hill) and Alternative 5 (Ridgeline), which would primarily be constructed on uplands. The potential cost of electricity and sources for lighting along the access road are likely to be higher than Alternatives 1 and 2. Maintenance of a new airport road would be difficult during inclement weather conditions and be subject to costs for a local contractor, which may vary due to limited availability of qualified contractors in Scammon Bay. Traveling at least 2 miles to the airport would be difficult for Scammon Bay residents since many of them do not own motor vehicles. They will be traveling to and from the airport via the ATV, snow machine, and on foot. Landowners and the local community do not support Alternative 3 based on the public comments and the resolution, which may lead to resistance for DOT&PF to study and acquire land to construct this alternative.

Alternative 5 (Ridgeline) was not selected to advance for additional analysis. This alternative is estimated to be the least expensive for airport embankment construction and erosion protection but also has the most uncertainty in the cost estimate because the exact route and constructability of the 6-mile access road is unknown. The potential cost of electricity and sources for lighting along the access road is likely to be the highest of the alternatives due to sheer distance from the community. Maintenance of a new airport road would be difficult during inclement weather conditions and be subject to costs for a local contractor, which may vary due to limited availability of qualified contractors in Scammon Bay. Traveling at least 6 miles to the airport would be difficult for Scammon Bay residents since many of them do not own motor vehicles. They will be traveling to and from the airport via the ATV, snow machine, and on foot. This alternative is also expected to have the highest risk to aviation safety because the cross winds and weather on top of the ridgeline is expected to be very poor. Landowners and the local community do not support this Alternative 4 based on the public comments and the resolution, which may lead to resistance for DOT&PF to study and acquire land to construct this alternative.

5 RECOMMENDATIONS

DOT&PF will pursue FAA funding for a Phase II reconnaissance study to conduct in-depth analysis for Alternatives 1 (No Action), 2 (Raise & Shift), and 4 (Castle Hill). DOT&PF will evaluate the three alternatives in anticipation of future environmental analysis for an airport improvement or relocation project, consistent with NEPA. This study and subsequent phases are federally funded and required to comply with NEPA, which requires the evaluation of a reasonable range of alternatives when assessing potential impacts of a proposed project, meaning they must consider multiple options beyond the preferred alternative, including a “no action” alternative, to ensure a thorough analysis of potential environmental effects.

Under the Phase II study, the three alternatives will undergo a more in-depth evaluation that may include geotechnical conditions, wind conditions, material sources, coastal storm/flooding/erosion, and environmental impacts, including cultural resources, and other issues that may be required to ensure compliance with FAA standards. A life cycle cost analysis will be developed for each alternative to determine economic feasibility and ability to meet federal grant assurances. Constructability analysis may include phasing, closures, material transportation, material stockpiling, NAVAIDs, floodplain impacts, and culvert and drainage analysis to better determine each alternative location’s suitability for airport construction. Procuring aerial and/or LIDAR imaging may be beneficial for the selection of a preferred alternative, particularly for the analysis of potential access roads. Further Right of Way analysis and impacts to community transportation, housing and potential impacts on neighboring landowners will be evaluated. Further utility analysis such as electricity availability, fueling, and wastewater treatment for airport improvements will also be conducted. Most importantly, there will be increased public involvement and stakeholder engagement to allow for more community guidance for the final selection of an alternative.

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APPENDIX A: COST ESTIMATE

Engineer's Quantity Calculations

for

State of Alaska
Department of Transportation & Public Facilities
Central Region

Construction Project:

Scammon Bay Airport Feasibility Study

AIP No. 3-02-0255-005-2023

Project No. CFAPT01005

Prepared by: Stantec

ARCHITECTURE · ENGINEERING · LAND SURVEYING · PLANNING

4/25/2024

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Cost Summary

Alternative	Construction Cost Estimate	Local or Barged Material	Notes
Raise and Shift Existing Airport 340' East	$75,659,173	Local	
Raise and Shift Existing Airport 340' East	$130,448,802	Barged	
Relocate Airport South to Ridgeline	$59,398,368	Local	
Relocate Airport South to Ridgeline	$109,266,097	Barged	
Relocate Airport to Castle Hill Location	$66,714,222	Local	
Relocate Airport to Castle Hill Location	$126,997,027	Barged	
Relocate Airport East to Near	$94,588,701	Local	
Relocate Airport East to Near	$182,828,676	Barged	

Engineer's Estimate

Project Name: **Project Number:** CFAPT01005

SCAMMON BAY AIRPORT RELOCATION: Raise & Shift (Local Material) **AIP 3-02-0255-005-2023**

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	14	$1,000	$14,000
D701.010.0072	CS Pipe, 72-inch	LF	300	$1,200	$360,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$200,000	$200,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	15,440	$20	$308,800
P152.190.0000	Borrow	CY	161,330	$40	$6,453,183
P154.010.0000	Subbase Course	CY	51,215	$75	$3,841,111
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P185.010.0000	Primary Armor Stone, Class I	TON	61,353	$186	$11,411,575
P185.090.0000	Underlayer Stone, Class I	TON	53,731	$164	$8,811,917
P299.020.0000	Crushed Aggregate Surface Course	TON	38,515	$70	$2,696,037
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	60,336	$4	$241,344
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	Utility Extensions	LS	ALL REQUIRED	$237,000	$237,000
				Subtotal:	$46,909,968
	DESIGN CONTINGENCY		Design Contingency	25.00%	$11,727,492
				Subtotal:	$58,637,460
			Construction Engineering	22%	$12,900,241
			ICAP	7.03%	$4,122,213
				Total	$75,659,914

7/11/2024

Engineer's Estimate

Project Name: Project Number: CFAPT01005

SCAMMON BAY AIRPORT RELOCATION: Raise & Shift (Barged Material) AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	14	$1,000	$14,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$200,000	$200,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	15,440	$20	$308,800
P152.190.0000	Borrow	CY	161,330	$133	$21,456,833
P154.010.0000	Subbase Course	CY	51,215	$175	$8,962,593
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P185.010.0000	Primary Armor Stone, Class I	TON	61,353	$286	$17,546,831
P185.090.0000	Underlayer Stone, Class I	TON	53,731	$264	$14,185,037
P299.020.0000	Crushed Aggregate Surface Course	TON	38,515	$140	$5,392,074
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	60,336	$4	$241,344
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	Utility Extensions	LS	ALL REQUIRED	$237,000	$237,000
				Subtotal:	$80,879,512
	DESIGN CONTINGENCY		Design Contingency	25.00%	$20,219,878
				Subtotal:	$101,099,390
			Construction Engineering	22%	$22,241,866
			ICAP	7.03%	$7,107,287
				Total	$130,448,543

Engineer's Estimate

Project Name: SCAMMON BAY AIRPORT RELOCATION: Near (Local Material)

Project Number: CFAPT01005 AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	5	$1,000	$5,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	40,306	$20	$806,111
P152.190.0000	Borrow	CY	370,691	$40	$14,827,644
P154.010.0000	Subbase Course	CY	58,313	$75	$4,373,472
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P185.010.0000	Primary Armor Stone, Class I	TON	61,353	$186	$11,411,575
P185.090.0000	Underlayer Stone, Class I	TON	53,731	$164	$8,811,917
P299.020.0000	Crushed Aggregate Surface Course	TON	41,369	$70	$2,895,796
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	210,251	$4	$841,005
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	UTILITY EXTENSIONS	LUMP SUM	ALL REQUIRED	$1,838,500	$1,838,500
				Subtotal:	$58,646,021
	DESIGN CONTINGENCY		Design Contingency	25.00%	$14,661,505
				Subtotal:	$73,307,526
			Construction Engineering	22%	$16,127,656
			ICAP	7.03%	$5,153,519
				Total	$94,588,701

Engineer's Estimate

Project Name: SCAMMON BAY AIRPORT RELOCATION: Near (Local Material)

Project Number: CFAPT01005 AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	5	$1,000	$5,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	40,306	$20	$806,111
P152.190.0000	Borrow	CY	370,691	$133	$49,301,918
P154.010.0000	Subbase Course	CY	58,313	$175	$10,204,769
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P185.010.0000	Primary Armor Stone, Class I	TON	61,353	$286	$17,546,831
P185.090.0000	Underlayer Stone, Class I	TON	53,731	$264	$14,185,037
P299.020.0000	Crushed Aggregate Surface Course	TON	41,369	$140	$5,791,593
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	210,251	$4	$841,005
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	UTILITY EXTENSIONS	LUMP SUM	ALL REQUIRED	$1,838,500	$1,838,500
				Subtotal:	$113,355,763
	DESIGN CONTINGENCY		Design Contingency	25.00%	$28,338,941
				Subtotal:	$141,694,703
			Construction Engineering	22%	$31,172,835
			ICAP	7.03%	$9,961,138
				Total	$182,828,676

Engineer's Estimate

Project Name: **Project Number:** CFAPT01005

SCAMMON BAY AIRPORT RELOCATION: Castle Hill (Local Material) **AIP 3-02-0255-005-2023**

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	23	$1,000	$23,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	166,594	$20	$3,331,876
P152.190.0000	Borrow	CY	284,495	$40	$11,379,787
P154.010.0000	Subbase Course	CY	72,222	$75	$5,416,667
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P299.020.0000	Crushed Aggregate Surface Course	TON	52,797	$70	$3,695,767
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	251,111	$4	$1,004,445
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	UTILITY EXTENSIONS	LUMP SUM	ALL REQUIRED	$3,677,000	$3,677,000
				Subtotal:	$41,363,542
	DESIGN CONTINGENCY		Design Contingency	25.00%	$10,340,885
				Subtotal:	$51,704,427
			Construction Engineering	22%	$11,374,974
			ICAP	7.03%	$3,634,821
				Total	$66,714,222

4/25/2024

Engineer's Estimate

Project Name: SCAMMON BAY AIRPORT RELOCATION: Castle Hill (Barged Material)

Project Number: CFAPT01005 AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	23	$1,000	$23,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	166,594	$20	$3,331,876
P152.190.0000	Borrow	CY	284,495	$133	$37,837,791
P154.010.0000	Subbase Course	CY	72,222	$175	$12,638,889
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P299.020.0000	Crushed Aggregate Surface Course	TON	52,797	$140	$7,391,533
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	251,111	$4	$1,004,445
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	UTILITY EXTENSIONS	LUMP SUM	ALL REQUIRED	$3,677,000	$3,677,000
				Subtotal:	$78,739,535
	DESIGN CONTINGENCY		Design Contingency	25.00%	$19,684,884
				Subtotal:	$98,424,418
			Construction Engineering	22%	$21,653,372
			ICAP	7.03%	$6,919,237
				Total	$126,997,027

Engineer's Estimate

Project Name: SCAMMON BAY AIRPORT RELOCATION: Ridgeline (Local Material)

Project Number: CFAPT01005 AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	17	$1,000	$17,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	47,991	$20	$959,825
P152.190.0000	Borrow	CY	224,174	$40	$8,966,964
P154.010.0000	Subbase Course	CY	67,426	$75	$5,056,944
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P299.020.0000	Crushed Aggregate Surface Course	TON	47,539	$70	$3,327,748
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	188,288	$4	$753,151
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	Utility Extensions	LS	ALL REQUIRED	$4,911,000	$4,911,000
				Subtotal:	$36,827,633
	DESIGN CONTINGENCY		Design Contingency	25.00%	$9,206,908
				Subtotal:	$46,034,541
			Construction Engineering	22%	$10,127,599
			ICAP	7.03%	$3,236,228
				Total	$59,398,368

Engineer's Estimate

Project Name: SCAMMON BAY AIRPORT RELOCATION: Ridgeline (Barged Material)

Project Number: CFAPT01005
AIP 3-02-0255-005-2023

Item No	Pay Item	Pay Unit	Quantity	Unit Price	Amount
	Land Purchase	Acre	17	$1,000	$17,000
G100.010.0000	Mobilization and Demobilization	LS	ALL REQUIRED	$3,500,000	$3,500,000
G115.010.0000	Worker Meals and Lodging, or Per Diem	LS	ALL REQUIRED	$1,500,000	$1,500,000
G130.010.0000	Field Office	LS	ALL REQUIRED	$60,000	$60,000
G130.020.0000	Field Laboratory	LS	ALL REQUIRED	$30,000	$30,000
G130.060.0000	Nuclear Testing Equipment Storage Shed	EACH	1	$20,000	$20,000
G130.090.0000	Engineering Communications	CS	ALL REQUIRED	$10,000	$10,000
G131.010.0000	Engineering Transportation (Truck)	EACH	4	$50,000	$200,000
G131.020.0000	Engineering Transportation (ATV)	EACH	1	$15,000	$15,000
G135.010.0000	Construction Surveying by the Contractor	LS	ALL REQUIRED	$500,000	$500,000
L100.010.0000	Airport Lighting	LS	ALL REQUIRED	$1,500,000	$1,500,000
L132.010.0010	Install Approach Lighting Aids, PAPI	LS	ALL REQUIRED	$500,000	$500,000
P152.010.0000	Unclassified Excavation	CY	47,991	$20	$959,825
P152.190.0000	Borrow	CY	224,174	$133	$29,815,157
P154.010.0000	Subbase Course	CY	67,426	$175	$11,799,537
P167.020.0000	Dust Palliative	LS	ALL REQUIRED	$250,000	$250,000
P299.020.0000	Crushed Aggregate Surface Course	TON	47,539	$140	$6,655,496
P640.020.0000	Segmented Circle (Panel-Type)	LS	ALL REQUIRED	$50,000	$50,000
P641.010.0000	Erosion, Sediment, and Pollution Control Administration	LS	ALL REQUIRED	$50,000	$50,000
P641.030.0000	Temporary Erosion, Sediment, and Pollution Control	LS	ALL REQUIRED	$300,000	$300,000
P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives	CS	ALL REQUIRED	$200,000	$200,000
P641.070.0000	SWPPP Manager	LS	ALL REQUIRED	$150,000	$150,000
P681.010.0000	Geotextile, Separation	SY	188,288	$4	$753,151
S142.040.0000	Equipment Storage Building	LS	ALL REQUIRED	$4,000,000	$4,000,000
U400.0X0.00X0	Utility Extensions	LUMP SUM	ALL REQUIRED	$4,911,000	$4,911,000
				Subtotal:	$67,746,166
	DESIGN CONTINGENCY		Design Contingency	25.00%	$16,936,541
				Subtotal:	$84,682,707
			Construction Engineering	22%	$18,630,196
			ICAP	7.03%	$5,953,194
				Total	$109,266,097

Quantities

RAISE EXISTING - Alternative eliminated, but used for Raise & Shift Calculations

	Alternative	X section End Area	Length	Width	Depth	Area (SY)	Volume (CY)	Tons (x2)
Runway	Sta. 2+30-29+00	1951	2670				192932	
	29+00-38+30	1024	930				35271	
	Total Fill						**228203**	
	Subbase		3800	150	2		42222	
	CABC		3800	150	0.75		15833	
	Borrow						170148	
	Geotextile Fabric							
APRON	Total Fill							
	Surface Area		250	400	8		29630	
	Side Slopes		1100	32	8		5215	
	CABC		250	400	0.75		2778	
	Subbase		250	400	2.00		7407	
	Borrow						24659	
	Geotextile Fabric							
Road	Total Fill	408	**400**				**6044**	
	CABC		400	28	0.5		207	
	Subbase		400	28	1		415	
	Borrow						5422	
	Geotextile Fabric							
Taxiway	Total Fill	999	200				7400	
	CABC		200	79	0.75		439	
	Subbase		200	79	2		1170	
	Borrow						5791	
	Geotextile Fabric	0						
Airport	Borrow						206020	412040
	Subbase						51215	102430
	CABC						19257	38515
	Geotextile Fabric							

Quantities

RAISE & SHIFT EXISTING

	Alternative	X section End Area	Length	Width	Depth	Area (SY)	Volume (CY)	Tons (x2)
Runway	5+70-29+00	1951	2330				168364	
	29+00-38+30	1024	930				35271	
	38+30-41+70	2548	340				32086	
	200' Extension	2410	250				22315	
	Total Fill						258036	
	Subbase		3800	150	2		42222	
	CABC		3800	150	0.75		15833	
	Minus Borrow for Bank Armor	165.31	9650				59083	
	Unclassified Ex for Bank Armor	43.2	9650				15440	
	Borrow						125457	
	Geotextile Fabric		500	150		8333		
APRON	**Same as Raise RW Alt**							
	Total Fill						34844	
	CABC						2778	
	Subbase						7407	
	Borrow						24659	
	Geotextile Fabric						0	
Road	**Same as Raise RW Alt**							
	Total Fill						**6044**	
	CABC						207	
	Subbase						415	
	Borrow						5422	
	Geotextile Fabric						0	
Taxiway	**Same as Raise RW Alt**							
	Total Fill						7400	
	CABC						439	
	Subbase						1170	
	Borrow						5791	
	Geotextile Fabric						0	
Airport	Borrow						161330	322659
	Subbase						51215	102430
	CABC						19257	38515
	Geotextile Fabric					60336		
	Erosion Protection		10450					
	Excavation						15440	

Quantities

Ridgeline

	Alternative	X section End Area	Length	Width	Depth	Area (SY)	Volume (CY)	Tons (x2)
Runway	Total Fill						167956	
	Subbase	332	3800				46726	
	CABC	115.1	3800				16199	
	Borrow						167956	
	Excavation						22482	
	Geotextile Fabric					91231		
APRON and TW	Total Fill						20857	
	Surface Area							
	Side Slopes							
	CABC-Apron		200	400	0.75		2222	
	CABC-TW		300	79	0.75		658	
	Subbase-Apron		200	400	2		5926	
	Subbase-TW		300	79	2		1756	
	Borrow						20857	
	Geotextile Fabric					17890		
Road	Total Fill	173	9500				60870	
	CABC	15.2	9500		0.5		5348	
	Subbase	37	9500		1		13019	
	Borrow						35361	
	Geotextile Fabric		9500	75		79167		
	Excavation	145	9500				51019	
Airport	Borrow						224174	
	Subbase						67426	
	CABC						23770	47539
	Geotextile Fabric					188288		
	Excavation						47991	

Quantities

CASTLE HILL

	Alternative	X section End Area	Length	Width	Depth	Area (SY)	Volume (CY)	Tons (x2)
Runway	Total Fill						377778	
	Subbase	332	3800				46726	
	CABC	115.1	3800				16199	
	Borrow						218376	
	Excavation						96477	
	Geotextile Fabric					120993		
APRON and TW	Total Fill						28594	
	Surface Area							
	Side Slopes							
	CABC-Apron		200	400	0.75		2222	
	CABC-TW		300	79	0.75		658	
	Subbase-Apron		200	400	2		5926	
	Subbase-TW		300	79	2		1756	
	Borrow						17730	
	Geotextile Fabric					21785		
	Excavation						302	
Road	Total Fill	173	13000				83296	
	CABC	15.2	13000		0.5		7319	
	Subbase	37	13000		1		17815	
	Borrow						48389	
	Geotextile Fabric		13000	75		108333		
	Excavation	145	13000				69815	
Airport	Borrow						284495	
	Subbase						72222	
	CABC						26398	52797
	Geotextile Fabric					251111		
	Excavation						166594	

Quantities

Near

	Alternative	**X section End Area**	**Length**	**Width**	**Depth**	**Area (SY)**	**Volume (CY)**	**Tons (x2)**
Runway	Total Fill						354983	
	Subbase	332	3800				46726	
	CABC	115.1	3800				16199	
	Borrow						292058	
	Excavation						20000	
	Geotextile Fabric					109422		
APRON and TW	Total Fill						78587	
	CABC-Apron		200	400	0.75		2222	
	CABC-TW		300	79	0.75		658	
	Subbase-Apron		200	400	2		5926	
	Subbase-TW		300	79	2		1756	
	Borrow						68025	
	Geotextile Fabric							
	Excavation					25076	5000	
Road	Total Fill	173	2850				18261	
	CABC	15.2	2850				1604	
	Subbase	37	2850				3906	
	Borrow						10608	
	Geotextile Fabric		2850	75		23750		
	Excavation	145	2850				15306	
Airport	Borrow						370691	
	Subbase						58313	
	CABC						20684	41369
	Geotextile Fabric					210251		
	Excavation						40306	

Utility Estimate

PROJECT NAME: AMATS: Scammon Bay "Ridgeline" estimate
Location: Scammon Bay, AK

Utility Company	Description of Work and Location	Unit	Unit Cost	Total
UUI (GCI)	Install aerial 25- 100 pair (6 miles = 31680 ft)	31680	$ 45.00	$ 1,425,600.00
AVEK	Install aerial single phase poles and line (6 miles = 127 poles)	127	$ 21,000.00	$ 2,667,000.00
			Subtotal cost of utility works :	$ 4,092,600.00
			20%	$ 818,520.00
			Total cost of utility works :	**$ 4,911,120.00**

Assumed distance from community center is new installation length. This can be updated once final location is selected, the exact length of the access road needed for the airport is finalized, and reviewing AVEC poles for closer connections to tie into. Assumed 20% mark up for barging in freight.

PROJECT NAME: AMATS: Scammon Bay "Castle Hill" estimate
Location: Scammon Bay, AK

Utility Company	Description of Work and Location	Unit	Unit Cost	Total
UUI (GCI)	Install aerial 25- 100 pair (4.5 miles = 23760 ft)	23760	$ 45.00	$ 1,069,200.00
AVEK	Install aerial single phase poles and line (4.5 miles = 95 poles)	95	$ 21,000.00	$ 1,995,000.00
			Subtotal cost of utility works :	$ 3,064,200.00
			20%	$ 612,840.00
			Total cost of utility works :	**$ 3,677,040.00**

Assumed distance from community center is new installation length. This can be updated once final location is selected, the exact length of the access road needed for the airport is finalized, and reviewing AVEC poles for closer connections to tie into. Assumed 20% mark up for barging in freight.

PROJECT NAME: AMATS: Scammon Bay "Shift and Raise" estimate
Location: Scammon Bay, AK

Utility Company	Description of Work and Location	Unit	Unit Cost	Total
UUI (GCI)	Install aerial 25- 100 pair (.3 miles = 1584 ft)	1584	$ 45.00	$ 71,280.00
AVEK	Install aerial single phase poles and line (.3 miles = 6 poles)	6	$ 21,000.00	$ 126,000.00
			Subtotal cost of utility works :	$ 197,280.00
			20%	$ 39,456.00
			Total cost of utility works :	**$ 236,736.00**

Assumed distance from community center is new installation length. This can be updated once final location is selected and determining if new services will be needed. Assumed 20% mark up for barging in freight.

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P152.010.0000 - Unclassified Excavation					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/24/2024	
CHECKED BY			DATE		

P152.010.0000 - Unclassified Excavation

P152.01

$ -

CY

Engineers Est. Quantity = CY

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Kaltag Airport Improvements	2021	2,800	CY	$ 19.40	$ 12.50	$ 18.00	
Bethel Airport Parallel Runway I	2019	26,910	CY	$ 10.00	$ 17.00		
CHEFORNAK AIRPORT REHA	2022	9,400	CY	$ 24.00	$ 24.00		
Saint Mary's Airport Improveme	2022	13340	CY	$ 19.65	$ 6.24	$ 30.00	
			CY				
			CY				
			CY				

	Average Unit Price	Median Price
By All	$ 18.08	$ 18.70
By Projects	$ 18.19	

USE $20/CY

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0				
P152.200.0000 - BORROW				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG		DATE	4/5/2024
CHECKED BY			DATE	

P152.200.0000 - BORROW

P152.20

$ -

TON

Engineers Est. Quantity = TON

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
KWETHLUK AIRPORT REHAB	2023	2,940	TON	$ 76.00	$ 215.20	$ 434.85	
CHEFORNAK AIRPORT REHA	2022	38,940	TON	$ 85.00	$ 155.00		
MEKORYUK AIRPORT REHAE	2023	12,386	TON	$ 157.00	$ 185.00	$ 166.00	
CHEFORNAK AIRPORT REHA	2022	38940	TON	$ 85.00	$ 155.00		
Shishmaref Airport Erosion Cor	2022	23000	TON	$ 95.00	$ 105.50	$ 159.01	
			TON				
			TON				

	Average Unit Price	Median Price
By All	$ 159.50	$ 155.00
By Projects	$ 154.24	

Average Unit Price (Low Bidder)

$ 99.60 TON $ 122.06

= 200 CY

Assume 1/3 discount for quantity

USE: **133.33** CY

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P152.200.0000 - BORROW					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/24/2024	
CHECKED BY			DATE		

P152.200.0000 - BORROW

P152.20

$ -

TON

Engineers Est. Quantity = TON

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Kaltag Airport Improvements	2021	2,900	TON	$ 53.15	$ 35.00	$ 25.00	
Bethel Airport Parallel Runway I	2019	45,300	TON	$ 18.00	$ 13.00		
SLEETMUTE AIRPORT RESUI	2022	10,960	TON	$ 48.00	$ 47.00		
Saint Mary's Airport Improveme	2022	24450	TON	$ 18.80	$ 12.41	$ 15.00	
Marshall Airport Improvements	2023	214300	TON	$ 34.00	$ 48.16		
			TON				
			TON				

	Average Unit Price	Median Price
By All	$ 30.63	$ 29.50
By Projects	$ 31.44	

Use $60/CY

1/3 discount for quantity

Use $40/CY

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P152.190.0000 - BORROW					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/24/2024	
CHECKED BY			DATE		

P152.190.0000 - BORROW

P152.19

$ -

TON

Engineers Est. Quantity = CY

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Eagle Airport Electrical Equipm	2022	37	CY	$ 492.00	$ 225.00	$ 35.00	
South Naknek Airport Runway F	2019	29,600	CY	$ 75.00	$ 110.00	$ 105.00	
Bettles Airport Lighting and Res	2021	2,975	CY	$ 11.00	$ 10.00	$ 36.00	
KWETHLUK AIRPORT REHAB	2023	460	CY	$ 153.00	$ 311.30	$ 1,012.66	
			CY				
			CY				
			CY				

	Average Unit Price	Median Price
By All	$ 214.66	$ 107.50
By Projects	$ 214.66	

NOT USED

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P154.020.0000 - SUBBASE COURSE					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/24/2024	
CHECKED BY			DATE		

P154.020.0000 - SUBBASE COURSE

P154.02

Engineers Est. Quantity =

TON

$ -

TON

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Noorvik Airport Rehabilitation	2021	34,131	TON	$ 24.00	$ 40.00	$ 39.00	
Kaltag Airport Improvements	2021	8,700	TON	$ 27.10	$ 50.00	$ 28.00	
Saint Mary's Airport Improveme	2022	18,530	TON	$ 29.05	$ 21.87	$ 30.00	
Marshall Airport Improvements	2023	56300	TON	$ 48.00	$ 72.67		
			TON				
			TON				
			TON				

	Average Unit Price	Median Price
By All	$ 37.24	$ 30.00
By Projects	$ 39.17	

Use $37.24/Ton

=$75/CY **Local Material**

Due to lack of AASHTOWare data - Use $175/CY for Barge Cost

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P299.020.0000 Crushed Aggregate Surface Course					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/8/2024	
CHECKED BY			DATE		

P299.020.0000 Crushed Aggregate Surface Course

P299.02

$ -

Ton

Engineers Est. Quantity = Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
KWETHLUK AIRPORT REHAB	2023	38,971	Ton	$ 156.00	$ 215.00	$ 449.59	
CHEFORNAK AIRPORT REHA	2022	46,320	Ton	$ 93.00	$ 175.00		
MEKORYUK AIRPORT REHAE	2023	1,872	Ton	$ 188.00	$ 195.00	$ 180.00	
CHEFORNAK AIRPORT REHA	2022	46320	Ton	$ 93.00	$ 175.00		
Shishmaref Airport Erosion Cor	2022	1600	Ton	$ 150.00	$ 256.00	$ 199.43	
KIPNUK AIRPORT REHABILIT	2021	49010	Ton	$ 110.00	$ 170.10		
			Ton				

	Average Unit Price	Median Price
By All	$ 187.01	$ 175.00
By Projects	$ 178.51	

Average Low Bidder, similar quantity

$ 113.00

Inflate @ 10% per year

136

Use $140

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
P299.020.0000 Crushed Aggregate Surface Course					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/24/2024	
CHECKED BY			DATE		

P299.020.0000 Crushed Aggregate Surface Course

P299.02

$ -

Ton

Engineers Est. Quantity = Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Kaltag Airport Improvements	2021	13,000	Ton	$ 70.20	$ 115.00	$ 135.00	
Marshall Airport Improvements	2023	51,400	Ton	$ 65.00	$ 85.97		
Noorvik Airport Rehabilitation	2021	44,577	Ton	$ 38.65	$ 52.00	$ 47.00	
Ekwok Airport & New Stuyahok	2021	50570	Ton	$ 26.00	$ 60.00	$ 53.00	
			Ton				
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 67.98	$ 60.00
By Projects	$ 68.61	

Use $70/TON

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0				
P185.010.0000 Primary Armor Stone, Class I				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG	DATE	4/23/2024	
CHECKED BY		DATE		

P185.010.0000 Primary Armor Stone, Class I

P185.01

Engineers Est. Quantity = Ton

$ -

Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Shishmaref Airport Erosion Cor	2023	8,300	Ton	$ 265.00	$ 273.00	$ 319.02	
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 285.67	$ 273.00
By Projects	$ 285.67	

Use $286/TON Barged

Due to lack of AASHTOWare data for locally available Armor Stone, use $186/TON

0				
P185.090.0000 Underlayer Stone, Class I				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG	DATE	4/23/2024	
CHECKED BY		DATE		

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

P185.090.0000 Underlayer Stone, Class I

P185.09

$ -

Ton

Engineers Est. Quantity =

Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Shishmaref Airport Erosion Cor	2022	5,800	Ton	$ 210.00	$ 270.00	$ 310.27	
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 263.42	$ 270.00
By Projects	$ 263.42	

USE $264/TON

Due to lack of AASHTOWare data for locally available Armor Stone, use $164/TON

0				
611.2011.000A Underlayer Rock				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG	DATE	4/23/2024	
CHECKED BY		DATE		

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

611.2011.000A Underlayer Rock

611.201

$ -

Ton

Engineers Est. Quantity = Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
ALASKA PENINSULA HIGHW/	2019	460	Ton	$ 220.00	$ 280.00	$ 236.00	
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 245.33	$ 236.00
By Projects	$ 245.33	

NOT USED

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0					
611.2000.0000 Armor Rock					
SHEET NUMBER	1	OF	1	PIH	
CALCULATED BY	JAG		DATE	4/23/2024	
CHECKED BY			DATE		

611.2000.0000 Armor Rock

611.200

$ -

Ton

Engineers Est. Quantity =

Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Shishmaref Sanitation Road En	2019	6,121	Ton	$ 215.00	$ 196.00	$ 219.79	
Northern Region Deep Culverts	2020	7,794	Ton	$ 60.00			
CHINIAK HWY EROSION RES	2018	1,729	Ton	$ 61.00	$ 95.00	$ 100.00	
			Ton				
			Ton				
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 135.26	$ 100.00
By Projects	$ 118.53	

NOT USED

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

0				
611.0002.0004 RIPRAP CLASS 4				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG	DATE	4/23/2024	
CHECKED BY		DATE		

611.0002.0004 RIPRAP CLASS 4

611.000

$ -

Ton

Engineers Est. Quantity = Ton

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
KALIFORNSKY BEACH ROAD	2019	450	Ton	$ 156.20	$ 135.00	$ 185.00	
JNU MENDENHALL RIVER FL	2023	1,913	Ton	$ 69.00	$ 85.00	$ 95.00	
TOFTY ROAD SULLIVAN CRE	2021	230	Ton	$ 120.00	$ 58.00	$ 246.76	
SEWARD HMY: MP 17-22.5 RE	2021	7800	Ton	$ 100.00	$ 50.00	$ 165.00	
Parks Highway Bridge Replacei	2021	100	Ton	$ 74.75	$ 85.00	$ 98.00	
			Ton				
			Ton				

	Average Unit Price	Median Price
By All	$ 114.85	$ 98.00
By Projects	$ 114.85	

NOT USED

0				
611.0001.0003 RIPRAP CLASS 3				
SHEET NUMBER	1	OF	1	PIH
CALCULATED BY	JAG	DATE	4/23/2024	
CHECKED BY		DATE		

State of Alaska
Department of Transportation and Public Facilities
Central Region Highway Design

611.0001.0003 RIPRAP CLASS 3

611.000

$ -

CY

Engineers Est. Quantity = CY

Project	Year	Quantity	Unit	Low Bidder 1	2nd Low Bidder 2	3rd Low Bidder 3	Remarks
Gulkana River Boat Launch Mu	2021	200	CY	$ 95.00	$ 92.00	$ 90.00	
Delta River Flooding - Larry Spe	2020	1,700	CY	$ 41.00	$ 60.00	$ 70.00	
QUARTZ CREEK BRIDGE REI	2022	3,100	CY	$ 248.00	$ 290.00		
			CY				
			CY				
			CY				
			CY				

	Average Unit Price	Median Price
By All	$ 123.25	$ 91.00
By Projects	$ 139.44	

NOT USED

APPENDIX B: FORECAST, INVENTORY, ISSUES, FACILITY REQUIREMENTS

Scammon Bay Airport Planning Study

February 2024

Forecast, Inventory, Issues, Facility Requirements

CFAPT01005 / AIP 3-02-0255-005-2023

Prepared for:

State of Alaska
Department of Transportation & Public Facilities, Central Region
4111 Aviation Ave.
Anchorage, Alaska 99516-6900

Prepared by:

Stantec Consulting Services Inc.
725 E Fireweed Lane, Suite 200
Anchorage, AK 99503

EXECUTIVE SUMMARY

The Central Region of the Alaska Department of Transportation and Public Facilities (DOT&PF) is conducting an airport planning study for the Scammon Bay Airport (SCM). The purpose of this project is to improve the safety of aviation infrastructure in Scammon Bay.

This report discusses the aviation activity forecast for Scammon Bay Airport and describes the purpose of a forecast and the methods used to gather and analyze the data considered. Aviation activity trends and results of previous forecasts will be summarized and compared to the findings of this forecast. The results of this forecast will be considered in the development of the Scammon Bay planning study.

The purpose of an aviation activity forecast is to:

1) Establish the current operational demands of the airport.
2) Evaluate historic airport uses and trends that affect aviation activity at the airport.
3) Forecast future operational demands based on the current demand and historic trends.

Scammon Bay Airport is a public DOT&PF-owned Commercial Service – Non-Primary, Community Off-Road airport. The airport has a single, gravel, 3,000-foot-long, 75-foot-wide runway. The airport has regularly scheduled passenger service from Grant Aviation and Ryan Air, primarily flying Cessna 208 Caravans and Casa C212s.

The major issue facing the Scammon Bay Airport is flooding, which is destabilizing the airport surface and embankment, submerges the lighting system and navigational aids, and results in airport closures. The closures prevent residents from being able to evacuate during emergencies, access emergency medical services, send or receive mail, or have food and fuel delivered.

A current forecast was developed for the Scammon Bay Airport. The forecasted activity levels at the airport establish that the existing and future Aircraft Approach Category (AAC) and Airplane Design Group (ADG) is B-II (S), and the designated Critical Aircraft are the Cessna C208 Caravan and Piper PA-31 (Navajo).

The current facility was compared with the airport design standards for the current forecasted Critical Aircraft, which is AAC and ADG B-II (S). Detailed recommendations are discussed in Section 5, and include extending the length of the runway to 3,200 feet to be in compliance with the Federal Aviation Administration (FAA) recommendations for instrument approaches.

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°F	Degrees Fahrenheit
%	Percent
AAC	Aircraft Approach Category
AC	Advisory Circular
ADG	Airplane Design Group
AIP	Airport Improvement Program
ALP	Airport Layout Plan
ARC	Airport Reference Code
AWOS	Automated Weather Observation System
Casa C212	Casa/Nurtanio C212 Aviocar
CTAF	Common Traffic Advisory Frequency
DOT&PF	Department of Transportation and Public Facilities
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FEMA	Federal Emergency Management Agency
GA	General Aviation
GPS	Global Positioning System
IFR	Instrument Flight Rules
LRRS	Long Range Radar Station
MGW	Main Gear Width
MIRL	Medium Intensity Runway Lights
MSL	Mean Sea Level
NAVAID	Navigational Aid
OFZ	Obstacle Free Zone
RCAG	Remote Center Air/Ground
RNAV	Area Navigation
ROFA	Runway Object Free Area
ROFZ	Runway Object Free Zone
RPZ	Runway Protection Zone
RSA	Runway Safety Area
SCM	Scammon Bay Airport
SREB	Snow Removal Equipment Building
RW	Runway
TAF	Terminal Area Forecast
TDG	Taxiway Design Groups
TOFA	Taxiway Object Free Area
TSA	Taxiway Safety Area
TSS	Threshold Siting Surfaces
USBTS	U.S. Bureau of Transportation Statistics
USFWS	U.S. Fish and Wildlife Service
VFR	Visual Flight Rules

1 INTRODUCTION

The Central Region of the Alaska Department of Transportation and Public Facilities (DOT&PF) is conducting an airport planning study for the Scammon Bay Airport (SCM) (Figures 1-1, 1-2, 1-3, 1-4).

Scammon Bay is located along the Kun River lowlands and the foothills of the Askinuk Mountains. The Kun River provides important transportation connections downriver to the bay and upriver to summer fish camps. The community port, and adjacent riverbanks, are populated with numerous small boats, which facilitate transportation and subsistence activities.

The population of Scammon Bay is 98 percent (%) Alaska Native, making it an environmental justice population. The community was known in Cup'ik as Maraayaq, and residents were known as Maraayarmiut. Scammon Bay is represented by the Calista Regional Corporation and Askinuk Village Corporation. It is also part of the Association of Village Council Presidents.

Scammon Bay residents live, at most, 0.7 miles away from the Airport. This proximity is important because most residents arrive at the Airport on foot, or in open-air, off-road vehicles. There is no passenger shelter at the Scammon Bay Airport. During inclement weather, residents listen for their aircraft and then travel to the Airport. Flights also arrive at unexpected times, and residents may be affected by irregular flight schedules.

The Scammon Bay Airport provides the only year-round access to other communities and emergency health care infrastructure. There are no roads connecting Scammon Bay to other communities. During the summer, Scammon Bay is accessible by air and water. Barge service remains an important transportation mode for goods during the summer. During the winter, transportation can occur via air or over snow/ice. Air travel is the only way to reach the hub community of Bethel (150 miles away) throughout most of the year.

The Scammon Bay Airport experiences flooding and high water events, which causes airport closures and damages infrastructure. The Airport plays a vital role in the daily life of the residents of Scammon Bay. Flooding on the runway affects pilot control, prevents residents from being able to access emergency medical services, delivery of food, medical supplies, and fuel. In Scammon Bay, the Yukon Kuskokwim Health Corporation runs a community health center, with itinerant nursing visits. Any emergency medical care must be sought in Bethel or Anchorage.

Table 1-1 provides documentation of the history of storm damage in Scammon Bay. Figure 1-5 provides a visual illustration of the flooded airport.

Table 1-1 List of Scammon Bay Storms

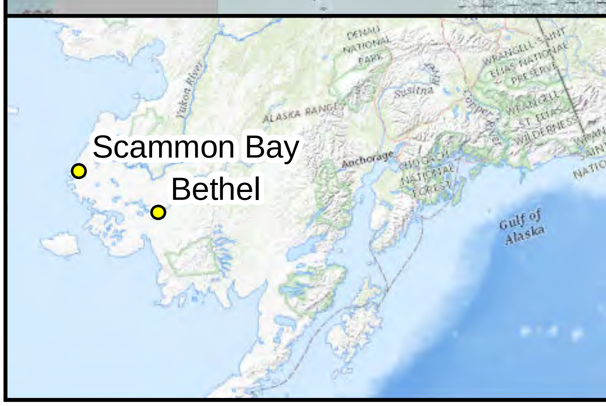
Date	Event	Description	FEMA Declared Disasters
1976 (August)	Storm surge flood	Storm surge flood from Bering Sea. Flooded the airstrip, sewage lagoon, and two homes	No
1977	Flood	High wind driven waves	No
1981	Flood	Wind driven waves	No
1982	Flood	Wind driven waves	No
2004 (October)	Storm	High-water levels flooded airport	Yes
2011 (November)	Coastal Flood	Storm caused water levels to rise significantly in the lower Yukon River with high-water levels at Scammon Bay	Yes
2013 (November)	Coastal Flood	Significant washout of roads and airport	Yes
2016	Flood	Flooding of airport and roads	No
2022 (September)	Storm	High-water levels flooded airport	Yes

Key:

FEMA – Federal Emergency Management Agency

Source: City of Scammon Bay, 2013; NOAA 2023; FEMA 2023

To coordinate the community's planning for building resilient aviation infrastructure, the need exists for an airport planning study to review the feasibility of potential alternative locations of the Airport and compare them to the current site. This study will analyze data for existing conditions to compare the conditions and costs of the airport alternatives, to determine a feasible alternative.



SCAMMON BAY
AIRPORT PLANNING STUDY

November 2023

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

0 3.25 6.5 13 Miles

1:400,000 (at original document size of 8.5x11)

Figure 1-1: Project Location and Vicinity Map

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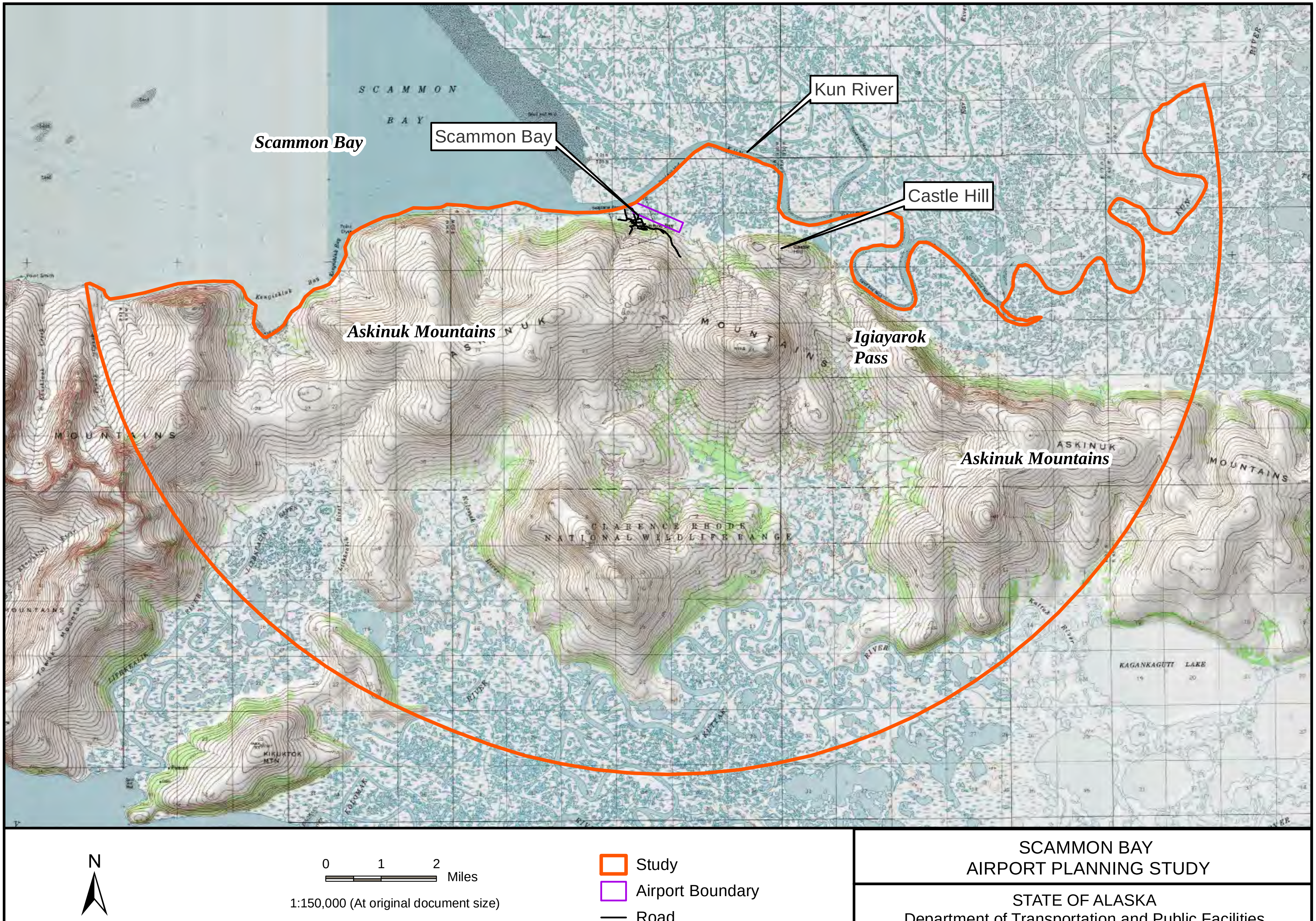


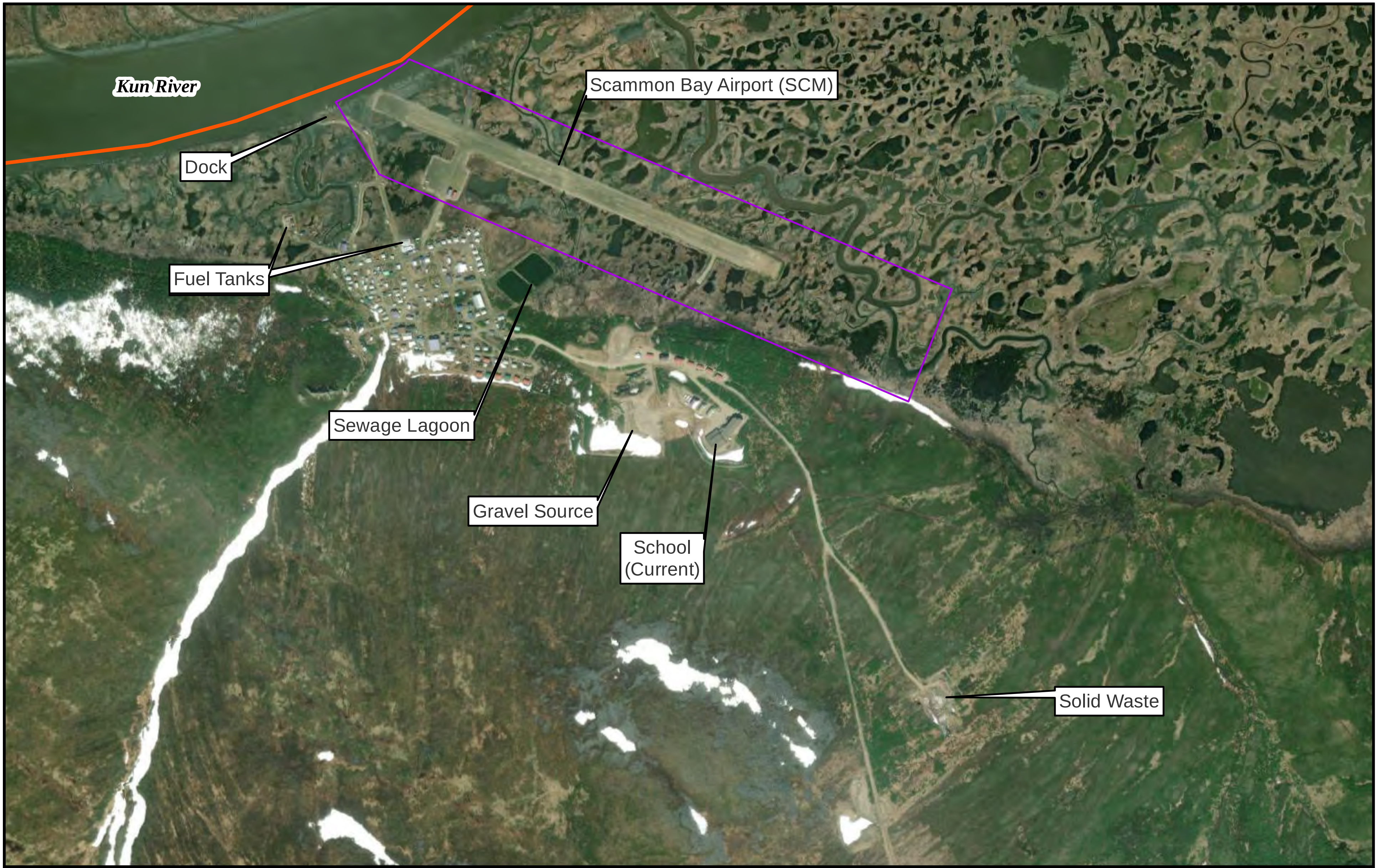
Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

January 2024

Figure 1-2: Study Area



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Study Area
Airport Boundary
Road

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

SCAMMON BAY
AIRPORT PLANNING STUDY

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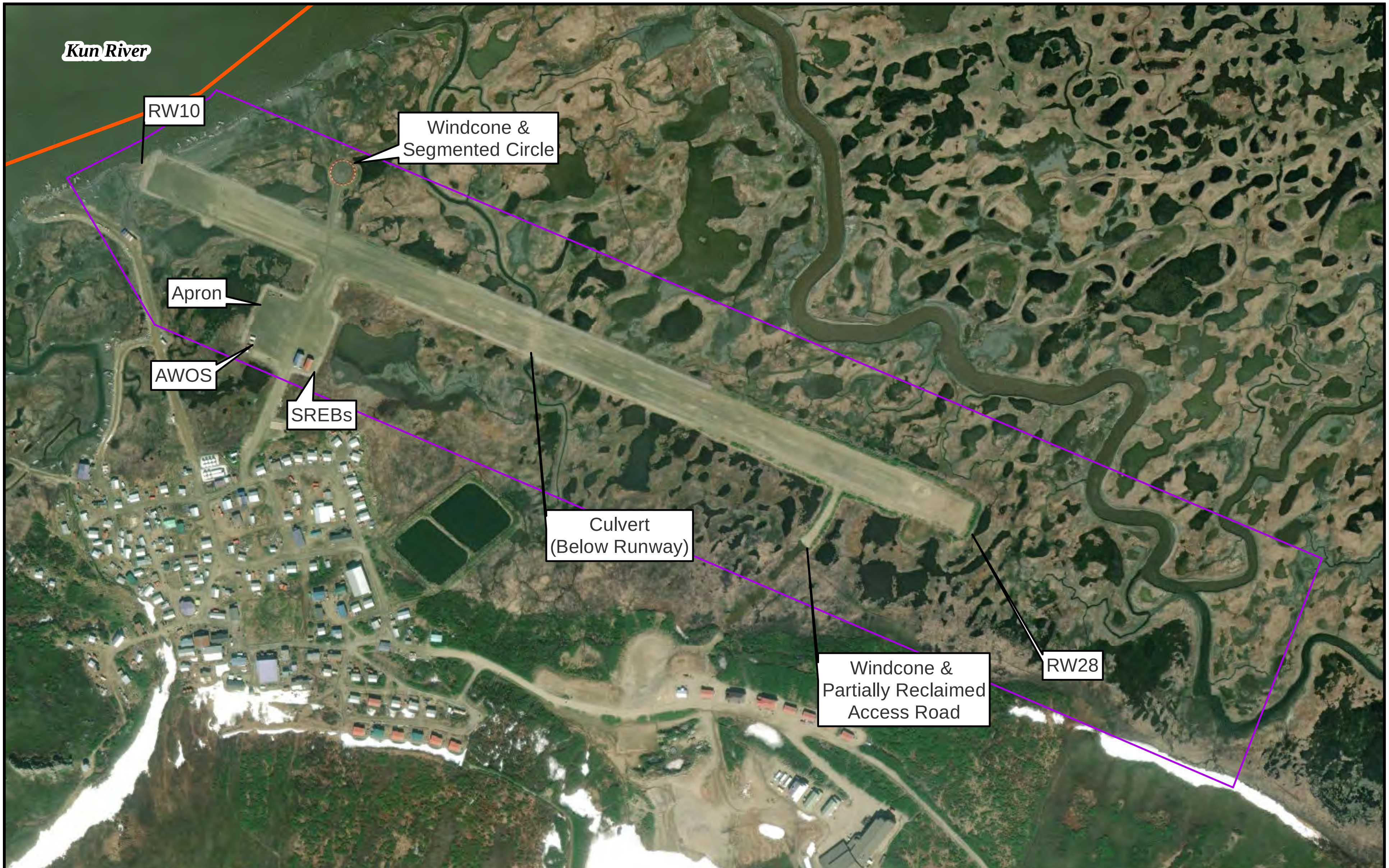
Figure 1-3: Scammon Bay



Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
SREB: Snow Removal Equipment Building
AWOS: Automated Weather Observation System

SCAMMON BAY
AIRPORT PLANNING STUDY

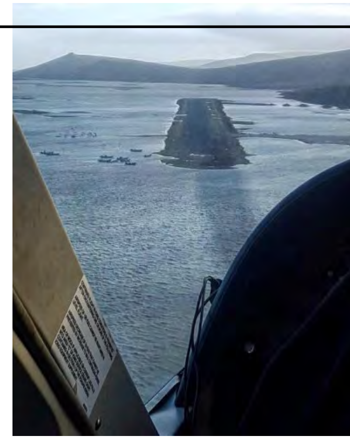
STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

January 2024

Figure 1-4: Scammon Bay Airport (SCM)

Figure 1-5 Scammon Bay Airport Flood Pictures

*2004 flooding of the runway is evident in the middle of the picture (DGGS, 2023a). Note the two (red and blue) airport snow removal equipment buildings on the airport apron.



*2016 flooding of airport from view of an approaching aircraft

*2022 flooding of the runway (DGGS, 2023b). Note the two (red and blue) airport snow removal equipment buildings on the right side of the picture.

*Low resolution 1994 view of airport from a similar vantage as the 2004 and 2022 pictures (DCRA, 1994).

2 INVENTORY

SCM is a public DOT&PF-owned Commercial Service – Non-Primary, Community Off-Road airport. It is not a Federal Aviation Regulation (FAR) Part 139 certificated airport and only serves FAR Part 135, air taxi operations. SCM operates with regularly scheduled passenger service from Grant Aviation and Ryan Air, primarily flying Cessna 208 Caravans and Casa/Nurtanio C212 Aviocar (Casa C212).

SCM has a single, gravel, 3,000-foot-long, 75-foot-wide runway, with medium-intensity runway edge lights. The runway is listed as soft during 'breakup, after rains, and high tides,' with large rocks. The runway is subject to flooding from the adjacent Kun River.

2.1 Funding Background

The Federal Aviation Administration (FAA) has funded 16 Airport Improvement Program (AIP) projects for the facility. The history of AIP grant-funded projects is summarized in Table 2-1.

The Airport land was acquired through the AIP program in 1991 (Grant 3-02-0255-001-1991). When accepting FAA grants to complete airport improvements, the airport owner agrees to maintain compliance with FAA grant assurances from the date of acceptance of a grant for airport development (such as runway rehabilitation) for the minimal useful life of the development, from the date the improvement was completed. The length of those grant assurances depends on the type of project, per Table 3-7 of the FAA Airport Improvement Handbook (Order 5100.38D, Change 1). However, the grant obligations for land ownership are unlimited. The grant obligations will impact planning for airport relocation, as the airport must be operated throughout its grant obligation cycle.

The Federal Emergency Management Agency (FEMA) provided funding for Scammon Bay in 2013 to bring the Airport back to pre-flood conditions. FEMA also provided funding for a Hazard Mitigation Plan, which made the community eligible to apply for additional FEMA funding.

Table 2-1 Airport Improvement Program at SCM

Year	Grant Number	Description	Grant Agreement Date	Grant Close Date	Grant
2022	3-02-0255-004-2022	Seal Runway Pavement Surface/Pavement Joints	9/12/2022		$1,065,829
2022	3-02-0255-004-2022	Seal Apron Pavement Surface/Pavement Joints	9/12/2022		$391,095
2022	3-02-0255-004-2022	Seal Taxiway Pavement Surface/Pavement Joints	9/12/2022		$48,887
2017	3-02-0200-115-2017	Install Miscellaneous NAVAIDS, Remove and Replace Rotating Airport Beacon and Airport Beacon Tower.	9/21/2017	1/31/2022	$211,837
2015	3-02-0200-101-2015	Acquire Snow Removal Equipment	9/21/2015	11/18/2021	$365,238
2012	3-02-0200-087-2012	Rehabilitate Runway 10/28 Various Surface Preservation Maintenance	9/19/2012	1/9/2019	$10,500
2009	3-02-0200-069-2009	Rehabilitate Runway 10/28	8/20/2009	12/19/2014	$532,000
2007	3-02-0200-060-2007	Rehabilitate Runway 10/28	5/31/2007	8/6/2013	$211,736
2003	3-02-0255-002-2003	Construct Snow Removal Equipment Building	8/4/2003	8/17/2007	$753,265
1991	3-02-0255-001-1991	Construct Taxiway	8/20/1991	6/21/1993	$24,567
1991	3-02-0255-001-1991	Improve Snow Removal Equipment Building	8/20/1991	6/21/1993	$77,011
1991	3-02-0255-001-1991	Install Runway Lighting	8/20/1991	6/21/1993	$100,077
1991	3-02-0255-001-1991	Rehabilitate Runway 10/28	8/20/1991	6/21/1993	$1,323,145
1991	3-02-0255-001-1991	Acquire Land for Development	8/20/1991	6/21/1993	$77,011
1991	3-02-0255-001-1991	Acquire Snow Removal Equipment	8/20/1991	6/21/1993	$104,421
1991	3-02-0255-001-1991	Construct Apron	8/20/1991	6/21/1993	$122,136

Key:
NAVAIDS – Navigation Aids
SCM – Scammon Bay Airport

Source: Alaska Aviation System Plan

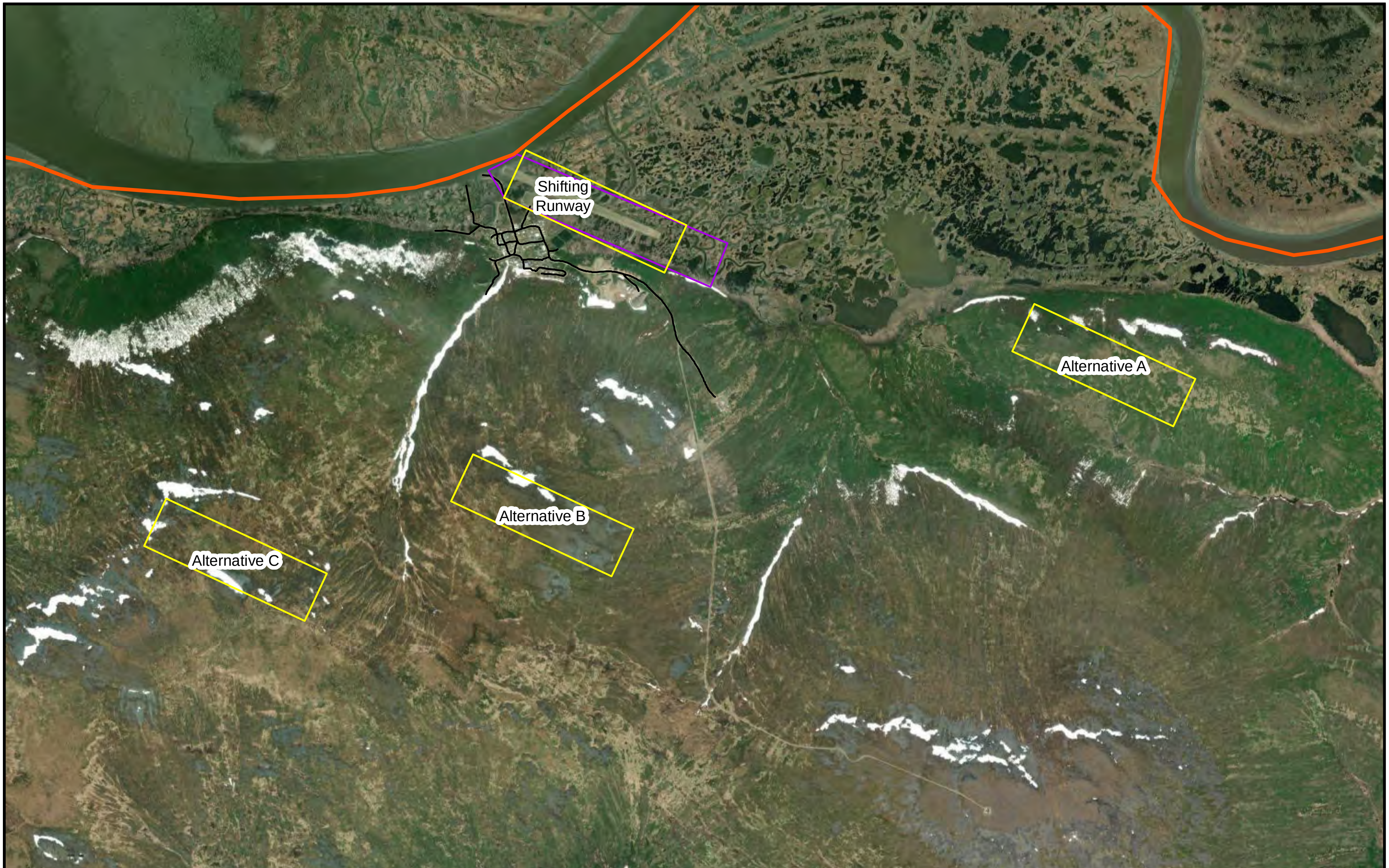
2.1.1 Past Planning Efforts

2.1.1.1 2019 Planning

In 2019, DOT&PF conducted an Alternative Analysis for relocating the Airport in response to flooding. Alternatives included (with cost estimates from the 2019 report) (Figure 2-1):

- No Action
- Elevation of Current Runway ($20 million)
- Shifting the Runway ($25 million)
- Shifting the Runway (with reconstruction of apron/haul road) ($30 million)
- Relocating the Airport (three alternatives, $40-60 million)
    - Alternative A: Castle Hill or Adjacent Valley
    - Alternative B: Central Askinuk Mountain Peaks and Valley Areas
    - Alternative C: Western Mountain

The recommended Alternative was Shifting the Runway (with reconstruction of apron/haul road). This was favored because relocating the Airport was determined to be less convenient for the community and would have had greater environmental impacts. Cost was also prohibitive for airport relocation, as was compliance with Part 77 surfaces. Fog and wind direction is also a concern for an airport relocated to a higher elevation. Airport relocation would also require land acquisition and a new access road.



N

0 0.3 0.6 Miles

1:35,278 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

- Study Area
- Airport Boundary
- 2019 Alternative
- Road

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

November 2023

Figure 2-1: 2019 Airport Alternatives

2.1.1.2 2022 Planning

In 2022, HDR published a Coastal Report (HDR, 2022a) and a Hydrology and Hydraulics Report (HDR 2022b). The Coastal Report included discussion of a storm surge and wave analysis in service of provided recommendations for airport surface elevations, airport relocation, and erosion protection. HDR recommended a surface elevation of 18.5 feet, which would meet a 50-year storm return period with a 2% Annual Exceedance Probability. The current runway ranges between 10 and 17.5 feet in surface elevation. HDR recommended that the runway shift 340 feet along its current alignment to account for river movement over a 50-year period.

HDR also recommended different erosion protection strategies to resist the river movement and provided cost estimates for the different erosion protection strategies (Table 2-2).

Table 2-2 Cost Summary of Armor Rock Revetments

Description	Cost
Buried-Toe 4H:1V Concept	$67.7M
Above-Ground Toe 2.5H:1V and 2H:1V Concept	$30.1M
Above-Ground Toe 2.5H:1V Concept	$30.9M
Above-Ground Toe 2H:1V Concept	$31.9M
Above-Ground Toe 1.5H:1V Concept	$33.3M
Buried-Toe 4H:1V Concept	$67.7M

Key:
H – High
M – Million
V – Vertical
Source: HDR, 2022a

The Hydrology and Hydraulics Report (HDR, 2022b) describes the hydrologic and flood frequency characteristics of the area. The hydraulic analysis focuses on the cross-runway culvert and appropriate culvert sizing.

2.1.2 Role in National Aviation System

SCM is listed as a Community Off-Road airport in the Alaska Aviation System Plan. The Airport is listed as Non-Primary, Commercial Service in the National Plan of Integrated Airport Systems. The Airport does not receive Essential Air Service or Part 139 service. The Airport is owned by DOT&PF, is not regularly staffed, and maintenance is completed by a contracted provider. There are new and old Snow

Removal Equipment Buildings (SREB), no passenger facilities, and no Airport Rescue Firefighting facility.

2.2 Airfield/Airspace

Scammon Bay had an Airport Layout Plan (ALP) updated in 2004 and As-Built in 2019 after the FEMA project. As a reminder, the Airport Design Advisory Circular (AC) was updated to FAA AC 150/5300-13B after 2019. Future Airport development will follow the latest edition of this AC.

2.2.1 Runways

Per the 2004 ALP, SCM is categorized as an Airport Reference Code (ARC) A-II airport with an ultimate ARC of B-II. An A-II ARC indicates that the Airport typically serves aircraft with approach speeds of less than 91 knots and with wingspans between 49 and 78 feet or a tail height of 20 to 30 feet. The B-II classification is for aircraft with approach speeds greater than 91 knots and less than 121 knots.

SCM has a single, gravel runway which is 3,000 feet long and 75 feet wide (Figure 2-1). It is classified as a utility runway, typically accommodating aircraft of 12,500 pounds or less. The runway lies within 10 degrees magnetic alignment of 100/280 degrees and is designated Runway (RW) 10/28. Aircraft approaching from the west are said to be using RW 10 and RW 28 from the east.

The runway is effectively flat, with a reported elevation of 22 feet Mean Sea Level (MSL). The difference in elevation between runway ends is 5.5 feet. The runway surface is gravel with reported soft areas, particularly during spring breakup, heavy rains, or extreme high tides.

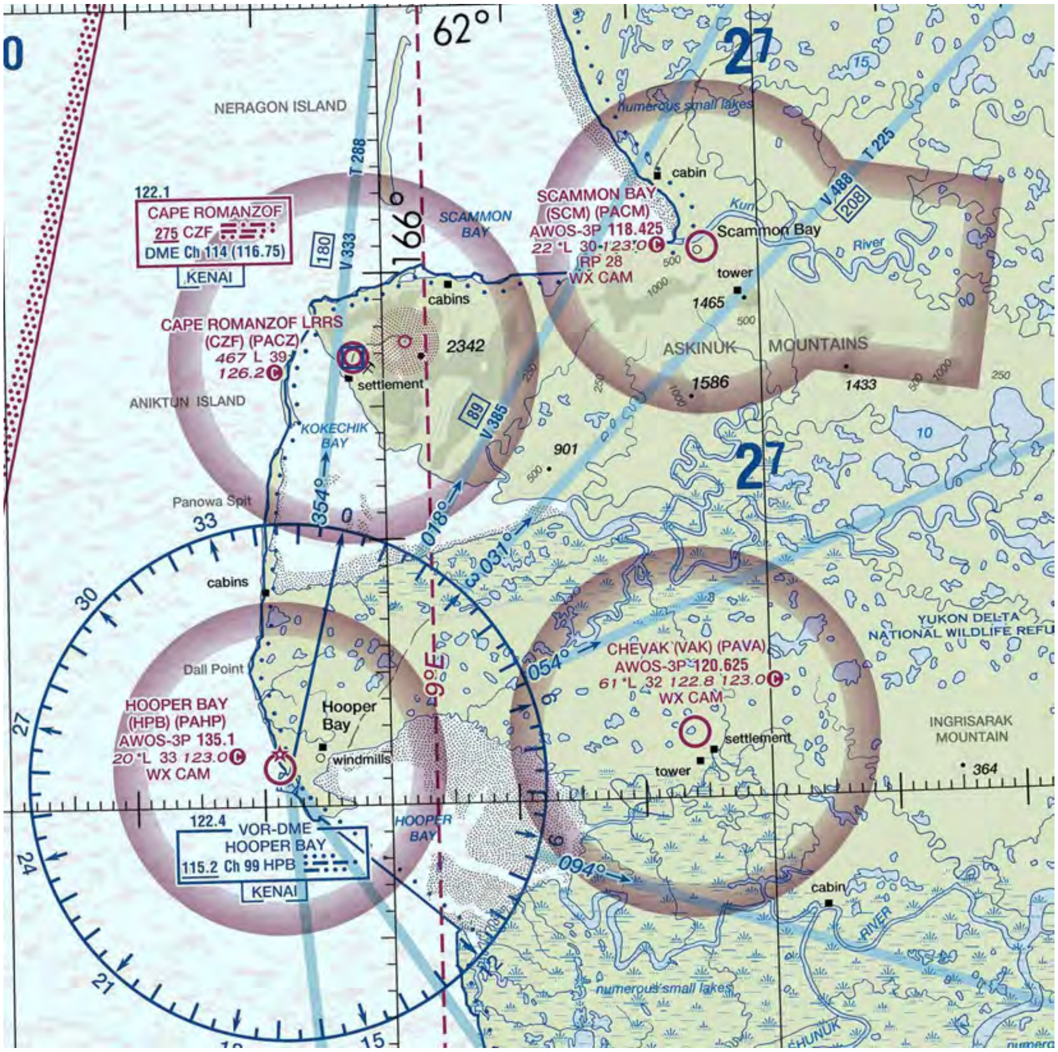
There is one non-standard condition shown on the ALP:

- Ultimate runway width of 100 feet, to account for wind coverage.

Rock revetments have been used to protect the runway from erosion along the Kun River, and a damaged culvert is located in the middle of the runway. The culvert allows for drainage under the runway.

Scammon Bay is located near three other community airports: Cape Romanzof Long Range Radar Station (LRRS) (15 miles), Hooper Bay (28 miles), and Chevak (22 miles) (Figure 2-2). Scammon Bay, Hooper Bay, and Chevak are served on the same passenger flight, from the hub of Bethel. Cape Romanzof LRRS is typically only visited by charter aircraft.

Figure 2-2 SCM Sectional



2.2.2 Taxiways

SCM has one 35-foot-wide taxiway, which connects the Airport and the apron.

2.2.3 Aprons

SCM has one apron, measuring 250 feet x 300 feet. This provides for the parking and loading/unloading of aircraft. The apron also houses the SREBs and an Automated Weather Observation System (AWOS) weather station. FAA support facilities are also located on the apron. Power is provided to the infrastructure on the apron from the community.

2.2.4 Safety Area, Object Free Area, and Object Free Zone

The Runway Safety Area (RSA) is 150 feet x 3,600 feet, providing a cleared, graded, drained area for aircraft to occasionally operate off the runway.

The Runway Object Free Area (ROFA) is 500 feet x 3,600 feet, providing a clear area around the runway to protect aircraft during landing and takeoff. Objects in the ROFA must be constructed on frangible (breakable) mounted supports.

The Runway Object-Free Zone (ROFZ) is 250 feet x 3,400 feet. It is designed to provide protection to aircraft on landing and takeoff.

2.2.5 Lightings, Marking, and Signing

The runway is lit with Medium Intensity Runway Lights (MIRL). There are no runway markings or navigation aids.

The windsock is lit but noted as unreliable. An unlit windsock is also present on the eastern portion of the runway.

2.2.6 Navigational Aids

The Anchorage Air Route Traffic Control Center provides approach and departure service via the Cape Romanzof Remote Center Air/Ground (RCAG) on Frequency 124.5. The controllers are primarily concerned with Instrument Flight Rules (IFR) aircraft at an altitude greater than 18,000 feet.

At Scammon Bay, pilots communicate with other pilots and advise their intentions on the Common Traffic Advisory Frequency (CTAF) Frequency 123.0. The AWOS reports are broadcast on Frequency 118.425.

2.2.7 Visual Approach Aids

Runway MIRL can be activated by the CTAF to provide increased visibility during periods of reduced visibility. MIRL are pilot-activated.

2.2.8 Instrument Approach Procedures

SCM has three Area Navigation Global Positioning System (RNAV GPS) Non-Precision Instrument Approach Procedures. RNAV (GPS) RW 10 is an approach requiring that, at 1,100 feet MSL, there is 1.25 statue-mile visibility for Category A aircraft (Figure 2-3). RNAV (GPS) RW 28 is an approach requiring that at 900 feet MSL, there is 1.25 statue-mile visibility for Category A aircraft for Localizer Performance approaches (Figure 2-5). Both of these approach procedures provide obstacle clearance for terrain and other features with lower visibility minimums than Visual Flight Rules (VFR) approaches. In comparison, VFR flight requires a 1,000-foot ceiling and 3 statue-miles of visibility.

RNAV (GPS)-B is an approach requiring that at 760 feet, there is 2.25 statue-mile visibility for Category A aircraft (Figure 2-5). This approach provides a lower altitude option, by approaching from the north, but requires greater visibility than the other instrument approaches.

2.2.9 Airspace and Air Traffic Management

The Part 77 surfaces from the 2004 ALP are as follows:

- Primary Surface: The Primary Surface is longitudinally centered on the runway and identical to the elevation of the nearest corresponding point on the runway centerline.
- Horizontal Surface: The Horizontal Surface is a horizontal plane 150 feet above the established airport elevation (for SCM, it is at 172 feet). The perimeter of the Horizontal Surface is established by swinging a 5,000-foot radius arc from the center of each end of the primary surface and connecting each arc with lines tangent to those arcs.
    - The Horizontal Surface at SCM is penetrated by terrain in multiple locations.
- Conical Surface: The Conical Surface is a surface extending outward and upward from the periphery of the Horizontal Surface at a slope of 20:1 (horizontal to vertical) for a horizontal distance of 4,000 feet.
    - The Conical Surface at SCM is penetrated by terrain in multiple locations.

Figure 2-3 Instrument Approach RNAV (GPS) RWY 10

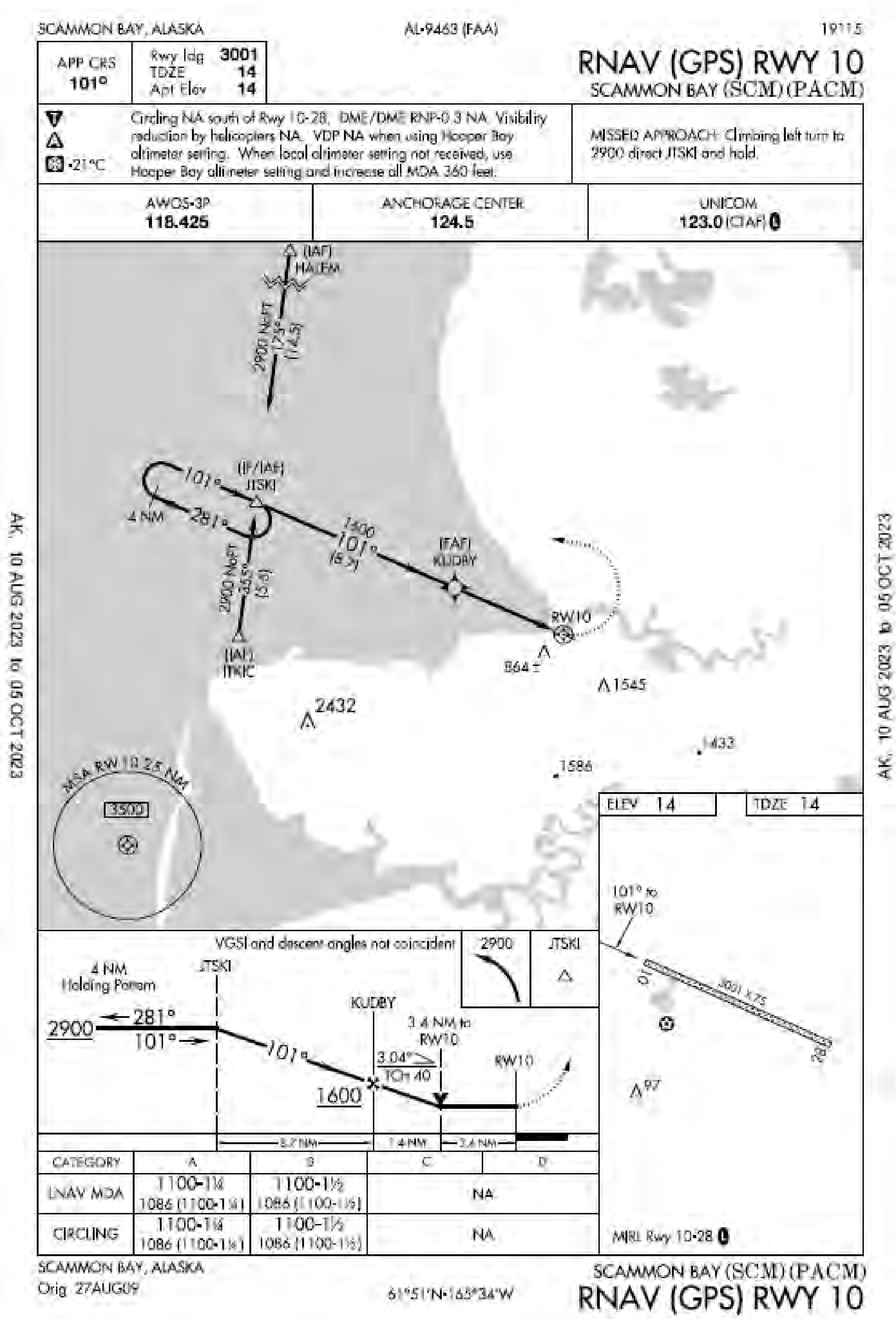


Figure 2-4 Instrument Approach RNAV (GPS) RWY 28

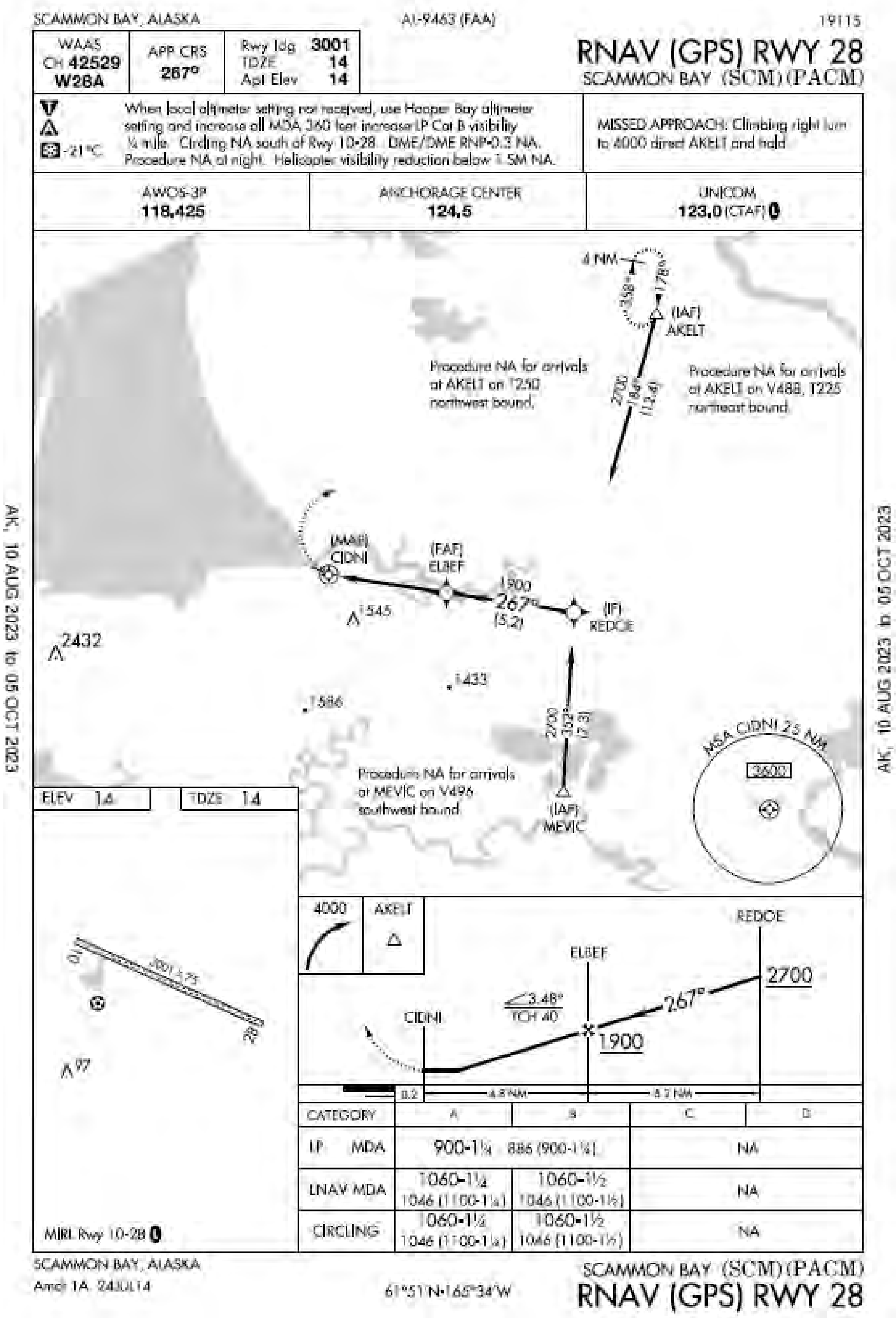
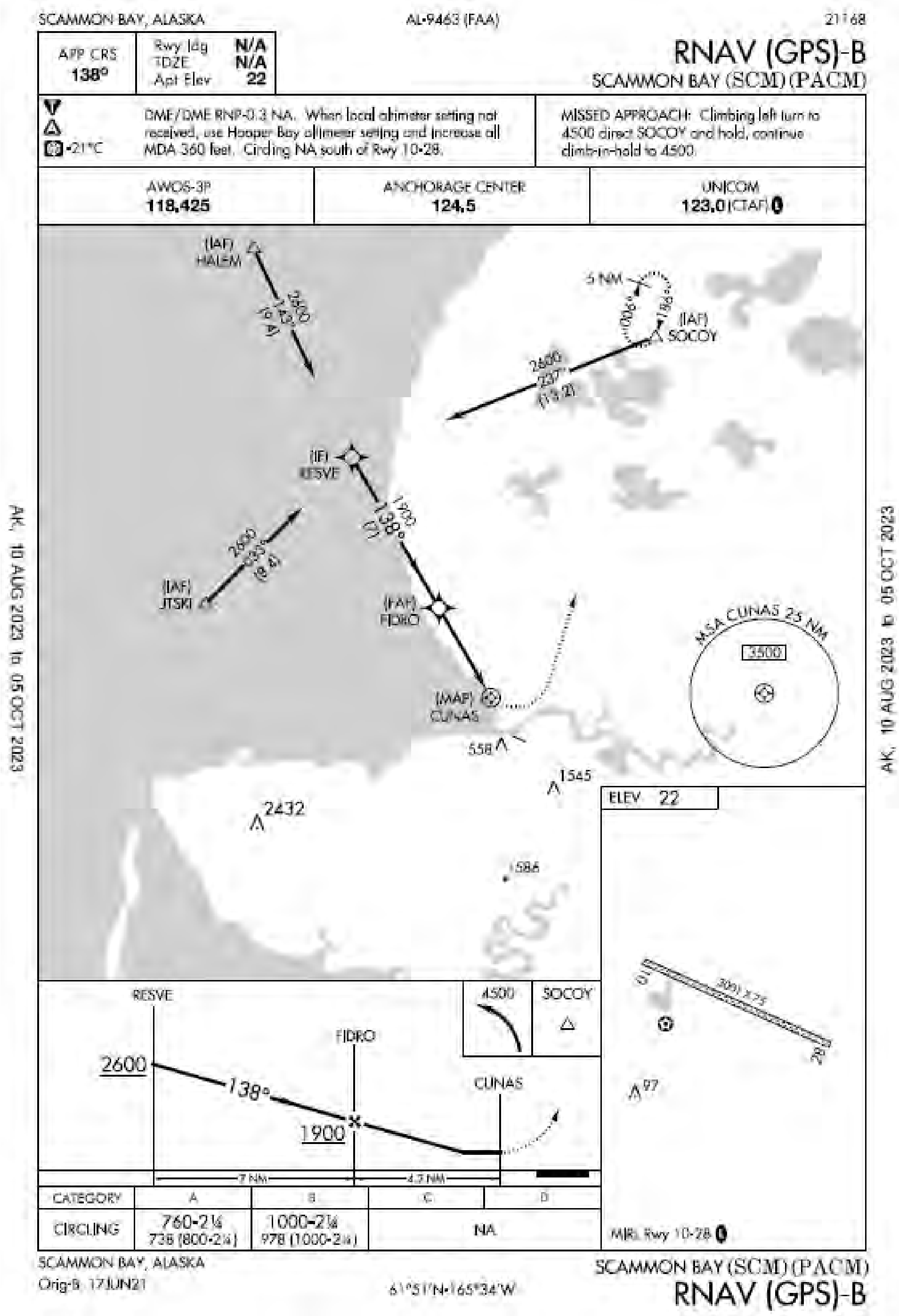


Figure 2-5 Instrument Approach RNAV (GPS)-B



- Approach Surface: The Approach Surface is longitudinally centered on the extended runway centerline and extends outward and upward from each end of the Primary Surface. The ultimate surface for both runways is 34:1.
- Transitional Surface: The Transitional Surfaces extend outward and upward at right angles to the runway centerline and the extended runway centerline at a slope of 7:1 (horizontal to vertical) from the sides of the Primary and Approach Surfaces to the Horizontal Surface.

2.2.10 Weather

SCM is equipped with an AWOS and an internet accessible webcam system (Figures 2-6 and 2-7). The AWOS measures precipitation in addition to collecting visibility, cloud, and ceiling data. A lighted windsock is present opposite of the apron, outside of the ROFA. An unlighted windsock is present on the eastern portion of the runway.

Figure 2-6 Northeast and East (right) Views from Scammon Bay (FAA, 2023a)

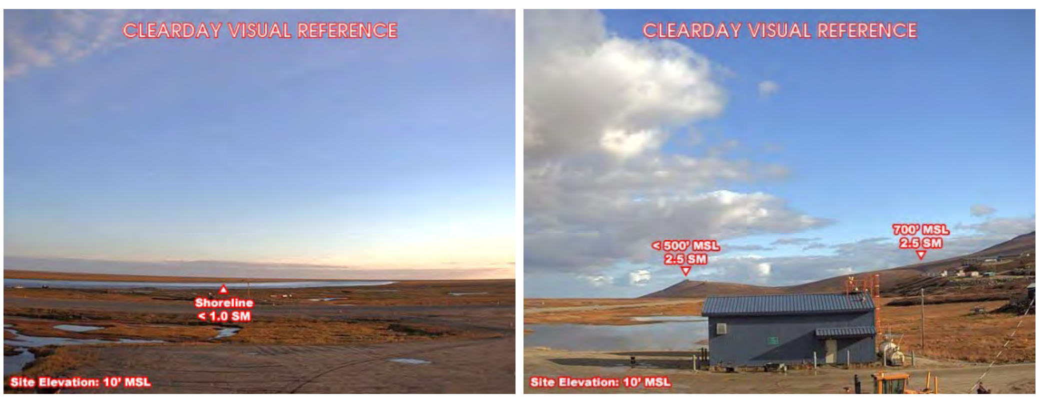
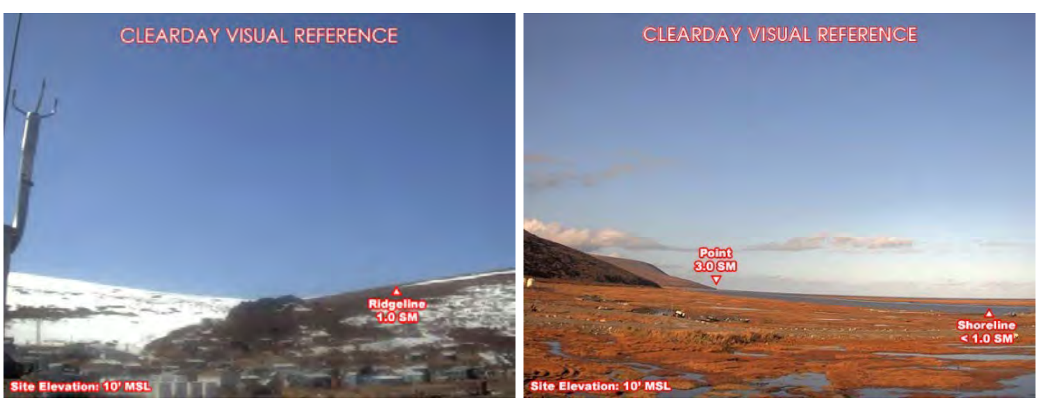


Figure 2-7 Southwest and West (right) Views from Scammon Bay (FAA, 2023a)



Wind data for the previous ALP (2004) was collected at Cape Romanzof LRRS, located 15 miles from Scammon Bay, because no local data was available at the time. Wind data is now available for Scammon Bay through the FAA Airport Data and Information Portal for the period 2013 to 2022 (Table 2-3). Using this data, wind roses were calculated with the following assumptions: Runway True Bearing of 299.5, Crosswind of 13 knots [B-II (S)], Bidirectional Runway. Wind data shows All Weather 90.4% wind coverage for a 13-knot crosswind, and Instrument Weather 87.54% coverage for a 13-knot crosswind (Figure 2-8). As a note, a 13-knot crosswind is referenced because the expected Critical Aircraft is a B-II (S) classification.

Wind analysis revealed that no orientation of a single runway at SCM can meet the 95% crosswind criteria for either a 10.5-knot or a 13-knot crosswind. In situations where a single runway cannot meet 95% coverage, the FAA recommends development of a crosswind runway or, if terrain does not allow, an increase in the runway dimensions to meet the next largest ARC requirements (AC 150/5300-13B, Appendix B Wind Analysis, B.2.3.2).

At SCM, terrain makes creation of a crosswind runway cost prohibitive. Consequently, this report recommends increasing the runway dimensions to the next largest ARC requirements for runway width while maintaining ARC requirements for RSA, ROFZ, and Runway Protection Zone (RPZ).

2.3 Facilities

There are no passenger shelter, terminal, or other facilities at SCM. Passengers wait for the aircraft outside, or they listen for the approaching aircraft and then travel to the apron.

There are no cargo facilities at SCM. Cargo is handled by the general public and the pilot of the aircraft.

There are no General Aviation (GA) facilities at SCM.

Table 2-3 SCM Weather Summaries

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Precip. (inches)	0.85	0.38	0.67	0.44	1.50	1.91	4.31	5.47[1]	5.07	3.08	0.66	0.63
Mean Max Temp (°F)	13.8	17.6	18.3	28.51	41.5	53.2	57.1	56.2	49.5	38.1	25.6	19.9
Mean Min Temp (°F)	3.1	6.0	6.2	18.0	31.8	43.4	48.4	47.9	42.2	31.5	17.8	10.0
Mean Avg Temp (°F)	8.5	11.8	12.3	23.3	36.7	48.3	52.7	52.0	45.8	34.8	21.7	14.9
% of time under Non-VFR conditions[2]	28%	24%	24%	28%	25%	19%	21%	21%	18%	16%	19%	23%

Key:

[1] The calculation of this value excluded values from August of 2008 because the station-reported total precipitation for that month was 610.59 inches. Such a quantity is unlikely and its exclusion provides an average that aligns more closely with those of the preceding and subsequent months.

[2] Non-VFR conditions summarized from SCM visibility and ceiling observations at the Airport between 2005 and 2022

°F – degrees Fahrenheit

% – percent

AVG – Average

Max – Maximum

Min – Minimum

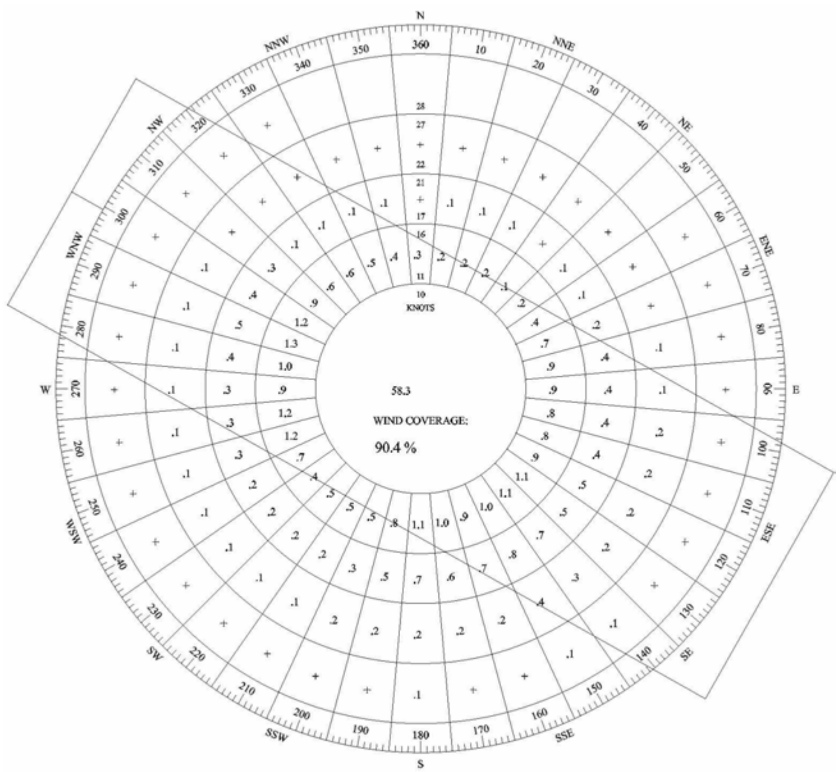
Precip. – Precipitation

Temp – Temperature

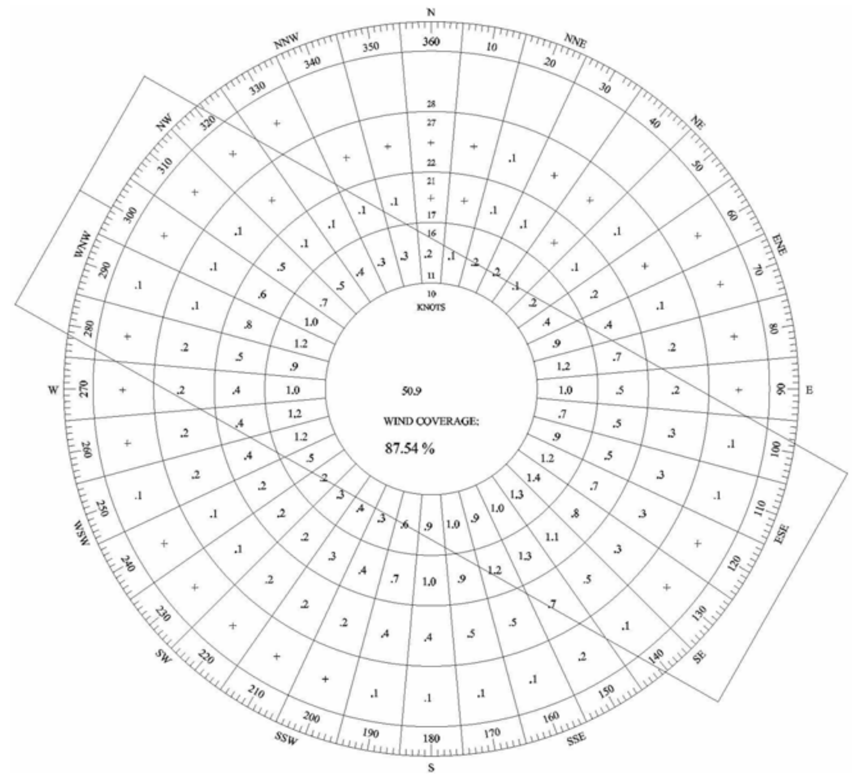
VFR – Visual Flight Rules

Source: ASOS-AWOS-METAR Data Download, https://mesonet.agron.iastate.edu/request/download.phtml?network=AK_ASOS and https://xmacis.rcc-acis.org/.

Figure 2-8 Wind Rose



All Weather Conditions, 13 knot crosswind



Instrument Meteorological Conditions, 13 knot crosswind

Runway 10/28		
Weather	10.5 knots (A-I & B-I)	13 knots (A-II & B-II)
All Weather	83.97%	90.4%
Instrument Weather	80.49%	87.5%

(Federal Aviation Administration Recommends 95 percent crosswind component coverage)

2.3.1 Fuel Storage

Aviation fuel is not available for purchase at SCM.

Fuel storage on the Airport is limited to a 1,000-gallon heating oil tank and a 1,000-gallon diesel fuel tank at the SREBs.

The community receives fuel deliveries by barge from the city dock, which is on Airport property and adjacent to the threshold of Runway 10. Fuel is transferred through a pipeline, along the access road on Airport property, to a tank farm off Airport property. The community would like to improve the city dock but has difficulty receiving funding due to its location on Airport property. The community would prefer to maintain the existing dock, rather than build a new one. If the Airport is relocated, the community would be interested in acquiring the property.

2.3.2 Chemical Materials

No chemicals, other than standard vehicle maintenance lubricants, are stored at the Airport.

2.4 Maintenance and Operations

Airport maintenance facilities include two SREBs.

2.5 Access, Circulation, and Parking

The apron is accessed by the community Airport access road. Airport access roads serving only the airport are typically eligible for AIP funding. The Airport access road has an encroaching basketball court. This basketball court may impact the length of airport access road eligible for AIP funding.

The community has a city dock, haul road to the dock, and freight storage on Airport property. These developments are not typically eligible for AIP funding. Funding to maintain or improve these facilities is difficult to obtain because they are on Airport property. If the Airport is shifted or relocated, the community would be interested in purchasing the property.

There is no formal parking at the Airport. Users access the apron directly.

The Airport is not fenced.

2.6 Utilities

The Airport is connected to the city's power grid, which provides the electricity for the Airport. Telecommunications is also provided to the Airport.

No other utilities are present on the Airport.

2.7 Land Use

Land use plans indicate there are no leases at the Airport (Figures 2-9 and 2-10). The FAA does have a weather station and support facilities on the apron, and there is a utility pole on the apron.

The sewage lagoon is located off Airport property, approximately 540 feet south of the center the runway.

The solid waste facility is located off Airport property, approximately 3,500 feet southeast of the runway end.

The city dock, haul road, and freight storage are on Airport property, adjacent to the runway threshold. Boats are stored on the shoreline surrounding the runway.

The community is located directly adjacent to the Airport. In rural Alaska, communities are often located close to the airport. Community stakeholders tend to view airplane noise as a welcome reminder of connections to regional infrastructure, rather than as an inconvenience.

There is no borough or city zoning in the area.

2.7.1 Property

The ALP published a Property Plan (Figure 2-9), and DOT&PF maintains a Land Occupancy Plan (Figures 2-10 and 2-11). The Property Plan indicates that the runway and Airport access road are owned by the State of Alaska.

The approach to RW10 has an aviation and hazard easement from the State of Alaska Department of Natural Resources to DOT&PF.

A portion of the land off the end of RW28 needs to be acquired from the Calista Corporation and the Askinuk Corporation.

Figure 2-9 Property Plan

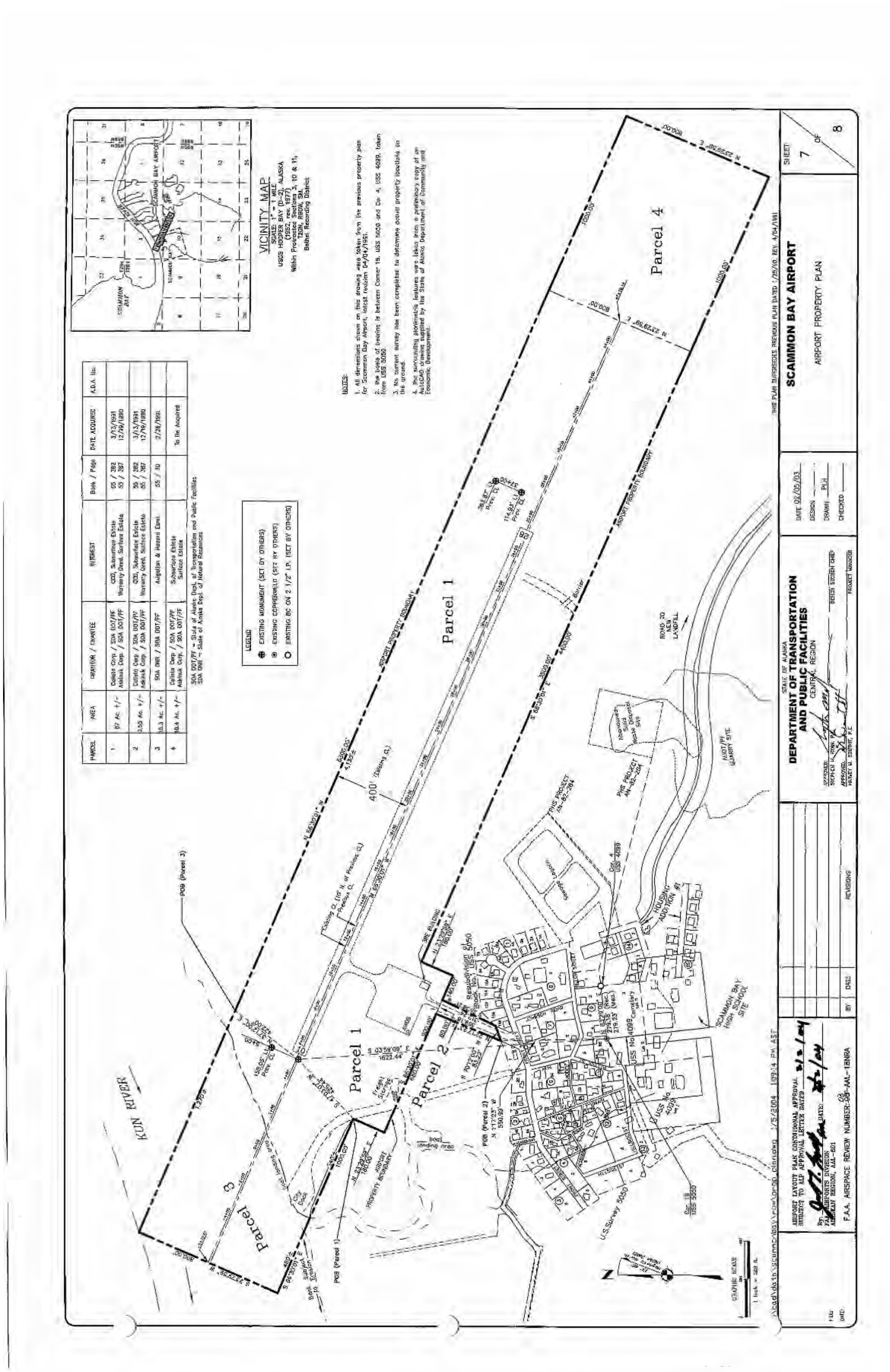


Figure 2-10 Land Occupancy Plan Sheet 1

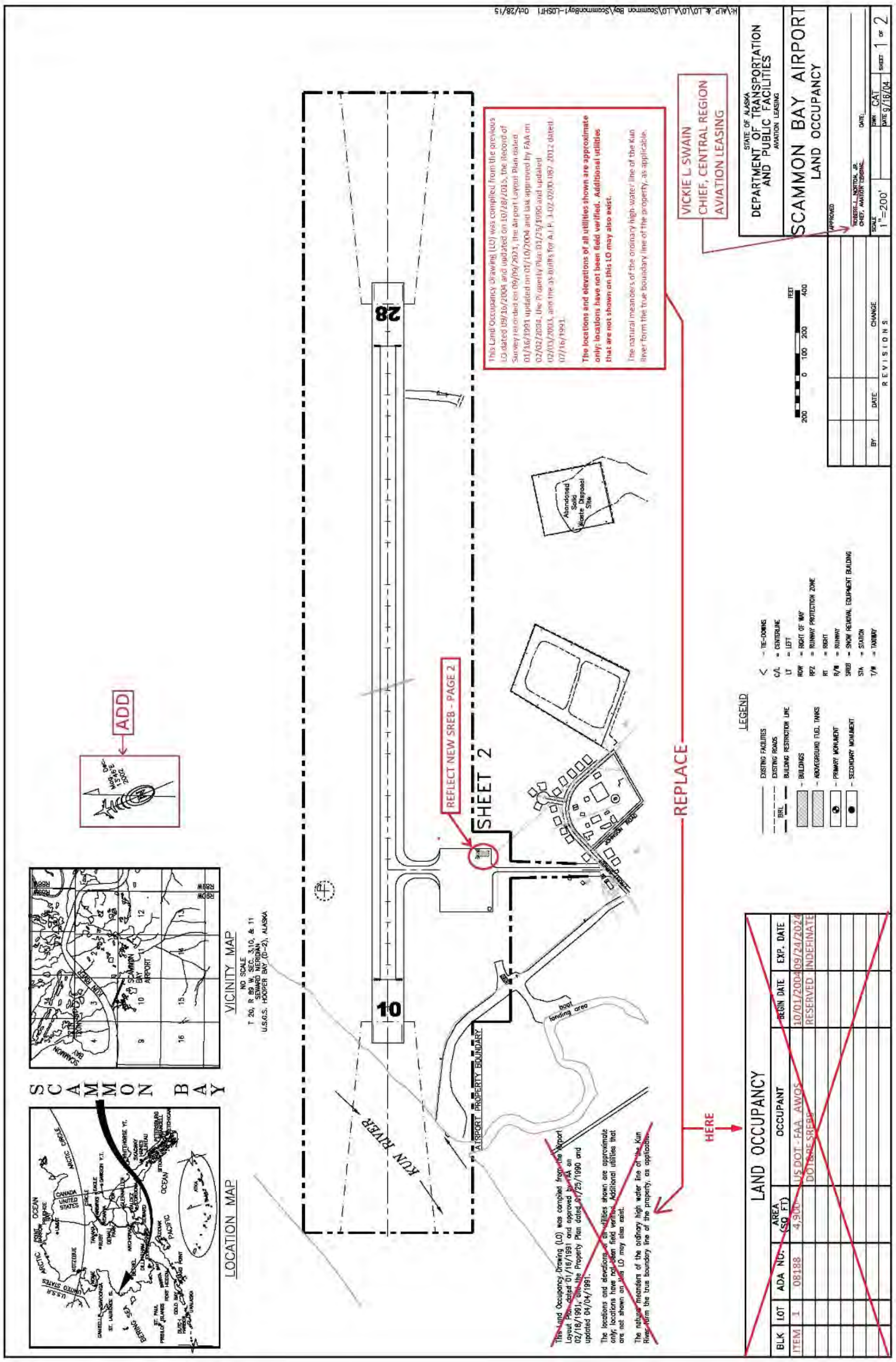
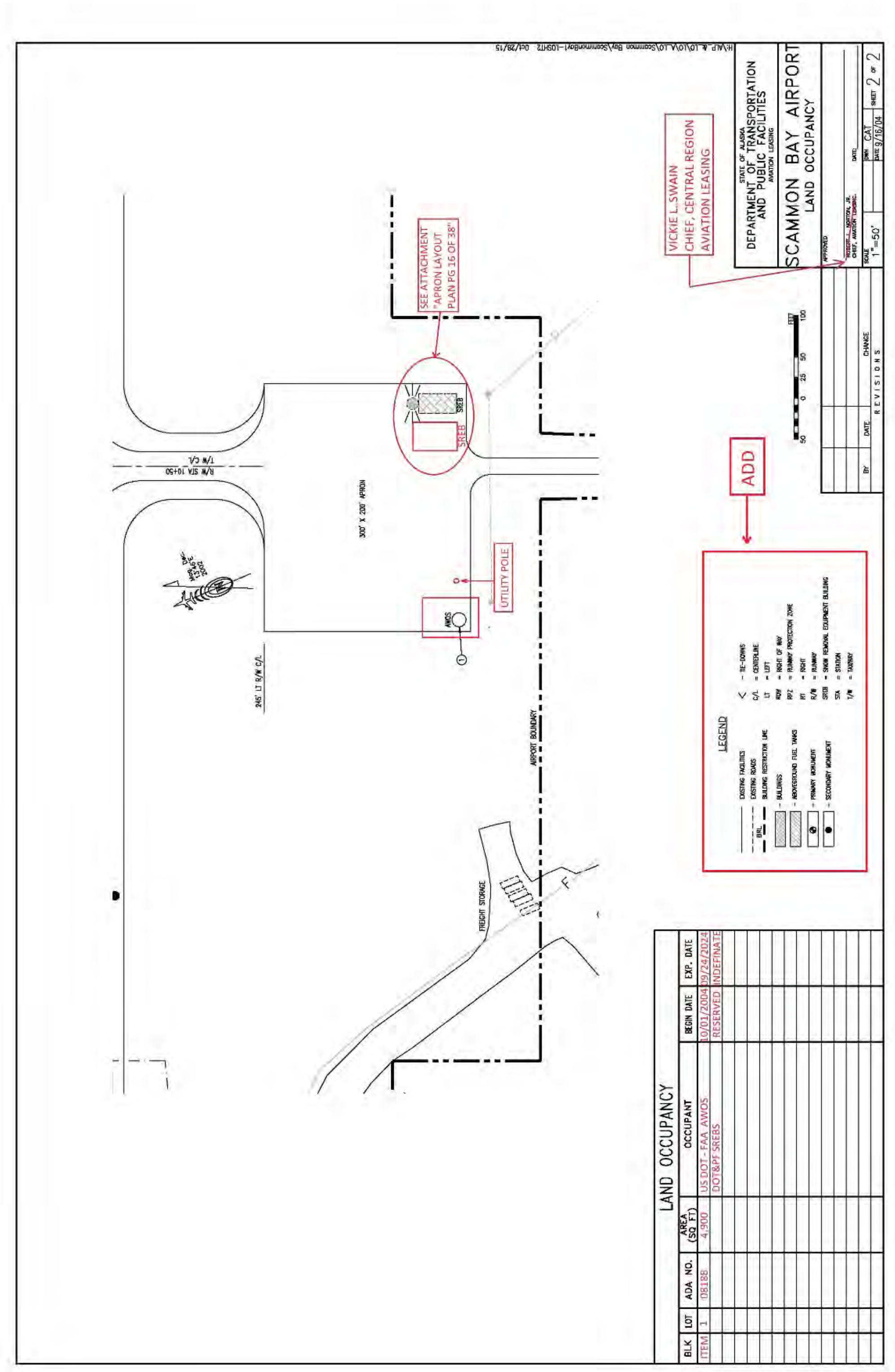


Figure 2-11 Land Occupancy Plan Sheet 2



3 FORECAST AND AVIATION ACTIVITY

3.1 Commercial Activity

Commercial flights are the primary activity at Scammon Bay, there is no significant military or general aviation use of the Airport.

Commercial activity operates on a hub and spoke system, from the primary hub of Bethel. Two air carriers, Grant Aviation and Ryan Air, provide most of the service (Tables 3-1 and 3-2). Grant Aviation schedules flights four times per day (only two times per day on Sundays), and Ryan Air schedules flights once per day. In early 2020, Hageland Aviation (Ravn Alaska) ended service to the community, as the parent company went bankrupt.

There is a variance between different datasets for flights completed. The air carrier-reported data for 2022 indicate that Grant Aviation and Ryan Air completed 89% and 70% of their scheduled flights, respectively (USBTS, 2023). Flight radar tracking data indicate that only 19% of scheduled flights to Scammon Bay were completed between October 7 and December 7, 2023 (FlightRadar24.com). This disparity may come from different data collection methods (U.S. Bureau of Transportation Statistics [USBTS] data is air carrier self-reported, Flight Radar data is from third party air traffic monitoring) but illustrates an uncertainty about level of service.

Scammon Bay is not connected to any other community by road. Aviation provides the only year-round connection to other communities and regional infrastructure, such as medical care, groceries, and retail. While seasonal boating, barge, and overland travel do provide connections to other communities in the winter and summer; in the spring and fall, the Airport remains the only lifeline to other communities and to medical care.

The number of passengers enplaned at Scammon Bay is shown in Table 3-3 and illustrated on Figure 3-1. A decrease in aviation activity occurred because of COVID-19 pandemic restrictions in 2020 and 2021. Aviation activity began to pick back up in 2022.

Table 3-1 Operations of Major Air Carriers Providing Service to Scammon Bay, 2013- 2022

Air Carrier	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Grant Aviation	1,704	1,628	1,727	1,690	1,414	1,590	1,925	1,685	2,040	2,413
Ryan Air (also Arctic Transportation)	208	220	242	214	280	282	266	285	346	514
Yute (Air and Commuter Service)	48	16	20	18	18	22	4	6	63	152
Bering Air Inc.	4	10	-	-	8	10	8	38	40	148
Fox Aircraft	-	-	-	-	-	-	-	-	-	118
Iliamna Air Taxi	-	-	-	-	-	-	-	12	10	4
Katmai Air	-	-	-	-	-	-	-	-	2	1
Alaska Central Express	4	-	-	-	-	-	-	-	-	-
Ravn Alaska (also Northern Pacific Airways)	-	-	-	2	6	-	2	-	-	-
Frontier Flying Service	-	-	-	-	6	2	-	-	-	-
Hageland Aviation Service	2,245	2,639	2,441	2,576	1,974	1,847	1,646	254	-	-
Everts Air Alaska and Everts Air Cargo	-	-	2	-	-	-	-	-	-	-
Total	4,213	4,513	4,432	4,500	3,706	3,753	3,851	2,280	2,501	3,350

Source: USBTS, 2023.

Table 3-2 Aircraft Used by Major Air Carriers in 2022

Air Carrier	Aircraft	Operations
Grant Aviation	Gipps Aero Ga8 Airvan	52
	Cessna C206/207/209/210 Stationair	70
	Cessna 208 Caravan	832
Ryan Air	Cessna C206/207/209/210 Stationair	70
	Casa/Nurtanio C212 Aviocar	824
	Cessna 208 Caravan	832
	Pilatus PC-12	958

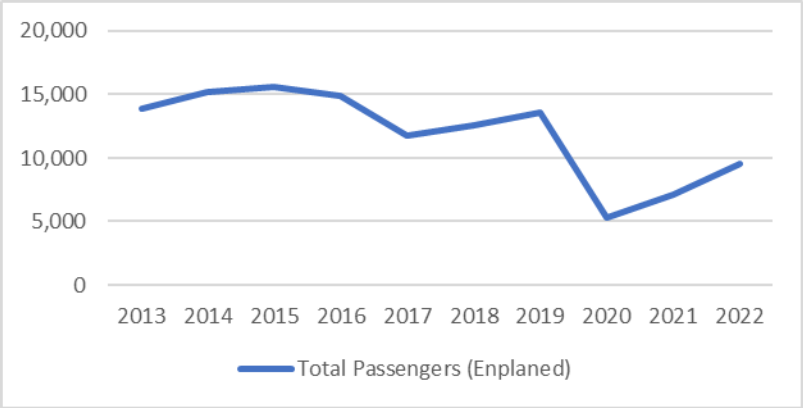
Source: USBTS, 2023.

Table 3-3 Passengers, Freight, and Mail at Scammon Bay, 2013- 2022

Year	Passengers (Leaving)	Passengers (Incoming)	Total Passengers (Enplaned)	Freight (Leaving)	Freight (Incoming)	Freight (Total)	Mail (Leaving)	Mail (Incoming)	Mail (Total)
2013	6,395	7,510	13,905	77,282	245,092	322,374	222,075	1,054,810	1,276,885
2014	7,474	7,672	15,146	68,486	243,696	312,182	307,253	1,293,912	1,601,165
2015	7,826	7,814	15,640	55,755	215,921	271,676	255,669	1,164,383	1,420,052
2016	7,483	7,389	14,872	48,820	181,657	230,477	259,721	1,146,167	1,405,888
2017	5,886	5,845	11,731	43,649	197,827	241,476	168,818	1,128,822	1,297,640
2018	6,276	6,246	12,522	37,980	229,943	267,923	141,259	1,036,875	1,178,134
2019	6,793	6,741	13,534	28,621	194,012	222,633	170,301	1,043,342	1,213,643
2020	2,646	2,697	5,343	27,449	239,545	266,994	121,181	1,113,329	1,234,510
2021	3,576	3,564	7,140	29,368	235,120	264,488	73,949	1,152,124	1,226,073
2022	4,773	4,791	9,564	24,476	501,149	525,625	64,913	1,346,783	1,411,696

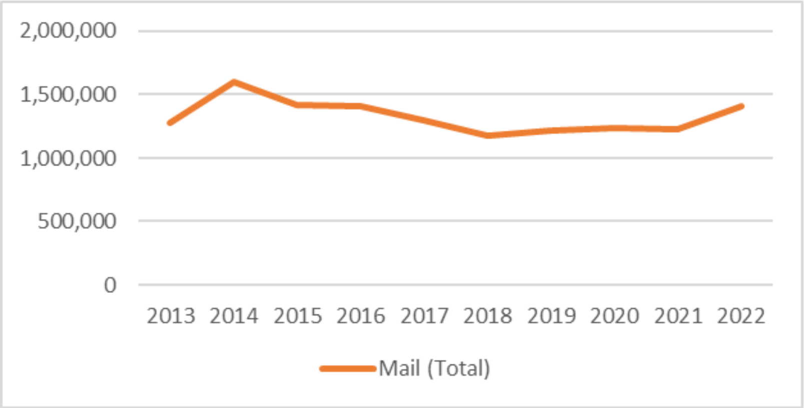
Source: USBTS, 2023.

Figure 3-1 Enplaned Passengers at Scammon Bay, 2013- 2022



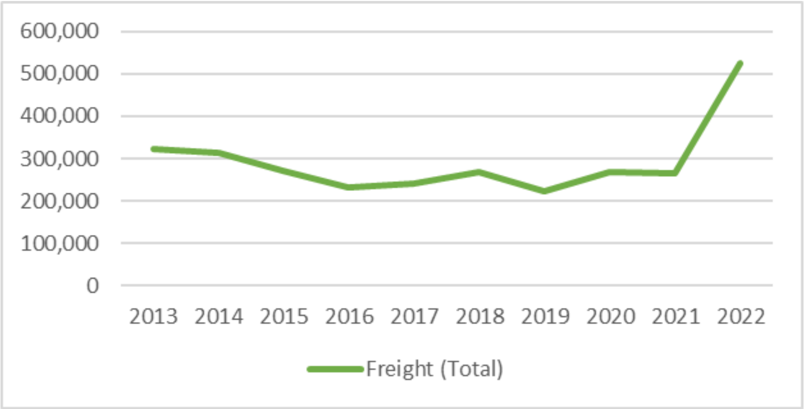
Source: USBTS, 2023.

Figure 3-3 Total Mail (pounds) at Scammon Bay, 2013- 2022



Source: USBTS, 2023.

Figure 3-2 Total Freight (pounds) at Scammon Bay, 2013- 2022



Source: USBTS, 2023.

To emphasize the importance of the Airport, it is important to note that the residents of Scammon Bay have a significantly larger number of per capita enplanements than the nation as a whole. With 9,564 enplanements in 2022 (Table 3-3), the per capita enplanements for Scammon Bay is approximately 17. For comparison, in 2022 for the United States as a whole, there were 853 million enplanements for 338 million people – an average of 2.5 enplanements per capita. Scammon Bay residents have approximately six times more enplanements per capita than the United States average.

Beyond enplanements, Table 3-3 and Figures 3-2 and 3-3 also demonstrate the importance of freight and mail service at the Airport. In 2022, the mail and air freight transported approximately 3,400 pounds of freight per capita at Scammon Bay. The vast majority of this freight is goods being transported into Scammon Bay. These goods represent a significant source of supplies for local residents, including groceries, consumer goods, and other essentials. The seasonal barge is the only other major source of freight into the community, and the barge is reserved for large, non-perishable items such as vehicles and building supplies.

Figures 3-2 and 3-3 show the past mail and freight activity at SCM. Mail activity remained constant throughout the COVID-19 downturn with regard to enplanements, demonstrating the continued importance of the mail system in supplying Scammon Bay.

It is relevant to note that the freight increased dramatically in 2022, roughly doubling to 525,625 pounds in 2022 from 264,488 pounds in 2021. Freight numbers are only released for the first 6 months of 2023, but the trend appears to have returned to pre-2022 levels, with approximately 170,000 pounds shipped between January and June 2023 (Table 3-4).

To investigate the freight shipments in 2022, Table 3-4 breaks down the monthly freight shipped at SCM between 2013 and 2023. The average per month volume typically varies between 15,000 and 20,000 pounds. March, April, and May of 2022 are exceptional for the high volume of shipments (italicized and underlined in Table 3-4) of between 76,603 pounds and 87,394 pounds. April of 2023 also saw higher than normal levels of freight (46,373 pounds). Interviews with air carriers indicated that these were temporary increases, related to the import of fuel and construction of a church.

Table 3-4 Monthly Freight Transportation (pounds) at Scammon Bay, 2013- 2023

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Mean per Month
2013	9,422	16,104	10,331	22,713	40,957	26,485	32,861	30,829	16,073	17,733	12,842	8,742	245,092	20,424
2014	9,473	12,839	14,827	11,676	26,789	19,548	21,181	20,682	19,093	54,477	19,924	13,187	243,696	20,308
2015	9,284	10,201	11,576	16,324	16,338	26,367	19,340	13,887	19,603	26,553	34,058	12,390	215,921	17,993
2016	12,720	9,771	15,168	19,367	15,398	14,510	16,285	14,359	15,347	11,874	13,302	23,556	181,657	15,138
2017	13,580	7,509	14,920	14,869	18,191	15,411	20,733	23,089	19,689	22,642	12,715	14,479	197,827	16,486
2018	10,014	3,926	11,554	9,758	18,633	26,325	23,004	21,868	24,530	25,792	25,190	29,349	229,943	19,162
2019	11,664	7,977	16,620	19,765	19,472	16,959	19,485	15,586	18,194	18,278	15,792	14,220	194,012	16,168
2020	15,560	10,654	12,295	16,327	20,221	19,488	27,035	32,409	31,471	23,581	13,196	17,308	239,545	19,962
2021	23,279	31,332	12,349	23,174	19,832	16,429	18,235	18,530	14,088	23,363	22,289	12,220	235,120	19,593
2022	23,889	29,904	***87,394***	***76,603***	***82,172***	28,630	15,603	25,729	32,349	46,112	26,403	26,361	501,149	41,762
2023	27,919	14,095	25,567	***46,373***	26,858								140,812	28,162
Mean Per Month	15,164	14,028	21,146	25,177	27,715	21,015	21,376	21,697	21,044	27,041	19,571	17,181	15,164	

Bold, italics, underline – high volume shipments

Source: USBTS, 2023.

3.2 Airport Operations

Airport operations are dominated by the regular commercial air-taxi service provided by Grant Aviation and Ryan Air (Tables 3-1 and 3-2). Grant Aviation flies the Cessna C208 Caravan, Cessna 207 Stationair, and Gipps Aero Ga8 Airvan. Ryan Air flies the Cessna 208 Caravan, Casa C212, Cessna 207 Stationair, and the Pilatus PC-12. Aircraft have different operations envelopes, with utility operations allowing limited acrobatic operations, and normal operations excluding these types of maneuvers.

The bulk of the operations are completed by the Cessna 208 Caravan, which is an Aircraft Approach Category (AAC) A and Airplane Design Group (ADG) II (S) aircraft (Tables 3-5, 3-6, and 3-7). The AAC/ADG categorizes aircraft by aircraft design requirements, specifically approach speed and wingspan. The second most common aircraft is the Casa C212, which is an A-II aircraft, but logged only 340 annual operations at SCM.

Preliminary data indicates an increasing usage in 2023 of the Piper PA-31 (Navajo) (B-I) by Fox Aircraft (Table 3-5). As of September 2023, preliminary data indicate 240 year-to-date operations at Scammon Bay. This is an increase from previous years, and if the trend continues for the final quarter of 2023, would indicate ~320 operations in 2023 (Table 3-5). Due to this increasing use, the planning team interviewed Fox Aircraft about their operations. In 2022 and 2023, Fox Aircraft has been using a Navajo to offer chartered air service and has seen expanding operations at SCM. They anticipate offering regularly scheduled air service in 2024 and beyond, starting at 3 to 4 times per week, 1 to 2 trips per day. While the Navajo has historically not crossed the 500-operation threshold, this indicates that it may in 2024. As a result, it is included in the consideration of the critical aircraft.

The Casa C212 and Gipps Airvan are important to note as the primary heavy cargo haulers using SCM. They can both takeoff in excess of 10,000 pounds, and maintain the slow airspeeds required to operate on A-I/II airports. These provide important cargo haul capability to Scammon Bay and supplement the seasonal barge service.

There are no general aviation aircraft based at Scammon Bay. No general aviation aircraft are registered in the FAA Aircraft Owners Database, and none are reported on the 5010 database.

Table 3-5 Aircraft Operations at Scammon Bay, 2013- 2022

Year	AAC	ADG	TDG	Small?	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cessna 208 Caravan	A	II	1A	S	3,039	3,193	3,444	3,748	3,092	3,239	3,442	1,961	2,168	2,539
Casa/Nurtanio C212 Aviocar	A	II	1A		200	208	170	152	194	188	166	159	162	340
Cessna C206/207/209/210 Stationair	A	I	1A	S	495	586	363	368	296	246	180	40	71	173
Cessna C208B/Grand Caravan	A	II	1A	S	0	0	0	0	6	4	4	8	26	124
Piper PA-31 (Navajo)/T-1020	B	I	1A	S	189	162	158	24	14	8	36	40	2	102
Gipps Aero Ga8 Airvan	A	I			0	0	34	14	84	54	17	28	34	26
Beech 200 Super Kingair	B	II	2		28	6	0	0	2	4	0	26	12	22
Piper PA-32 (Cherokee 6)	A	I	1A	S	0	0	0	0	0	4	4	4	10	13
Pilatus PC-12	A	II	2	S	2	0	4	2	2	0	0	12	16	9
Cessna 172 Skyhawk	A	I	1A	S	0	0	0	6	4	4	0	0	0	2
Beech 1900 A/B/C/D	B	II	2		4	0	0	0	0	0	0	2	0	0
Cessna 406 Caravan II					256	358	259	184	0	0	0	0	0	0
De Havilland DHC8-100 Dash-8	B	III	3		0	0	0	2	6	0	2	0	0	0

Key: AAC – Aircraft Approach Category; ADG – Airplane Design Group; TDG – Taxiway Design Group

Source: USBTS, 2023

Table 3-6 Aircraft Approach Category (AAC) and Airplane Design Group (ADG)

AAC	Approach Speed (knots)	ADG	Wingspan (feet)	Tail Height (feet)
A	less than 91	I	To 48	To 20
B	91-120	II	49-78	20-30
C	121-140	III	79-117	30-45
D	141-165	IV	118-170	45-60
E	166 or more	V	171-213	60-66
		VI	214-262	66-80

Source: AC 150/5300-13A, Airport Design

Table 3-7 Aircraft Design Requirements at Scammon Bay

Aircraft	AAC	ADG	TDG	Wingspan	Length	Cockpit to Main Gear	Main Gear Width (MGW)	MTOW
Cessna 208 Caravan	A	II	1A	52.1	37.6	7.7	11.7	9062
Casa/Nurtanio C212 Aviocar	A	II	1A	62.3	53	18.1	11.2	16976
Cessna C206/207/209/210 Stationair	A	I	1A	36-36.8	28.3-31.5	1.8-6	8.1-10.3	3600-3800
Cessna C208B/Grand Caravan	A	II	1A	52.1	37.6	7.7	11.7	9062
Piper PA-31 (Navajo)/T-1020	B	I	1A	40.7	32.6	10.7	13.8	6500
Gipps Aero Ga8 Airvan	A	I						
Beech 200 Super Kingair	B	II	2	54.5	43.8	15	17.2	12500
Piper PA-32 (Cherokee 6)	A	I	1A	36.2	27.6	7.2	11.1	3600
Pilatus PC-12	A	II	2	53.3	47.3	11.4	14.8	10450

Key: AAC: Aircraft Approach Category; ADG: Airplane Design Group; TDG: Taxiway Design Group; MTOW: Maximum Takeoff Weight (pounds)

Source: USBTS, 2023.

There are also no known military aircraft operations at Scammon Bay. The Cape Romanzof LRRS Airport is located 15 miles from SCM, and SCM could be used as a weather refuge, if required.

3.2.1 Airport Operations Forecast

FAA forecasting guidance recommends using demographic, economic, geographic, and aviation trends to forecast airport activity. Scammon Bay is primarily a residential community, with limited economic activity. The factors influencing aviation activity are related to changes in the residential population at Scammon Bay. Geography plays an important factor, because aviation service is provided on flights from Bethel, which serve multiple regional communities on the same trip. There are no known military or general aviation activities. The population trends for Scammon Bay, and the region, are the best indicator of airport operations.

The Alaska Department of Labor and Workforce Development provides historic population counts for the Bethel Census Area, Kusilvak Census Area (which includes Scammon Bay), and Scammon Bay itself (Table 3-8 and Figure 3-4). The department also provides projections of future population for the Bethel Census Area and Kusilvak Census Area (Table 3-8). Since a future projection is not available for Scammon Bay, the percentage of population change projected for the Kusilvak Census Area was extrapolated to Scammon Bay, to provide an estimate for the local future population (Table 3-8).

Since 2011, the population at Scammon Bay has increased from 503 to 615 (Table 3-8). This represents a population fluctuation of 22%. Overall, the State of Alaska anticipates that the population is expected to moderately increase, from the current population of 615 individuals to 775 in 2045.

To account for the inherent uncertainty in population projections, Table 3-9 provides High, Medium, and Low growth forecasts. The Medium forecast was set equal to the State's projected population change for the Kusilvak Census Area (Table 3-8). The High and Low forecasts were set for +/- 2% of the Medium growth rates, respectively (Table 3-9). This results in a range of population forecasts for Scammon Bay (Figure 3-4, Table 3-9).

Table 3-8 Population Estimates: Historic (2011 – 2022) and Estimated (2025 – 2045)

	Bethel Census Area	(% Growth)	Kusilvak Census Area	(% Growth)	Scammon Bay	(% Growth)
2011	17,539		7,710		503	
2012	17,717	1.0%	7,738	0.4%	537	6.8%
2013	18,140	2.4%	8,046	4.0%	522	-2.8%
2014	18,407	1.5%	8,212	2.1%	535	2.5%
2015	18,582	1.0%	8,361	1.8%	569	6.4%
2016	18,595	0.1%	8,397	0.4%	579	1.8%
2017	18,717	0.7%	8,448	0.6%	582	0.5%
2018	18,685	-0.2%	8,571	1.5%	605	4.0%
2019	18,874	1.0%	8,477	-1.1%	601	-0.7%
2020	18,666	-1.1%	8,368	-1.3%	600	-0.2%
2021	18,485	-1.0%	8,163	-2.4%	579	-3.5%
2022	18,207	-1.5%	8,158	-0.1%	615	6.2%
2025	18,349	0.8%	8,620	5.7%	649	5.7%
2030	18,902	3.0%	9,024	4.7%	680	4.7%
2035	19,476	3.0%	9,409	4.3%	709	4.3%
2040	20,070	3.0%	9,808	4.2%	739	4.2%
2045	20,737	3.3%	10,282	4.8%	775	4.8%

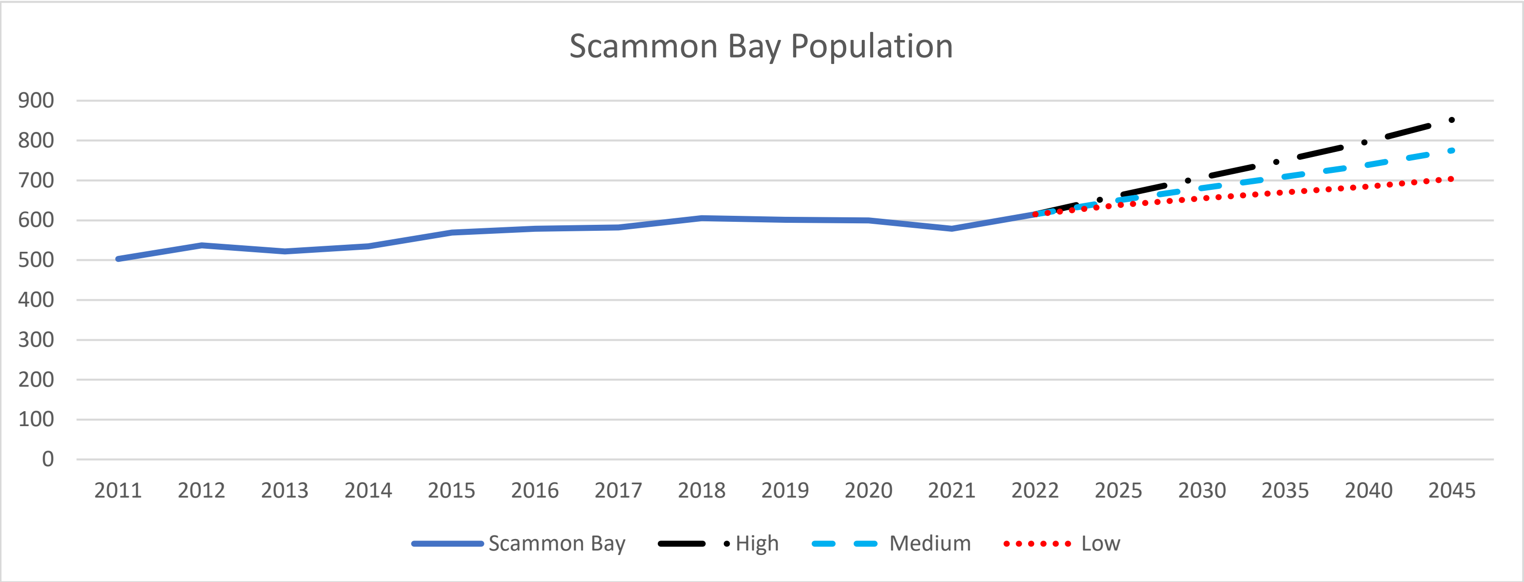
Key: % – percent Source: ADLWD, 2023

Table 3-9 Scammon Bay Population Estimates: High, Medium, Low

	High	(% Growth)	Medium	(% Growth)	Low	(% Growth)
2025	615		615		615	
2030	638	3.70%	650	5.70%	662	7.70%
2035	655	2.70%	681	4.70%	707	6.70%
2040	670	2.30%	710	4.30%	751	6.30%
2045	685	2.20%	740	4.20%	798	6.20%

Key: % – percent Source: ADLWD, 2023

Figure 3-4 Scammon Bay Population: Historic (2011 – 2021) and Estimated (2025 – 2045)



Reported aircraft operations have remained remarkably constant since 2013 (Table 3-10). While these activity levels are derived from regular reports from air carriers and may be subject to data gaps from unreported data, the general trends demonstrate that enplanements dipped due to COVID-19 in 2020 and 2021. Disregarding the COVID-19 dip, operations have typically remained between 3,426 and 4,936 per year. This trend is in spite of total enplanements decreasing from 13,905 in 2013 to 9,564 in 2022 (Table 3-10). The steady activity may be the result of daily flights being less full and the 'milk run' structure of air service. The 'milk run' structure is where air charters serve many communities on the same flight from Bethel, thus compensating for the low demand to any single community.

3.2.1.1 Population Based Forecast

The population-based forecast was used to correlate percentage changes in population with aviation activity (i.e., operations and enplanements).

To estimate operations and enplanements, the High/Medium/Low growth estimates (Table 3-9) were applied to the historical data. Table 3-10 presents the forecasted operations and enplanements, with a medium forecast of between 3,620 and 4,318 operations from 2025 to 2045. Since military and general aviation aircraft do not appear to have a history of operations at the Airport, no military or general aviation activity is included in the forecast. These forecasts represent a return of activity to pre-COVID levels, while also reflecting the slowly growing population

Table 3-11 presents forecasted mail and freight, with a medium forecast of mail between 1,491,698 and 1,794,133 pounds from 2025 to 2045. For mail, this continues to represent a growth of mail that corresponds to the population growth for the community. For freight, there is a significant disparity between the 2022 tonnage and previous years. Regardless of which numbers (2022 or pre-2022) are used for a baseline, the differences are not large enough to require a difference in design requirements for the Airport. As a result, the 2022 freight numbers were used for consistency.

Table 3-12 presents forecasted aircraft operations, calculated from the expected medium population growth rates, applied to the 2022 aircraft operations numbers. These indicate that the Cessna 208 Caravan is expected to remain the dominant aircraft. The Piper PA-31 (Navajo) aircraft estimates were adjusted, to take into account the air carrier interview, which anticipates passenger service taking place three times a week, two times a day.

Table 3-10 Scammon Bay Operations and Enplanements: Historic and Forecast

	Operations						Enplanements					
	Historic	Forecast				% Change	Historic	Forecast				% Change
		Low	Medium	High	TAF			Low	Medium	High	TAF	
2013	3,953						13,905					
2014	4,331					110%	15,146					109%
2015	4,936					114%	15,640					103%
2016	4,652					94%	14,872					95%
2017	4,453					96%	11,731					79%
2018	4,394					99%	12,522					107%
2019	4,798					109%	13,534					108%
2020	2,591					54%	5,343					39%
2021	1,889					73%	7,140					134%
2022	3,426					181%	9,564					134%
2025		3,551	3,620	3,689	500	106%		9,915	10,106	10,297	3,426	106%
2030		3,647	3,790	3,936	500	105%		10,180	10,579	10,985	3,426	105%
2035		3,729	3,951	4,181	500	104%		10,412	11,031	11,674	3,426	104%
2040		3,813	4,119	4,443	500	104%		10,644	11,498	12,402	3,426	104%
2045		3,921	4,318	4,746	500	105%		10,946	12,054	13,250	3,426	105%

Key:
% – percent
% Change is from the Medium Forecast
% Difference between TAF and Population based forecasts are not depicted due to TAF being so far below actual activity.
TAF – Terminal Area Forecast

Sources: Historic numbers from USBTS, 2023. TAF forecast from FAA, 2023b.

Table 3-11 Scammon Bay Freight and Mail: Historic and Forecast

	Freight (Pounds)					Mail (Pounds)				
	Historic	Forecast Low	Forecast Medium	Forecast High	% Change	Historic	Forecast Low	Forecast Medium	Forecast High	% Change
2013	322,374					1,276,885				
2014	312,182				97%	1,601,165				125%
2015	271,676				87%	1,420,052				89%
2016	230,477				85%	1,405,888				99%
2017	241,476				105%	1,297,640				92%
2018	267,923				111%	1,178,134				91%
2019	222,633				83%	1,213,643				103%
2020	266,994				120%	1,234,510				102%
2021	264,488				99%	1,226,073				99%
2022	525,625				199%	1,411,696				115%
2025		544,916	555,413	565,910	106%		1,463,505	1,491,698	1,519,891	106%
2030		586,874	587,071	586,848	106%		1,576,195	1,576,725	1,576,127	106%
2035		626,195	614,663	602,693	105%		1,681,800	1,650,831	1,618,682	105%
2040		665,645	641,094	616,555	104%		1,787,754	1,721,817	1,655,912	104%
2045		706,915	668,020	630,119	104%		1,898,595	1,794,133	1,692,342	104%

Key:

% – percent

% Change is from the Medium Forecast

% Difference between TAF and Population based forecasts are not depicted due to TAF being so far below actual activity.

TAF – Terminal Area Forecast

Sources: Historic numbers from USBTS, 2023. TAF forecast from FAA, 2023b.

Table 3-12 Aircraft Operations Forecast (Medium Growth)

	AAC	ADG	TDG		2022	2025	2030	2035	2040	2045
Growth Rate						6%	6%	5%	4%	4%
Cessna 208 Caravan	A	II	1A	S	2,539	2,691	2,853	2,995	3,115	3,240
Casa/Nurtanio C212 Aviocar	A	II	1A		340	360	382	401	417	434
Cessna C206/207/209/210 Stationair	A	I	1A	S	173	183	194	204	212	221
Cessna C208B/Grand Caravan	A	II	1A	S	124	131	139	146	152	158
Piper PA-31 (Navajo)/T-1020	B	I	1A	S	102	624	661	695	722	751
Gipps Aero Ga8 Airvan	A	I			26	28	29	31	32	33
Beech 200 Super Kingair	B	II	2		22	23	25	26	27	28
Piper PA-32 (Cherokee 6)	A	I	1A	S	13	14	15	15	16	17
Pilatus PC-12	A	II	2	S	9	10	10	11	11	11
Cessna 172 Skyhawk	A	I	1A	S	2	2	2	2	2	3
Total Operations					3,350	4,067	4,311	4,526	4,707	4,896
Subtotal	A				3,226	3,420	3,625	3,806	3,958	4,117
	B				124	647	686	720	749	779
		I			316	851	902	947	985	1,024
		II			3,034	3,216	3,409	3,579	3,723	3,872

Key:
% – percent
AAC – Aircraft Approach Category
ADG – Airplane Design Group
TDG – Taxiway Design Group

Peak hour operations were not calculated due to the low level of activity. It would be unusual for more than two aircraft to be operating near the facility at the same time.

SCM has a diverse fleet mix, and so this forecast follows the specifications of FAA AC 150/5000-17 Example 8. The forecasted activity is subtotaled by AAC and ADG (Table 3-12), for ease of determination of critical aircraft. Forecasted AAC activity is expected to exceed 500 operations per year for A and B, due to the new Piper PA-31 (Navajo) operations taking place. ADG activity is expected to exceed 500 operations per year for I and II.

3.2.1.2 FAA Forecast

The FAA (2023b) publishes a forecast of aviation activity for U.S. airports called the Terminal Area Forecast (TAF) (Table 3-10). These estimates forecast a flat 500 total operations for every year at

Scammon Bay. The TAF also provides enplanement forecasts for a flat number of 3,426 into the future (Table 3-10). For un-towered airports, these estimates are often different than actual operations.

When the 5- or 10-year forecast is for less than 100,000 total annual operations or 100 based aircraft, the forecast does not need to be reviewed at FAA Headquarters, but FAA approval is required prior to funding of AIP Projects.

3.3 Critical Aircraft

Critical Aircraft are the most demanding aircraft types, or groupings of aircraft with similar characteristics, which make regular use of an airport. Per FAA AC 150/5000-17 "regular use" is defined as at least 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations. The critical aircraft determines the applicable design standards for facilities on the Airport.

The AAC and ADG categorizes aircraft by aircraft design requirements, specifically approach speed and wingspan. Between 2013 and 2022, only one aircraft had more than 500 annual operations: the Cessna 208 Caravan (Table 3-5).

The forecasted critical aircraft is B-II (S). This is due to the most demanding aircraft exceeding 500 annual operations being a mix of the AAC B Piper PA-31 (Navajo) and the ADG II Cessna 208 Caravan (Tables 3-12 and 3-13). Both are TDG 1A and designated as small aircraft.

Table 3-13 Critical Aircraft and Projected Aircraft Operations

Year	AAC	ADG	TDG	Small?	2022	2025	2030	2035	2040	2045
Cessna 208 Caravan	A	II	1A	S	2,691	2,853	2,995	3,115	3,240	2,691
Piper PA-31 (Navajo)/T-1020	B	I	1A	S	102	624	661	695	722	751

Casa C212 (A-II [S]) is worth noting, with 340 annual operations in 2022 and a projected increase to 434 operations in 2045.

4 ISSUES

The following is a summary of issues identified in the inventory and through interviews:

1. Runway erosion
2. Runway flooding
3. Cross-runway culvert failure
4. Inadequate crosswind coverage

5 FACILITY REQUIREMENTS

5.1 Airfield Capacity

The FAA estimates that a single runway has the capacity for 98 VFR and 59 IFR flights per hour, resulting in 230,000 operations per year (FAA, 1983). The High forecast for SCM is 4,896 operations per year. As a result, a single runway is expected to provide adequate capacity for all of the forecasted activity levels.

5.2 Security

The SCM is currently unfenced. FAA funds the construction of a fence if there are documented wildlife or security issues. A fence can both prevent unauthorized access to the runway and also trap wildlife. A fence traditionally discourages public use of the runway, but gates are unlikely to be functional because the airlines rely on the public to assist in loading and unloading cargo and mail from aircraft.

5.3 Design Standards

The AAC/ADG code is used by the FAA to describe the operational physical characteristics of aircraft operating at an airport. The AAC, designated by letter, represents the Aircraft Approach Category as defined by the aircraft approach speed (Table 5-1). The ADG, designated by roman numeral, represents the Airplane Design Group determined by aircraft wingspan and tail height (Table 5-2). Generally, AAC speed is related to runways and runway-related facilities, while ADG relates primarily to separation criteria involving taxiways and runways.

Table 5-1 AAC Classifications and Aircraft Classifications

Approach Category	Approach Speed (knots)	Typical Aircraft
A	<90	Cessna 206, Cessna 208
B	91-120	Piper PA-31 (Navajo)
C	121-140	Lockheed C-130
D	141-165	MD-11

Key: AAC – Aircraft Approach Category; AC – Advisory Circular; FAA – Federal Aviation Administration

Source: FAA AC 150/5300-13B, *Airport Design*

AC 150/5300-13B, *Airport Design*, defines a “small aircraft” as an aircraft with a maximum certificated takeoff weight of 12,500 pounds or less.

Table 5-2 ADG Classifications and Aircraft Classifications

Approach Category	Wingspan (feet)	Typical Aircraft
I	To 48	Cessna 206, Piper PA-31 (Navajo)
II	49-78	Cessna 208, Casa C212
III	79-117	De Havilland Dash 8
IV	118-170	Lockheed C-130, DC-10
V	171-213	Boeing 747
VI	214-262	Lockheed C-5B

Key: AC – Advisory Circular; ADG – Airplane Design Group; FAA – Federal Aviation Administration

Source: FAA AC 150/5300-13B, Change 1, *Airport Design*

The AAC/ADG for Scammon Bay is B-II (S) because the most demanding aircraft exceeding 500 annual operations being a mix of the AAC B Piper PA-31 (Navajo) and the ADG II Cessna 208 Caravan.

5.4 Runway Requirements

5.4.1 Dimensional Criteria

The design aircraft for SCM is a B-II (S) (AC 150/5300-13B Section 3.3 and Table G-3). The visibility standard was selected as not less than 1 mile, since the lowest visibility instrument approach (RNAV RW10) is for 1.25 statue-mile visibility.

Table 5-3 shows the Existing Conditions, FAA design criteria, and Recommendations.

5.4.2 Orientation

Wind coverage for the runway is 83.97% for 10.5 knot crosswinds, and 90.4% coverage for 13 knot crosswinds. For the Critical Aircraft (B-II [S]), the allowable crosswind component is 13 knot winds.

No orientation of a single runway can meet the 95% crosswind criteria.

For wind coverages less than 95%, development of a crosswind runway should be evaluated. If terrain does not allow for a crosswind runway, increasing the runway dimensions to the next largest ARC requirements should be considered (AC 150/5300-13B, Appendix B Wind Analysis, B.2.3.2).

At SCM, terrain makes the creation of a crosswind runway cost prohibitive. This report recommends increasing the runway dimensions to the next largest ARC requirements (B-III) for runway width while maintaining B-II requirements for the RSA, ROFZ, and RPZ.

Table 5-3 Runway Design Standards

	Runway 10/28 (Existing)	Design Aircraft (Alone)	Recommendation
Orientation: Crosswind Coverage	90.4%	90.4%	90.4% & Increase to B-III standard
Runway Length	3,000 feet	2,700 feet	3,200 feet*
Runway Width	75 feet	75 feet	100 feet**
RSA Width	150 feet	150 feet	150 feet
RSA Length (beyond runway threshold)	300 feet	300 feet	300 feet
ROFZ Width	250 feet	250 feet	250 feet
ROFZ Length (beyond runway threshold)	200 feet	200 feet	200 feet
ROFA Width	500 feet	500 feet	500 feet
ROFA Length (beyond runway threshold)	300 feet	300 feet	300 feet
RPZ Inner Width	250 feet	250 feet	250 feet
RPZ Outer Width	450 feet	450 feet	450 feet
RPZ Length	1,000 feet	1,000 feet	1,000 feet
Taxiway Width	35 feet	35 feet	35 feet

Key:
* 3,200 feet recommended due to instrument approach AC 150/5300-13B Table K-1
** Increase in width to B-III to accommodate for lack of crosswind coverage AC 150/5300-13B, Appendix B.2.3.2
% – percent
AC – Advisory Circular
ROFA – runway object free area
ROFZ – runway object free zone
RPZ – Runway Protection Zone

5.4.3 Length

Runway length requirements are determined by analyzing the airport's Critical Aircraft. The recommended length for the primary runway is determined by considering the aircraft type, or family of aircraft with similar performance characteristics, that is forecast to use the runway on a regular basis in tandem with FAA AC 150/5325-4B *Runway Length Requirements for Airport Design* (FAA, 2005). Departures are the primary consideration in the runway length analysis since they typically require more runway length than landings.

Runway length requirements are determined based on several variables which include the airport's mean high temperature for the hottest month of the year (July, 57° Fahrenheit) and elevation (22 feet MSL). The FAA recommends using figures for coverage of 95% of the fleet, because Scammon Bay is not near a major metropolitan area. The recommended runway length for small aircraft with more than 10 passengers is 2,700 feet (Table 5-4) (disregarding instrument approaches).

Table 5-4 Runway Length Requirements

Category	Length	Recommendation
Weather, Critical Airport, and Facility Based *	2,700 feet	
Instrument Approach Based**	3,200 feet	x
Manufacturer Published	**Takeoff Ground Roll**	
Cessna 208 Caravan	1,160 feet	
Cessna 206	1,060 feet	

Key:
* FAA Design Standard 150/5325-4B
**FAA Design Standard 150/5300-13B
Takeoff Ground Roles from Cessna (https://cessna.txtav.com/).
FAA - Federal Aviation Administration

Since SCM has an instrument approach, the FAA publishes additional recommendations for runway length. For runways with instrument approaches, the runway should meet the 3,200-foot minimum length requirement for instrument approaches from AC 150/5300-13B Table K-1.

In addition, the manufacturers' performance calculations were referenced for the two mostly commonly used aircraft at Scammon Bay (Table 5-4). In addition to the C208 and C206, the Casa 212 Aviocar should be considered, although it has less reliable information available on takeoff ground roll (one available datapoint is 1,312-foot ground roll advertised in an aircraft listing [https://www.globalair.com/aircraft-for-sale/specifications?specid=944]). Weight and other characteristics will change the ground roll requirements.

As a result of the preceding discussion, the recommended runway length for SCM is 3,200 feet.

5.4.4 Width

FAA AC 150/5300-13B, *Airport Design*, states that runways serving B-II (S) aircraft, with a visibility of no less than 1 mile, have a width of 75 feet (FAA, 2022). The width of the existing runway at Scammon Bay is 75 feet (Table 5-5).

Runway width design should also consider crosswinds. If a single runway airport does not meet the required crosswind coverage, such as is the case at SCM, AC 150/5300-13B, Appendix B Wind Analysis, B.2.3.2 allows for a wider runway when a crosswind runway is impractical or cost-prohibitive. This wider runway would be a B-III runway standard width of 100 feet.

Table 5-5 Runway Width Requirements

Category	Width	Recommendation
Existing	75 feet	
Critical Aircraft Design (B-II)	75 feet	
Crosswind Increase (B-III)	100 feet	x

Key:
FAA – Federal Aviation Administration
Source: FAA Design Standard 150/5325-4B

Since no orientation of a single runway at Scammon Bay can meet the 95% crosswind criteria and the construction of a crosswind runway is impractical and/or cost-prohibitive, an increase in runway width to 100 feet is recommended.

5.4.5 Airfield Safety Areas

This section presents FAA design standards for various airfield safety areas. The following airfield safety areas are reviewed in this section:

- Runway Safety Area (RSA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Object Free Area (ROFA)
- Runway Protection Zone (RPZ)

Runway Safety Area. The RSA is a critical, two-dimensional area surrounding the runway. The RSA should be:

- Cleared, graded, and free of potentially hazardous surface variations.
- Properly drained.
- Capable of supporting snow removal equipment, and aircraft (without causing damage to the aircraft).
- Free of objects except those mounted on low-impact resistant (frangible) supports and whose location is fixed by function.

The RSA at Scammon Bay is 150 feet wide, centered on the runway centerline, and extends 300 feet beyond the ends of the runway.

Current FAA standards require a B-II (S) RSA to be 150 feet wide and extend 300 feet beyond the ends of the runway.

This report recommends maintaining the B-II (S) standard for SCM, instead of a larger B-III standard, due to cost-prohibitive terrain.

Runway Obstacle Free Zone. The ROFZ is a three-dimensional volume of airspace that supports the transition of ground to airborne operations or vice versa. The ROFZ is centered above the runway centerline. The ROFZ clearing standards prohibit airplanes from taxiing and parking in the ROFZ during operations. Also, only objects that are frangibly mounted and needed for the safe movement of aircraft operations are allowed to penetrate the ROFZ.

The ROFZ at Scammon Bay is 250 feet wide and extends 200 feet beyond each end of the runway.

Current B-II (S) standards require that the ROFZ be 250 feet wide and extend 200 feet beyond the end of each runway.

This report recommends maintaining the B-II (S) standard for SCM, rather than adopting the B-III standard, due to cost-prohibitive terrain.

Runway Object Free Area. The ROFA is a two-dimensional ground area that surrounds the runway. FAA standards prohibit parked aircraft and objects from residing in the ROFA, with the exception of Navigational Aids (NAVAIDs) or objects that are frangibly (low-impact resistant) mounted.

The ROFA at Scammon Bay is 500 feet wide and extends 300 feet past each end of the runway.

Current B-II (S) standards require the ROFA to be 500 feet wide and extended 300 feet beyond each runway end.

This report recommends maintaining the B-II (S) standard for SCM, instead of adopting the B-III standard, due to cost-prohibitive terrain.

Runway Protection Zone. The RPZ is a two-dimensional, trapezoidal surface that is centered on the extended runway centerline. The function of the RPZ is to enhance the protection of people and property on the ground, typically achieved by airport control through land acquisition. The RPZ is primarily a land-use planning tool. The RPZ begins past the runway threshold.

The RPZ at Scammon Bay is 250 feet by 450 feet by 1,000 feet long. The Airport owns or has easements for all of the RPZ, but some of the RPZ overlaps with frequently used areas such as the river and boat landing area.

Current B-II (S) standards require the RPZ for an A/B-II Small Aircraft runway to be 250 feet by 450 feet by 1,000 feet long.

This report recommends maintaining the B-II (S) recommendation for SCM, instead of adopting the B-III standard, due to cost-prohibitive terrain.

5.5 Approach and Departure Threshold Siting Surfaces

Threshold Siting Surfaces (TSS) protect the use of the runway and allow pilots to follow standard approach and departure procedures. The FAA requires TSSs be clear of obstacle penetrations. The approach TSS slope for approach ends of runways with non-precision approaches only providing lateral guidance and visibility minimums greater than or equal to ¾ statute mile is 20:1. The departure slope standard is 40:1 for all instrument operations. The specific dimensions are described in AC 150/5300-13B.

5.6 Runway Line of Sight

For runways without a full parallel taxiway, the design standard is that any point 5 feet above the runway centerline must be mutually visible with any other point 5 feet above the runway centerline.

Existing runway conditions at Scammon Bay meet current line of sight design standards. SCM has a 5-foot line-of-sight that is mutually visible. The runway has a difference in elevation between the runway ends of 5.5 feet, with the higher end being on the eastern side, away from the river.

5.7 Taxiway Requirements

5.7.1 Taxiway Design Group

Taxiways are based on Taxiway Design Groups (TDG). The TDG is determined using a combination of the longest Cockpit to Main Gear Distance and widest Main Gear Width (MGW) of a theoretical airplane using the taxiway. TDG establishes standards for taxiway and taxiway shoulder width, while the ADG determines Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA) widths.

The Cessna 208 Caravan and Piper PA-31 (Navajo) are currently the critical aircraft, with a TDG 1A determination (Table 5-6). The other common aircraft are also TDG 1A. According to FAA AC 150/5300-13B, *Airport Design*, TDG 1A airports require 25-foot-wide taxiways with 10-foot shoulders (FAA, 2022).

Table 5-6 Taxiway Design Group Requirements

Category	Width	Recommendation
Existing	35 feet	x
Critical Aircraft Design (TDG 1A)	25 feet + 10-foot shoulders	

Key: TDG – Taxiway Design Group

Source: FAA Airport Design 150/5300-13B

This report recommends maintaining the TDG 1A standard for SCM, instead of adopting the standard of a larger category, due to cost-prohibitive terrain.

5.8 Aprons

Scammon Bay currently has one 250-foot by 350-foot apron with a gravel surface.

5.9 Airspace

The FAR Part 77 Surfaces are discussed below.

Primary Surface. The 2004 ALP for SCM indicates that there are no penetrations of the Primary Surface.

Transitional Surface. The 2004 ALP for SCM indicates that there are no obstructions to the Transitional Surface.

Horizontal Surface. The 2004 ALP for SCM indicates that there are terrain obstructions to the Horizontal Surface.

Conical Surface. The 2004 ALP for SCM indicates that there are multiple terrain obstructions to the Conical Surface.

Approach Surface. The 2004 ALP for SCM indicates that there are no terrain obstructions to the Approach Surface.

5.10 Passenger and Cargo Loading/Unloading

5.10.1 Airside Requirements

Current aircraft operations at SCM use the runway for taxiing, with parking available on the apron. Aircraft are seldom parked for long periods on the apron; most aircraft stop to load, unload, and takeoff again.

Services are not typically provided to aircraft, and fuel is not available for purchase. Scheduled commuter flights must purchase fuel elsewhere.

5.10.2 Passenger and Cargo Facilities

There are no passenger terminal or cargo facilities at SCM. Passengers wait in the weather for flights or listen for the arriving aircraft prior to leaving home. This procedure functions when the airport is located close to the community, and it increases convenience when actual arrival times of scheduled aircraft vary widely.

As a result, one consequence of relocating the Airport would be an increase in hardship for passengers. There are no passenger facilities at SCM and there are few closed-cabin vehicles in the community. All-Terrain Vehicles are the most common mode of transportation. If the distance to the Airport is increased, the community would have greater difficulty in taking advantage of the Airport during inclement weather.

Cargo handling is completed by passengers or volunteers from the community. There is no area for storing cargo.

5.10.3 Landside Requirements

There is no parking or traffic circulation provided at SCM.

5.10.4 Passenger Convenience and Access to Airport Facilities

Passenger services are inconvenient at SCM. There are no airport facilities for passengers to access. There is no shelter for passengers. Parking is not provided at the Airport, and passengers are encouraged to act as cargo and baggage handlers.

5.11 General Aviation Requirements

There are no general aviation facilities at SCM. Transient airport parking can take place at the apron, although no tie downs are provided.

5.12 Air Cargo Requirements

Air cargo is primarily brought in on regularly scheduled passenger service. There are no air cargo facilities. The public helps load and unload air cargo, which amounts to ~3,400 pounds of freight per capita per year.

5.13 Support Facilities

5.13.1 Airport Maintenance

Two SREBs are located along the apron at SCM. Airport maintenance is provided by a DOT&PF contractor.

5.14 Utilities

SCM is connected to the community power and telecommunications system. No other utilities are provided.

5.15 Land Use

A community road to the community port is present on Airport property.

The solid waste facility is located closer than 5,000 feet to the runway.

6 ENVIRONMENTAL OVERVIEW

This section is intended to provide a brief environmental overview of the major environmental constraints at the current Scammon Bay Airport. A more detailed environmental review for off-airport alternative analysis will be provided in the Feasibility Study environmental review.

6.1 Biotic Resources

6.1.1 Threatened and Endangered Species

SCM is listed by the National Marine Fisheries Service (NMFS, 2023) as adjacent to potential habitat for species listed under the Endangered Species Act, including:

- Endangered Species
  - Fin whale
  - North Pacific right whale
  - Humpback whale
- Threatened Species
  - Bearded Seal
  - Ringed Seal

SCM is also listed by the U.S. Fish and Wildlife Service (USFWS) as potential habitat for species listed by the Endangered Species Act (USFWS, 2023). These species include:

- Endangered Species
  - Short-Tailed Albatross
- Threatened Species
  - Polar Bear
  - Wood Bison
  - Spectacled Eider
  - Steller’s Eider

Of those species, the only critical habitat near SCM is for Polar Bear, which is directly adjacent to the Airport. As a note, critical habitat for the Spectacled Eider and Steller's Eider is present in the larger Study Area, but not near the Airport (USFWS, 2023).

6.1.2 Marine Mammals

Species with habitat adjacent to the Airport that do not fall under the Endangered Species Act but that are protected under the Marine Mammal Protection Act include the spotted seal (NMFS 2023).

Huntington, Nelson, and Quakenbush (2017) report on traditional knowledge interviews held with Scammon Bay residents in January 2017. Interviewees reported the importance and presence of ringed seals, spotted seals, bearded seals, walrus, and beluga whales in the area. The Kun River was reported as important for young, bearded seal summer habitat. Other species reported by interviewees in the region include ribbon seals, sea lions, killer whales, porpoises, and sea otters.

6.1.3 Birds

The FAA's Alaska Supplement warns pilots that the runway hosts birds.

The USFWS lists the immediate area around the Airport as being occupied by Black Turnstones, a Bird of Conservation Concern, which is most likely present in May, June, and July (USFWS, 2023). As a note, the larger Study Area also hosts birds identified by the USFWS as vulnerable (i.e., Common Eider, Long-tailed Duck, Red-breasted Merganser, Red-throated Loon) (USFWS, 2023).

The USFWS recommends time periods in which to avoid vegetation clearing and consequent impacts to migratory birds. These time periods are from May 5 through July 25 (in areas with Black Scoter the time period is May 20 through August 10, and in areas with Canada Geese the time period is April 20 through July 25).

6.1.4 Fish

The Kun River is listed as an Anadromous Water by the Alaska Department of Fish and Game for chum salmon, inconnu/sheefish, and whitefishes (Giefer and Graziano, 2023).

The cross-runway culvert has not recently been sampled to determine if it provides fish habitat. The 1991 Environmental Assessment for SCM reports that blackfish inhabit the creek flowing under the runway (ADOT&PF, 1991).

6.2 Floodplains and Coastal Erosion

Scammon Bay is not part of the Federal Emergency Management Agency floodplain mapping program.

SCM is subject to flooding and erosion. This analysis is presented more fully in the Coastal Report (HDR 2022a) and earlier in this document.

6.3 Parklands, Recreational Areas

There are no designated parklands or recreational areas near the Airport. The immediate area surrounding the Airport (within at least 3 miles) is owned by Alaska Native organizations.

Scammon Bay is surrounded by the Yukon-Delta National Wildlife Refuge. The refuge is a patchwork of land ownership, but no parcel is closer than 3 miles to SCM.

A 17b easement crosses Airport property (Figure 6-1). 17b easements were created by the Alaska Native Claims Settlement Act and allows for public use for access to lands and waterways.

An RS2477 trail exists off Airport property, extending east from Scammon Bay (Figure 6-1). RS2477 trails were created by the Mining Law of 1866 and provide for access across lands.

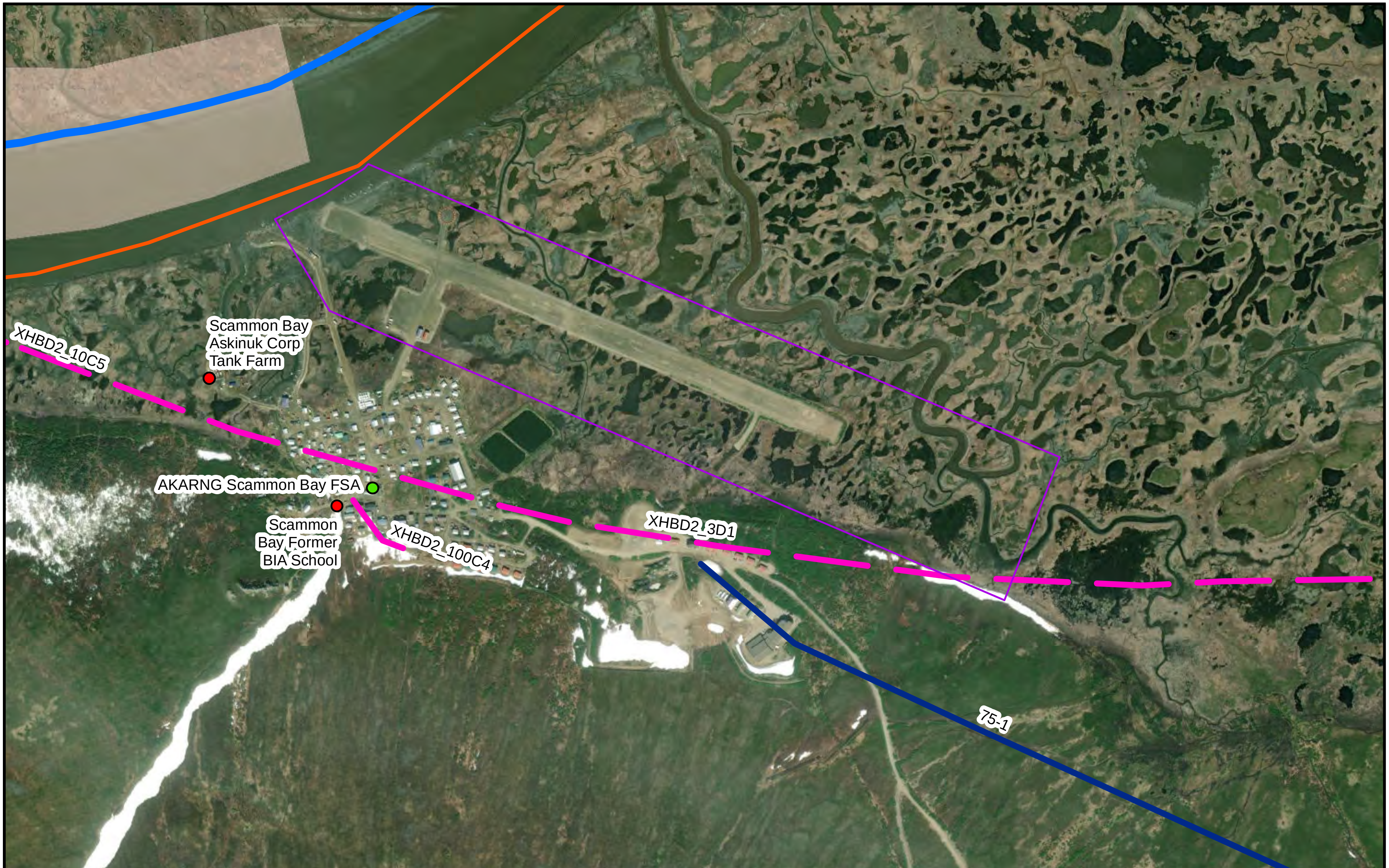
6.4 Cultural Resources

No cultural survey has been completed for this planning study.

6.5 Noise

Aircraft approach and depart directly adjacent to the community of Scammon Bay. This subjects the community to airplane noise.

In many rural Alaskan communities, aircraft noise is not seen as a negative impact but rather as a welcome reminder of the connection to the larger hub communities and infrastructure.



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Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area

Airport Boundary

DEC Contaminated Sites

Active

Cleanup Complete

Anadromous Waters

17b Easement

RS2477 Trails

Polar Bear Critical Habitat

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

November 2023

Figure 6-1: SCM Environmental

6.6 Hazardous Materials and Storage

The Alaska Department of Environmental Conservation contaminated sites atlas reports two Active and one Cleanup Complete contaminated site off Airport property (ADEC 2023). The active sites are the Askinuk Corporation Tank Farm and the former Bureau of Indian Affairs school (Figure 6-1). At the tank farm, 7,000 gallons of gasoline were spilled into the environment and sheens were observed in the Kun River. At the school, diesel contamination was found to extend from the surface to at least 6 feet below surface.

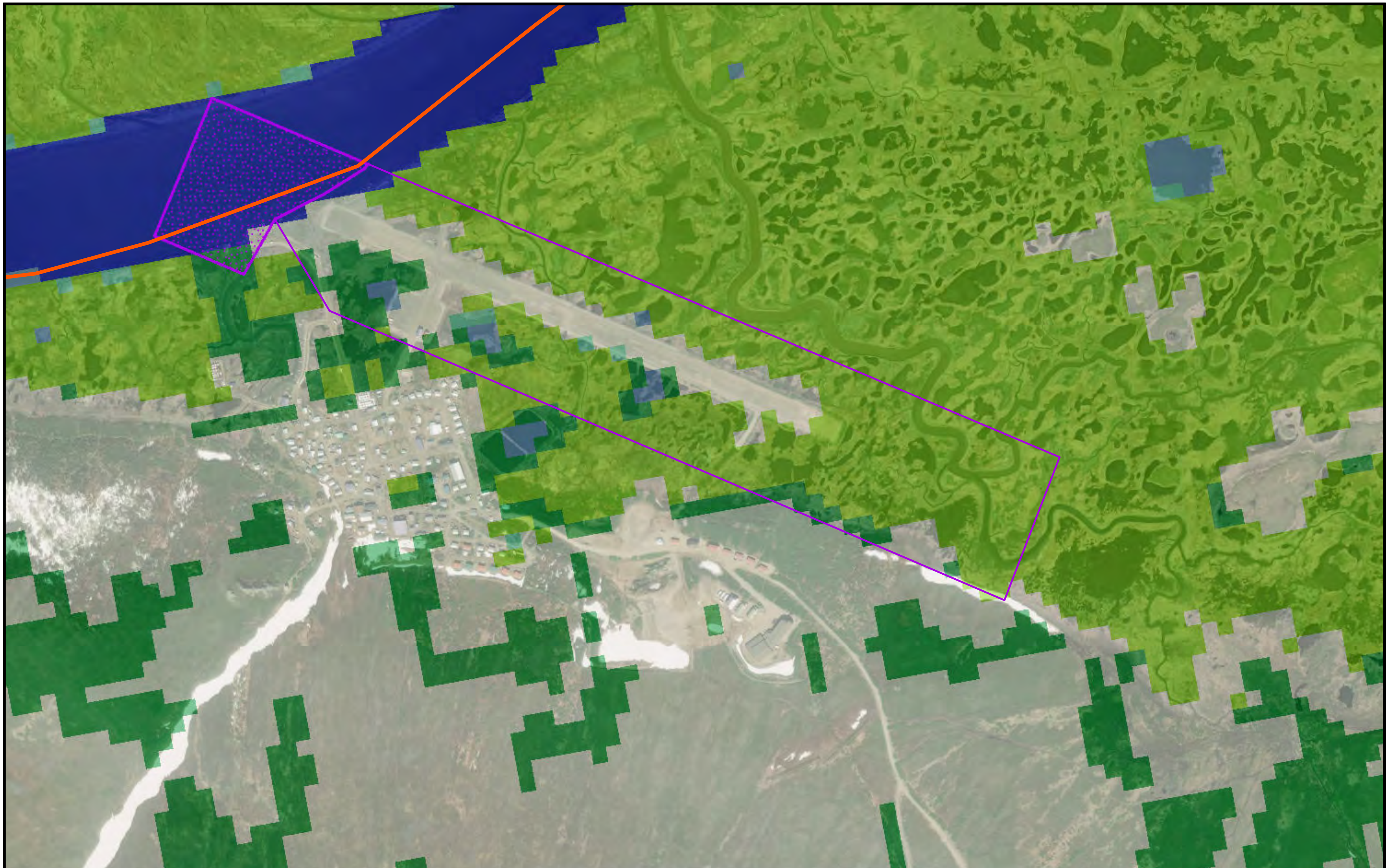
On SCM, there is storage of some fuel and small amounts of hazardous materials to operate the Airport maintenance equipment.

6.7 Solid Waste

The community solid waste facility is located approximately 3,560 feet southeast of the runway edge (Figure 1-3). The previous dump was adjacent to Airport property, and this new facility is located farther away.

6.8 Wetlands

There is no National Wetland Inventory coverage for the Scammon Bay area. A wetland study will be required if development is undertaken. The current best available wetland information is provided by the University of Alaska Anchorage's Alaska Vegetation and Wetland Composite (Flagstad et al., 2018). This uses aerial imagery signatures to provide estimated vegetation and wetland mapping. Figure 6-2 indicates that much of the lowland areas surrounding Scammon Bay are wetlands, while the surrounding foothills are uplands.



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Study Area
Airport Boundary
Easement - Polygon

Vegetation Map
Wetland
Emergent Wetland
Forested/Shrub Wetland
Pond; Lake
Riverine
Upland

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

November 2023

Figure 6-2: SCM Vegetation

6.9 Land Status

Beyond the land status discussed in the inventory, there is an aviation easement off the end of RW10, over the Kun River.

The Airport property is in a management agreement between the DOT&PF and State of Alaska Department of Natural Resources.

The community road accessing the community dock is located on Airport property.

The Airport access road has a basketball court encroaching on the road.

Scammon Bay is surrounded by the Yukon-Delta National Wildlife Refuge.

6.10 Energy Supplies, Natural Resources, and Sustainable Design

Scammon Bay has a material site located inside of the community (Figure 1-3). In the past, the community has voiced opposition to using this material source for Airport projects. The community would like to reserve that material for local needs. Given Scammon Bay's geographical position, there may be additional material available near the community; or material may need to be barged in. Barging materials typically adds substantial costs to projects in rural Alaska.

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APPENDIX C: COASTAL REPORT – SCAMMON BAY AIRPORT IMPROVEMENTS FEASIBILITY STUDY (HDR 2022A)

Coastal Report – Scammon Bay Airport Improvements Feasibility Study

Project Number: CFAPT00691
AIP: 3-02-0255-003-2023

Alaska Department of Transportation and Public Facilities, Central Region

Scammon Bay, Alaska

December 19, 2022

Prepared by:
HDR

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Contents

Tables

Figures

Acronyms and Abbreviations

AEP	Annual Exceedance Probability
ASOS	Automated Surface Observing System
DEM	Digital Elevation Model
DHI	Danish Hydraulic Institute
DMVA	Department of Military and Veterans' Affairs
DOT&PF	State of Alaska Department of Transportation and Public Facilities
FEMA	Federal Emergency Management Agency
H&H	Hydrology and Hydraulic
HD FM	Hydrodynamic Flexible Mesh
ft	feet
IfSAR	Interferometric Synthetic Aperture Radar
in	inches
LiDAR	Light Detection and Ranging
m	meter
mm	millimeter
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
RSLR	relative sea-level rise
s	second
SCM	Scammon Bay State Airport (International Air Transport Association's airport code)
SW	Spectral Wave
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

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1. Introduction

1.1 Project Overview

This Coastal Report is prepared for the State of Alaska Department of Transportation and Public Facilities (DOT&PF) Central Region as part of a larger feasibility study to assess improvements to the airport at Scammon Bay (project).

The project is at the Scammon Bay State Airport (SCM), which is a state-owned, public use airport. The airport consists of one runway and one seaplane landing area. The DOT&PF proposes various airport improvements to enhance safety, improve infrastructure, and bring the airport to Federal Aviation Administration standards. These improvements consist primarily of repairing elements that have been damaged by flooding or have otherwise deteriorated, including:

- Increasing the elevation of the runway, taxiway, apron, and access road
- Shifting the runway away from the Kun River
- Replacing the culvert under the runway
- Placing erosion protection adjacent to the Kun River and airport embankments
- Making various building and aviation-specific additions and replacements
- Obtaining additional right-of-way

1.2 Scope of Coastal Analyses

The project involves providing coastal engineering and hydrology and hydraulic (H&H) recommendations to guide a larger feasibility study regarding the various airport improvements to better protect SCM from flooding and scour. Recommended improvements to the airport specific to coastal engineering are detailed within this report. Details on H&H analysis to support this project are provided under separate cover (HDR, 2022).

The coastal analyses for this project include a review of readily available background information, site visit performed in May 2021, storm surge analysis, and wind wave analysis. Details of these analyses are discussed herein.

1.3 Organization of Report

This report is organized as follows:

- Section 2 discusses existing general conditions.
- Section 3 discusses data used in coastal analysis.
- Section 4 discusses the design criteria.
- Section 5 discusses the coastal analysis.

- Section 6 presents the coastal engineering design recommendations.
- Section 7 presents the summary.
- Section 8 presents the references cited.

All elevations provided are based on the North American Vertical Datum of 1988 (NAVD88) unless otherwise specified.

2. General Conditions

2.1 General Physical Characteristics

The project site is located in the community of Scammon Bay in the Kusilvak Census Area, in Western Alaska. Scammon Bay has a population of 594 (U.S. Census Bureau 2020) and covers 299 acres (see Figure 1). The airport is located at the northeast edge of the community. The Scammon Bay community sits at the meeting point of the base of the Askimuk mountain range and flat, intertidal wetlands. Wetlands, ponds, and connecting streams dominate the area to the north and east.

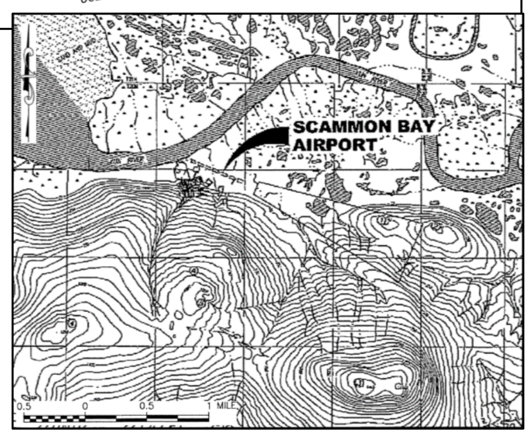

Figure 1: Location and Vicinity Map

Recreated from DOT&PF 2004 and 2013

The airport sits on the south bank of the Kun River, a perennial stream with a bankfull width of approximately 900 feet. Several unnamed tributaries of the Kun River are located near the community, one of which flows underneath the runway through a singular culvert. Tidal influence is evident in the tributary by the nearly vertical stream banks that are 2–3 feet in depth. The tributary's confluence is located approximately 2 miles from the mouth of the Kun River.

2.1.1 Runway 10/28 and Seaplane Landing Area 4W/22W

The airport consists of one Type A, gravel runway designated as 10/28, and one seaplane landing area designated as 4W/22W. The runway is located at the northeast edge of the community, sits at an elevation between +10 and +17.5 feet NAVD88, and runs northwest to southeast at a +0.19 percent slope. It is encompassed by intertidal wetlands with the unnamed perennial stream that runs through a culvert under the runway from south to north. One access road connects the runway to the community. The seaplane landing area is located at the northwest edge of the community.

2.1.2 Runway Culvert

The existing structure is a 48-inch-diameter, 405-foot-long, smooth interior wall, corrugated, high-density polyethylene culvert that runs under the runway. It was installed with a 0.1 percent slope, with an inlet invert elevation of +4.0 feet NAVD88 and an outlet invert elevation of +3.6 feet NAVD88. Additional information on the condition of the existing culvert can be found in the accompanying *Hydrology and Hydraulics Report* (HDR, 2022).

3. Data Used for Coastal Analysis

3.1 Metocean Data

Meteorological and oceanic (metocean) data were gathered from readily available sources. For data not available at Scammon Bay, data from the nearest reasonable location were used. The following provides details on metocean data used for the coastal analysis.

3.1.1 Water Level

Tidal datum information from the National Oceanic and Atmospheric Administration (NOAA) is available for the Kun River near Scammon Bay (Station 9467124) and is shown in Table 1. This information comes from a historical short-term tide station that collected water level data from July 24, 2020, to October 22, 2020 (approximately 3 months).

Table 1: Kun River Tidal Datums (NOAA Station ID: 9467124)

Datum	Elevation (feet from MLLW)	Elevation (feet, based on NAVD88)
Mean Higher High Water (MHHW)	6.47	6.77
Mean High Water (MHW)	5.70	6.00
Mean Tide Level (MTL)	3.29	3.59
Mean Sea Level (MSL)	3.20	3.50
Mean Low Water (MLW)	0.88	1.18
Mean Lower Low Water (MLLW)	0	0.30
NAVD88	-0.30	0

Source: NOAA 2021c
Notes: NAVD88 = North American Vertical Datum of 1988.

Long-term water level data for Scammon Bay are not available; thus, review/prediction of relative sea-level rise (RSLR) over time is not possible near the project site. The nearest location to Scammon Bay with a long-term water level dataset is Nome, Alaska, approximately 180 miles to the north. The Nome tide station has measured RSLR at a rate of 0.15 inch per year with a confidence interval of +/- 0.11 inch per year (3.89 millimeter [mm]/year with a 95 percent confidence interval of +/- 2.88 mm/year). Figure 2 shows the long-term trend plot developed by NOAA (NOAA 2021d). Assuming a similar RSLR at Scammon Bay, the increase in sea level over a 50-year period would be 0.64 feet.

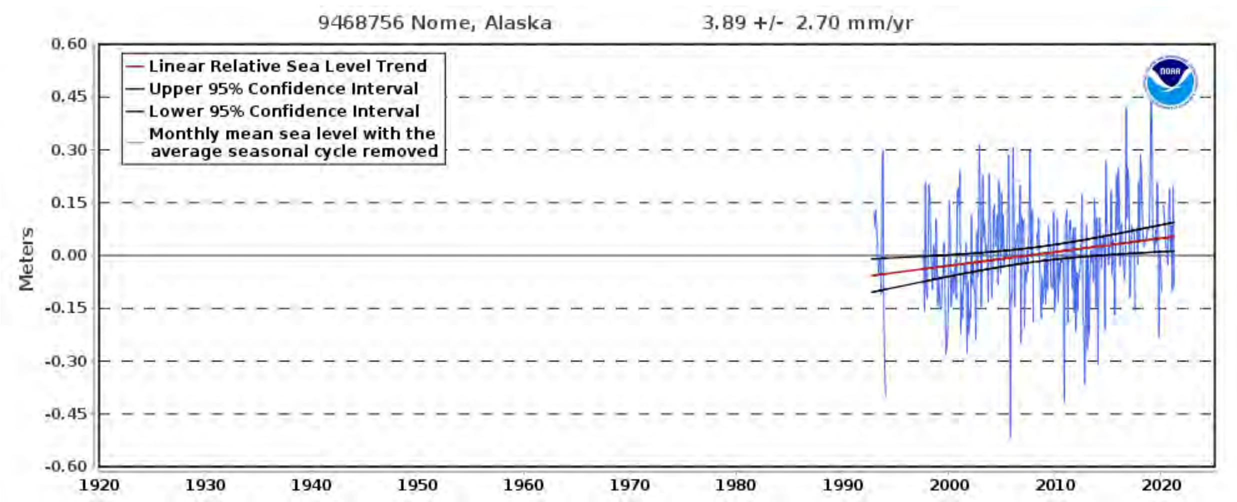

Figure 2: Relative Sea-Level Rise at Nome, AK

Source: NOAA 2021d

Statistical storm surge water level predictions in western Alaska were developed by the U.S. Army Corps of Engineers (USACE) in *Storm-Induced Water Level Prediction Study for the Western Coast of Alaska* (USACE 2009). The study provides statistical storm surge water levels at 17 locations in Western Alaska. The two nearest locations to Scammon Bay for statistical storm surge elevations are Agcklarok, Alaska, and Hooper Bay, Alaska, approximately 50 miles northeast and 30 miles southwest of Scammon Bay, respectively (Figure 3). Storm surge predictions for Agcklarok and Hooper Bay are shown in Table 2.

Table 2: Probabilistic Storm Surge Elevations for Agcklarok, AK, and Hooper Bay, AK

Return Period (years)	Agcklarok Surge Level (feet)	Hooper Bay Surge Level (feet)
5	4.8	6.5
10	6.7	8.1
15	7.4	8.4
20	7.8	8.6
25	8.3	8.8
50	10.1	10.0
100	12.1	11.5

Note: Storm surge elevations are reported independent of tidal influence.
Source:USACE 2009

Figure 3: Statistical Storm Surge Data Source Locations

3.1.2 Wind

Historic wind direction and speed information starting in 2010 at the project site is available via the Scammon Bay Automated Surface Observing System (ASOS). ASOS wind observations are reported as 2-minute averages. These durations were converted to 1-hour averaged wind speeds for wind-generated wave simulations (see Section 5.2). An extreme value analysis using these data was performed to determine statistical wind speeds and associated wind directions at Scammon Bay. An example of the statistical wind speed that includes data for “all directions” is shown on Figure 4. The wind direction data were binned to the nearest 10 degrees. The 1-hour wind speed duration was chosen based on the large fetch that would occur during a flooding event in which the surrounding flats are considered open water.

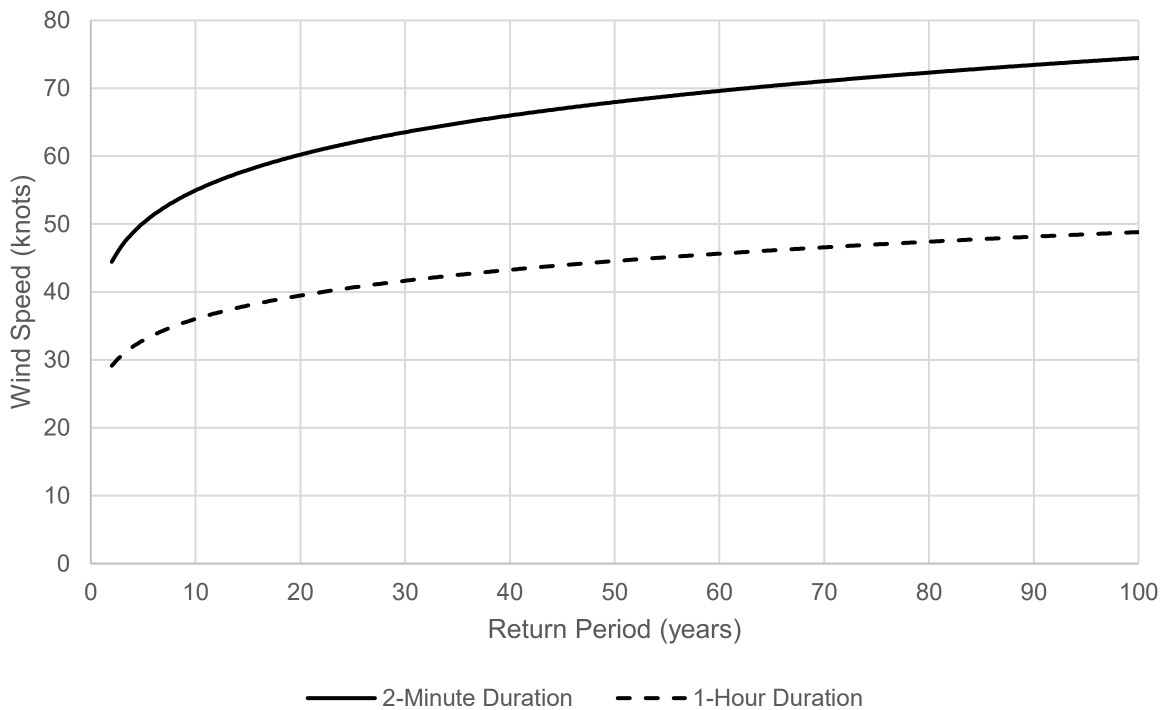

Figure 4: Statistical Wind Speeds for All Directions at Scammon Bay

3.1.3 Waves

Wave data are not available for Scammon Bay during a flooding event. Therefore, wave conditions were determined using MIKE 21 Spectral Wave (SW) software, a two-dimensional depth-averaged spectral wave numerical model. The model simulates wind-generated wave conditions at the project site. Additional wave information based on model results is presented in Section 5.2.

3.1.4 Sea Ice

Historic data from the University of Alaska Fairbanks indicate that Scammon Bay (coastal water body) typically contains at least 80 percent sea ice in January, February, and March, and contains variable levels of sea ice during all other months excluding August, September, and October (UAF 2021).

3.2 Elevation Data

3.2.1 Topography

The topographic data in the form of Digital Elevation Models (DEMs) were obtained using a combination of readily available Interferometric Synthetic Aperture Radar (IfSAR) data (USGS 2019) and Light Detection and Ranging (LiDAR) data (State of Alaska Division of Geological & Geophysical Surveys 2021).

3.2.2 Bathymetry

Bathymetric information in the offshore area to the west of Scammon Bay was gathered from NOAA National Geodetic Data Center datasets (NOAA 2021a) and NOAA Navigation Chart

16240 (NOAA 2021b). The chart reported depths in feet below mean lower low water. These data were then converted to NAVD88 using the relationship provided in Table 1.

Readily available bathymetric data for the Kun River or its tributaries were not found. Therefore, elevation data for the Kun River and three of its unnamed tributaries were estimated using a combination of channel width, estimated bankfull discharge, bathymetric maps of the Yukon River for comparison, and engineering judgement.

4. Design Criteria

Design criteria for coastal recommendations utilize a 50-year return period (2 percent annual exceedance probability [AEP]) for water level (for both concurrent and non-coastal conditions) and 100-year return period (1 percent AEP) for wind-generated waves. Design life duration is assumed to be 50 years.

5. Coastal Analysis

A coastal analysis was performed that consisted primarily of developing a storm surge numerical model and a wave numerical model. The purpose of these models was to better understand potential storm surges and wave conditions that affect the design of runway elevation and erosion mitigation.

5.1 Storm Surge Analysis

A storm surge analysis was performed to approximate potential water surface elevations and current speed/direction at the SCM due to an extreme flood event. The analysis was performed using the MIKE 21 Hydrodynamic Flexible Mesh (HD FM) numerical model. The model was developed to simulate a 50-year (2 percent AEP) and 100-year (1 percent AEP) representative storm surge events.

5.1.1 Storm Surge Model Description

MIKE 21 HD FM, developed by the Danish Hydraulic Institute (DHI), is software used for developing two-dimensional hydrodynamic models based on a flexible (unstructured) mesh. Models developed with MIKE 21 HD FM simulate water level variations and flows in coastal areas, estuaries, and floodplains (DHI 2017a). The flexible mesh module allows for higher-resolution elements at locations requiring better resolution of the hydrodynamics (e.g., near the project site and nearby flow paths).

5.1.2 Model Domain and Mesh

The model domain for the MIKE 21 HD FM storm surge simulations includes offshore, upland (which contains the project site), and backland areas. The offshore area applies coastal surge elevations that subsequently flow through the entire model domain. The backlands area is intended to provide added area/volume for surge inundation to flow to avoid unrealistic boundary effects impacting the project site (i.e., acts as a hydraulic storage area).

The mesh contains 50,524 elements and 27,385 nodes. The backlands area has a relaxed mesh resolution to improve model computation efficiency. The offshore and uplands areas have finer resolution with elements decreasing in size along flow paths and near the project site. Bed resistance information in the form of Manning's M values (reciprocal of Manning's n) were applied to the domain. A Manning's M value of 32 meter$^{1/3}$/second was assigned to the offshore area and a Manning's M value of 20 meter$^{1/3}$/second was assigned to the upland and backland areas.

Primary sources of elevation data used to create the mesh are summarized in Table 3.

Table 3: Elevation Data Summary

Data Source	Source Datum and Units	Model Location
IfSAR, Y-K Delta 2016 LiDAR Scammon 2015 elevation data	Horizontal: UTM Zone 3, meters Vertical: NAVD88, meters	Project area
Alaska Yukon Delta Base Order 2018 D18 Digital Elevation Model	Horizontal: Alaska Albers, meters Vertical: NAVD88, meters	All other upland and backland areas
NOAA Navigation Chart 16240	Horizontal: WGS 1984, degrees Vertical: Depth at MLLW, feet	Offshore area

Note: The horizontal and vertical datums used for the project are UTM Zone 3, Meters and NAVD88, Meters respectively. Source datum/units were converted to these project datums. IfSAR = Interferometric Synthetic Aperture Radar, Y-K Delta = Yukon-Kuskokwim Delta, LiDAR = Light Detection and Ranging, UTM = Universal Transverse Mercator, NAVD88 = North American Vertical Datum of 1988, NOAA = National Oceanic and Atmospheric Administration, WGS = World Geodetic System, MLLW = mean lower low water.

Figure 5 provides a view of the entire model domain. The colors represent bathymetry/topography elevations. Figure 6 and Figure 7 provide enlarged views of the mesh showing the finer resolution for the project site and flow paths.

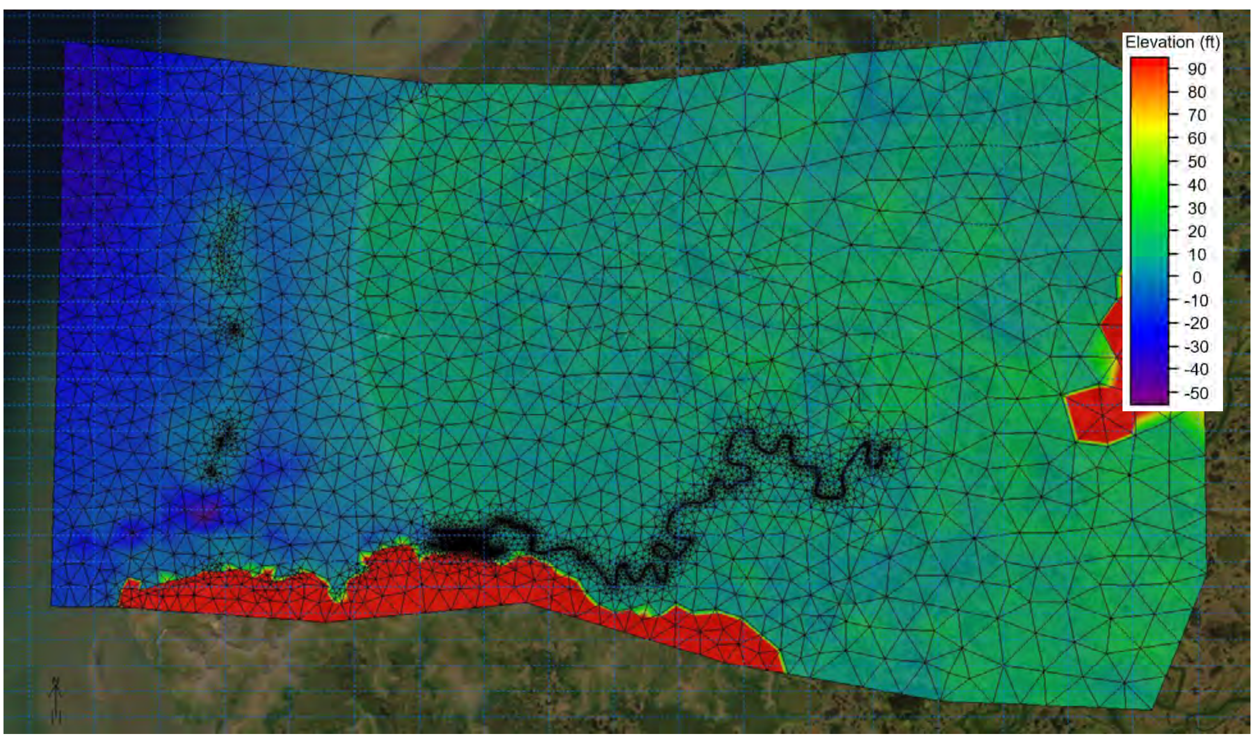

Figure 5: MIKE 21 HD FM Storm Surge Model Mesh - Full Domain

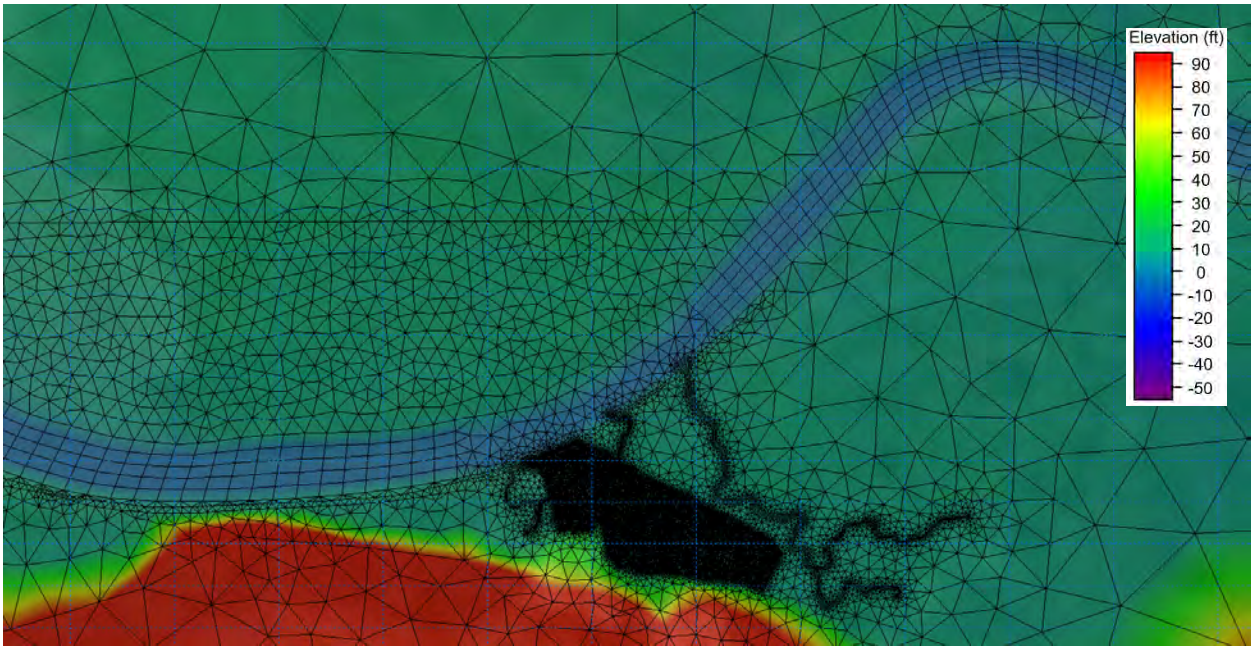

Figure 6: MIKE 21 HD FM Storm Surge Model Mesh - Enlarged View Showing the Kun River and Scammon Bay

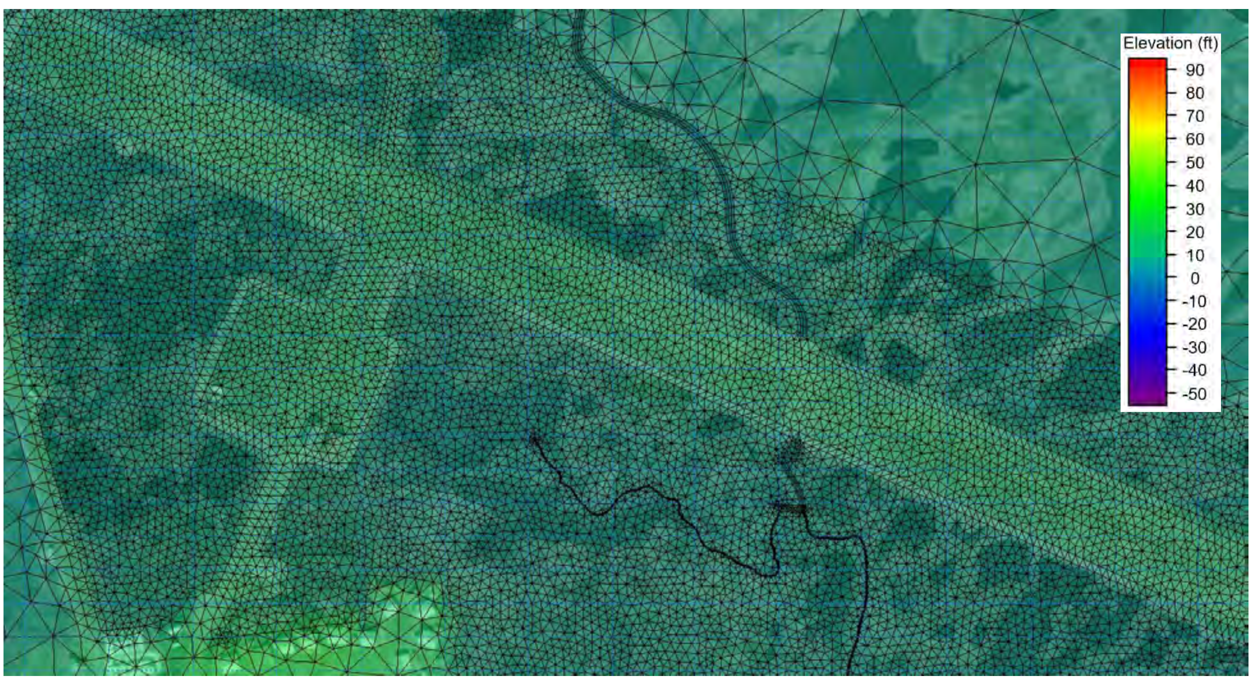

Figure 7: MIKE 21 HD FM Storm Surge Model Mesh - Enlarged View Showing Project Area

5.1.3 Storm Surge Model Boundary Conditions

The storm surge model was forced using both a storm surge hydrograph that was applied to the offshore boundary as well as a flow rate for the Kun River applied upstream of the runway. The storm surge hydrograph combined typical tides, anticipated RSLR, and a statistical storm surge in which the peak surge occurs at a high tide.

Statistical Storm Surge Development: Historic storm surge events identified by USACE (2009) in Nome were evaluated for shape, duration, and season of occurrence. Several events identified by USACE took place during the month of February. These storm surges were not included in the analysis, as sea ice is understood to dampen the effects of coastal storm surges (Barnhart et al. 2014).

All surges were analyzed independent of tidal influence. A representative storm surge unit hydrographic was developed that combined the fast rise of a storm surge observed with the fastest fall (receding water level) of a storm surge observed and maintained a peak level duration of a typical storm surge for Western Alaska. The intent of combining the fastest storm surge rise and fall was to simulate the higher end of current speeds near the runway during a flood event both as the storm surge enters and as it recedes. The unit storm surge hydrograph was scaled using the USACE (2009) 50- and 100-year storm surge heights for the Agcklarok location (see Section 3.1.1). Surge heights from the Agcklarok location were applied in lieu of the Hopper Bay location, as they were found to be more conservative.

Typical Tides: Typical tide data were gathered from NOAA Station 9467124 Kun River (NOAA 2021e). Based on review of Western Alaska storm surge occurrences as well as local anecdotal data, the fall season (September, October, and November) was found to be the most likely time of year for storm surge occurrence. Thus, the typical tide used for the boundary condition utilizes the NOAA tidal predictions during this period. Figure 8 shows the predicted tides for the fall 2021 at the Kun River NOAA station. The highest seasonal tide during this period was identified and used in the storm surge hydrograph.

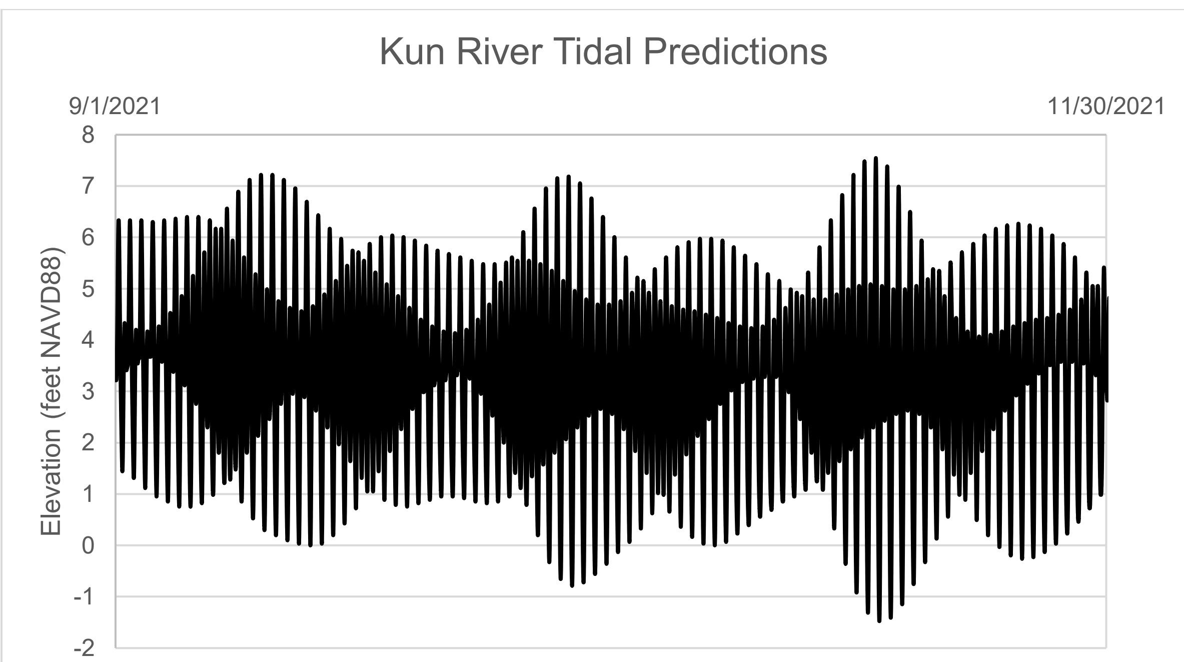

Figure 8: Kun River Tidal Prediction - Fall 2021

Combined Storm Surge Hydrograph: The representative storm surge was superimposed over the tidal predictions such that the peak of the surge coincided with the largest predicted tide.

The surge was set to begin following 2 days of normal tide to allow the model to ramp up and establish typical hydrodynamic conditions prior to the introduction of a storm surge. To account for RSLR, the storm surge hydrograph was increased by 0.64 foot representing potential sea level rise increase over a 50-year project duration. Figure 9 shows the design 100-year return period coastal surge with the typical tide and isolated surge components. All water level information was applied to the domain's western boundary in the offshore area (see Section 5.1.2).

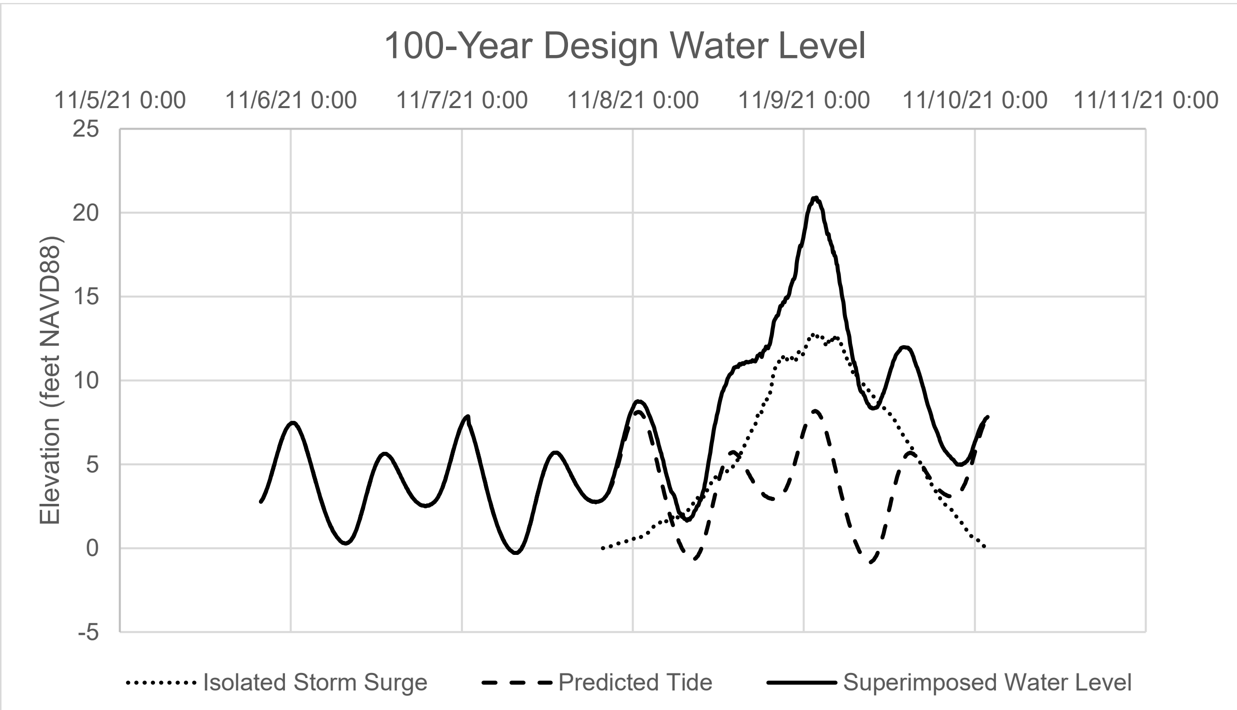

Figure 9: 100-year Return Period Storm Surge Hydrograph with Predicted Tide and Isolated Representative Surge Components

<u>*Kun River:*</u> Flow from the Kun River was included along the model boundary approximately 45 miles upstream of the runway terminal. The storm surge models assumed that the Kun River was flowing at base flow (40 percent bankfull flow). A sensitivity check comparing flood elevations at SCM during the 2 percent AEP storm surge with base flow with the concurrent 2 percent AEP storm surge and 2 percent AEP extreme runoff event as well as the 2 percent AEP runoff event with no storm surge, was performed. Design discharges for the Kun River are in Appendix B of the in the accompanying *Hydrology and Hydraulics Report* (HDR, 2022). Results of this sensitivity check showed that the additional discharge from the Kun River had a minimal effect on modeling results. The concurrent surge/riverine flood event raised water surface elevations by 0.003 feet at its peak, and the riverine event with no storm surge yielded flood elevations that did not reach the runway in most locations.

5.1.4 Storm Surge Model Limitations and Assumptions

The model developed for the coastal surge assessment at Scammon Bay is intended to be a simplistic approximation of surge inundation due to a 50-year and 100-year return period storm surge at SCM. Thus, the following limitations and assumptions should be noted:

- The model is not calibrated. Field hydrodynamic data required for calibration have not been collected. DHI recommended defaults are used for model parameters. This approach is expected to provide conservative peak water levels.
- The culvert that runs beneath the Scammon Bay Airport Runway was defined by its characteristics detailed in the 2013 Scammon Bay Airport Flood Permanent Repairs Department of Military and Veterans' Affairs (DMVA)/FEMA project plans, which are assumed to be representative of the existing culvert.
- Given that little information on bed resistance is available in the domain, bed resistance values used were assumed constant in each area and were determined by ocular estimation. This is unlikely to be the case in nature, but it provides more realistic results than neglecting roughness entirely.
- RSLR information was obtained from Nome and is assumed to be representative of the RSLR at Scammon Bay.
- Storm surge elevations were obtained from Agcklarok and are assumed to be representative of storm surge elevations at Scammon Bay.
- The shape of storm surge events was obtained from Nome and is assumed to be representative of the shape of storm surge events at Scammon Bay.
- Only one representative surge was used to determine inundation. A sensitivity analysis using different surge slopes was not performed. The surge hydrograph used was assumed to be conservative and is expected to provide higher-end values of current speed.
- Peak surge was aligned to occur simultaneously with a high tide event with the intent to represent a conservative surge elevation. A sensitivity analysis of storm surge effects at different tidal phases was not performed.
- The Kun River was assumed to be flowing at base flow (40 percent bankfull flow). Flow from other streams in the model domain were excluded and were assumed to have minimal impact of results.

5.1.5 Storm Surge Model Simulations

Two model simulations were performed: a 50-year return period (2 percent AEP) storm surge event and a 100-year return period (1 percent AEP) storm surge event. The storm surge input used for the 100-year return period model is shown on Figure 9. The storm surge input for the 50-year return period event is the same, with the peak surge elevation adjusted to match the 50-year maximum surge height provided in Table 2. The model simulations ran for 1,020 timesteps, with each timestep representing 6 minutes. The total simulation time for both models was approximately 4 days (102 hours).

5.1.6 Storm Surge Model Results

Storm surge model results were reviewed for surge inundation and potential impacts near the SCM runway, taxiway, and access road. The storm surge models resulted in a near-complete inundation of the runway and taxiway from both the 50-year and 100-year events. Maximum water surface elevation and current speeds are summarized in Table 4. The higher current speeds in the model are associated with breaching of the roadway as this area is flooded. Assuming that the improved runway is above the surge elevation, this rate of current speed is not anticipated. The fastest current speed observed not associated with a breach (current traveling around the runway/wind cone areas) is also provided since this is anticipated to be more representative of storm surge current speeds under the Future With Project condition. Figure 10 shows maximum predicted water surface elevations for the 50-year storm surge event.

Table 4: Storm Surge Model Water Elevations Results, Current Results, and Reference Elevations

Location	Elevation (feet NAVD88)
Reference Elevations	
Runway Centerline – Southeast End	+17.4 feet
Runway Centerline – At Culvert	+12.7 feet
Runway Centerline – At Taxiway	+13.5 feet
Center of Taxiway	+13.1 feet
50-Year Max Water Surface Offshore	+18.9 feet
100-Year Max Water Surface Offshore	+20.9 feet
Model Results Elevations	
50-Year Max Water Surface Elevation Near SCM	+16.1 feet
100-Year Max Water Surface Elevation Near SCM	+18.4 feet
Model Results Current	
Maximum Current Speed (breaching roadway)	7.5 feet/second
Maximum Current Speed, West Runway Terminal	4.1 feet/second
Maximum Current Speed, East Runway Terminal	2.2 feet/second
Maximum Current Speed, Culverts (either side)	2.2 feet/second

Note: NAVD88 = North American Vertical Datum of 1988

Figure 10: Peak Water Surface Elevation Results for the 50-Year Storm Surge Event

5.2 Wave Analysis

A wave analysis was conducted to determine potential wave conditions at the Scammon Bay Airport that coincide with a flooding event. MIKE 21 SW numerical model software was used to simulate wave conditions at the project site.

5.2.1 Wave Model Description

The MIKE 21 SW numerical model was used to assess wind-generated wave height and period at the project site. MIKE 21 SW, developed by DHI, is software used for developing two-dimensional spectral wave models based on a flexible (unstructured) mesh. Models developed with MIKE 21 SW simulate wind-generated waves and swell (DHI 2017b). The flexible mesh module allows for higher resolution at areas of interest (e.g., near the runway embankment) while relaxing the resolution away from the project site to increase computation efficiency.

5.2.2 Model Domain and Mesh

The model domain for the MIKE 21 SW simulations includes an approximately 30-mile fetch centered at SCM in all directions that are not obstructed by the Askimuk Mountains. The mesh contains 29,873 elements and 15,229 nodes. Mesh elements increase in size as radial distance from SCM increases. Mesh elements along the runway embankment have a fine resolution allowing for multiple (approximately three) elements per wave length. Features with potential to influence wave conditions, such as nearby roads and detention ponds, were also defined with increased resolution.

Primary sources of elevation data used to create the mesh are the same as those for the MIKE 21 HD FM and are summarized in Table 3.

Figure 11 provides a view of the entire model domain. The colors represent different elevations. Figure 12 and Figure 13 provide enlarged views of the mesh showing the finer resolution for the project site.

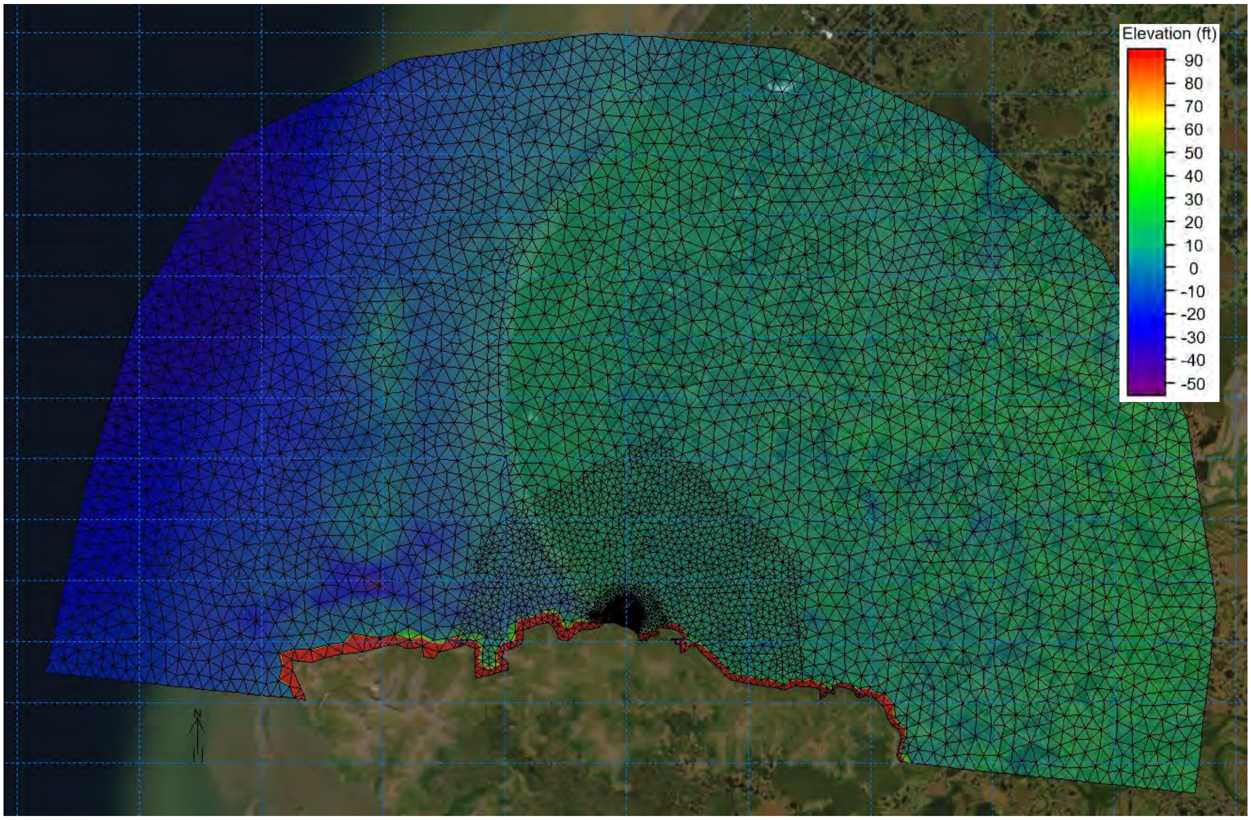

Figure 11: MIKE 21 SW Wave Model Mesh - Full Domain

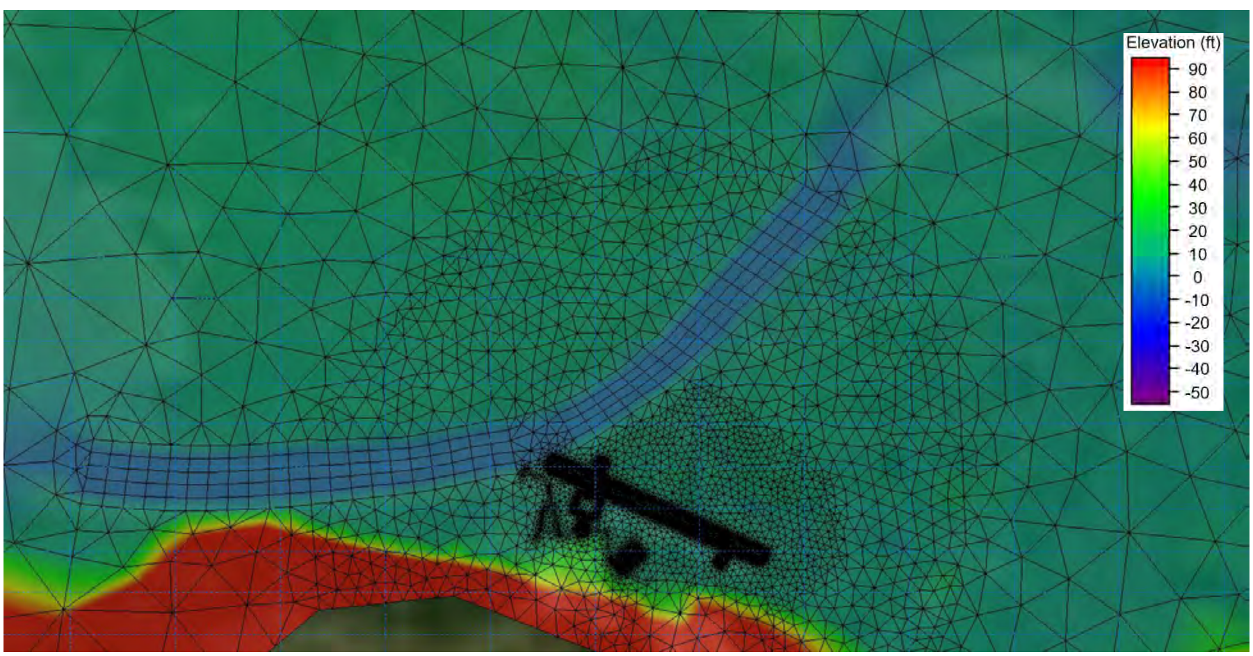

Figure 12: MIKE 21 SW Wave Model Mesh - Enlarged View Showing the Kun River and Scammon Bay

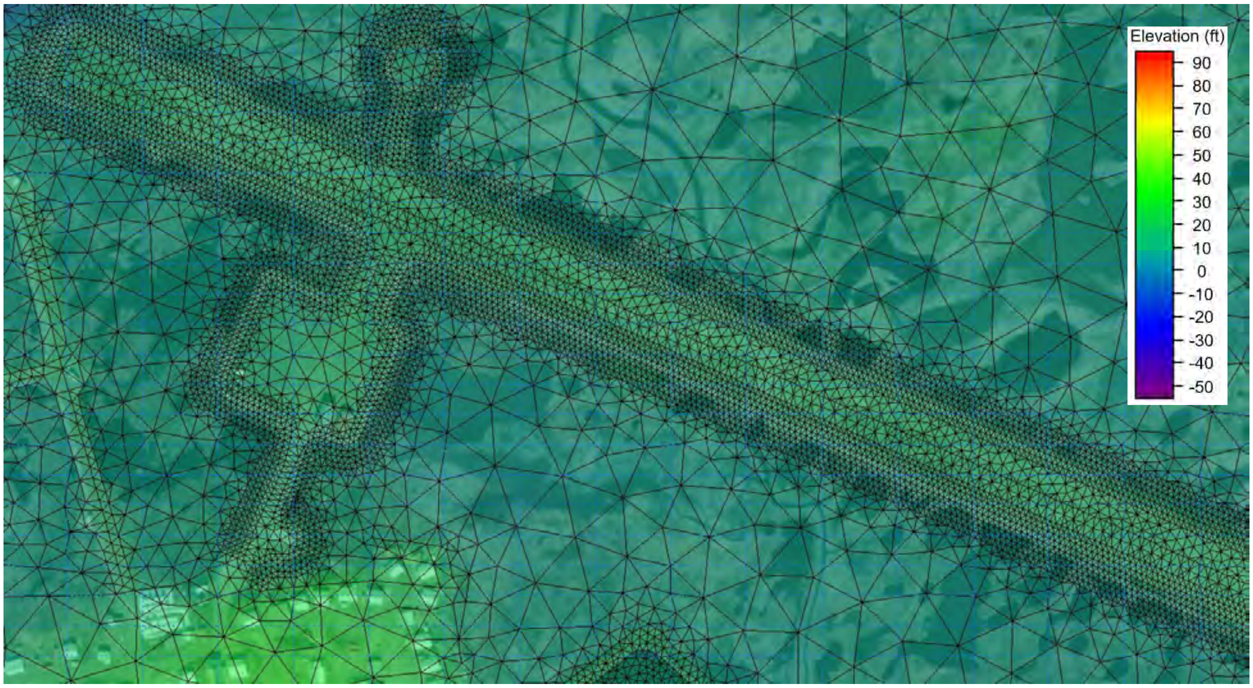

Figure 13: MIKE 21 SW Wave Model Mesh - Enlarged View Showing Refined Mesh Around Runway Embankment

5.2.3 Wave Model Boundary Conditions

Primary model inputs included water level, wind speed, and wind direction. Wave (beyond those generated by wind) and current boundary conditions were not included in the model.

Water Level: The 100-year return period water level was determined by using the maximum water level reached during the Storm Surge Analysis numerical modeling (Section 5.1). This water level was applied constantly throughout the domain for all simulations (i.e., no tidal action), as this provides a more conservative approach for simulating wave conditions.

Wind: Wind events were identified from the Scammon Bay ASOS dataset from 2010 to 2021 (temporal extent of data). These events were sorted into 16 intercardinal directions on a 22.5° interval. An extreme value analysis was performed for "All Directions" (shown on Figure 4) and for each intercardinal direction. The 100-year return period wind speeds for each direction are shown in Table 5.

Table 5: 100-year Wind Events by Direction

Direction	Direction (degrees)	Speed (knots)
North	0	30.7
North by Northeast	22.5	26.4
Northeast	45	23.2
East by Northeast	67.5	28.9
East	90	31.2
East by Southeast	112.5	33.5
Southeast	135	33.3
South by Southeast	157.5	33.3
South	180	43.9
South by Southwest	202.5	33.4
Southwest	225	34.0
West by Southwest	247.5	28.0
West	270	34.7
West by Northwest	292.5	33.4
Northwest	315	29.0
North by Northwest	337.5	24.8

5.2.4 Wave Model Limitations and Assumptions

Limitations and assumptions for the MIKE 21 SW wave model are as follows:

- The model is not calibrated. However, nomographs for wind-generated waves provided in the USACE Shore Protection Manual (USACE 1984) were reviewed for similar water depths and fetches and were found to have good agreement with the wave height and period results.
- Bed resistance was not included in this model. Although this is not a situation that can occur in nature, it provides a conservative approach to wave height estimation.
- Wind events from 2010 to 2021 are assumed to be a representative sample for the statistical analyses.
- Waves in Scammon Bay were assumed to be wind-generated waves only (i.e., swell from the ocean was not included). Swell is assumed to dissipate energy well before reaching the runway during a surge event due to their long wave periods and influence of the shallow water depths.

5.2.5 Wave Model Simulations

Sixteen model simulations (one for each intercardinal direction) varying the wind speed and wind direction were performed. The water level for each simulation was held constant for each simulation, achieving a steady-state wave condition as opposed to continually varying the water level as a tidal cycle. The constant water level was set as the maximum water level during 100-year storm surge model near the runway.

5.2.6 Wave Model Results

Wave model results were extracted at 108 locations around the SCM runway, taxiway, and access road. The largest spectral significant wave heights and associated periods were identified for each extraction location from the 16 model simulations (Figure 14). These results were then used to determine stone stability and overtopping rates at multiple locations along the perimeter of the runway/taxiway/access road.

Figure 14: Spectral Significant Wave Height Results at Scammon Bay Airport

6. Coastal Engineering Design Recommendations

6.1 Airport Surface Elevations

Airport surface elevation recommendations consider storm surge, RSLR, and wave overtopping. Recommendations are provided for both a 50-year (2 percent AEP) and 100-year (1 percent AEP) storm surge event. The RSLR component assumes a 50-year project life duration.

The criteria for determining a recommended runway elevation use critical overtopping discharge rates for revetment seawalls. Table 6 provides the critical discharge guidance from CIRIA (2007). To reduce maintenance and repair due to overtopping, setting the runway elevation to achieve an overtopping discharge at “No Damage” is recommended.

Table 6: Critical Overtopping Discharge for Revetment Seawalls

Description	Q Mean Overtopping Discharge (m^3/s per m)
No Damage	q < 0.05
Damage if promenade not paved	0.05 < q < 0.2
Damage even if promenade paved	q > 0.2

Source: CIRIA 2007
Note: m^3/s per m = cubic meters per second per meter.

Overtopping discharge was calculated at multiple locations (at the same locations shown in Figure 14) around the perimeter of the airport features (runway, taxiway, access road) using the 50- or 100-year return period scenarios assuming side slope of 4H:1V with an armor stone embankment. The elevation was varied until the maximums of all of the locations reviewed were at or below the critical overtopping discharge threshold. Table 7 provides the recommended Airport Surface Elevations and associated overtopping discharges.

Table 7: Recommended Airport Surface Elevations and Associated Overtopping Discharges

Return Period	Recommended Airport Surface Elevation	Overtopping Discharge (m^3/s per m)
50-Year (2% AEP)	**+18.5 feet NAVD88**	0.02 Avg; 0.05 Max
100-Year (1% AEP)	+20.5 feet NAVD88	0.01 Avg; 0.04 Max

Note: m^3/s per m = cubic meters per second per meter; AEP = Annual Exceedance Probability; NAVD88 = North American Vertical Datum.

Airport usability due to storm surge is associated with the probability of occurrence of an event that exceeds the critical overtopping rate of “no damage” over the project life duration. In a storm surge event where the overtopping exceeds this value, it is expected that conditions will exist that do not allow safe use of the runway, such as flooding, damage to the runway or runway safety area, or debris thrown up onto the runway. Unless significant damage is sustained, the duration in which the runway would be unusable would be on the order of a few days to a week. This is based on observations of Western Alaska storm surge hydrographs in which storm surge events will often reach a maximum surge level and sustain that level for 1 to 3 days before receding. It is then assumed that some form of cleanup and minor grading is required to return the runway to a usable condition. Probability of occurrence for the 50- and 100-year storm surge events over varying project life durations is provided in Table 8.

Table 8: Storm Surge Probability of Occurring at Least One Time over the Project Life Duration

Project Life Duration (years)	50-Year Storm Surge (2% AEP)	100-Year Storm Surge (1% AEP)
25	39.7%	22.2%
30	45.4%	26.0%
50	**63.5%**	**39.5%**
75	77.9%	52.9%
100	86.3%	63.4%

Note: AEP = Annual Exceedance Probability.

6.2 Runway Relocation

Historical georeferenced aerial imagery from 1948 and 1977 was gathered for the project area. Riverbank positions were delineated based on the apparent water-land interface. When overlaying these riverbank positions with a recent (2020) aerial image, it can be inferred that the Kun River is migrating towards the runway, albeit slowly. Riverbank retreat near the runway terminal from 1948 to 2020 ranges from 115 to 190 feet, which equates to 1.6 to 2.6 feet per year. Similarly, riverbank retreat from 1977 to 2020 near the terminal ranges from 55 to 100 feet, which equates to 1.3 to 2.3 feet per year.

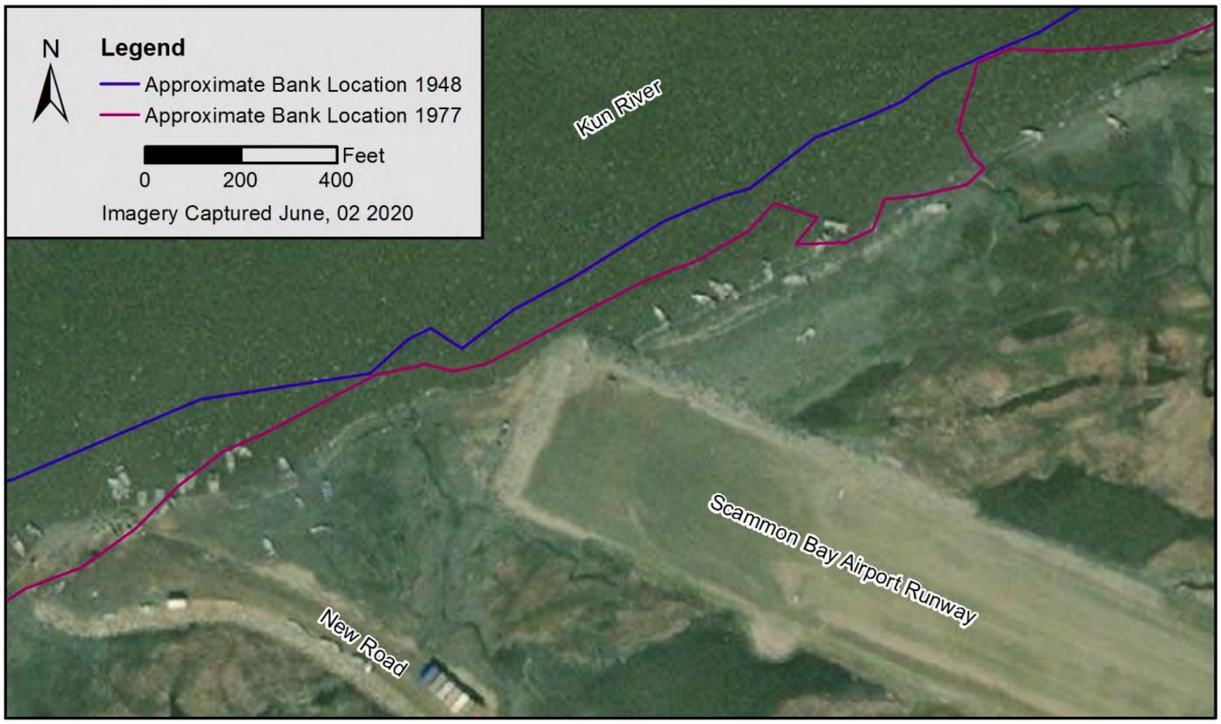

Figure 15: Historical Riverbank Position Superimposed over Recent (2020) Aerial Imagery

Assuming a conservative migration rate of 3 feet per year, the runway would need to be relocated 150 feet from the current riverbank location for a 50-year project life duration. Thus, considering the slightly oblique alignment of the runway and protrusion of the runway terminal beyond the existing riverbank position, the runway would need to shift approximately 340 feet along its current alignment. Figure 16 shows the proposed shifted runway graphically in comparison to the existing runway location. When the runway is shifted, it does not appear that any significant flow paths will be displaced. The distance from the runway terminal to the edge of the wetlands (area where terrain elevation abruptly increases) is shortened from approximately 550 feet to 500 feet with the proposed shift.

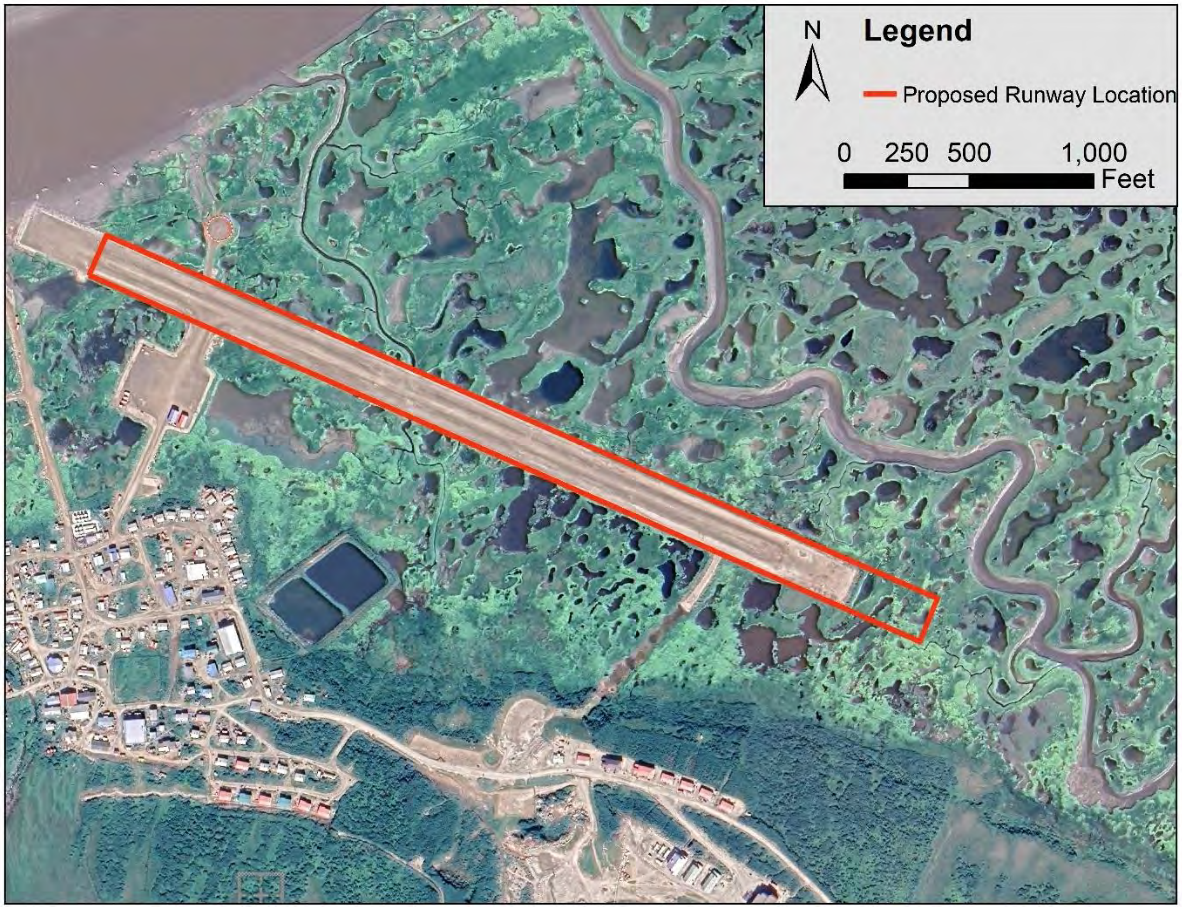

Figure 16: Proposed Runway Relocation

6.3 Erosion Protection

Erosion protection is recommended along the perimeter of the runway, taxiway, and access road to mitigate damage to the embankment due to waves and to reduce wave overtopping, which can damage the surface of the airport features. A traditional buried-toe armor rock revetment, a suitable long-term option for erosion protection that requires minimal maintenance, was the initial method assessed for shoreline protection. This method was assessed using the approximate 4H:1V existing side slopes of the runway. Subsequently, alternative erosion protection methods were assessed to evaluate more cost-effective solutions. These methods included an armor rock revetment with an above-ground toe at various slopes as well as a marine mattress.

6.3.1 Buried-Toe Armor Rock Revetment Method

If a traditional buried-toe armor rock revetment is used, two revetment sections are recommended for different areas of the project area. Each revetment section is a two-layer revetment consisting of a primary amor stone and filter stone material with an underlaying geotextile filter fabric. An embankment slope of 4H:1V was selected based on the proposed repair design in the 2013 Scammon Bay Airport Flood Permanent Repairs DMVA/FEMA project drawings. Armor rock revetments can be constructed at steeper slopes (generally as steep as

2H:1V); however, the size of primary armor stone material and subsequently the layer thickness/volume of stone increases as a result.

6.3.2 Primary Armor Stone (Buried-Toe Armor Rock Revetment Method)

A stone stability analysis was performed to assess primary armor stone size needed for potential waves and currents during a flood event. From this analysis, it was found that wave conditions were the controlling factor. Ice was not considered for armor stone size for the following reasons:

1. The structure will generally be above the tidal level at which ice plucking is not a concern.
2. The runway terminal is a significant distance away from the Kun River, and it is not expected that ice breakup in the river will affect the stability of the revetment.
3. Storm surges generally occur during fall, when sea ice is not present in Scammon Bay.

Stone stability using both the van der Meer and Hudson methodologies was calculated at multiple locations around the runway, taxiway, and access road. From these calculations, it was determined that the maximum required median primary armor stone weight for the van der Meer and Hudson methodologies is 300 lbs. and 400 lbs., respectively. Required median stone size varied along the perimeter runway, taxiway, and access road, with the larger stone calculated at the western runway terminal, primary wind cone, and western embankment of the taxiway and access road. Calculated median stone weight around the perimeter of the runway, taxiway, and access road is shown visually on Figure 17.

Due to the short-period waves anticipated, a riprap-type gradation (wide/uniform gradation) is recommended in lieu of a coastal armor-type gradation (narrow gradation). The riprap-type gradation is generally easier to produce and thus should have a reduced cost compared to a coastal armor-type gradation. The recommended gradation is provided in tabular form in Table 9 and shown graphically in Figure 18. This gradation is the same as ASTM 6092 R-700 with the exception that it is “percent lighter by count” and not “percent lighter by weight.” Also, this gradation is very similar to a DOT&PF Class III gradation.

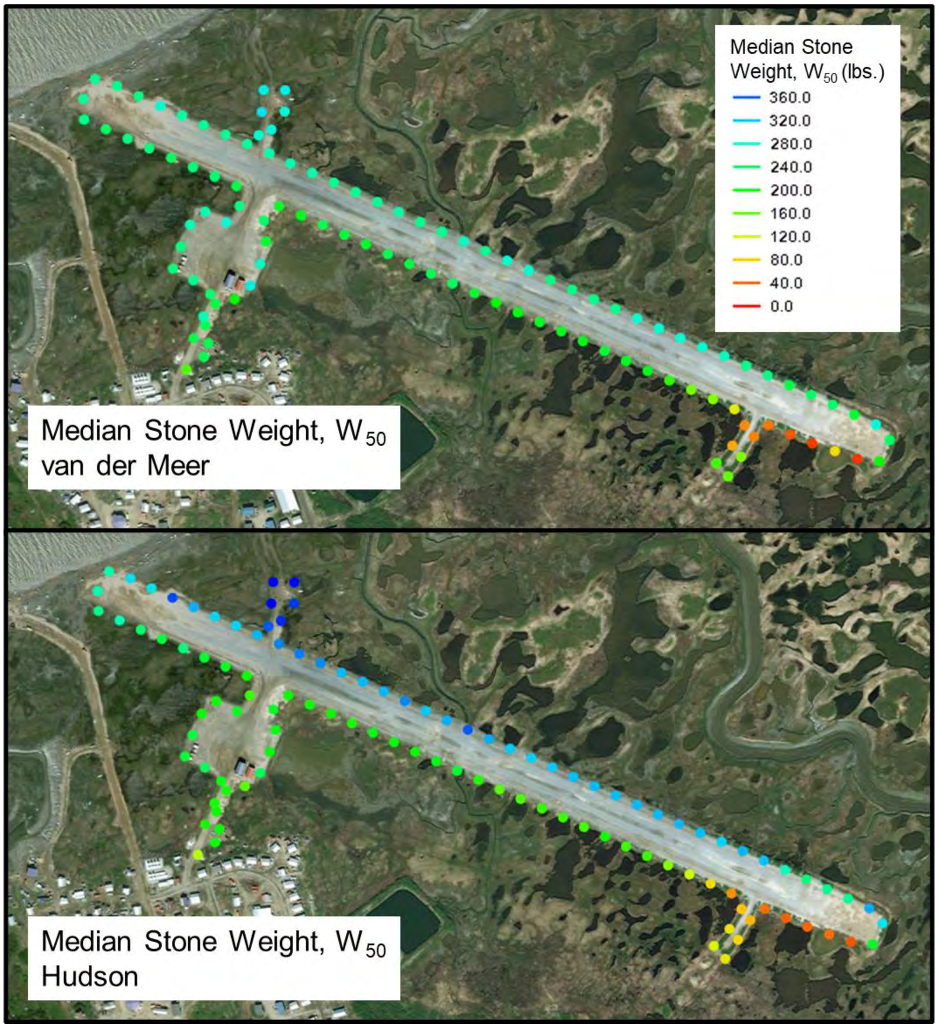

Figure 17: Median Armor Stone Weight using the van der Meer (upper image) and Hudson (lower image) Methodologies

Table 9: Recommended Primary Armor Stone Gradation (PA-700)

Stone Weight, lbs.	Percent Lighter by Count
1,500	100
700	50–100
300	15–50
60	0–15

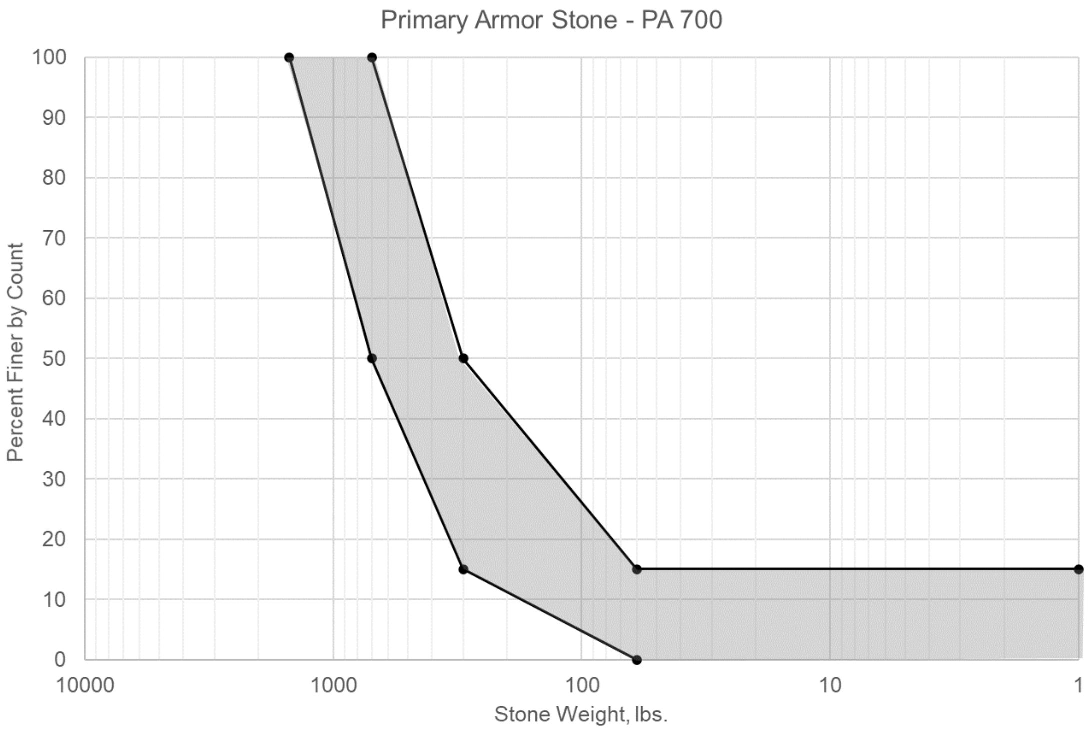

Figure 18: Recommended Primary Armor Stone Gradation (PA-700)

6.3.3 Filter Stone (Buried-Toe Armor Rock Revetment Method)

Filter stone is recommended to be placed under the primary armor stone to provide distribution of the armor stone weight against the underlaying geotextile filter fabric and improved interlocking with the armor stone layer. The filter stone size follows guidance for the USACE *Shore Protection Manual* (USACE 1984) and EM 1110-2-1614 (USACE 1995). The upper bound of the filter stone was selected to match the lower bound of the primary armor stone to increase yield of the processed quarry stone. The recommended gradation for the filter stone is provided in tabular form in Table 10 and shown graphically in Figure 19.

Table 10: Recommended Filter Stone Gradation (F-30)

Stone Weight, lbs.	Percent Lighter by Count
60	100
30	0–50
5	0–15

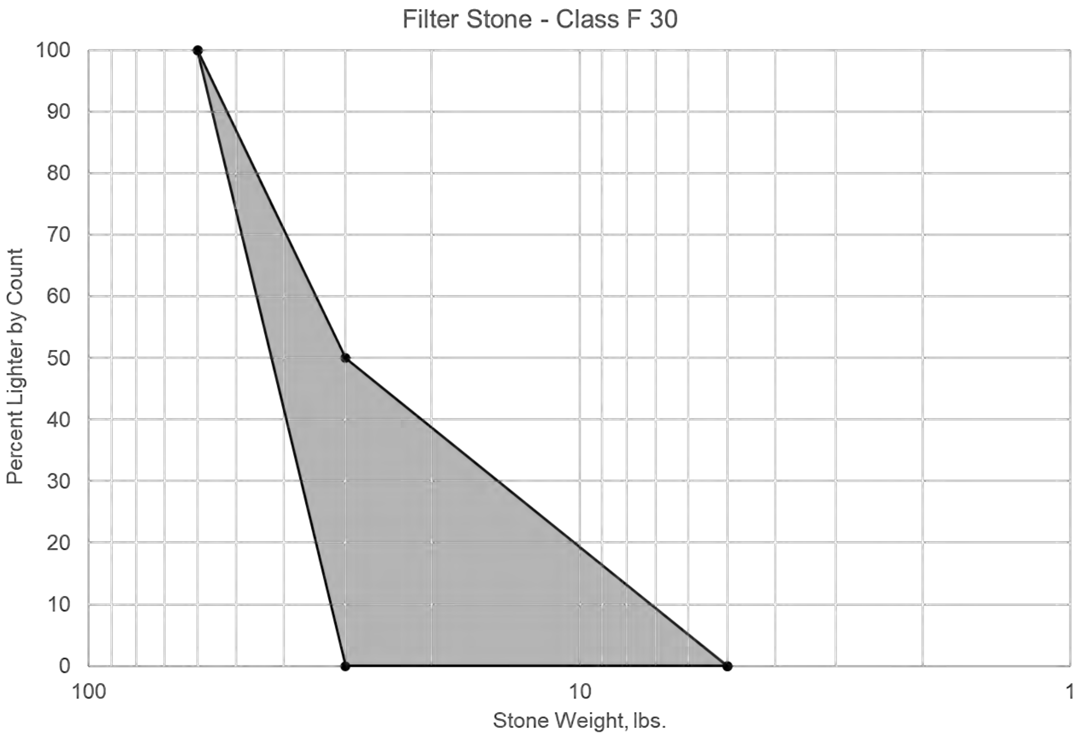

Figure 19: Recommended Filter Stone Gradation (F-30)

6.3.4 Revetment Typical Sections (Buried-Toe Armor Rock Revetment Method)

Two revetment sections are recommended that vary in the design of structure toe. The Erosion Protection – Type I revetment includes a more substantial buried toe that is recommended for areas along the runway, taxiway, and access road with moderate to extreme scour potential. The Erosion Protection – Type II revetment uses a simple entrenched toe with *in-situ* backfill. This section is recommended in areas along the runway, taxiway, and access road with low scour potential. Each toe design follows guidance from EM 1110-2-1614 and should be buried 4 feet below the existing grade to prevent scour. Scour depths were assumed to be equivalent to 1.0-1.5 times the significant wave height.

The revetment typical sections for erosion protection are provided in Figure 20 and Figure 21. Both sections utilize the same primary armor and filter material. The Erosion Protection – Type II areas are expected to have less wave energy and thus could utilize a smaller Primary Armor stone (W_{50} of approximately 200 lbs.). Requiring two primary armor stone and consequentially two filter stone material types is expected to complicate the construction logistics, which may offset any gains from using a smaller material. Given this unknown, a potential procurement strategy to solicit a lower cost is to provide an optional Erosion Protection – Type II with a smaller section utilizing a smaller primary armor stone and filter stone material. Minimum armor and filter stone layer thicknesses (3’) are specified to be two times the median stone diameter (D_{50}).

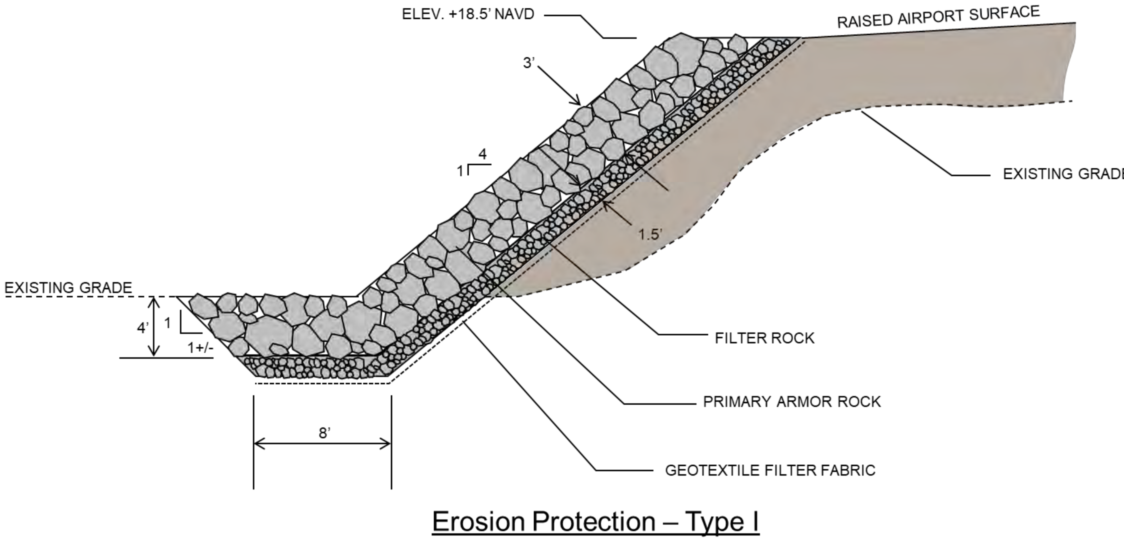

Figure 20: Erosion Protection - Type I Recommended Typical Section

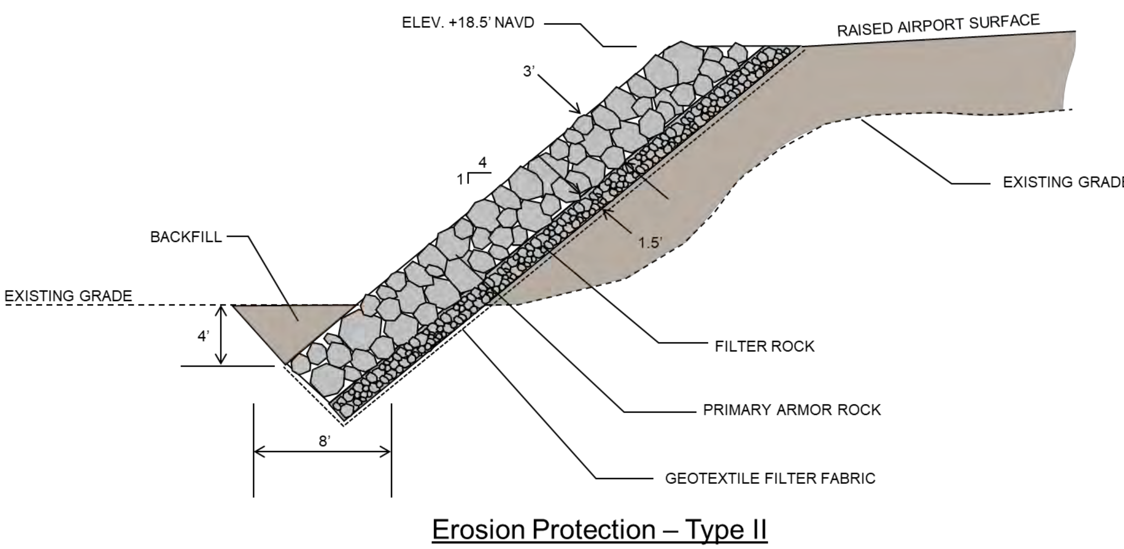

Figure 21: Erosion Protection - Type II Recommended Typical Section

6.3.5 Armor Rock Revetment with an Above-Ground Toe

An armor rock revetment with an above-ground toe reduces the excavation and, when constructed at steeper angle than 4H:1V, requires less material thus reducing the initial construction cost.

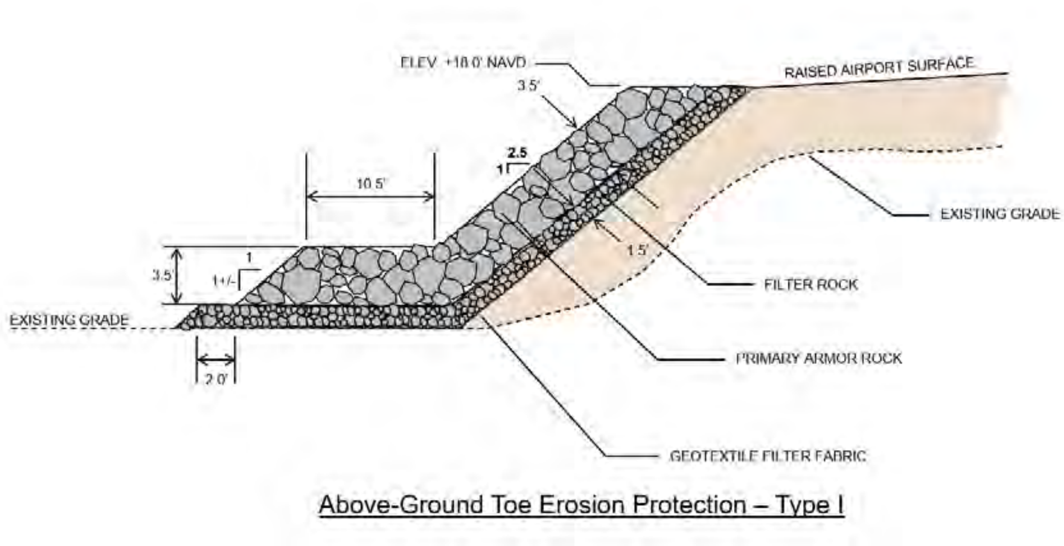

Figure 22: Example of an Above-Ground Toe Erosion Typical Section (Type I 2.5H:1V Concept Shown)

Several configurations of revetments with an above-ground toe were assessed to quantitatively compare construction cost to the initial buried-toe revetment with a 4H:1V slope. These include the following:

- 2.5H:1V & 2H:1V Concept – This concept uses three typical sections covering the entire airport perimeter. In areas with the largest waves, the revetment uses 2.5H:1V slope. In areas with moderate wave action, the revetment uses a 2H:1V slope. In areas with minimal wave action, the revetment uses filter rock material as the primary protection.
- 2.5H:1V Concept – This concept uses three typical sections. In areas with the largest waves as well as moderate waves, a 2.5H:1V slope is used, however, the armor rock size is different creating two different sections. A third section using only filter rock is used in areas with minimal wave action.
- 2H:1V Concept - This concept uses three typical sections. In areas with the largest waves as well as moderate waves, a 2H:1V slope is used, however, the armor rock size is different creating two different sections. A third section using only filter rock is used in areas with minimal wave action.
- 1.5H:1V Concept - This concept uses three typical sections. In areas with the largest waves as well as moderate waves, a 1.5H:1V slope is used, however, the armor rock size is different creating two different sections. A third section using only filter rock is used in areas with minimal wave action.

A summary of these different concepts is provided in Table 11 which also includes a conceptual cost difference from the buried-toe revetment.

Table 11: Summary Comparison of Armor Rock Revetments

Revetment Concept	Type I Armor W_{50}	Type II Armor W_{50}	Revetment Cost Contribution
Buried-Toe 4H:1V Concept	300 lbs.	300 lbs.	$67.7M
Above-Ground Toe 2.5H:1V and 2H:1V Concept	370 lbs.	380 lbs.	$30.1M
Above-Ground Toe 2.5H:1V Concept	520 lbs.	380 lbs.	$30.9M
Above-Ground Toe 2H:1V Concept	520 lbs.	380 lbs.	$31.9M
Above-Ground Toe 1.5H:1V Concept	790 lbs.	590 lbs.	$33.3M

Notes:
1. Revetment cost contribution includes in-place costs of primary armor stone, filter stone, geotextile fabric, and any excavation or fill required.
2. Primary armor stone unit price used is $240 per ton
3. Filter stone unit price used is $200 per ton
4. Geotextile filter fabric unit price used is $10 per square yard
5. Excavation unit price used is $25 per cubic yard
6. Backfill unit price used is $25 per cubic yard
7. A contingency of 30% was used in the cost contribution calculation

6.3.6 Marine Mattress

A potential drawback from using a traditional armor rock revetment, especially in remote locations without suitable local armor material, is the capital cost to construct the project. A marine mattress can be used in environments with low to moderate wave conditions and are advantageous in that they can utilize much smaller, less expensive rock. In other words, the ability to produce high quality large armor stone is not a requirement. A marine mattress is made of geotextile grid in the shape of a 'mattress' that contains small rock. Mattresses are laid in a single layer. Mattress thickness come in a variety of sizes (6", 9", 12", 18", and 24"). Mattresses are generally about 20 to 30 feet long (35 feet max) and 5 feet wide. The mattress can be filled in place or fabricated offsite and placed on a prepared foundation using specialty spreader bars. Figure 23 provides a typical schematic of a marine mattress. An example of marine mattress used as erosion protection is shown in Figure 24.

Figure 23. Typical schematic of a marine mattress (Photo source: Tensar.com)

Figure 24. Example of a marine mattress used for erosion protection (Photo source: tensar.com)

It is anticipated that a 12" mattress placed at 1.5H:1V slope can handle the wave conditions at Scammon Bay. The east side of the runway would require excavation to achieve the 1.5H:1V slope or, alternatively, the marine mattress could be placed directly on grade with minor excavation. These concepts are shown schematically in Figure 25 and Figure 26. The west and mid runway, which have a lower existing grade, would require fill to achieve the 1.5H:1V slope. This concept is shown schematically in Figure 27. For comparison, the marine mattress cost component as shown would be $11M (roughly a third less expensive than any of the armor rock options).

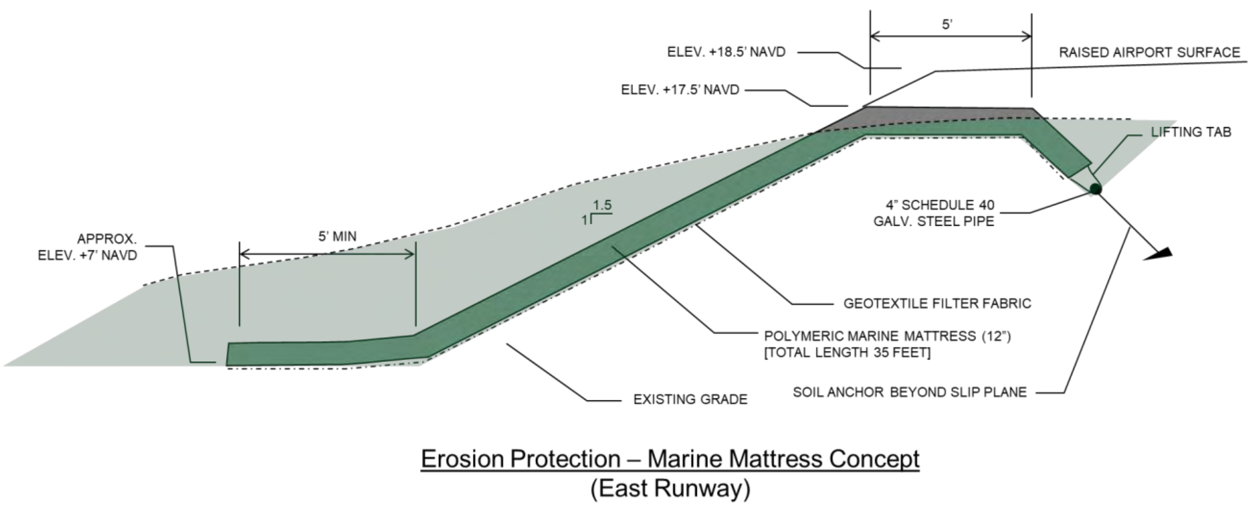

Figure 25. Marine mattress schematic for the east side of the runway (1.5H:1V slope)

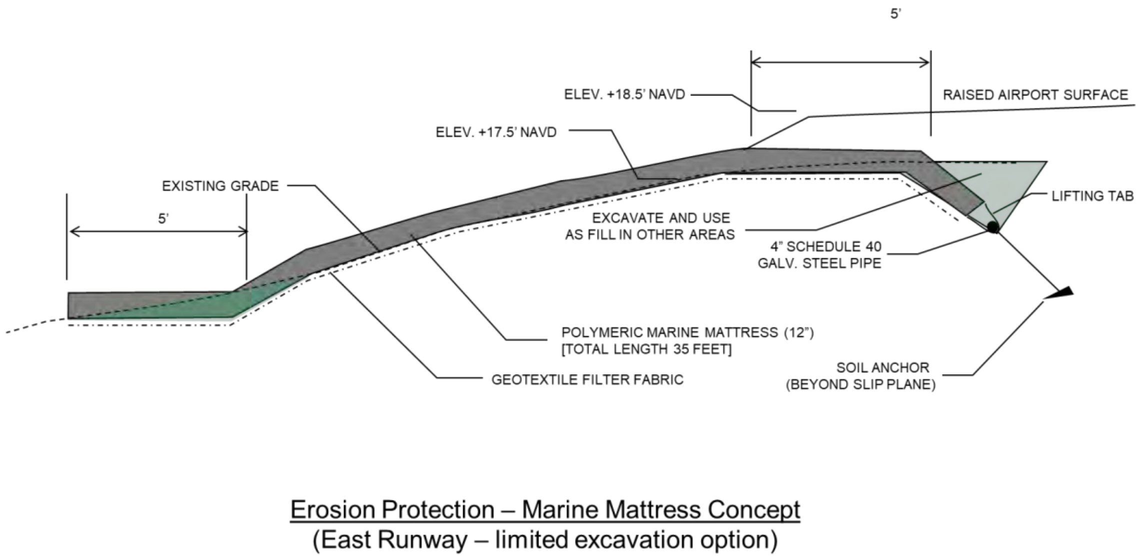

Figure 26. Marine mattress schematic for the east side of the runway (use existing slope)

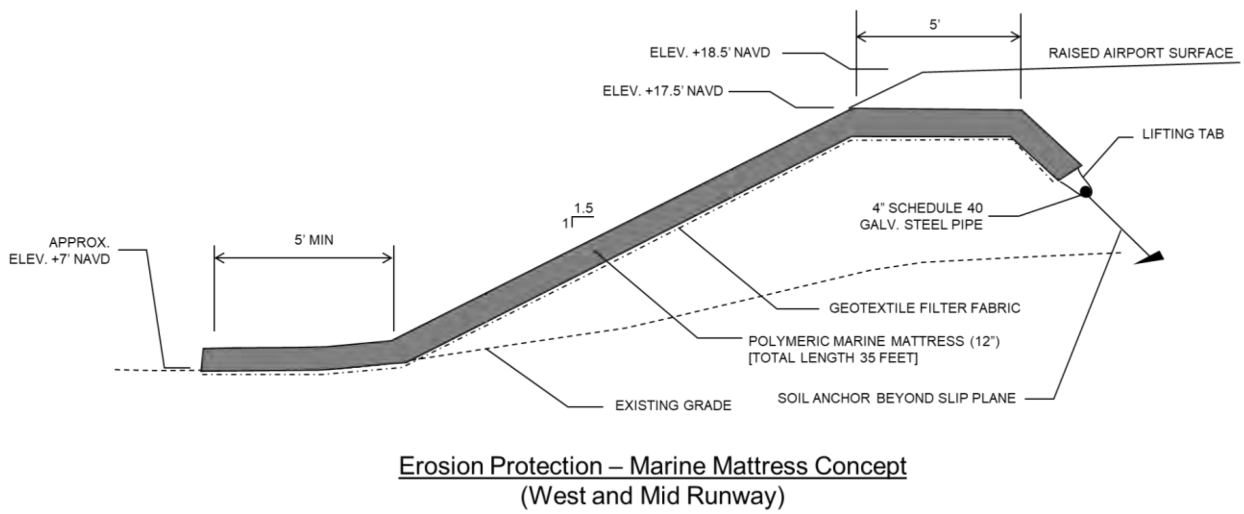

Figure 27. Marine mattress schematic for the west side and mid runway

6.3.7 Other Alternatives Not Assessed

Other alternatives not assessed in detail that may warrant some future consideration include:

- Articulating Concrete Block Mats
- Gabions
- Sacrificial Rock Material/Berm Revetments

Articulating block mats include multiple concrete pieces that interlock via geometry (i.e., puzzle piece), strung together using cable, chain, or rope, or combination of the interlocking geometry and cabling. They can be used in light to moderate wave environments and have a minimal profile compared to armor rock revetments. Similar to a marine mattress, they require a prepared subgrade.

Gabions are like marine mattresses in that they are units that contain small rock, however, are smaller and block-like in geometry. They can be placed more vertically, such as along a riverbank, or at a prescribed slope. There are various gabion materials including zinc and galvanized steel (not suitable for a coastal environment), stainless steel, and HDPE/plastic.

Sacrificial rock material/berm revetments are like the revetments presented in this section, but instead utilize smaller stone and have a larger cross-section, expecting to have movement within the structure during large events. Material is either simply lost (sacrificial) or a berm feature is redistributed by the storm developing a more stable ‘S’ shape. These structures generally require more material than a traditional armor rock revetment (larger cross section) but may be a benefit economically by using smaller material if the unit price of the rock is significantly cheaper than the equivalent larger material needed for a traditional revetment.

7. Summary

This document presents a preliminary coastal analysis and recommendations pertaining to coastal engineering components as part of a larger feasibility study for improvements to the Scammon Bay Airport. Readily available metocean and elevation data were gathered to develop a coastal storm surge model and spectral wave model to determine potential water levels, current speeds, and wave conditions at the runway, taxiway, and access road. Based on this analysis, airport surface elevation for a 50-year return period storm surge (2 percent AEP) is +18.5 feet NAVD. A 340-foot shift in the runway location along its current alignment away from the Kun River is also recommended based on historical migration rates of the riverbank near the runway terminal. To mitigate against erosion, multiple revetment sections were developed and compared using conceptual costs for protection of the runway, taxiway, and access road perimeters.

The following are key recommendations regarding the feasibility of improving the Scammon Bay Airport:

1. To reduce potential for flood inundation, damage from current flow due to breaching, and damage from flooding and wave overtopping, it is recommended to increase the elevation of the Airport Surfaces. For a 2 percent AEP, an elevation of +18.5 feet NAVD88 is recommended.
2. Relocating the runway along its current alignment at 340 feet is recommended for a project life duration of 50 years.
3. Erosion protection (armor rock revetment or marine mattress) is recommended around the perimeter of the runway, taxiway, and access road is recommended to mitigate potential erosion and scour due to waves and currents during a flood event.

4. In areas expected to sustain larger wave condition, a section with a toe designed for moderate to severe scour is recommended.
5. Different sections that utilize smaller typical sections should be considered in areas of the airport perimeter that experience smaller wave action.
6. Erosion protection utilizing marine mattresses (or other alternatives to armor rock revetment) should be given consideration, given the infrequent and moderate wave conditions expected to reduce overall construction cost.

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APPENDIX D: HYDROLOGY AND HYDRAULICS REPORT – SCAMMON BAY AIRPORT IMPROVEMENTS FEASIBILITY STUDY (HDR 2022B)

Hydrology and Hydraulics Report – Scammon Bay Airport Improvements Feasibility Study

Project Number: CFAPT00691
AIP: 3-02-0255-003-2023

Alaska Department of Transportation and Public Facilities, Central Region

Scammon Bay, Alaska

December 19, 2022

Prepared by:

HDR

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Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AWC	*Anadromous Waters Catalog*
cfs	cubic feet per second
CMP	corrugated metal pipe
DOT&PF	State of Alaska Department of Transportation and Public Facilities
DS	Downstream
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPID	Fish Passage Inventory Database
GFDL-CM3	NOAA Geophysical Fluid Dynamics Laboratory - Coupled Model 3.0
GIS	Geographic Information Systems
GCM	Global Circulation Model
H&H	Hydrology and Hydraulics
HDPE	High Density Polyethylene
HEC	Hydraulic Engineering Circular
HW/D	headwater depth to culvert diameter ratio
IfSAR	Interferometric Synthetic Aperture Radar
LiDAR	Light Detection and Ranging
MHHW	mean higher-high water
MLLW	mean lower-low water
MTL	mean tide level
NAVD88	North American Vertical Datum of 1988
NCAR-CCSM4	National Center for Atmospheric Research - Atmospheric Research Community Earth System Model 4
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PCM	*Alaska Highway Preconstruction Manual*
PIH	Plans-in-Hand
PRISM	Parameter-elevation Regression on Independent Slopes Model
Q_{50}	50-year design discharge
SCM	Scammon Bay Airport (International Air Transport Association’s airport code)
SNAP	University of Alaska Fairbanks Scenarios Network for Alaska + Arctic Planning
TR-55	Technical Release 55
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

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1. Introduction

1.1 Project Overview

This Hydrology and Hydraulics (H&H) Report is prepared for the State of Alaska Department of Transportation and Public Facilities (DOT&PF) Central Region as part of a larger feasibility study to assess improvements to the airport at Scammon Bay (project).

The project is at the Scammon Bay State Airport (SCM), which is a state-owned, public use airport. The DOT&PF proposes various airport improvements to enhance safety, improve infrastructure, and bring the airport to Federal Aviation Administration standards. These improvements consist primarily of repairing elements that have been damaged by flooding or have otherwise deteriorated over time, including:

- Increasing the elevation of the runway, taxiway, apron, and access road
- Shifting the runway away from the Kun River
- Replacing the culvert under the runway
- Placing erosion protection adjacent to the Kun River and airport embankments
- Making various building and aviation-specific additions and replacements
- Obtaining additional right-of-way

1.2 Scope of Hydrologic and Hydraulic Analyses

The project involves providing H&H and coastal engineering recommendations to guide a larger feasibility study regarding the various airport improvements to better protect SCM from flooding and scour. The H&H portion consisted of looking at the removal and replacement of one 48-inch-diameter cross culvert near the center of the existing runway. The crossing conveys an unnamed tributary to the Kun River and will require hydraulic design. As of the writing of this report, Alaska Department of Fish and Game (ADF&G) had not determined if this crossing will require hydraulic design to accommodate anadromous fish passage. If anadromous fish passage requirements are established, the supplementary design considerations will need to be considered for the feasibility study.

Details specific to the coastal engineering recommendations to support this project are provided under a separate report (HDR, 2022).

HDR conducted a background review, site visit, and discussions with DOT&PF to gain an overall understanding of the project drainage and site-specific drainage issues. This was followed by basin delineations, development of flood frequencies, culvert hydraulic calculations, and tidal analyses. These are discussed in this report and detailed in its appendices.

1.3 Organization of Report

This report is organized as follows:

- Section 2 discusses existing hydrologic and hydraulic conditions.
- Section 3 discusses the project design criteria.
- Section 4 discusses the hydrologic analysis.
- Section 5 discusses the hydraulic analysis.
- Section 6 discusses floodplain management.
- Section 7 presents the summary and recommendations.
- Section 8 presents the references cited.

All elevations provided are based on the North American Vertical Datum of 1988 (NAVD88) unless otherwise specified.

2. Hydrologic and Hydraulic Conditions

2.1 General Physical Characteristics

The project is located in the community of Scammon Bay in Western Alaska, in the Kusilvak Census Area (Figure 1). Scammon Bay has a population of 594 (U.S. Census Bureau 2020) and covers 299 acres. The runway is located on the south shore of the Kun River along the northeast edge of the community.

DOT&PF and HDR conducted a site visit in May 2021 to assess the existing runway culvert and the surrounding area. Appendix A includes HDR's site visit report with photographs.

Local topography was analyzed using publicly available Interferometric Synthetic Aperture Radar (IfSAR) and Light Detection and Ranging (LiDAR) digital elevation data (State of Alaska Geological & Geophysical Surveys 2021).

Geology of the area was interpreted from the United States Geological Survey (USGS) Geologic Map of Alaska via an online mapper (Wilson et al. 2015).

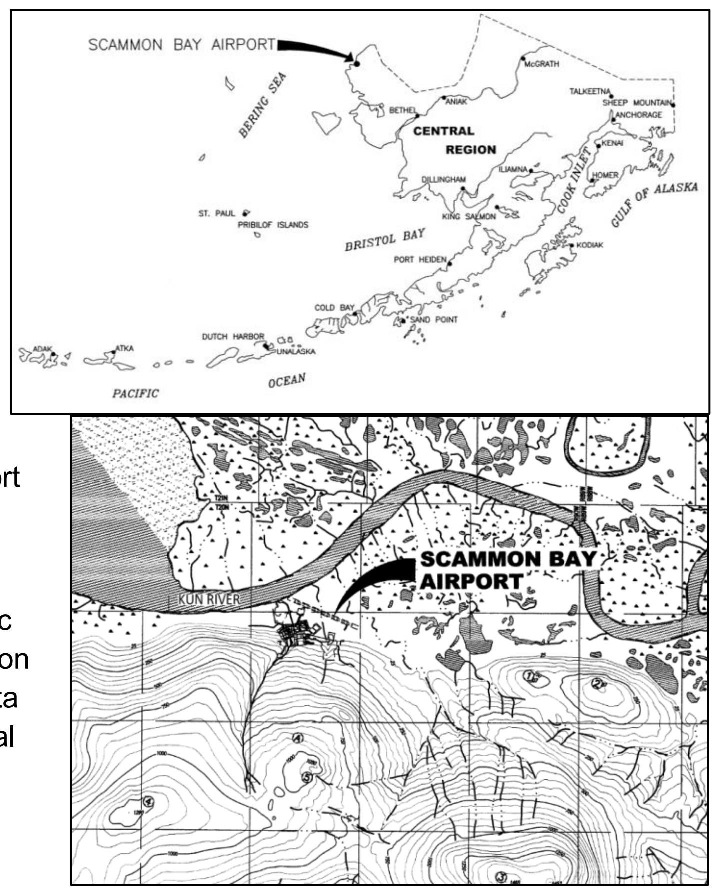

Figure 1: Location and Vicinity Map

Recreated from DOT&PF 2004 and 2013b

Land cover characteristics in the area were analyzed for use in hydrologic estimations and are summarized in Table 1. Land cover type and corresponding hydrologic properties were determined by analysis of vegetation that was observed during site visits, aerial photography, and cover classifications from the National Land Cover Database (NLCD) (Dewitz 2020). Water feature coverage, such as rivers, streams, and ponds, were classified by similar means and the 2021 Alaska Hydrography Database (USGS 2021).

2.1.1 Runway 10/28

The airport consists of one Type A, gravel runway (designated by 10/28). The runway sits between 10 and 17.5 feet in elevation and runs northwest to southeast at a +0.19 percent slope. It is bounded by the Kun River to the northwest, surrounded by intertidal wetlands, and connected to the community with one access road to the southwest.

The runway sits near the border of two geologic regions: uplands and wetlands. The USGS classifies the upland areas of the community as intermediate granitic rocks and the adjacent wetland areas as unconsolidated and poorly consolidated surficial deposits (Wilson et al. 2015).

2.1.2 Runway Culvert

The existing structure beneath the runway is a 48-inch-diameter, 198-foot-long, smooth interior wall, corrugated, high-density polyethylene (HDPE) pipe. The DOT&PF *2013 Scammon Bay Airport Flood Permanent Repairs DMVA/FEMA* plans show the culvert with a 0.2 percent slope, an inlet invert elevation of 4.0 feet, and an outlet invert elevation of 3.6 feet. The crossing allows flow from a perennial stream (unnamed tributary) to pass beneath the runway and discharge to the Kun River.

Upstream of the culvert, the stream meanders through the hillside, the eastern portion of the community, and tundra for approximately 1,400 feet. During the May 2021 site visit, the existing culvert was inspected and appeared to be sagging and partially collapsed in three locations. While the inlet was not visible due to mounded snow, a large pool of water (10–15 feet wide and approximately 20 feet long) was observed immediately upstream of the inlet. A noticeable foul odor was also documented and is suspected to be caused by effluent seeping from the wastewater lagoon, located next to an upstream portion of the meandering stream. This assumption was not confirmed during the site visit.

Downstream of the culvert, the stream travels approximately 1,700 feet through intertidal wetlands to its receiving waters, the Kun River. At the outlet, the stream is approximately 5 feet wide but widens to 10–14 feet immediately downstream of the outlet. Tidal influence on the stream channel is evident from the nearly vertical stream banks that range from 2 to 3 feet in depth.

2.2 Climate

The Scammon Bay area has a maritime climate and receives an average annual precipitation of 24 inches due to its coastal proximity. Climate records for the area indicate that the warmest temperatures occur in July, averaging 51 degrees Fahrenheit (°F), and the coldest temperatures occur in February, averaging 8.4°F. Precipitation varies from the driest month (February), with an average 1.0 inch of rain, to the wettest month (August), with an average 4.4 inches of rain

(SNAP 2021). Historical annual snowfall is around 68 inches and typically accumulates between October and April (Western Regional Climate Center 2021).

2.3 General Basin Hydrology

Scammon Bay is located on the Yukon-Kuskokwim Delta, 60 miles southwest of the mouth of the Yukon River. Most of the streams within the Yukon-Kuskokwim Delta are made up of shallow sloped, meandering channels flowing through tundra and wetlands that contain numerous oxbow lakes and relic channels on their way to the Bering Sea. The Scammon Bay community is located at the intersection of three distinct hydrologic features: the Kun River to the north and east, the Askinuk Mountains to the south, and the Bering Sea to the west. The airport lies along the Kun River, 0.75 mile upstream from its mouth.

2.3.1 Kun River Basin

The Kun River generally flows east to west and acts as a northern boundary for the community of Scammon Bay as it reaches its receiving waters, Scammon Bay, in the eastern Bering Sea. The Kun River's drainage basin at the Scammon Bay airport encompasses an estimated 461 square miles and contains portions of the Askinuk Mountains, perennial alpine streams, tundra, wetlands, and ponds. It is bounded by relatively flat tundra and wetlands to the north, the Black River to the east, and the Askinuk mountain range to the southwest, shown on Figure 2. The wetlands and ponds make up approximately 19 percent of the basin area and likely account for significant flow attenuation during heavy rainfall events.

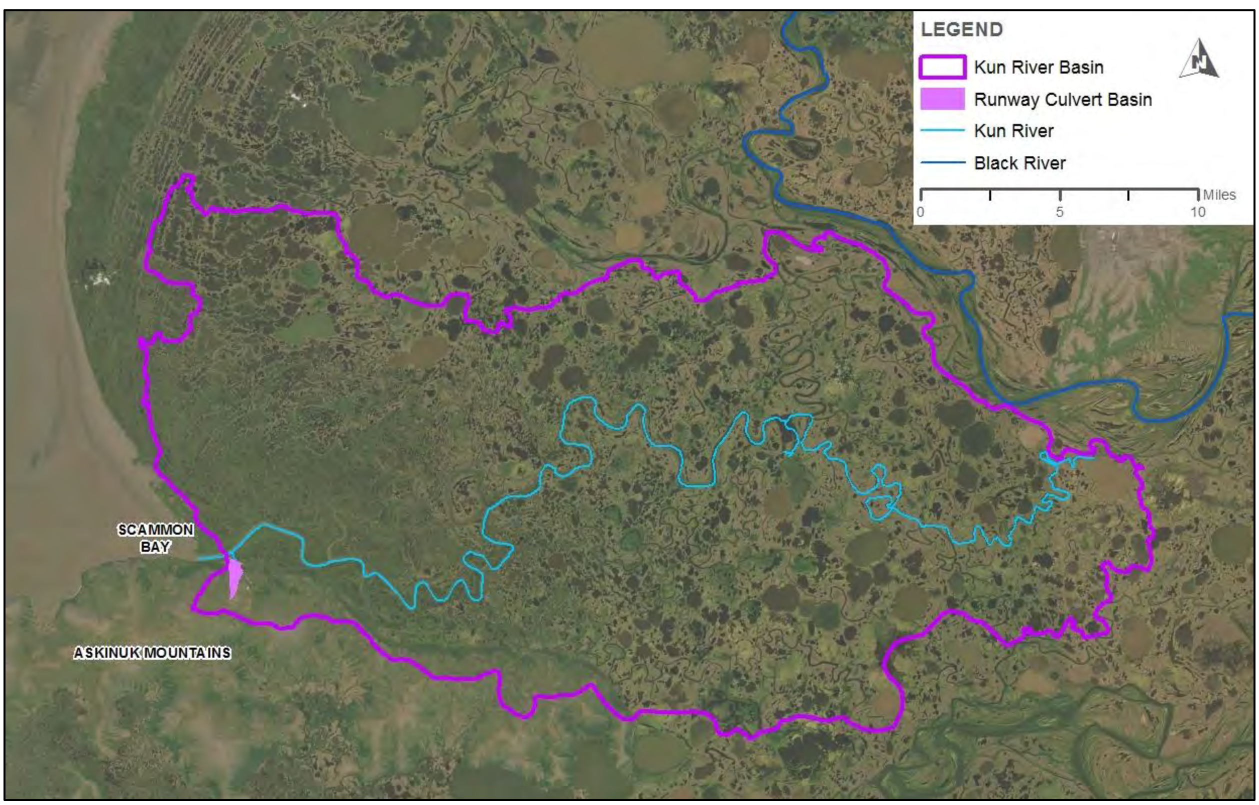

Figure 2: Kun River Basin

The Kun River is listed in the ADF&G *Anadromous Waters Catalog* (AWC) as having Arctic Char and Chum Salmon (ADF&G 2021a).

2.3.2 Runway Culvert Basin

The runway culvert basin for the unnamed tributary to the Kun River is approximately 296 acres. It receives flows from a portion of the hillside above the community, flows from the community, and (likely) small amounts of seepage from the community's sewage lagoon. It is a perennial stream that meanders through the tundra for approximately 1,400 feet before passing through the runway culvert and then traveling approximately 1,700 feet through the intertidal wetlands to the Kun River. The runway culvert basin and surrounding area are shown on Figure 3.

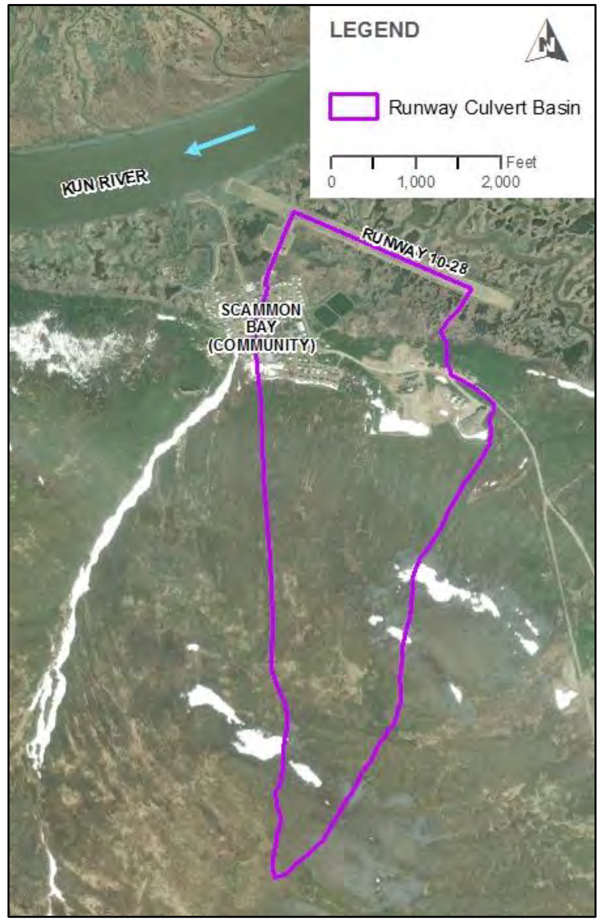

Figure 3: Runway Culvert Basin

During June 2021, discussions with ADF&G indicated that this tributary may have suitable habitat for fish species residing in the Kun River, but it is not currently listed in the AWC.

2.3.3 Basin Characteristic Summary

Table 1 summarizes standard basin characteristics for the Kun River and the runway crossing identified for analysis. These characteristics are frequently used when evaluating hydrology at ungaged sites and are included for reference. Of these characteristics, the values used to calculate design discharges are area and annual precipitation.

Table 1: Project Drainage Basin Characteristics

Feature	Runway Culvert Basin Unnamed Tributary to the Kun River	Kun River at the Scammon Bay Airport
Area (square miles)	0.46	461
Area with Lake and Pond Storage (%)	0.45	18.9
Forested Area[a] (%)	1.6	0.39
Average Stream Slope[a] (feet/feet)	0.13	0.002
Mean Elevation (feet)	363	31
1971–2000 PRISM[b] Annual Precipitation (inches)	24.5	19.0

Notes: PRISM = Parameter-elevation Regression on Independent Slopes Model.
[a] Dewitz 2020.
[b] Gibson 2009.

2.4 Additional Hydrologic Attributes

This section summarizes other hydrologic attributes as required by DOT&PF's *Alaska Highway Preconstruction Manual* for H&H reports (DOT&PF 2013a). Since the runway culvert's basin lies within the greater Kun River basin, both basins are discussed further.

2.4.1 Tidal Influence

The mouth of the unnamed tributary is approximately 2 miles upstream from where the Kun River flows into Scammon Bay in the eastern Bering Sea. The National Oceanic and Atmospheric Administration (NOAA) monitors a tidal benchmark on the Kun River (Station ID: 9467124) that is 948 feet upstream of the runway (NOAA 2021a). The mean lower low water (MLLW) and mean higher high water (MHHW) elevations recorded at this benchmark are 0.30 foot and 6.77 feet, respectively. The existing runway culvert's outlet invert elevation is 3.60 feet, which is 0.01 foot above the mean tide level (MTL) and 3.17 feet below the MHHW. It was suspected that the tributary and culvert were tidally influenced upon inspection during the May 2021 site visit and was later confirmed through coastal modeling.

The runway culvert is estimated to be tidally influenced 45 percent of the time but is never completely inundated during astronomical tides. This percentage is assumed to increase over time due to a predicted 0.64-foot increase in relative sea level over the next 50 years. The culvert can, however, become fully inundated during a coastal storm surge event, which is an abnormal rise in sea level caused by a storm. The extent to which the culvert is inundated is dependent on the severity of the event. See Table 2 for a comparison of the existing culvert outlet's elevation to typical tidal elevations.

Table 2: Kun River (NOAA Station ID: 9467124) Tidal Datums

Datum	Elevation (feet, based on NAVD88)	Elevation (feet from MLLW)
Mean Higher High Water (MHHW)	6.77	6.47
Mean High Water (MHW)	6.00	5.70
Runway Culvert Outlet Invert	3.60	3.30
Mean Tide Level (MTL)	3.59	3.29
Mean Sea Level (MSL)	3.50	3.20
Mean Low Water (MLW)	1.18	0.88
Mean Lower Low Water (MLLW)	0.30	0
NAVD88	0	-0.30

Sources: NOAA 2021b.
Notes: NAVD88 = North American Vertical Datum of 1988.

Based on the 50-year return interval storm surge model, the water surface elevation is greatest (15.7 feet) as the storm recedes the area. The velocities surrounding the inlet of the culvert were nearly identical (1.7 feet per second) during the building and receding of the storm.

2.4.2 Freshwater Streams

The project is located on the banks of the Kun River and includes one perennial freshwater stream, the unnamed tributary to the Kun River, that passes through the runway culvert. Various other perennial freshwater streams (named and unnamed tributaries of the Kun River), seasonal freshwater streams, wetlands, and ponds are located within the greater Kun River basin.

2.4.3 Navigation

The unnamed tributary of the Kun River that passes through the runway culvert is not listed in the Alaska Department of Natural Resources (ADNR) navigable waters catalog as navigable. Sections of the Kun River are listed as either undetermined or potentially navigable, with the mouth and section along the community listed as undetermined (ADNR 2021a). There is an active city-owned, seaplane landing base located at the northwest edge of the community. Additionally, the local community utilizes small boats in the surrounding area.

In a United States Army Corps of Engineers (USACE) – Alaska District 2009 report, barges were indicated to bring bulk supplies in the summer months (the Bering Sea is ice-free from late June through October). The barge landing was noted to be easy to access (USACE 2009).

2.4.4 Confluences

The confluence of the unnamed tributary is approximately 2 miles upstream of the mouth of the Kun River. There are no other confluences upstream of the crossing that would affect the site hydraulics during large flood events.

The Kun River has several named confluences and numerous other unnamed tributaries. From its headwaters to the mouth, the Iaslaktoli, Tungpuk, Kikneak, and Ear rivers converge with the Kun River before it flows into Scammon Bay and then the Bering Sea.

2.4.5 Mining Activity

Based on the ADNR mining claims map, the project extents have no active mining activity (ADNR 2021b). In the past, there may have been some mining activity along the shores of Scammon Bay, but there have been no significant historical mining operations in the project area that might affect the hydrology at the crossing site.

2.4.6 Debris Problems

Problems with debris have not been documented at the crossing, nor were they listed during the May 2021 site visit as a design concern. The flows from the unnamed tributary to the Kun River emanate from upland tundra and wetlands where debris is typically not an issue. The Kun River drains a large, predominantly boggy area that backwaters to the crossing during high-tide events. While the upstream reaches likely do not contain debris that would get stuck inside or damage the culvert, driftwood and other large floating objects brought in during incoming tides might affect the project site.

2.4.7 Icing Problems

Icing problems were not listed as a design concern or observed during the May 2021 site visit. A thaw pipe or other icing counter measures were not observed in the existing runway culvert. If there is seepage from the sewage lagoon, it would provide slightly warmer flows to the culvert, lowering icing potential.

Substantial snow accumulation was present at the runway culvert inlet and outlet. This accumulation is thought to be due to winter runway maintenance, and caution should be taken in the future to avoid plowing/stacking snow near the culvert inlet and outlet to prevent reduction of the hydraulic capacity of the culvert. In terms of icing, snow cover may act as insulation for the culvert.

2.4.8 Fish Passage

The unnamed tributary of the Kun River has not been identified or nominated for fish passage based on the ADF&G Fish Passage Inventory Database (FPID) (ADF&G 2021b). The Kun River is mapped as anadromous in the AWC and is listed with having Arctic Char and Chum Salmon (ADF&G 2021a). While no fish sampling has been conducted in the tributary, its direct connection to the Kun River with no apparent barriers to fish passage increases the likelihood that it contains fish.

Discussions with ADF&G to date indicate that while the stream is relatively small and has a small connected habitat, ADF&G desires to maintain connectivity with the Kun River. Discussion with ADF&G should be concluded, and determination should be made on design requirements.

3. Design Criteria

Specific design criteria for airport culverts are not provided in the Alaska Aviation Preconstruction Manual or the FAA Advisory Circular for Airport Drainage Design (dated 8/15/2013). Therefore, the new runway is to be designed to the standards set forth in the *Alaska Highway Preconstruction Manual* (PCM) *(*DOT&PF 2013a) and the *Alaska Highway Drainage Manual* (Drainage Manual) (DOT&PF 2006). Both documents require culverts 48 inches in diameter or greater to be hydraulically designed (PCM section 450.9.7, Drainage Manual section 9.2.2). Table 1120-1 of the PCM establishes a design flood frequency of 50 years (Q_{50}) for this type of crossing. The Drainage Manual, section 9.3.3, requires a headwater depth to culvert diameter ratio (HW/D) no greater than 1.5. The proposed culvert should have a design life of 30 to 75 years.

If required at future design stages, fish passage shall be accommodated and the structure design will follow the guidelines set forth by the *Memorandum of Agreement between ADF&G and DOT&PF for the Design, Permitting, and Construction of Culverts for Fish Passage* (DOT&PF 2001).

4. Hydrologic Analysis

4.1 Flood Frequency Analyses

The method of flood frequency analysis is typically selected by the contributing basin area. The 2016 USGS Regression Equations (USGS 2016) are typically used when the (site) basin meets the minimum area and mean annual precipitation criteria. In areas that do not meet the limitations of USGS Regression Equations, the Rational method and/or the National Resources Conservation Service (NRCS) Urban Hydrology for Small Watershed Technical Release 55 (TR-55; NRCS 1986) methods can be utilized. Between the two latter methods, the TR-55 method is typically selected for basins outside of the 2016 USGS regression equations criteria, as it tends to be the more conservative method for design discharges, producing higher estimated flows at Q_{50}. In a case in which the 2016 USGS regression equations can be used, the other methods can also be calculated, and their results compared for corroboration and consistency.

The methods considered and the basin area requirements for each method are:

- 2016 USGS regression equations (basin area greater than 0.4 square mile; between 8 and 280 inches of mean annual precipitation)
- Rational method (basin area less than 200 acres [0.31 square mile])
- NRCS TR-55 (no basin area limitation)

4.1.1 USGS Regression Equations

The USGS first introduced Regression Equations specific to Alaska (and the Yukon River) in 2003 and divided the state geographically into seven regions (Curran et al. 2003). These regions were drawn to group areas with similar hydrologic characteristics (e.g., climate, terrain) and had regression equations specific to each region. These equations were developed by analyzing the hydrologic characteristics of between 25 and 97 basins throughout each region. Basin characteristics that were used in the regression equations varied by region but typically (except for the North Slope) included basin area and mean annual precipitation, in addition to other regional characteristics such as percent storage area, elevation, percent forested area, and mean January temperature. The Regression Equations were updated and simplified in 2016, combining all seven regions into one and changing the hydrologic characteristics used in the equations to just two: basin area and mean annual precipitation (Curran et al. 2016). The basin for the runway culvert meets the 2016 Regression Equations' recommended criteria and was used for flood frequency analysis at the site.

To calculate discharges of various return intervals, basins are delineated in ArcMap using high-resolution imagery and topographic mapping. Precipitation values are developed in ArcMap by area-weighting the Mean Precipitation for Alaska 1971–2000 Parameter-elevation Regression on Independent Slopes Model (PRISM) dataset sponsored by the National Park Service (NPS) (Gibson, 2009).

4.1.2 NRCS TR-55 Method

TR-55 is a simplified version of the NRCS TR-20, which is used to estimate storm runoff and peak discharge for small basins. TR-55 uses basin geometry, 24-hour local rainfall depth, ground cover type, and peak discharge curves to estimate time of concentration and flood frequencies.

As part of the TR-55 method, the maximum flow length for each basin was determined using Geographic Information Systems (GIS) and surface LiDAR survey data obtained through the Alaska Division of Geological and Geophysical Surveys. The TR-55 method divides overland flow into three categories when estimating peak runoff: shallow sheet flow, shallow concentrated flow, and open channel flow. TR-55 states that open channel flow calculations should be used only in areas "where cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets (NRCS, 1986)."

Because limited cross sections or formal stream surveys exist for the project area, the flow lengths used to calculate times of concentration were broken down as follows. The first 300 feet of overland flow was designated as sheet flow. In basins where none of the information previously stated was available, the remaining flow length was split evenly between shallow concentrated flow and open channel flow. In basins where blue lines are present on USGS quadrangle sheets, the length of each blue line was assigned to open channel flow and the remaining flow length was assigned to shallow concentrated flow.

Local rainfall depth for the 24-hour event was obtained from the NOAA Atlas 14, Volume 7, Version 2 point precipitation frequency estimates.

4.1.3 FHWA HEC-17 Analyses

The Federal Highway Administration (FHWA) provides technical guidance for analyzing highways during extreme events in the Hydraulic Engineering Circular (HEC)-17, *Highways in the River Environment – Floodplains, Extreme Events, Risk, and Resilience* (FHWA 2016). HEC-17 lays out five varying levels of analysis to account for risk and vulnerability assessments. The appropriate level is chosen based on information available, project needs, and service life (see Chapter 7 of HEC-17 [FHWA 2016]).

A Level 2 analysis, which includes the analysis of confidence limits in addition to the Level 1 – Historical Discharge Analysis, was determined to be appropriate. The Level 1 analysis is completed and summarized in Section 4.1.4. Based on a hydrologic service life of between 30 and 75 years, the Level 2 analysis reviews the 68 percent confidence interval of the design discharge and other methods of estimating nonstationary impacts, specifically anticipated increases in precipitation due to climate change. These values allow for consideration of a larger exposure period, when the probability of extreme events and nonstationary impacts increase, and current estimates of climate change impacts.

To estimate increases to flows over the service life of the culvert (30-75 years), the University of Alaska Fairbanks Scenarios Network for Alaska + Arctic Planning (SNAP) data were used to adjust the annual PRISM precipitation data and the NOAA Atlas 14, Volume 7, Version 2 point precipitation frequency estimates.

SNAP has predicted an overall increase in annual precipitation of 9.1 percent for the years 2060–2069 and 17 percent for the years 2090–2099. The 2090–2099 precipitation values were used as they provide a more conservative estimate for the anticipated service life of the project. These increased factors were applied to the PRISM annual precipitation data used in the 2016 Regression Equations. It should be noted that the (limitations of) 2016 Regression Equations cautions users when exploring the potential for future precipitation increases from climate models within the Regression Equations because of the unknown error associated with the combination of methods. Because of this uncertainty, the SNAP adjusted results provided below are not intended for use as design flows.

Effects of climate change for the 24-hour rainfall event were also estimated based on SNAP data for the project area. SNAP currently has two Global Circulation Models (GCMs) that predict future short-duration rainfall events for the service life of the proposed structure (the years 2080–2099 were selected for this analysis): the NOAA Geophysical Fluid Dynamics Laboratory - Coupled Model 3.0 (GFDL-CM3) and the National Center for Atmospheric Research - Atmospheric Research Community Earth System Model 4 (NCAR-CCSM4). GFDL-CM3 uses an aggressive climate change model and estimates an increase in the 50-year, 24-hour rainfall depth of 299 percent. NCAR-CCSM4 uses a less aggressive but still conservative climate change model and predicts an increase in the 50-year, 24-hour rainfall depth of 59 percent, deeming it the chosen GCM for this analysis.

Table 3 shows the comparison of the design discharge for the basin (Level 1) with the upper limit of the 68 percent confidence interval and the SNAP adjusted 2016 Regression Equations. The purpose of this comparison is for design consideration, looking at the potential consequences, and mitigating where feasible and reasonable. These values are not meant to be used as design criteria.

Table 3: Level 2 HEC-17 Analyses

Stream Name	**Runway Culvert Basin Unnamed Tributary of the Kun River**		
Estimation Method	2016 USGS Regression Equations		
Adjustment	**None**	**Upper 68% Confidence Interval**	**SNAP Adjusted**
Return Period	Estimated Discharge (cfs)		
2-year	13	25	15
10-year	35	66	40
25-year	50	94	56
50-year	62	118	70
100-year	75	145	84

Notes: USGS = United States Geological Survey; cfs = cubic feet per second; SNAP = Scenarios Network for Alaska + Arctic Planning.

4.1.4 Flood Frequency Analyses Results

Table 4 and Table 5 summarize the results of the flood frequency analysis for the runway culvert and the Kun River respectively. Flood frequency analysis results for the Kun River were calculated for use in coastal analysis (see Coastal Analysis Report) and were not used to size the runway culvert. The 2016 USGS Regression Equations, and the SNAP adjusted TR-55 (only used for the runway culvert) results are included. The SNAP adjusted TR-55 results include estimates for future changes in precipitation for the service life of the culvert (30-75 years). Flood frequency analysis calculations are included in Appendix B.

Table 4: Flood Frequency Analysis Summary for the Runway Culvert

Return Period	Estimated Discharge (cfs)	
	2016 USGS Regression Equations	TR-55 with SNAP Adjustment
2-year	**13**	3.3
10-year	**35**	16
25-year	**50**	27
50-year[a]	**62**	37
100-year	**75**	49

Table 5: Flood Frequency Analysis Summary for the Kun River

Return Period	Estimated Discharge (cfs)
	2016 USGS Regression Equations
2-year	**3,235**
10-year	**5,937**
25-year	**7,403**
50-year[a]	**8,500**
100-year	**9,630**

The flood frequency results from the 2016 USGS Regression Equations will be used for design. Flood frequency analysis calculations are included in Appendix B.

4.1.5 Fish Passage Flows

Fish passage design is currently not within the project scope, as the crossing was not nominated for fish passage within the AWC prior to project initiation. Discussion with ADF&G indicates that maintaining connectivity with the anadromous Kun River is a desired project outcome. While no sampling or other methods for verifying fish residency have occurred, the unnamed tributary to the Kun River is assumed to have resident fish due to its unobstructed connection to the Kun River.

The DOT&PF and ADF&G Fish Passage Memorandum of Agreement outlines three tiers of design for fish passage: Tier 1 is stream simulation, Tier 2 is FISHPASS Program design, and Tier 3 is hydraulic engineering design. **As of the release of this report, a decision has not been made for the fish passage tier requirement.**

Once guidance from DOT&PF and ADF&G is obtained on the level of fish passage design requested, further analysis will need to be conducted to meet the chosen tier requirements. It should also be noted that the design fish species, size, and time of year will need to be supplied by ADF&G before further analysis can be conducted.

5. Hydraulic Analysis

Hydraulic calculations utilize FHWA's HY-8, version 7.60 (FHWA 2019), for hydraulic analysis at the runway culvert. HY-8 uses several essential design features for the crossing structure, tailwater, and roadway to automate culvert hydraulic calculations.

Additional hydraulic design considerations were made for this crossing, including tidal influence and fish passage. To accommodate tidal changes and floating debris, the crown of the culvert outlet should be designed 2 feet above the MHHW elevation to provide headspace in the culvert during high tide events. It should be noted that this crossing will be designed to the MHHW elevation, and not to coastal storm surge event elevations.

Fish passage requirements may change the maximum HW/D ratio and would need to be addressed. Section 5.1 presents the hydraulic characteristics and analyses for the existing and proposed structures.

5.1 Crossing Structure Sizing

The recommended structure has design criteria (tidal influence and fish passage) outside of the required hydraulic minimums that drove the structure selection. Hydraulic analysis served as a verification of the structure size selected. To accommodate tidal influence, the structure's outlet crown elevation was set at least 2 feet above the MHHW elevation with consideration for relative sea level rise of 0.63 feet (crown minimum of 9.40 feet) and the structure diameter was sized to maintain a HW/D ratio of less than 1.5 during the 50-year coastal storm surge event. To accommodate fish passage design, the inlet and outlet invert elevations were selected to maintain a constant hydraulic connection with the Kun River. Various other parameters may need to be met in the future based on a design fish and design flow required for fish passage design criteria.

A 72-inch-diameter culvert was needed to meet the minimum crown elevation requirement at MHHW. When modeling the 100-year upper 68 percent confidence interval of 145 cubic feet per second (cfs), a 72-inch-diameter culvert produces a HW/D ratio of 1.43.

The HW/D ratio for a 72-inch-diameter culvert during the 50-year return interval coastal storm surge event is 1.93. An increased structure size of a 96-inch-diameter culvert produces a HW/D of 1.44. In this case, the increase in cost and constructability of a 96-inch-diameter pipe in comparison with a 72-inch-diameter pipe is likely minimal in the overall project cost, and therefore justifies upsizing the pipe to 96-inches based on this design criteria.

See Figure 4 for a profile of the proposed culvert at the design discharge, Q_{50}, of 62 cfs. Table 6 summarizes the existing and proposed crossing structures and characteristics. Refer to Table 7 and Table 8 for summaries of the existing and proposed crossing structure hydraulics. See Appendix C for the HY-8 report and riprap apron calculations.

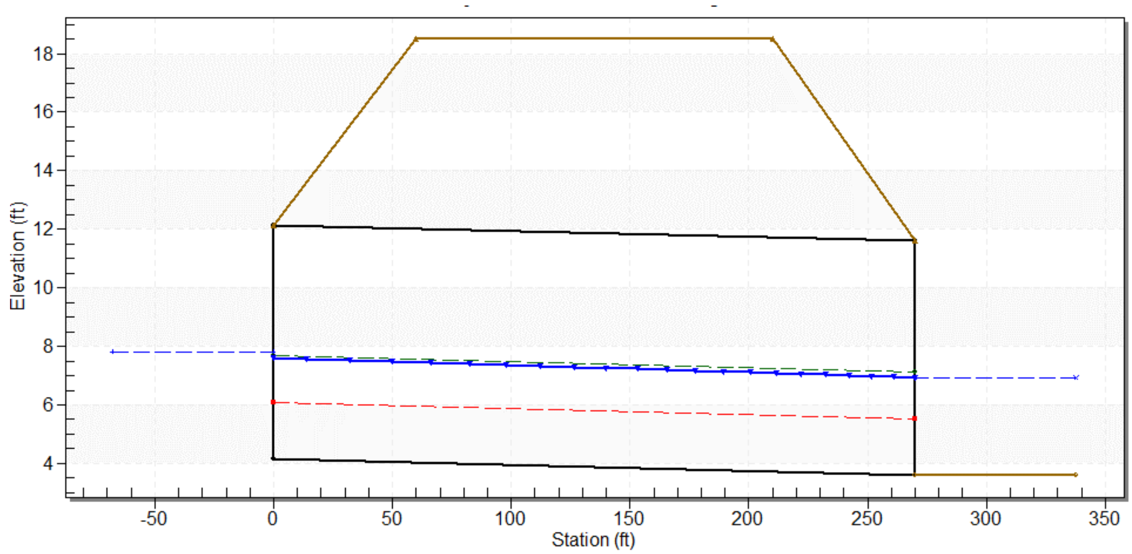

Figure 4: Proposed Culvert Profile at Q_{50} (62cfs)

Table 6: Existing and Proposed Culvert and Channel Characteristics

Culvert Name	Runway Culvert	
Structure	**Existing Structure**	**Proposed Structure**
Length (feet)	199	270
Shape and Dimension	48-inch, round, smooth-wall HDPE	96-inch, round, 8-gage[a] aluminum structural plate
Culvert Slope (%)	0.2	0.2
US Channel Slope (%)	1.3	
DS Channel Slope (%)	0.1	

Notes: HDPE = high-density polyethylene; US = upstream; DS = downstream.
[a] If 8 gage is unavailable, 10 gage is also acceptable.

Table 7: Existing Structures Hydraulic Analysis

Basin Name	Event (Q-Year)	Discharge (cfs)	Existing Structure				
			Headwater Elevation (feet)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	HW/D[a]	Tailwater Elevation (feet)
Runway Culvert	2	13	5.65	13	0		4.75
	50 (Design)	62	8.08	62	0		6.93
	100	75	8.79	75	0	1.2	7.42
	Upper 68% (50)	118	12.40	118	0	2.1	7.60
	Overtopping	126	13.2	126	0	2.3	7.60

Notes: cfs = cubic feet per second; HW/D = headwater depth to culvert diameter ratio.
[a] Blank unless HW/D is greater than 1.0.

Table 8: Proposed Structures Hydraulic Analysis

Basin Name	Event (Q-Year)	Discharge (cfs)	Proposed Structure Non-tidally influenced				Proposed Structure Tidally (MHHW) influenced			
			Headwater Elevation (feet)	Culvert Discharge (cfs)	HW/D[a]	Tailwater Elevation (feet)	Headwater Elevation (feet)	Culvert Discharge (cfs)	HW/D[a]	Tailwater Elevation (feet)
Runway Culvert	2	13	5.77	13		4.75	7.43	13		7.40
	50 (Design)	62	7.80	62		6.93	8.05	62		7.40
	100	75	8.25	75		7.42	8.24	75		7.40
	Upper 68% (50)	118	9.73	118		8.94	9.03	118		7.40
	Overtopping	315 / 500	18.50	315	1.8	12.00	18.50	500	1.8	7.40

Notes: cfs = cubic feet per second; HW/D = headwater depth to culvert diameter ratio.
[a] Blank unless HW/D is greater than 1.0.

5.1.1 Runway Culvert

The existing culvert is a 48-inch, round, smooth-wall HDPE pipe, is 198.15 feet in length with a 0.2 percent slope, and has an estimated HW/D ratio of 1.02 at the 50-year discharge. Its inlet and outlet inverts are at 4.0 feet and 3.6 feet, respectively. The outlet invert is 0.01 foot above the MTL and 3.17 feet below the MHHW.

The proposed culvert is a 270-foot-long, 96-inch, 8-gage aluminum structural plate culvert, at a 0.2 percent slope. When selecting culvert material, aluminum was preferred over steel due to its increased corrosion resistance to seawater. Structural plate pipe was selected over corrugated pipe because it comes in a thicker gage (8-gage vs 10-gage) and can be shipped in stacks of 4.5-foot sheets to cut cost getting to the site. 10-gage corrugated aluminum pipe is a viable alternative to structural plate, however, it can only be shipped in 20-foot long segments and may be more expensive to barge to the site.

The proposed culvert will pass the 50-year design discharge and the 100-year discharge with a HW/D ratio of less than 1. Its proposed inlet and outlet inverts are at 4.15 feet and 3.6 feet, respectively, keeping the same outlet invert elevation as existing conditions. To accommodate tidal influence, the structure's outlet crown reaches 11.6 feet in elevation, more than accounting for the desired 2 feet above the MHHW elevation (crown minimum of 8.77 feet). This additional elevation will allow for headspace in the culvert during high tide events and allow for up to 0.63 feet of relative sea level rise (see accompanying *Coastal Report*). When considering crossing resilience through HEC-17, a 72-inch culvert was determined to provide a more conservative design and allow for greater resiliency with a minimal increase in material and construction costs.

5.2 Riprap Protection

The flows from the unnamed tributary of the Kun River are significantly smaller and slower in velocity when compared to tidal influxes. Therefore, the inlet and outlet scour protection will be based on tidal flows and velocities. The riprap protections required for the tidal flows are analyzed and calculated in the accompanying *Coastal Report* and were determined to have an average diameter of 1.4 feet and average weight of 238 pounds. The riprap protection that will be used for the coastal applications will also be used to surround the inlet and outlet and serve as riprap aprons at their entrances. A mixture of sands, gravels, and fines should be placed within the upstream and downstream channel to fill voids between riprap to allow for migration of any local fish species into and out of the runway culvert. Mixture specifications will be specified at a future stage of design.

The Drainage Manual does not include guidance on the design of energy dissipators and riprap aprons. Chapter 10 of FHWA's HEC-14: *Hydraulic Design of Energy Dissipators for Culverts and Channels* (FHWA 2006) was used for the riprap apron design. The median riprap diameter size, or D50, is calculated using input variables of the design discharge, culvert diameter, and tailwater depth. Supercritical flow requires an additional adjustment using the normal depth within the culvert. Once the size of the riprap is determined, it can be compared to standard riprap classes. The dimensions of the riprap apron are determined based on the riprap class and diameter of the culvert.

Apron calculations can be found in Appendix C, and its layout and details can be found in the plan set.

5.3 End Section Treatment

The proposed culvert is designed to pass the 50-year return interval coastal storm-surge event with a HW/D ration of less than 1.5. During these events, the culvert may contain an air pocket that would create a buoyant force, possibly displacing the culvert upward. Anchors at each end of the culvert (inlet and outlet) are proposed to restrain against these buoyant forces. Concrete headwalls are recommended due to the lack of geotechnical information at the project site.

Based on buoyant force calculations, 20,032 pounds of restraining force, located 1 foot from each culvert end, is required to overcome buoyant forces under inundated, storm-surge conditions. Based on DOT&PF's standard plans for drainage, a precast, type 1, concrete headwall for a 96-inch culvert with 2 to 1 side slopes will provide the necessary restraining force (DOT&PF 2019).

6. Floodplain Management

This project is outside the limits of any Federal Emergency Management Agency (FEMA) mapped floodplain areas. As a federally funded project, this project is subject to the requirements of Executive Order 11988, which stipulates avoidance and mitigation of potential impacts to the 100-year floodplain (FEMA 1977). In addition, the enlarged culvert at the crossing will not increase the elevation of the 100-year floodplain. The proposed design calls for additional conveyance in the form of an enlarged structure where drainage improvements are included.

7. Summary and Recommendation

Table 9 outlines the existing and proposed culverts, with notes and details specific to the crossing.

Table 9: Culvert Summary Table

Purpose	Drainage Feature	Design Flow (cfs)	Anadromous Stream	Existing Structure					Proposed Work				
				Shape/ Type	Size (inches)	Length (feet)	Inverts (feet)	Discharge at HW/D = 1 (cfs)	Shape/ Type	Size (inches)	Length (feet)	Inverts (feet)	Discharge at HW/D = 1 (cfs)
Runway Culvert	Unnamed tributary of the Kun River	62 (50-year)	No	Round / HDPE	48	199	Inlet = 4.0 Outlet = 3.6	61	Round / SP Aluminum	96	270	Inlet = 4.15 Outlet = 3.6	184

Notes: cfs = cubic feet per second, HDPE = high density polyethylene, HW/D = headwater / diameter, SP = structural plate

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Appendix A – Field Notes and Trip Report

Appendix B – Flood Frequency Estimates and Supporting Data

Appendix C – HY-8 Report and Riprap Apron Calculations

Appendix A – Field Notes and Trip Report

Site Visit Report

Date:	Tuesday, May 25, 2021
Project:	Scammon Bay Airport Improvements CFAPT00691
To:	Jenelle Brinkman, PE (DOT&PF)
From:	Ronny McPherson, PE (HDR) Irene Turletes, PE (HDR)
Subject:	Scammon Bay Coastal and H&H Site Visit

A site visit was performed to Scammon Bay, AK to support the hydraulics & hydrology (H&H) and coastal processes in the vicinity of the Scammon Bay runway. The site visit occurred on May 18th, 2021 from approximately 2:30pm to 5:30pm. Conditions at the site were considered wintery/spring breakup, however, enough of the runway, runway edge, access road, surrounding uplands, and existing culvert were exposed to allow for an adequate understanding of the site. Weather was in the upper 30s and overcast for the duration of the site visit.

Site visit attendees included the following:

- Philip Cheasebro, DOT&PF
- Rory Bryant, DOT&PF
- Bill Starn, CRW
- Irene Turletes, HDR
- Ronny McPherson, HDR

The following provides observations from the site visit.

Existing Runway Culvert

1. The existing culvert spanning the width of the runway appears to be sagging and partially collapsed in three locations. The culvert was confirmed to be 3.5 feet diameter non-metallic (HDPE). Class I riprap was placed at both inlet and outlet for approximately 10 feet.
2. The stream at the culvert outlet appears to be approximately 5 feet wide with a depth of 1 foot at the time of the site visit. Immediately downstream, the channel became 10 to 14 feet wide and 0.5 to 0.75 feet deep at the thalweg. The stream appears to be tidal as evident by the 2 to 3 feet nearly vertical stream banks.
3. The upstream side at the culvert inlet had a large pool approximately ten to fifteen feet wide and approximately twenty feet long with a depth of approximately 2 feet at the time of the site visit. There was a noticeable foul odor at the culvert inlet and is suspected to be caused by some amount of effluent from the nearby wastewater lagoon. The inlet was not visible due to snow.

East Runway Terminal

1. There were no signs of obvious erosion due to wave action that would have occurred during upland flooding nor were the obvious signs of scour due to swift currents from

filling or draining the area between the runway and the adjacent higher land elevation during a storm surge.
2. There were signs of typical upland runoff erosion (e.g., rilling) and signs of heavy equipment and ATV wheel trenches along the perimeter.
3. The remnants of a burnt snowmachine was observed just landward of the east runway terminal
4. The east runway RSA elevation undulated significantly with noticeable ATV traffic
5. The lower elevations of the terminal bank had well established thick vegetation (i.e., alders, willows, or similar).
6. The windsock spur represents the shortest distance from the runway to the adjacent higher land elevation. There were no obvious signs of erosion or scour from waves/storm surge at this location. The bank material at this location primarily consisted of 2- to 4-inch gravel with very little fines.

West Runway Terminal

1. Armor rock material is placed along the western runway terminal which appeared to be in the DOT&PF Class II Riprap size range.
2. Several armor rocks were observed to be displaced and are no longer interlocked with the structure on north side of the runway. The armor rock at the very west terminal (immediately adjacent to the Kun River) was entirely displaced leaving only small stone material and fines.
3. The Kun River was observed to have a very slow flow rate (<1 fps) at the time of the site visit.

Anecdotal Data

Scammon Bay residents provided some anecdotal data when inquired about storm surge in the area. The following summarizes their comments

1. Storm surge only happens in the Fall (September through November). The latest storm surge recalled was once in December.
2. The highest storm surge recalled was shin to knee high above the runway apron. This equates to approximately +14 feet NAVD.
3. All houses in the community are higher than historical storm surge elevations.
4. When storm surges recede, it creates very fast currents around the East Runway Terminal. Noting that the river east of the runway and the Kun River also flows very quickly during these times.

Figure 1. Runway access road. Side slopes appeared to be in good condition – no obvious signs of scour/erosion.

Figure 2. Runway apron. Anecdotal data provided noted highest surges flood entire apron up to knee high.

Figure 3. Runway, wastewater lagoon, and creek. Photo taken from hillside vantage point south of runway and within the community.

Figure 4. Creek downstream of runway culvert outlet. Nearly vertical banks indicate tidal influence.

Figure 5. Runway culvert outlet.

Figure 6. Inside runway culvert looking from outlet to inlet. The culvert was observed to have some sagging and partially collapse in three locations

Figure 7. Pool at runway culvert inlet.

Figure 8. Side slope at windsock (closest point to adjacent elevation). No obvious scour or erosion caused by storm surge/waves.

Figure 9. Side slopes at east terminal. Vegetation observed along bank with no obvious signs of scour or erosion from storms surge waves.

Figure 10. North slope of runway edge. No obvious signs of recent scour or erosion due to storm surge/waves (side slopes were noted to have been reworked/graded).

Figure 11. Armor rock protection at western terminal along north edge (looking west). Some rocks observed to be displaced.

Figure 12. Armor rock protection at western terminal along north edge (looking east). Some rocks observed to be displaced but less than at the western end.

Figure 13. Western runway terminal. No armor rock observed.

Appendix B – Flood Frequency Estimates and Supporting Data

Project Name: Scammon Bay *Updated: 7/14/21 K. Grundhauser*

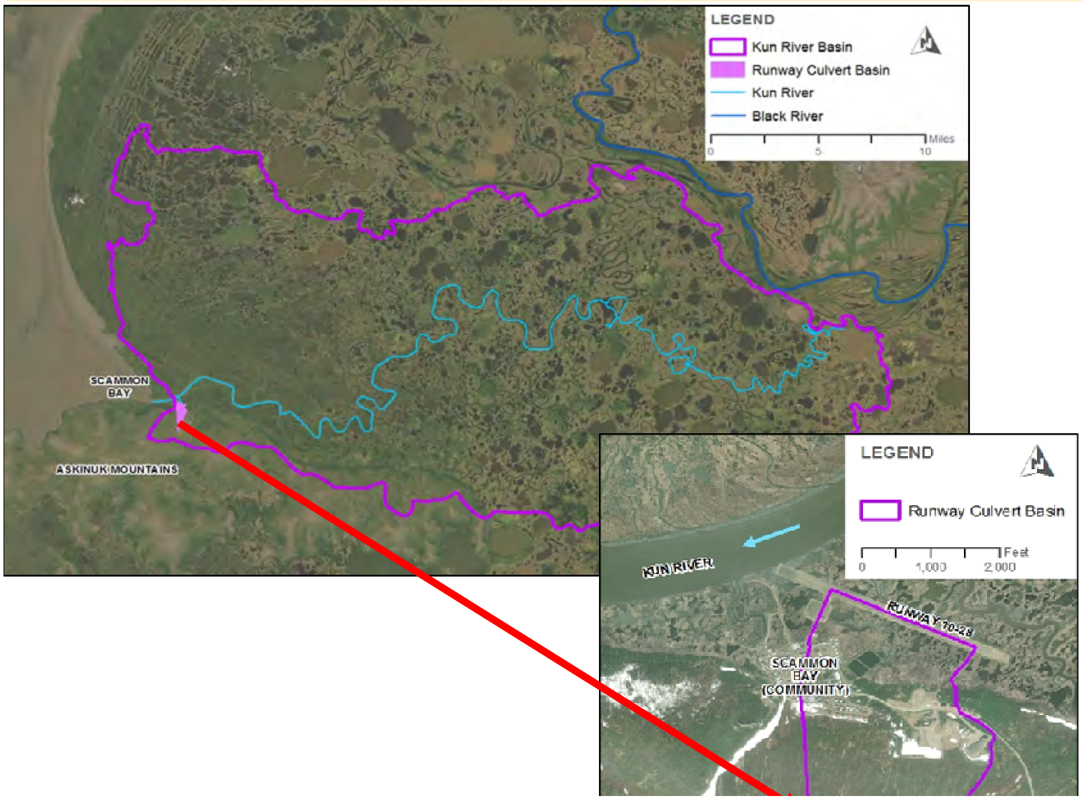
Step 1: Use basin size (ft^2) to determine which peak flow calculation methods apply by basin size.

Basin #	Basin Size	Basin Size	Basin Size	Applicable Method
	ft^2	acres	mi^2	
RW Culvert	**12,915,452**	**296**	**0.463**	**2016 USGS Regression Equations**
Kun River	**12,857,297,057**	**295163**	**461**	**2016 USGS Regression Equations**

Basin falls within 2016 USGS Regression Equation parameters

Basin falls only within NRCS TR-55 Parameters

Basin falls within Rational Method parameters and NRCS TR-55 parameters



Project Name Scammon Bay
Step 2: Calculate flows using 2016 USGS Regression Equations, flows incorporating SNAP Climate Data, and flows adjusting for local gage factors.

2016 USGS Regression Equations					**% Exceedance**							
					50%	20%	10%	4%	2%	1%	0.5%	0.2%
ADF&G Culvert ID #	**Basin Size**	**Basin Size**	**PRISM Precip ***	**PRISM Precip**	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**	**200-year**	**500-year**
	ft^2	mi^2	mm*100	in	2016 Regression Flow (cfs)							
RW Culvert	**12,915,452**	**0.46**	**58,047**	**22.9**	**12**	**24**	**33**	**47**	**58**	**71**	**84**	**103**
Kun River	**12,857,297,057**	**461.19**	**48,231**	**19.0**	**3235**	**4804**	**5937**	**7403**	**8500**	**9630**	**10778**	**12312**

*Values calculated in GIS using Zonal Statistics tool with basin polygons and 1 m by 1 m resampled rainfall raster.
Source: Mean Precipitation for Alaska 1981-2010, https://prism.oregonstate.edu/projects/alaska.php
**See SNAP Data

Basin falls within 2016 Regression Equation parameters
Basin falls outside of 2016 USGS Regression Equations

ADF&G Culvert ID #	**Basin Size**	**SNAP** Adjusted PRISM Precip**	**% Exceedance**							
			50%	20%	10%	4%	2%	1%	0.5%	0.2%
			2-year	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**	**200-year**	**500-year**
	mi^2	in	SNAP Adjusted Flow (cfs)							
RW Culvert	**0.46**	**26.7**	**14**	**27**	**38**	**53**	**66**	**80**	**95**	**116**
Kun River	**461.19**	**22.2**	**3800**	**5548**	**6802**	**8416**	**9620**	**10860**	**12115**	**13790**

Local Stream Gage Factors

Map Identification No.	**USGS Station No.**	**USGS station Name**	**Annual exceedance probability discharge, in cubic feet per second**												**Skew coefficient used for Sta AEP**	**Skew coefficient used in appendix B**	**MSE of skew coefficient used in appendix B**
			50-percent			**20-percent**			**10-percent**			**4-percent**					
			Sta	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**			
219	15304000	Kuskokwim River at Crooked Creek, Alaska	162,000	121,000	161,000	212,000	150,000	212,000	243,000	169,000	243,000	281,000	193,000	280,000	-0.141	0.260	0.154
361	15621000	Snake River near Nome, Alaska	2,710	925	2,680	3,430	1,450	3,400	3,820	1,830	3,790	4,240	2,340	4,200	-0.555	-0.555	0.235
209	15302000	Nuyakuk River near Dillingham, Alaska	19,400	17,300	19,400	23,200	22,800	23,200	25,400	26,500	25,500	27,900	31,200	28,000	-0.203	-0.202	0.115

Map Identification No.	**USGS Station No.**	**USGS station Name**	**Annual exceedance probability discharge, in cubic feet per second**												**Skew coefficient used for Sta AEP**	**Skew coefficient used in appendix B**	**MSE of skew coefficient used in appendix B**
			2-percent			**1-percent**			**0.5-percent**			**0.2-percent**					
			Sta	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**	**Sta**	**Reg**	**Wtd**			
219	15304000	Kuskokwim River at Crooked Creek, Alaska	308,000	210,000	306,000	334,000	226,000	331,000	359,000	243,000	355,000	392,000	264,000	385,000	-0.141	0.260	0.154
361	15621000	Snake River near Nome, Alaska	4,510	2,740	4,460	4,750	3,140	4,690	4,960	3,560	4,890	5,220	4,120	5,140	-0.555	-0.555	0.235
209	15302000	Nuyakuk River near Dillingham, Alaska	29,600	34,700	29,700	31,200	38,100	31,300	32,700	41,600	32,800	34,500	46,100	34,800	-0.203	-0.202	0.115

[Location of map identification Nos. are shown in figure 1. **Usage in this report**: Regr, used to develop regression equations; ReglSkew, used to develop regional skew; redundant, omitted from any regional analysis on the basis of hydrologic redundancy with another site; Sta, used for station analysis only. INF, infinity; No., number; PILF, potentially influential low flood; USGS, U.S. Geological Survey. ft^3/s, cubic feet per second; in., inches; mi^2, square miles]

Map identification No.	**USGS station No.**	**Station name**	**Drainage area (mi^2)**	**Mean annual precipitation (in.)**	**Kendall *tau* correlation coefficient, for sites having statistically significant trends**	**Kendall *tau* *p*-value**	**Usage in this report**	**Skew Region, for sites within applicable range of drainage area**	**Period of record used**	**Historic period length (years)[1]**	**Water year(s) for data omitted from analysis[2]**	**Number of peaks in record[3]**	**Perception threshold for water years noted (ft^3/s)[4,5]**	**Interval discharge range for noted water year (ft^3/s)[5]**	**PILF threshold (ft^3/s)[6]**	**Number of PILFs**
219	15304000	Kuskokwim River at Crooked Creek, Alaska	31100	21	--	--	Regr	--	1952-2012	61		60	1995: INF-INF (j, p)	--	--	--
361	15621000	Snake River near Nome, Alaska	86	22	--	--	Regr	--	1965-1991	27	1994 (d)	27		--	--	--
209	15302000	Nuyakuk River near Dillingham, Alaska	1510	37	--	--	Regr	--	1954-2012	59		50	1997-2002, 2005-2007: INF-INF (j, p)	--	--	--

Project Name Scammon Bay
Step 3: Calculate flows using TR-55 Method

*TR-55 Applied to all basins for comparison purposes. See TR-55 Publication for more detailed information about TR-55 Method and limitations.

Compute Watershed Runoff (Chapter 2)

Part 1: Determine Basin** area and CN
**If the basin is one homogenous basin, use only subbasin 1 and leave others blank. Otherwise break up basin into major subbasins

Basin ID*	Gravel/Dirt Road/Residential			Brush / Forest			Herbaceous / Water / Wetlands			**Product of CN x Area**
	Description	Area (sq. ft)	CN	Description	Area (sq. ft)	CN	Description	Area (sq. ft)	CN	
RW Culvert	Residential	2264152.82	82	Schrub / Forest	8762962	70	Brush	1888337	85	**74**

Part 2: Solve for Runoff Q (inches) using eq. 2-4 and eq. 2-3:
Use SNAP future estimates

Basin ID*	CN	S	P - Rainfall (inches) for 24-hour storm					Q - Runoff (inches)				
			2-Year	10-Year	25-Year	50-Year	100-Year	2-Year	10-Year	25-Year	50-Year	100-Year
RW Culvert	74	3.5	1.77	3.12	3.89	4.5	5.15	0.26	1.00	1.54	2.00	2.51

Time of Concentration and Travel Time (Chapter 3)

Part 3: Find Time of Concentration by adding all times Travel times
Part 3A: Calculate sheet flow time using eq. 3-3

*First 300 feet of all flows are assumed to be sheet flow

	Basin Slope		
	Max El (ft)	Min El (ft)	Flow Length (ft)
	Slope Calc		
Sheet	1060	1055	300
Shallow	1055	29.5	6189.8
Open	29.5	6.1	1814.3

Time of Concentration - Sheet Flow					
Basin ID*	Manning's n	L* (ft)	P_2 (in)	S (ft/ft)	T_t (hr)
		Flow Length	*2-yr, 24-hour*	*Slope*	
RW Culvert	0.20	300	0.059	0.0162	3.97

Part 3B: Calculate shallow concentrated flow* time using eq. 3-1

Basin ID*	Surface description	L (ft)	S (ft/ft)	V (ft/s)	T_t (hr)	
		Flow Length	*Slope*	*Average Vel.*		
RW Culvert	Hillside Brush	6190	0.1656	6.7	0.26	(Est. velocity)

Part 3C: Calculate open-channel flow time using eq. 3-3, or using open channel flow calculator***.

Open channel flows lengths assumed to be in a surveyed channel, channels visable from aerial photos, or where streams appear on USGS quadrangle sheets. Assumed a 10 ft wide rectangular channel, Manning's 0.04, at bankfull, ~14 cfs.

***Useful Online open channel flow calculator Auburn Engineering Department

*** For this project open channel flows lengths were measured from USGS topo maps.

Basin ID*	A (ft^2)	P_w (ft)	r (ft)	S (ft/ft)	Manning's n	V (ft/s)	L	T_t (hr)
	XS Area	*Wetted Perimeter*	*Hydraulic Radius*	*Channel Slope*			*Flow Length*	
RW Culvert	5.39	11.08	0.486462094	0.0129	0.04	2.6	1814	0.19

Part 3D: Calculate Time of Concetration by adding Parts 3A-3C.

Time of Concentration				
Basin ID*	Part 3A	Part 3B	Part 3A	T_c (hr)
	Sheet Flow	Shallow Concentrated Flow	Open Channel Flow	
RW Culvert	3.97	0.26	0.19	4.42

Graphical Peak Discharge Method (Chapter 4)

Part 4: Compute the peak discharge using Table 4-1, eq. 4-1, and exhibit 4-I, IA, II, III, or IV

Basin ID*	A_m (sq. mi)	CN	I_a	T_c (hr)	Rainfall Distribution (I, IA, II, III)	F_p	Q (in)	I_{a-2}/P	I_{a-10}/P	I_{a-25}/P	I_{a-50}/P	I_{a-100}/P
	Drainage Area	Runoff CN		Time of Conc.		Pond Factor No = 1.0	Runoff	2-Year Event	10-Year Event	25-Year Event	50-Year Event	100-Year Event
RW Culvert	0.46	74	0.703	4.42	Type I Storm Event	0.7	See Part 2	0.40	0.23	0.18	0.16	0.14

Basin ID*	q_{u-2} (csm/in)	q_{u-10} (csm/in)	q_{u-25} (csm/in)	q_{u-50} (csm/in)	q_{u-100} (csm/in)
	Use T_c & I_a/P with 4-1A	*Use T_c & I_a/P with 4-1A*	*Use T_c & I_a/P with 4-1A*	*Use T_c & I_a/P with 4-1A*	*Use T_c & I_a/P with 4-1A*
RW Culvert	39	48	53	55	58

TR-55 Peak Flows					
Basin ID*	q_{p-2} (cfs)	q_{p-10} (cfs)	q_{p-25} (cfs)	q_{p-50} (cfs)	q_{p-100} (cfs)
	2-Year Discharge	*10-Year Discharge*	*25-Year Discharge*	*50-Year Discharge*	*100-Year Discharge*
RW Culvert	3.3	16	27	37	49

Project Nai Scammon Bay
Step: HEC-17 Upper 68% Confidence Interval Analysis

Enter a site-description name:

Scammon Bay Airport - Runway Culvert

Enter the explanatory variables:

Drainage area, in square miles	DRNAREA	0.46	Equations are valid for DRNAREA between 0.4 and 1,000 mi^2 with PRECPRIS00 between 8 and 280 inches, and for DRNAREA greater than 1,000 and less than 31,100 mi^2 with PRECPRIS00 between 10 and 111 inches.
Mean annual precipitation from 1971-2000 PRISM data, in inches	PRECPRIS00	22.9	

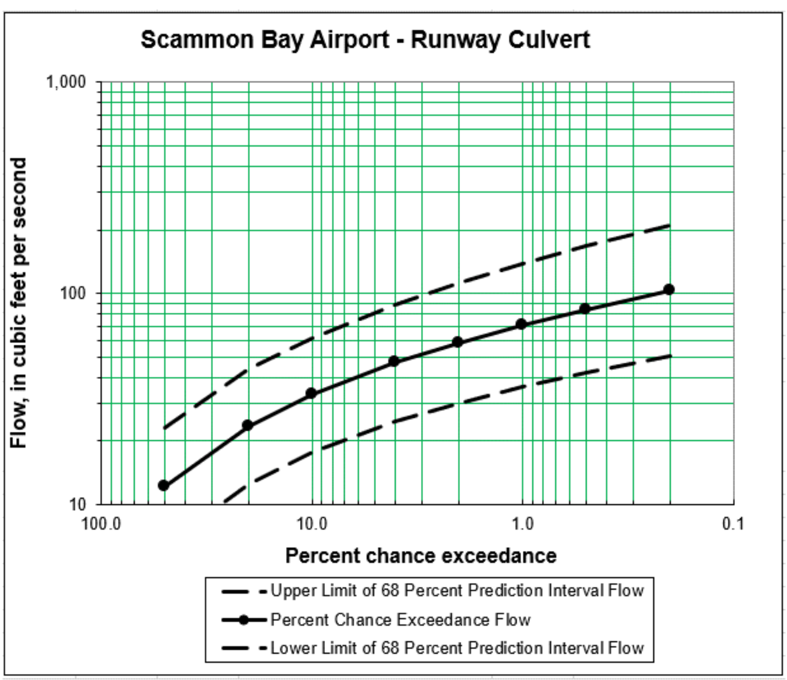
Warnings regarding range of variables:

Results:

Percent chance exceedance	Percent chance exceedance flow, in ft^3/s	Lower limit of 68 percent prediction interval flow, in ft^3/s	Upper limit of 68 percent prediction interval flow, in ft^3/s	-$SEP_{P,i}$ (percent)	+$SEP_{P,i}$ (percent)	Average $SEP_{P,i}$ (percent)
50	12.1	6.4	23.0	-47.4	90.0	71.4
20	23.5	12.5	43.9	-46.7	87.7	69.8
10	33.0	17.6	61.7	-46.8	87.8	69.8
4	46.8	24.6	88.8	-47.5	90.3	71.6
2	58.0	30.2	112	-48.1	92.8	73.4
1	70.6	36.3	138	-48.8	95.2	75.1
0.5	83.8	42.2	167	-49.8	99.3	78.0
0.2	103	50.2	211	-51.4	105.6	82.5

Notes

Differences in rounding of equation parameters can produce minor differences between the results obtained using the regression equations in table 7 and using WREG software. The estimates in this spreadsheet use the regression equations as published in table 7. The regression estimates for streamgages shown in table 4 were computed using WREG during the regression analysis.

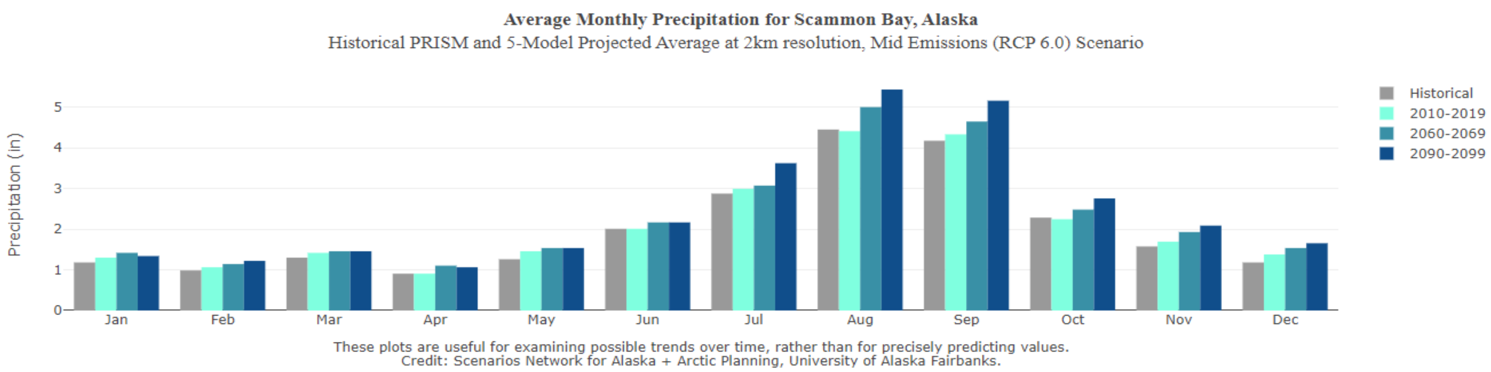


Appendix B: Flood Frequency Estimates and Supporting Data

Scammon Bay, AK SNAP Data**

Month	Precipitation (in)				2010-2099
	Historical	2010-2019	2060-2069	2090-2099	% Increase
January	1.18	1.30	1.42	1.34	3.0
February	0.98	1.06	1.14	1.22	14.8
March	1.30	1.42	1.46	1.46	2.8
April	0.91	0.91	1.10	1.06	17.4
May	1.26	1.46	1.54	1.54	5.4
June	2.01	2.01	2.17	2.17	7.8
July	2.87	2.99	3.07	3.62	21.1
August	4.45	4.41	5.00	5.43	23.2
September	4.17	4.33	4.65	5.16	19.1
October	2.28	2.24	2.48	2.76	22.8
November	1.57	1.69	1.93	2.09	23.3
December	1.18	1.38	1.54	1.65	20.0
Annual	24.17	25.20	27.48	29.49	17.0
			9.1	17.0	

Decimal Increase: 1.170



SNAP data collected from UAF Scenarios Network for Alaska + Arctic Planning website:

Data: https://www.snap.uaf.edu/tools/community-charts

About: https://uaf-snap.org/snap-story/community-charts-help-northerners-see-changes/

GFDL-CM3 Method and NCAR-CCSM4 Method Results

GFDL-CM3 Method (in)								
	2-Year	5-year	10-Year	25-Year	50-Year	100-Year	200-Year	500-Year
60-Minute	0.65	0.88	1.08	1.38	1.64	1.93	2.29	2.83
2-Hour	0.74	1.01	1.24	1.62	1.97	2.39	2.92	3.82
3-Hour	0.81	1.11	1.37	1.76	2.1	2.49	2.97	3.86
6-Hour	1.15	1.55	1.9	2.43	2.9	3.44	4.09	5.08
12-Hour	1.74	2.47	3.13	4.22	5.23	6.44	7.96	10.42
24-Hour	2.29	3.42	4.52	6.47	8.46	11.02	14.39	20.28

NCAR-CCSM4 Method (in)								
	2-Year	5-year	10-Year	25-Year	50-Year	100-Year	200-Year	500-Year
60-Minute	0.47	0.63	0.74	0.87	0.96	1.05	1.14	1.27
2-Hour	0.57	0.75	0.87	1.01	1.11	1.2	1.3	1.41
3-Hour	0.62	0.84	1	1.23	1.41	1.59	1.81	2.11
6-Hour	0.85	1.14	1.34	1.6	1.79	1.97	2.18	2.45
12-Hour	1.23	1.73	2.04	2.38	2.58	2.74	2.87	2.97
24-Hour	1.77	2.55	3.12	3.89	4.5	5.15	5.85	6.82

Predicted Change (%) using NCAR-CCSM4 Method								
	2-Year	**5-year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**	**200-Year**	**500-Year**
60-Minute	32	42	42	40	37	34	31	28
2-Hour	34	41	40	35	32	28	25	19
3-Hour	25	36	38	42	45	46	49	53
6-Hour	25	34	35	34	33	32	31	29
12-Hour	25	40	42	38	33	26	18	8
24-Hour	25	42	49	54	59	63	66	69

SNAP: Precipitation frequency estimates with future climate models
Data: https://snap.uaf.edu/tools/future-alaska-precip

Data Type: **Precipitation Intensity**
Units: English
Time Series: Partial Duration
Mountain Village **Precipitation intensity**

Precipitation Estimates (inches/hour)

Duration	Average Recurrence Interval (years)						
	2	10	25	50	100	200	500
5-min	1.49	2.18	2.62	2.95	3.29	3.67	4.16
10-min	1.00	1.46	1.76	1.98	2.21	2.46	2.80
15-min	0.780	1.14	1.37	1.55	1.72	1.92	2.18
30-min	0.518	0.760	0.910	1.03	1.14	1.27	1.45
60-min	0.355	0.520	0.623	0.703	0.782	0.873	0.992
2-hr	0.212	0.311	0.373	0.420	0.468	0.522	0.594
3-hr	0.165	0.241	0.288	0.325	0.362	0.404	0.459
6-hr	0.113	0.166	0.199	0.224	0.249	0.278	0.317
12-hr	0.082	0.120	0.144	0.162	0.181	0.202	0.230
24-hr	0.059	0.087	0.105	0.118	0.132	0.147	0.168

NOAA Atlas 14 Point Precipitation Frequency Estimates:
https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_ak.html

Appendix C – HY-8 Report and Riprap Apron Calculations

HY-8 Culvert Analysis Report

48-inch Aluminum Round Culvert

Existing Culvert

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Scammon Bay Runway Culvert

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5.06	40% Q2	5.60	5.60	0.00	1
5.71	Q2	14.00	14.00	0.00	1
8.28	Q50	66.00	66.00	0.00	1
9.19	Q100	80.00	80.00	0.00	1
11.85	Q50 U68%	112.00	112.00	0.00	1
13.28	Q100 U68%	138.00	121.42	16.33	12
13.20	Overtopping	126.46	126.46	0.00	Overtopping

Rating Curve Plot for Crossing: Scammon Bay Runway Culvert

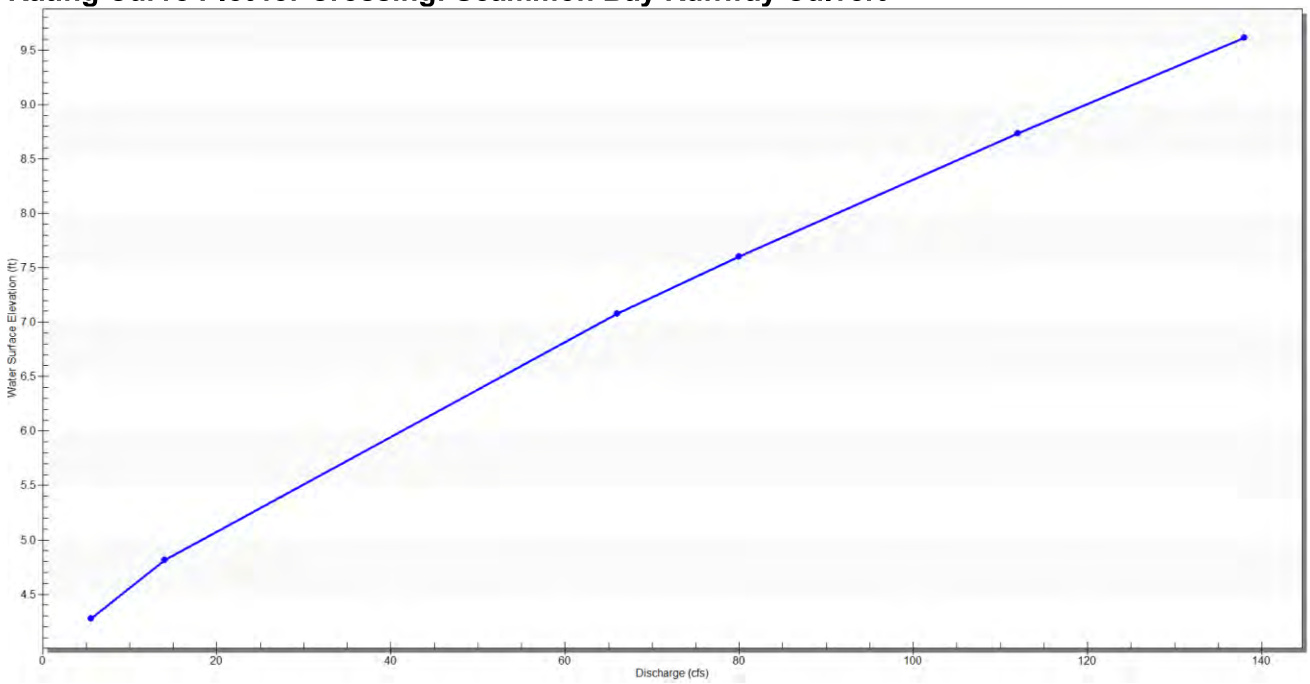


Table 2 - Culvert Summary Table: 48-inch Culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40% Q2	5.60	5.60	5.06	0.97	1.06	2-M2c	0.76	0.69	0.69	0.67	3.91	0.83
Q2	14.00	14.00	5.71	1.56	1.71	3-M2t	1.21	1.09	1.21	1.21	4.36	1.16
Q50	66.00	66.00	8.28	3.82	4.28	7-M1t	3.09	2.45	3.48	3.48	5.69	1.90
Q100	80.00	80.00	9.19	4.48	5.19	7-M2t	4.00	2.71	4.00	4.00	6.37	2.00
Q50 U68%	112.00	112.00	11.85	6.46	7.85	4-FFf	4.00	3.20	4.00	5.13	8.91	2.18
Q100 U68%	138.00	121.42	13.28	7.18	9.28	4-FFf	4.00	3.31	4.00	6.01	9.66	2.29

****

Straight Culvert

Inlet Elevation (invert): 4.00 ft, Outlet Elevation (invert): 3.60 ft

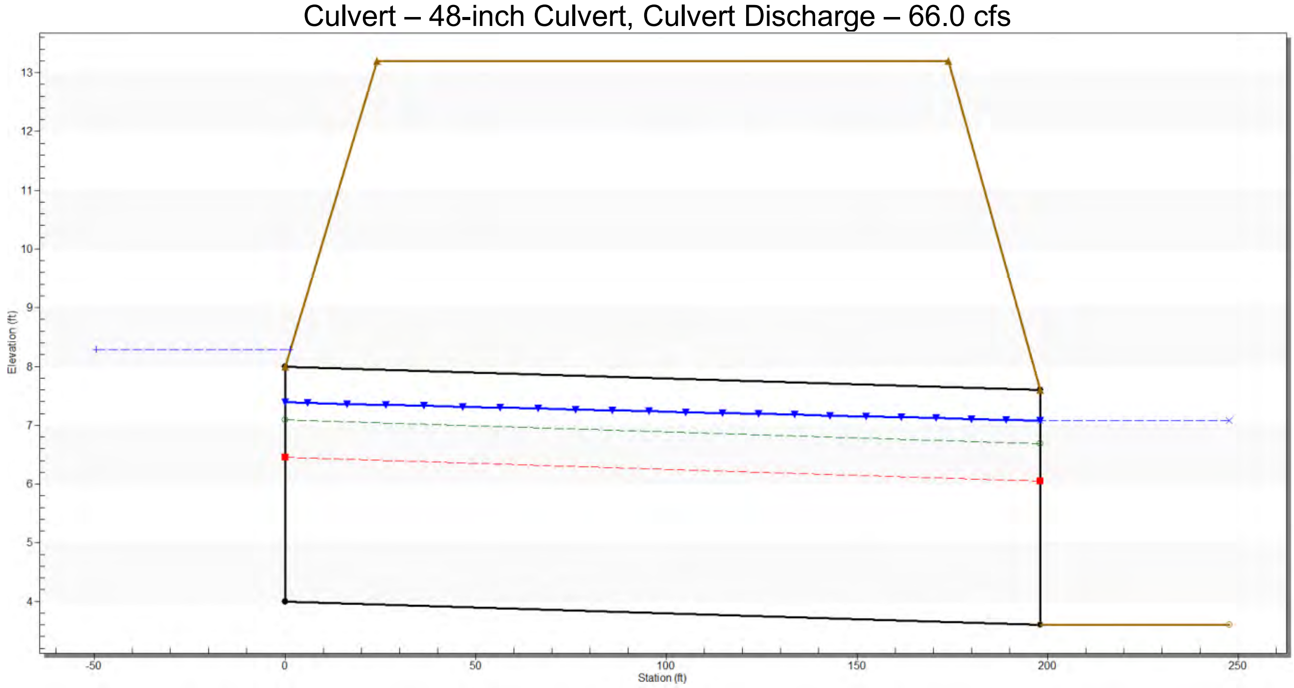
Culvert Length: 198.15 ft, Culvert Slope: 0.0020 ft/ft

****

Water Surface Profile Plot for Culvert: 48-inch Culvert

Crossing – Scammon Bay Runway Culvert, Design Discharge – 66.0 cfs

Culvert – 48-inch Culvert, Culvert Discharge – 66.0 cfs



Site Data - 48-inch Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.00 ft

Outlet Station: 198.15 ft

Outlet Elevation: 3.60 ft

Number of Barrels: 1

Culvert Data Summary - 48-inch Culvert

Shape: Circular

Diameter: 4.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Runway Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
5.600	4.274	0.674	0.830
14.000	4.812	1.212	1.155
66.000	7.079	3.479	1.897
80.000	7.599	3.999	2.000
112.000	8.731	5.131	2.183
138.000	9.614	6.014	2.295

Tailwater Channel Data: Scammon Bay Runway Culvert

Channel Type: Rectangular Channel

Bottom Width: 10.00 ft

Channel Slope: 0.0010 ft/ft

Manning’s n (channel): 0.040

Channel Invert Elevation: 3.60 ft

Roadway Data for Crossing: Scammon Bay Runway Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 13.20 ft

Roadway Surface: Gravel

Roadway Top Width: 150.00 ft

HY-8 Culvert Analysis Report

66-inch Aluminum Round Structural Plate Culvert

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Scammon Bay Runway Culvert

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5.35	40% Q2	5.60	5.60	0.00	1
6.03	Q2	14.00	14.00	0.00	1
8.54	Q50	66.00	66.00	0.00	1
9.18	Q100	80.00	80.00	0.00	1
11.39	Q50 U68%	112.00	112.00	0.00	1
13.69	Q100 U68%	138.00	138.00	0.00	1
18.50	Overtopping	185.23	185.23	0.00	Overtopping

Rating Curve Plot for Crossing: Scammon Bay Runway Culvert

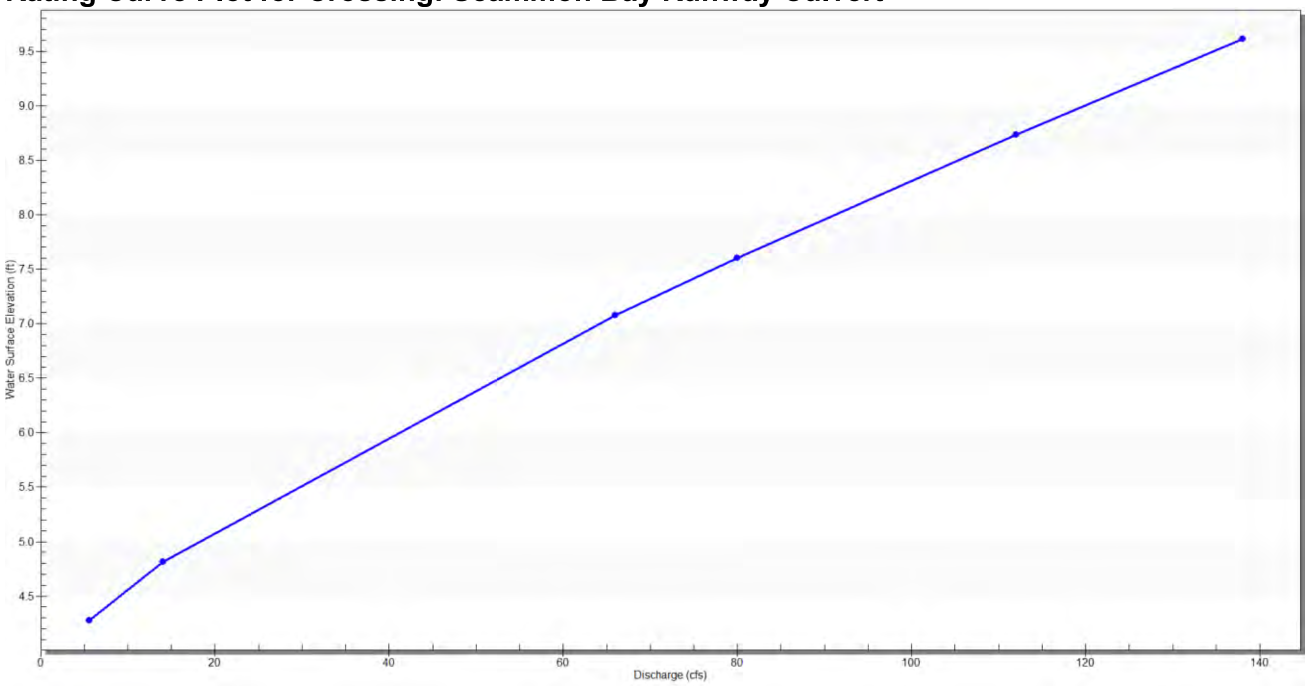


Table 2 - Culvert Summary Table: 66-inch Culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40% Q2	5.60	5.60	5.35	0.85	1.20	3-M2t	1.17	0.63	0.67	0.67	3.36	0.83
Q2	14.00	14.00	6.03	1.37	1.88	3-M2t	1.87	1.00	1.21	1.21	3.61	1.16
Q50	66.00	66.00	8.54	3.12	4.39	3-M2t	5.50	2.22	3.48	3.48	4.17	1.90
Q100	80.00	80.00	9.18	3.49	5.03	3-M2t	5.50	2.46	4.00	4.00	4.32	2.00
Q50 U68%	112.00	112.00	11.39	4.28	7.24	7-M2t	5.50	2.93	5.13	5.13	4.85	2.18
Q100 U68%	138.00	138.00	13.69	4.90	9.54	4-FFf	5.50	3.27	5.50	6.01	5.81	2.29

****

Straight Culvert

Inlet Elevation (invert): 4.15 ft, Outlet Elevation (invert): 3.60 ft

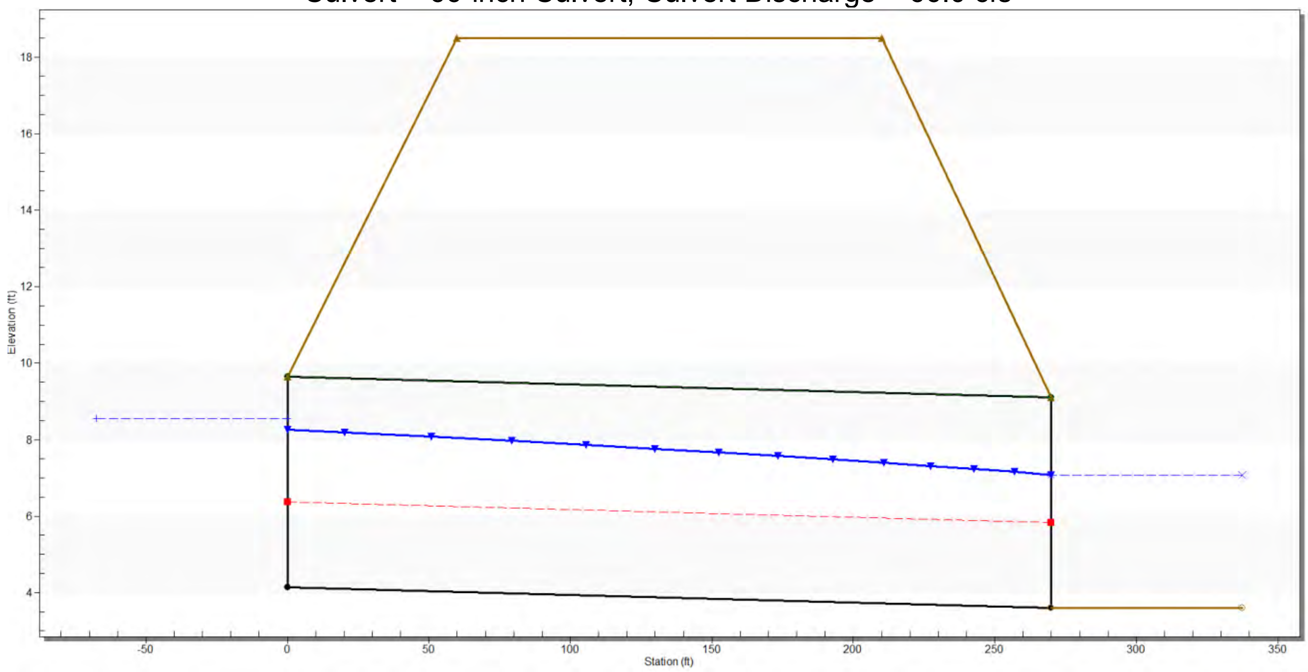
Culvert Length: 270.0 ft, Culvert Slope: 0.0020 ft/ft

****

Water Surface Profile Plot for Culvert: 66-inch Culvert

Crossing – Scammon Bay Runway Culvert, Design Discharge – 66.0 cfs

Culvert – 66-inch Culvert, Culvert Discharge – 66.0 cfs



Site Data - 66-inch Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.15 ft

Outlet Station: 270.00 ft

Outlet Elevation: 3.60 ft

Number of Barrels: 1

Culvert Data Summary - 66-inch Culvert

Shape: Circular

Diameter: 5.50 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Manning's n: 0.0350

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Runway Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
5.600	4.274	0.674	0.830
14.000	4.812	1.212	1.155
66.000	7.079	3.479	1.897
80.000	7.599	3.999	2.000
112.000	8.731	5.131	2.183

Tailwater Channel Data: Scammon Bay Runway Culvert

Channel Type: Rectangular Channel

Bottom Width: 10.00 ft

Channel Slope: 0.0010 ft/ft

Manning’s n (channel): 0.040

Channel Invert Elevation: 3.60 ft

Roadway Data for Crossing: Scammon Bay Runway Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 18.50 ft

Roadway Surface: Gravel

Roadway Top Width: 150.00 ft

HY-8 Culvert Analysis Report

72-inch Aluminum Round Structural Plate Culvert

(Preferred Alternative)

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Scammon Bay Runway Culvert

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5.34	40% Q2	5.60	5.60	0.00	1
5.98	Q2	14.00	14.00	0.00	1
8.35	Q50	66.00	66.00	0.00	1
8.91	Q100	80.00	80.00	0.00	1
10.36	Q50 U68%	112.00	112.00	0.00	1
12.23	Q100 U68%	138.00	138.00	0.00	1
18.50	Overtopping	215.25	215.25	0.00	Overtopping

Rating Curve Plot for Crossing: Scammon Bay Runway Culvert

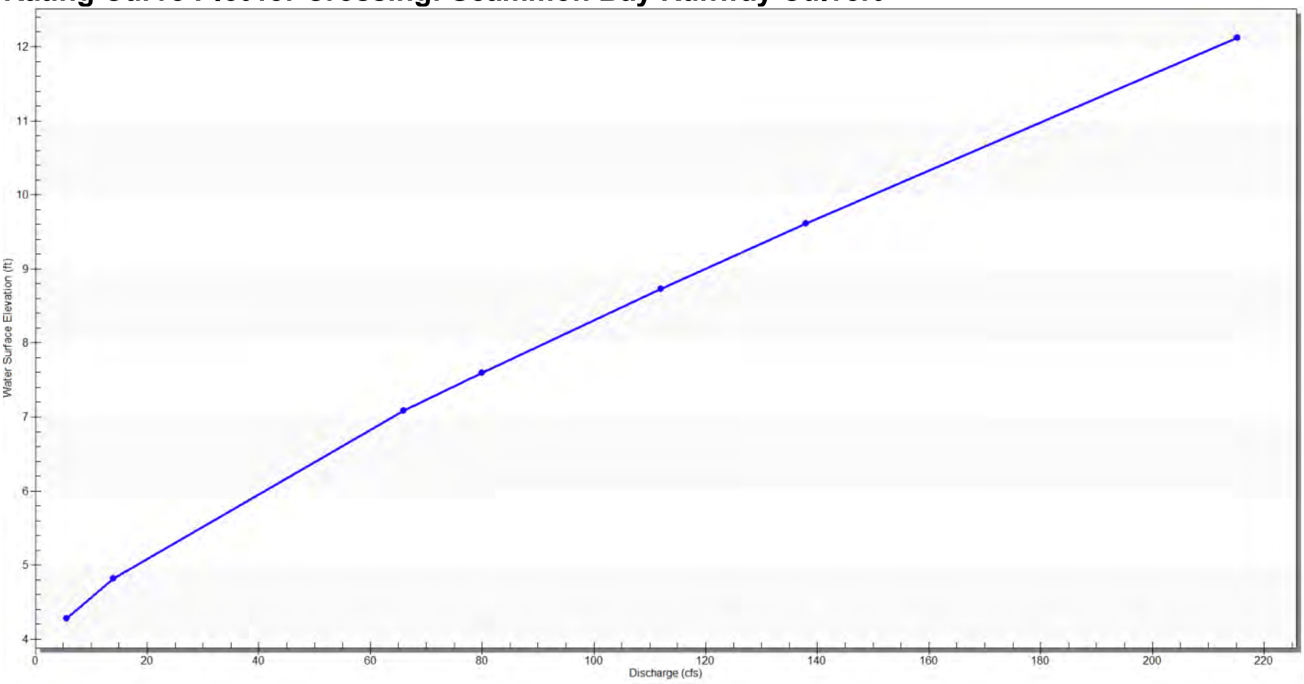


Table 2 - Culvert Summary Table: 72-inch Culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40% Q2	5.60	5.60	5.34	0.83	1.19	3-M2t	1.14	0.61	0.67	0.67	3.21	0.83
Q2	14.00	14.00	5.98	1.33	1.83	3-M2t	1.80	0.98	1.21	1.21	3.43	1.16
Q50	66.00	66.00	8.35	3.01	4.20	3-M2t	4.57	2.17	3.48	3.48	3.88	1.90
Q100	80.00	80.00	8.91	3.35	4.76	3-M2t	6.00	2.39	4.00	4.00	4.00	2.00
Q50 U68%	112.00	112.00	10.36	4.09	6.21	3-M2t	6.00	2.85	5.13	5.13	4.35	2.18
Q100 U68%	138.00	138.00	12.23	4.64	8.08	4-FFf	6.00	3.18	6.00	6.01	4.88	2.29

****

Straight Culvert

Inlet Elevation (invert): 4.15 ft, Outlet Elevation (invert): 3.60 ft

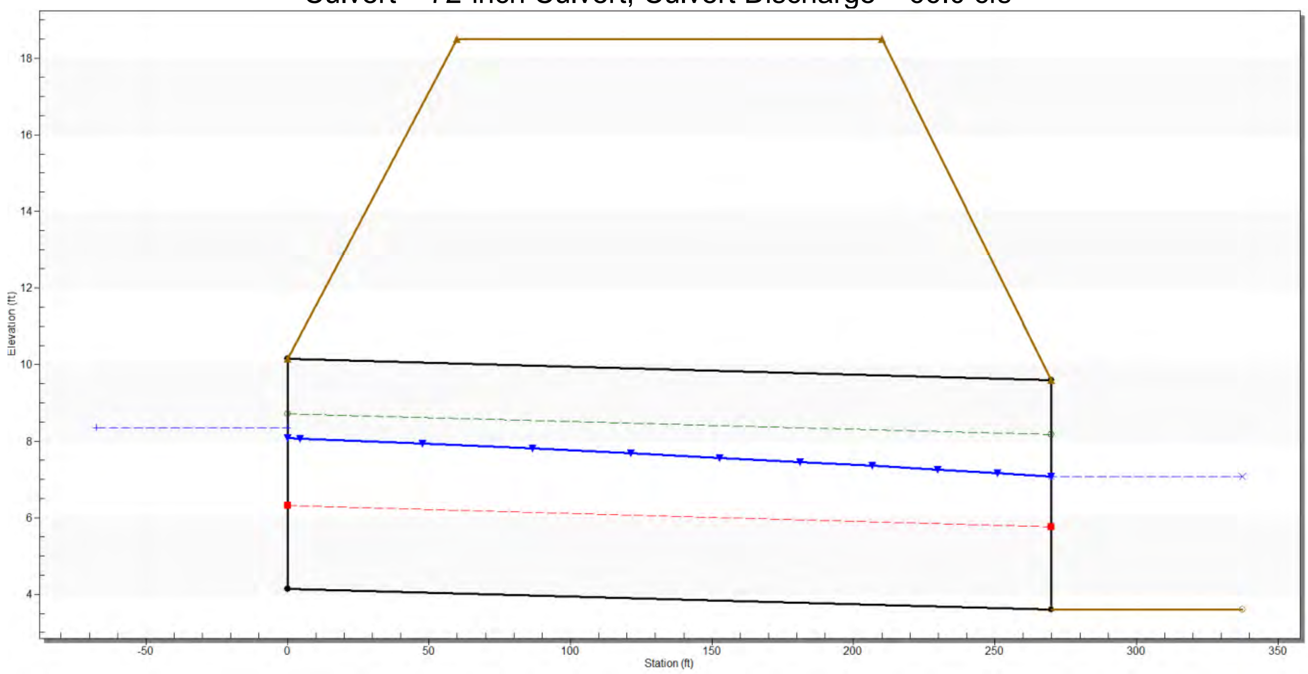
Culvert Length: 270.0 ft, Culvert Slope: 0.0020 ft/ft

****

Water Surface Profile Plot for Culvert: 72-inch Culvert

Crossing – Scammon Bay Runway Culvert, Design Discharge – 66.0 cfs

Culvert – 72-inch Culvert, Culvert Discharge – 66.0 cfs



Site Data - 72-inch Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.15 ft

Outlet Station: 270.00 ft

Outlet Elevation: 3.60 ft

Number of Barrels: 1

Culvert Data Summary - 72-inch Culvert

Shape: Circular

Diameter: 6.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Manning's n: 0.0350

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Runway Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
5.600	4.274	0.674	0.830
14.000	4.812	1.212	1.155
66.000	7.079	3.479	1.897
80.000	7.599	3.999	2.000
112.000	8.731	5.131	2.183
138.000	9.614	6.014	2.295

Tailwater Channel Data: Scammon Bay Runway Culvert

Channel Type: Rectangular Channel

Bottom Width: 10.00 ft

Channel Slope: 0.0010 ft/ft

Manning’s n (channel): 0.040

Channel Invert Elevation: 3.60 ft

Roadway Data for Crossing: Scammon Bay Runway Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 18.50 ft

Roadway Surface: Gravel

Roadway Top Width: 150.00 ft

HY-8 Culvert Analysis Report

72-inch Aluminum Round Structural Plate Culvert under Tidally Influence Conditions

(Preferred Alternative)

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Scammon Bay Runway Culvert

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6.79	40% Q2	5.60	5.60	0.00	1
6.89	Q2	14.00	14.00	0.00	1
8.26	Q50	66.00	66.00	0.00	1
8.67	Q100	80.00	80.00	0.00	1
9.64	Q50 U68%	112.00	112.00	0.00	1
10.51	Q100 U68%	138.00	138.00	0.00	1
18.50	Overtopping	265.81	265.81	0.00	Overtopping

Rating Curve Plot for Crossing: Scammon Bay Runway Culvert

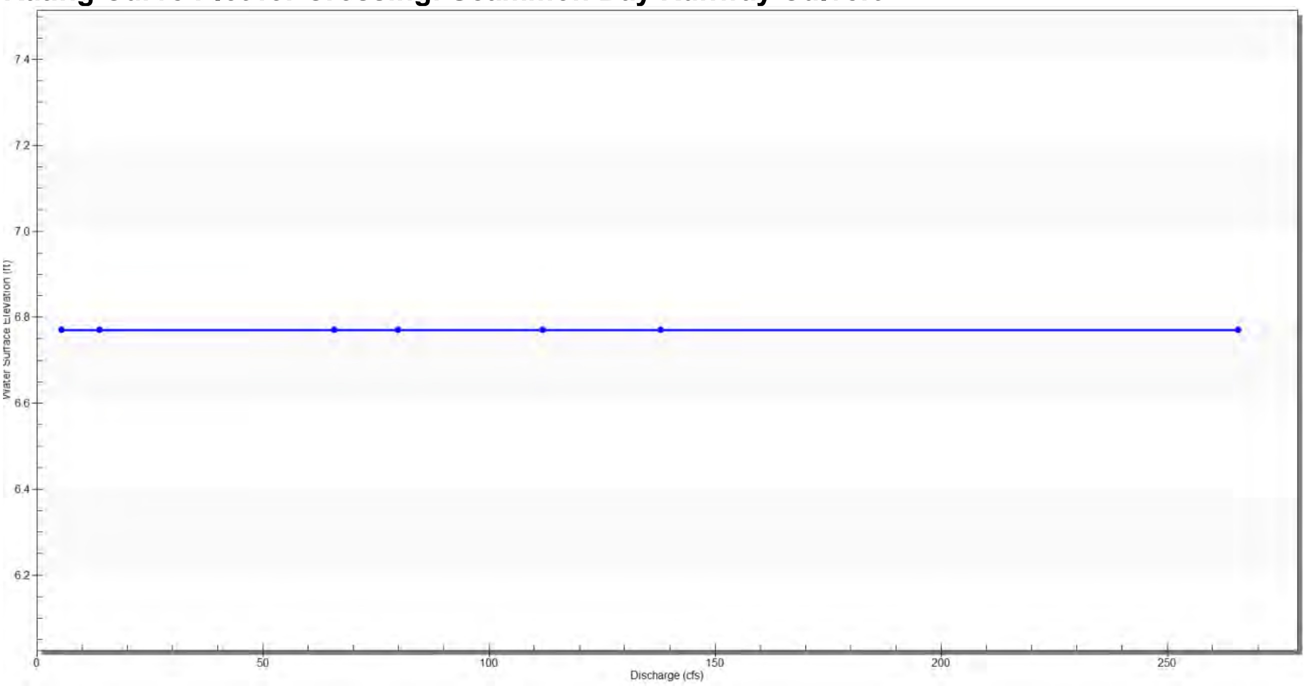


Table 2 - Culvert Summary Table: 72-inch Culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40% Q2	5.60	5.60	6.79	0.83	2.64	3-M1t	1.14	0.61	3.17	3.17	0.37	0.00
Q2	14.00	14.00	6.89	1.33	2.74	3-M1t	1.80	0.98	3.17	3.17	0.92	0.00
Q50	66.00	66.00	8.26	3.01	4.11	3-M2t	4.57	2.17	3.17	3.17	4.35	0.00
Q100	80.00	80.00	8.67	3.35	4.52	3-M2t	6.00	2.39	3.17	3.17	5.28	0.00
Q50 U68%	112.00	112.00	9.64	4.09	5.49	3-M2t	6.00	2.85	3.17	3.17	7.39	0.00
Q100 U68%	138.00	138.00	10.51	4.64	6.36	7-M2c	6.00	3.18	3.18	3.17	9.05	0.00

****

Straight Culvert

Inlet Elevation (invert): 4.15 ft, Outlet Elevation (invert): 3.60 ft

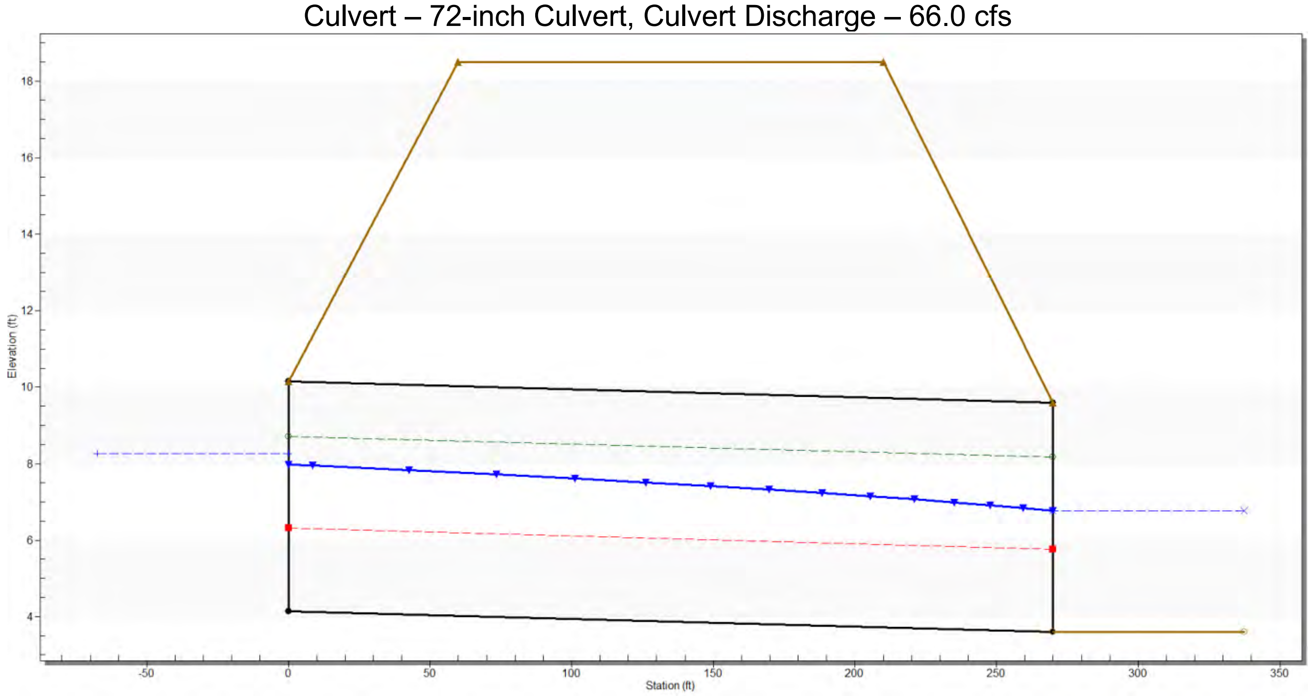
Culvert Length: 270.0 ft, Culvert Slope: 0.0020 ft/ft

****

Water Surface Profile Plot for Culvert: 72-inch Culvert

Crossing – Scammon Bay Runway Culvert, Design Discharge – 66.0 cfs

Culvert – 72-inch Culvert, Culvert Discharge – 66.0 cfs



Site Data - 72-inch Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.15 ft

Outlet Station: 270.00 ft

Outlet Elevation: 3.60 ft

Number of Barrels: 1

Culvert Data Summary - 72-inch Culvert

Shape: Circular

Diameter: 6.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Manning's n: 0.0350

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Runway Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
5.600	6.770	3.170	0.000
14.000	6.770	3.170	0.000
66.000	6.770	3.170	0.000
80.000	6.770	3.170	0.000
112.000	6.770	3.170	0.000
138.000	6.770	3.170	0.000

Tailwater Channel Data: Scammon Bay Runway Culvert

Channel Type: Constant Tailwater Elevation

Channel Invert Elevation: 3.60 ft

Constraint Tailwater Elevation: 6.77 ft (Mean Higher-High Water Elevation [MHHW])

Roadway Data for Crossing: Scammon Bay Runway Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 18.50 ft

Roadway Surface: Gravel

Roadway Top Width: 150.00 ft

Riprap Bed Sizing for Proposed Runway Culvert

Updated 7/21/2021 K. Grundhauser

Inputs
Set by Specs
Calculated

Step 1

From HEC-RAS or HY-8 enter values for depth and velocity of Q100 flows and select D85/15 and stability coefficients

This will produce the course fraction gradations for rip rap sizing at the bottom of the table

Using Corps of Engineers Equations - FHWA Circular on Development in the River System - Page 6.25.
FHWA NHI 01-004; River Engineering for Highway Encroachments, 2001
http://www.fhwa.dot.gov/engineering/hydraulics/library_arc.cfm?pub_number=8&id=20

Safety Factor	**1.5**			
Stability Coefficient for Incipient Failure	0.3	Round or Angular Rock?	Angular	(0.36 round rock, 0.3 angular rock)
Vertical Velocity Distribution Coeff	1.00	(1.0 for straight channels)		
Blanket Thickness Coeff	1	(1xD100 or 1.5 or D50 max, whichever is greater)		
Local depth of flow	4	ft for 100-year event		
Unit Weight of water	62.4	lb/ft^3	(assumed)	
Unit weight of rock	165	lb/ft^3	(assumed)	
Local depth-average velocity	4	ft/s from 100-year event avg. velocity in pipe		
Side Slope correction factor	1			
Gravitational Acceleration	32.2	ft/s^2		
D85/D15	3.4	(1.7-5.2)	IN RANGE	
D50/D30	2			

Note: This method is based on the minimum D30 size

Riprap Design Method - Selecting Proper Gradation, Page 131.
Design Hydrology and Sedimentology for Small Catchments, Haan, Barfield and Hayes, 1981.

D15	0.0	ft	1.0	inches
D30	0.1	ft	1.0	inches
D50	0.1	ft	2.0	inches
D85	0.2	ft	3.0	inches
D100	0.2	ft	3.0	inches

Using D50 size, used FHWA circular for Rip Rap design to spec out D100, D85 and D15.
D100 = 2.0D50

Buoyancy Force Calculations for Scammon Bay Runway Culvert *Updated: K. Grundhauser 7/9/2021*

Resistance = Weight of pipe + Weight of water (in pipe) + Weight of fill (over pipe), lbs/ft.

Hydrostatic Uplift (Buoyant) Force = Weight of water displaced by the pipe, lb/ft.

Assumed (from Virginia DOT):

Weight of dry fill =	F_d =	100	lb/ft^3	
Weight of coastal protection =	F_s =	160	lb/ft^3	<- D50 - 1.4' diameter, 238 lb. We calculated a 300-400 lb d50 with an average density of 160 lbs/ft3. The density can range from 155 into the 170s.
Unit weight of water =	γ =	62.43	lb/ft^3	

Provide:

Weight of pipe =	W_p =	47.6	lb/ft	(72-inch, 10-gage thickness, aluminum, CMP)
Flow =	Q =	138	cfs	@ Q100 68%
Headwater =	H =	12.1	ft	@ avg Q50 storm surge, 15.7 NAVD88
Diameter of the pipe =	D =	6	ft	
Radius of the pipe =	R =	3	ft	
Critical depth =	**y_c =**	**3.13**	**ft**	@ Q100 68%
Normal depth =	y_n =	6	ft	@ Q100 68%
Length of pipe =	L =	274.5	ft	
Length of pipe per unit =	$L_{(unit)}$ =	1		
Cross section area =	A_{xc} =	28.27	ft^2	

Calculate: **At Critical Depth**

Buoyant force = $L_{(unit)}$*A* Buoy = 1,765.2 lb/ft

Section 1 (Inlet)

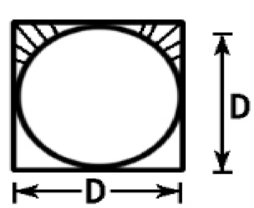
Surcharge (lbs./ft.) = Wt. of Fill + Wt. of Water + Wt. of Pipe

Area of Fill =	A_F =	0.00	ft^2					
Weight of Fill =	W_F =	0.0	lb/ft					
Area of Water =	A_W =	14.9	ft^2					
Weight of Water =	W_W =	931.3	lb/ft					
Weight of pipe =	W_p =	47.6	lb/ft					
Surcharge (lbs./ft.) =		978.9	lb/ft					
At Section 1 -	Weight	979	lb/ft	<	Buoy =	1,765	lb/ft	**Unstable**

Section 2 (Inlet to 12 ft)

Surcharge (lbs./ft.) = Wt. of Fill + Wt. of Water + Wt. of Pipe

Area of Fill =	A_F =	3.86	ft^2
Weight of Fill =	W_F =	618.1	lb/ft
Area of Water =	A_W =	14.9	ft^2
Weight of Water =	W_W =	931.3	lb/ft
Weight of pipe =	W_p =	47.6	lb/ft



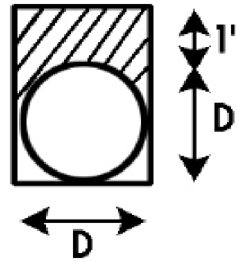
Surcharge (lbs./ft.) = 1596.9 lb/ft

At Section 2 -	Weight	1,597	lb/ft	<	Buoy =	1,765	lb/ft	**Unstable**

Section 3 (12 ft to 16 ft)

Surcharge (lbs./ft.) = Wt. of Fill + Wt. of Water + Wt. of Pipe

Area of Fill =	A_F =	9.86	ft^2
Weight of Fill =	W_F =	1578.1	lb/ft
Area of Water =	A_W =	14.9	ft^2
Weight of Water =	W_W =	931.3	lb/ft
Weight of pipe =	W_p =	47.6	lb/ft
Surcharge (lbs./ft.) =		2556.9	lb/ft

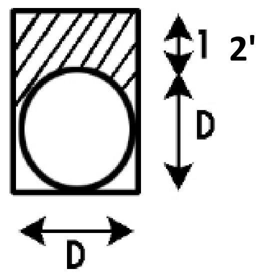


At Section 3 -	Weight	2,557	lb/ft	>	Buoy =	1,765	lb/ft	**Stable**

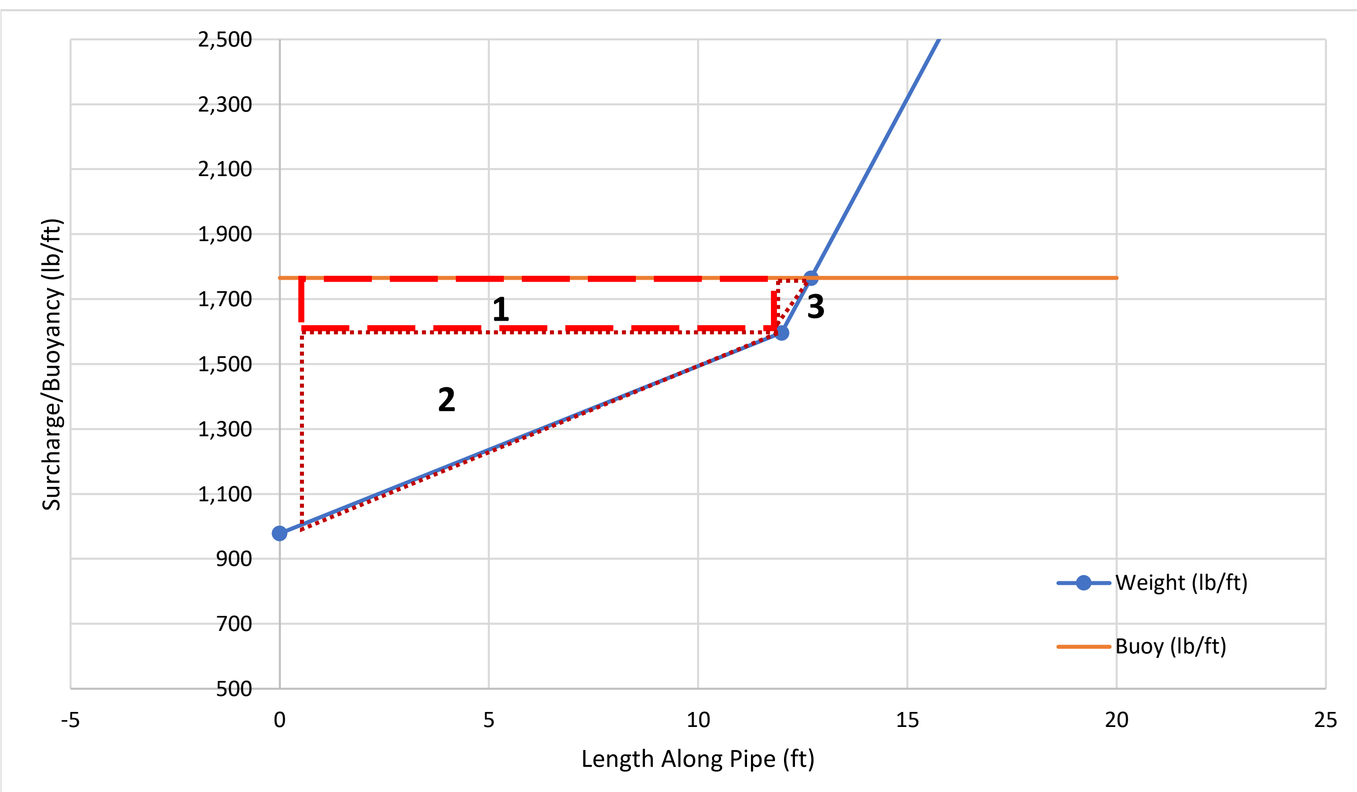
Section 4 (16 ft to 20 ft)

Surcharge (lbs./ft.) = Wt. of Fill + Wt. of Water + Wt. of Pipe

Area of Fill =	A_F =	15.86	ft^2
Weight of Fill =	W_F =	2538.1	lb/ft
Area of Water =	A_W =	14.9	ft^2
Weight of Water =	W_W =	931.3	lb/ft
Weight of pipe =	W_p =	47.6	lb/ft
Surcharge (lbs./ft.) =		3516.9	lb/ft



At Section 4 -	Weight	3,517	lb/ft	>	Buoy =	1,765	lb/ft	**Stable**



y= 240 x + -1283

Distance from Inlet (ft)	Weight (lb/ft)	Buoy (lb/ft)
0	979	1,765
0	979	1,765
12	1,597	1,765
12.700	1,765	1,765
16	2,557	1,765
20	3,517	1,765

Area			X Centroid	
1	2,017	lbs.	6	ft
2	3,708	lbs.	4.00	ft
3	59	lbs.	12.23	ft
Sum	5,784	lbs.	2.40	ft

Hinge Point =	12.700	ft			
Buoyancy Force =	59,561	lb*ft	Restrain =	59,561	lb*ft
Location of restraint =	1.00	ft (from Inlet)			
Required Restraining Forc	5,091	lb			

Minimum Restraining Force*	**5,091**	lbs. at	**1**	ft from Inlet.
	5,566		**2**	
	6,846		**4**	

Assume Concrete Toe Wall		**Wall**			**Toe**		
Width =	B_C =	11.0	ft		11.00	ft	
Depth =	D_C =	1	ft		4.00	ft	
Height =	H_C =	4	ft		1.00	ft	
Unit Weight of Concrete	W_C =	165	lb/ft^3				
Unit weight of water =	γ =	62.43	lb/ft^3				
Concrete weight =	13,612.50	lb	>	Buoy =	6,846.09	**lb**	**Passes**

*Analysis is for non-rigid pipe. Additional restraining force may not be needed for a rigid pipe.

Recommend

At the inlet and outlet, install a DOT standard toe wall, see detail for dimensions.

Sources:

Virginia DOT Procedure:	http://www.virginiadot.org/business/resources/LocDes/DrainageManual/chapter8.pdf
Pipe Weight:	https://www.conteches.com/Portals/0/Documents/Design%20Guides/CMP-Design-Guide.pdf?ver=2018-05-16-083622-383
General Soil Weights:	http://www.geotechnicalinfo.com/soil_unit_weight.html
Saturated Soil Weight:	https://www.concretepipe.org/wp-content/uploads/2014/09/DD_22M.pdf
Equation of a line:	https://planetcalc.com/8110/
DOT Standard Toe wall:	https://dot.alaska.gov/stwddes/dcsprecon/assets/pdf/stddwgs/eng/d3101p1.pdf

APPENDIX E: PUBLIC INVOLVEMENT

Public Involvement Plan

Public Involvement Plan
Scammon Bay Airport Planning Study

November 2023

State Program Number CFAPT01005 / AIP 3-02-0255-005-2023

Prepared for:

State of Alaska
Department of Transportation & Public Facilities, Central Region
4111 Aviation Way
Anchorage, Alaska 99519-6900

Prepared by:

Stantec Consulting Services Inc.
725 E Fireweed Lane, Suite 200
Anchorage, AK 99503

TABLE OF CONTENTS

1 INTRODUCTION

The Alaska Department of Transportation and Public Facilities Central Region (DOT&PF) is conducting an Airport Planning Study at Scammon Bay, funded by the Federal Aviation Administration (FAA). The study may include up to three planning and public involvement phases. The first phase is called a Feasibility Study, which will evaluate the feasibility of improving the airport in its current location or constructing a new airport at a different site near the community. Subsequent phases may include a site selection study and airport layout plan. This phase, though, is focused on gathering information about the airport and community needs.

The purpose of this Public Involvement Plan (PIP) is to encourage dialogue and sufficiently inform the public, airport users, and resource agencies during the Feasibility Study phase of this planning process. A combination of public meetings, a project website, and mailing lists will meet the objective of providing early opportunities in the planning process to take comments about potential issues before final recommendations are made.

Scammon Bay is a remote community located in the Kusilvak Census Area, near the Bering Sea, nearly 150 miles northwest of Bethel. The community is bordered by the Kun River and wetlands to the north and the Askinuk Mountains to the south. Much of the community, including the airport, is located at sea level elevation.

The Scammon Bay airport is owned and operated by DOT&PF. The airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. The Scammon Bay airport is expected to be impacted by major flooding sometime before 2030; the most recent major flood was in 2022.

2 PUBLIC OUTREACH

2.1 Public Meetings

One public meeting will be held during the Airport Feasibility Study phase of this planning study. The purpose of the meeting will be to inform the public about the project, field questions, and receive feedback.

The public meeting will focus on soliciting comments from the public on potential alternatives to address the needs identified in the Airport Feasibility Study. The meeting will summarize the identified needs at the airport. The majority of the meeting will be spent introducing alternatives which could address the needs identified at the airport.

Alternative locations for the airport will also be presented, in addition to pros and cons of maintaining the airport in the current location. The meeting will focus on stakeholders providing input on the current and alternative locations. The meeting will allow for informal discussion and formal comments to be documented from community members. Community members will be able to evaluate and voice support or concern about alternatives; and suggest improvements to the process.

Public meetings will also be held during subsequent planning phases if airport relocation is recommended and during a construction project for the airport, as required by the National Environmental Policy Act (NEPA).

2.2 Website

A public website will be hosted on the DOT&PF projects webpage to inform the public about the plan. This webpage will serve as a repository for documents, newsletters, and notifications about the Airport Planning Study. Contact information for project leaders will allow the public to directly participate in the plan.

2.3 Mailing List

A mailing list will be maintained throughout the project. This live document will include all of those people who have self-identified interest in the project, and any additional stakeholders who have been identified through scoping. The mailing list will be used to update interested stakeholders about project updates, open houses, and other appropriate events.

2.4 Informational and Educational Materials: Flyers and Comment Cards

Flyers and comment card materials will be published on the project website, sent in mailings, and be available as handouts at the open house. These are used to provide the public key information about the project, schedule, needs, and alternatives. The local Delta Discovery newspaper and KYUK, the public radio station for the Yukon-Kuskokwim Delta, will also be contacted to run notifications about the project.

2.5 Advertisement

Project meeting announcements will be sent to the project mailing list. Flyers will be sent to the Post Office and Library for display. Advertisements for public meetings will be run in the local newspaper, the Delta Discovery. Meeting announcements will also be published on the Alaska Online Public Notice website and a media release will be prepared.

Public meetings will be noticed at least 21 calendar days in advance and coordinated with the City of Scammon Bay and Native Village of Scammon Bay tribal leaders.

2.6 Comment Collection

Summaries of public meeting records, including documentation of comments received during open format discussions will be completed and appended to the Airport Planning Study. Individual comments received through comment forms, emails, and webpage outreach will be collected and saved in the project records. Relevant comments and responses will be summarized in tabular form and included in the Airport Planning Study.

2.7 Translation Services

Translation services will be available for the Central Yup'ik language at public meetings for the Feasibility Study.

3 POTENTIAL STAKEHOLDERS

The Scammon Bay Airport is an important component of the Scammon Bay community, providing the only year-round linkage to Bethel and the broader region. As a result, there are many interested parties, some which have been identified (below). Additional parties will be maintained in the mailing list.

- City of Scammon Bay
- Native Village of Scammon Bay and Scammon Bay Traditional Council
- Askinuk Corporation
- Calista Corporation
- Association of Village Council Presidents
- Lower Kuskokwim School District
- Commercial Operators
    - Bering Air
    - Fox Aircraft, LLC
    - Grant Aviation
    - Iliamna Air Taxi
    - Katmai Air
    - Ryan Air
    - Yute Commuter Service
- Aircraft Owners and Pilots Association
- Federal Agencies
    - FAA Airport Division
    - FAA Flight Service
    - FAA Runway Safety
- State Agencies
    - Department of Transportation and Public Facilities (DOT&PF)
    - Department of Commerce, Community, and Economic Development (DCCED), Division of Communities and Regional Affairs (DCRA)
    - Department of Environmental Conservation (DEC)
    - Department of Fish and Game (ADF&G)
- Department of Natural Resources (DNR)
- State Legislators and Federal Congressional Delegation

4 PROJECT CONTACTS

4.1 DOT&PF – Central Region

Philana Miles
PO Box 196900
Anchorage, AK 99519-6900
philana.miles@alaska.gov
907-269-0519

4.2 Stantec Consulting Services, Inc.

Ryan Cooper
725 East Fireweed Lane Suite 200
Anchorage, AK 99503
Ryan.Cooper@stantec.com
907-343-5241

Website: DOT&PF

Alaska Department of Transportation and Public Facilities

CENTRAL REGION

Scammon Bay Airport Planning Study

State/Federal Project No: CFAPT01005/AIP 3-02-0255-005-2023

Project Documents

Project Overview

We are conducting an airport planning study for Scammon Bay, a remote community located near the Bering Sea, along the Kun River.

The airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. The Scammon Bay airport is expected to be impacted by major flooding sometime before 2030; the most recent major flood was in 2022.

Scammon Bay is not on the road system and the airport is a critical link to essential infrastructure, such as medical care.

The purpose of this project is to improve the safety of aviation infrastructure in Scammon Bay. This study will evaluate the airport and determine whether rehabilitating the airport in its current location, or relocating the airport, would be the most prudent long-term airport management decision.

Work on this project includes:

- Public Involvement
- Inventory
- Needs Assessment
- Forecast
- Alternatives Evaluation

Project Background:

Scammon Bay is 150 miles from Bethel and has a runway directly adjacent to the Kun River. The runway regularly floods, which removes the community's ability to access medical care. Erosion also continues to shorten the runway. This hazard is well documented, in the Scammon Bay Hazard Mitigation Plan, flood records, and in the Alaska Aviation System Plan.

The major question is if the runway should be moved or reinforced. A Coastal Report and Hydrology and Hydraulics Report have already been completed (links available on the right).

The planning study is the first of three phases of airport analysis, which are:

1. Feasibility Study
2. Reconnaissance Study
3. Airport Layout Plan and Survey

What does the flooding look like?

Overview of Scammon Bay, Scammon Bay Airport, and the Kun River (Looking West)

2016 Flooding of the Runway

2022 Flooding of the Runway (Looking North, from the Foothills). Note the two (red and blue) airport snow removal equipment buildings on the right side of the picture.

Contact and Comment

LEAVE A COMMENT

Your input is valuable! Please review the documents and offer your comments on the project. The best contact information for the project is listed below.

This project is being developed in cooperation with the Federal Aviation Administration and Stantec Consulting Services, Inc.

If you have questions or comments about the project, please contact: ScammonBayAirportPlan@stantec.com

Or reach out directly to:

Philana Miles, C.M.
Project Manager, DOT&PF
PO Box 196900
Anchorage, AK 99519-6900
(907) 269-0519
philana.miles@alaska.gov

It is the policy of the Department of Transportation and Public Facilities (DOT&PF) that no person shall be excluded from participation in, or be denied benefits of any and all programs or activities we provide based on race, religion, gender, age, marital status, ability, or national origin, regardless of the funding source including Federal Transit Administration, Federal Aviation Administration, Federal Highway Administration and State of Alaska Funds. The DOT&PF complies with Title II of the Americans with Disabilities Act of 1990. Individuals with disabilities who may need auxiliary aids, services, and/or special modifications to participate in this public meeting should contact:

Philana Miles, C.M., (907) 269-0519, text telephone (TDD) (907) 451-2363

Requests should be made at least 14 days before the accommodation is needed.

Alaska Project Exchange APEX Alaska DOT&PF Connecting Alaska with construction information at dot.alaska.gov/construction & 511.alaska.gov

Use DOT&PF's **Alaska Project Exchange** tools to learn more about all of DOT&PF's active construction projects statewide!

- Want to know how construction will impact road traffic? Visit 511.alaska.gov
- Want to dig into the details about projects across the state? Visit dot.alaska.gov/construction

Website: ArcStory

Scammon Bay Airport Planning Study

The purpose of this project is to improve the safety of aviation infrastructure in Scammon Bay

Alaska Department of Transportation and Public Facilities (DOT&PF)
April 17, 2024

Welcome to the Public Involvement Website for the Scammon Bay Airport Planning Study. This online resource helps provide the materials in an interactive, 24-hour accessible format. Your feedback is important to us! You may visit the Comments section to leave your feedback.

Scammon Bay is a remote community located near the Bering Sea.

Why is the airport important?

- Scammon Bay is not connected to the road system
- The Airport is the only year-round access to medical care, groceries, and heating
- The Airport is the only year-round access for travel for school events
- The community has infrequent barge service and no ferry service
- The population is growing in Scammon Bay

The airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. The Scammon Bay airport is expected to be impacted by major flooding sometime before 2030; the most recent major flood was in 2022.

This airport planning study is designed to examine condition of the airport, the needs of the community, and ways the airport can continue to serve those needs. It also helps guide future project development.

Date	Event	Description
1976 (August)	Storm surge flood	Storm surge flood from Bering Sea. Flooded the airstrip, sewage lagoon, and two homes
1977	Flood	High wind driven waves
1981	Flood	Wind driven waves
1982	Flood	Wind driven waves
2004 (October)	Storm	High-water levels flooded airport
2011 (November)	Coastal Flood	Storm caused water levels to rise significantly in the lower Yukon River with high-water levels at Scammon Bay
2013 (November)	Coastal Flood	Significant washout of roads and airport
2016	Flood	Flooding of airport and roads
2022 (September)	Storm	High-water levels flooded airport

How often do storms and flooding happen at Scammon Bay?

The table shows the history of storms in Scammon Bay.

	2022	2025	2030	2035	2040	2045
Cessna 208 Caravan	2,539	2,691	2,853	2,995	3,115	3,240
Casa C212 Aviocar	340	360	382	401	417	434
Cessna C206/207/209/210 Stationair	173	183	194	204	212	221
Cessna C208B Grand Caravan	124	131	139	146	152	158
Piper PA-31 Navajo	102	624	661	695	722	751

The study forecast which airplanes will use the runway. The top 5 aircraft are shown in the table.

The Cessna 208 Caravan is expected to have the most operations.

The Piper PA-31 Navajo is expected to have increasing operations.

The forecasted critical aircraft is B-II (Small). This classification helps guide the design of the airport.

The inventory also documented these issues with the airport:

1. Runway erosion
2. Runway flooding
3. Cross-runway culvert failure
4. Inadequate crosswind coverage

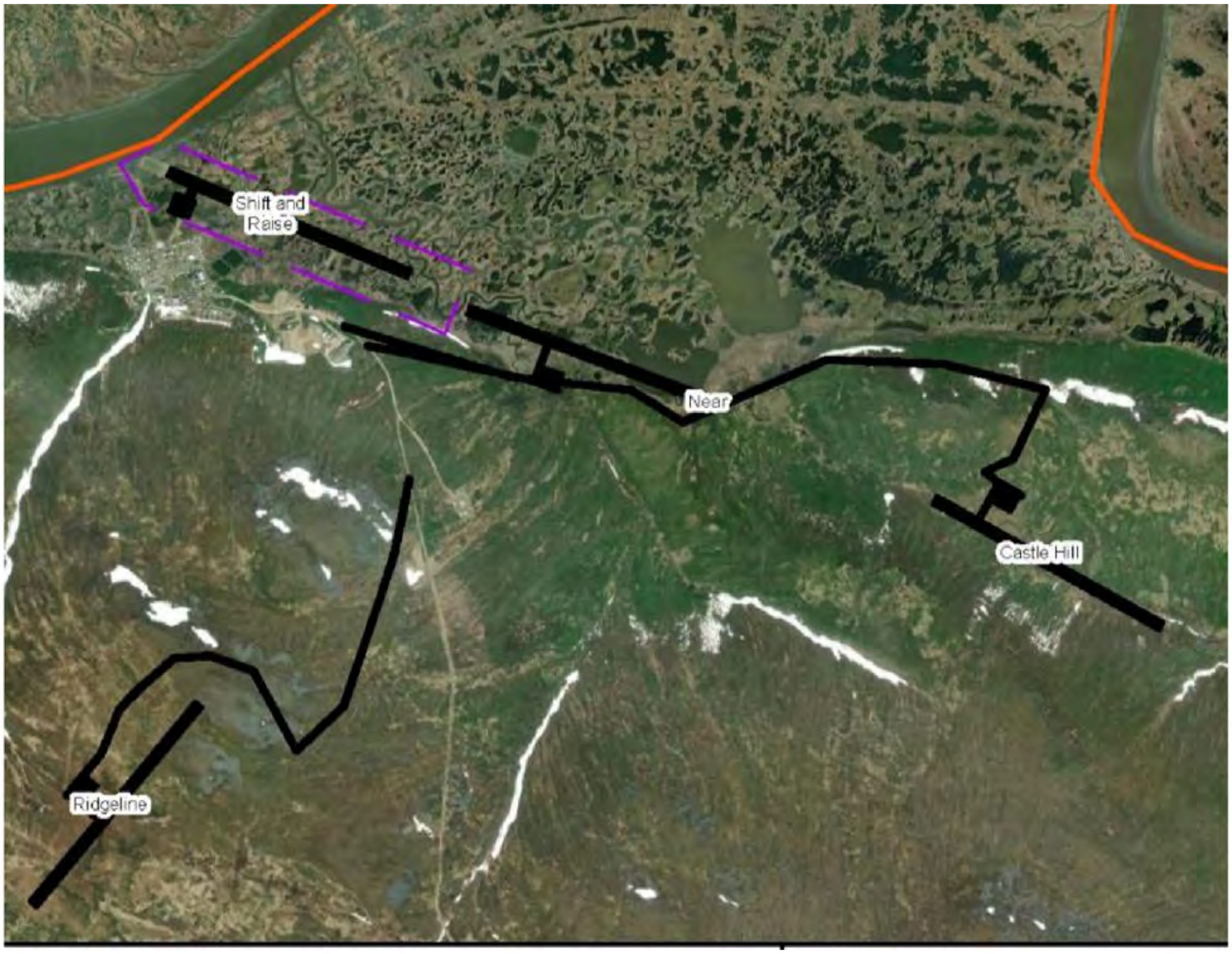
Previous studies have found:

Flooding threats can be resolved by raising the airport to +18.5 feet.

Erosion can be resolved by moving the airport inland 340 feet, and installing erosion protection infrastructure.

The cost for these improvements is similar to the cost of relocating the airport entirely.

The analysis lead DOT&PF to evaluate potential alternative locations.



5 Alternatives were examined:

Alternative 1 ("No Action") is for comparison, and does not solve the threats.

Alternative 2 (“Shift & Raise”) is shifting the runway 340 feet inland along its current alignment as protection from river movement. This alternative includes raising the surface elevation to +18.5 feet and installing erosion protection.

Alternative 3 (“Near”) is moving the Airport out of town, along the foothills.

Alternative 4 (“Castle Hill”) is moving the Airport to the valley between Castle Hill and the Askinuk Mountains.

Alternative 5 (“Ridgeline”) is moving the Airport to the ridgeline above Scammon Bay in the Askinuk Mountains.

Now we are engaging in Public Involvement. Your input is important in reviewing the potential alternatives!

Let's look at those alternatives in more detail.

Alternative 2: Shift & Raise

Safety and Reliability:
90.4% wind coverage

Protected from erosion

Convenient for passengers

Land Status: Acquire 3 acres of land

Environmental: Relatively low impacts

Constructability: Challenge, must allow operations at airport to continue

Cheaper with local material sites

Cost:

$75 M (local material)

$130 M (barged material)

Alternative 3: Near

Safety and Reliability:

Unknown wind coverage

Protected from erosion

Inconvenient for passengers

Land Status: Acquire 92 acres of land

Environmental: Medium new impacts (less than other move alternatives)

Constructability: Similar to Alternative 2, but existing runway would remain operational during construction

Access road may be difficult to construct and maintain

Cost:

$94 M (local material)

$182 M (barged material)

Alternative 4: Castle Hill

Safety and Reliability:

Unknown wind coverage

Protected from erosion

Very inconvenient for passengers

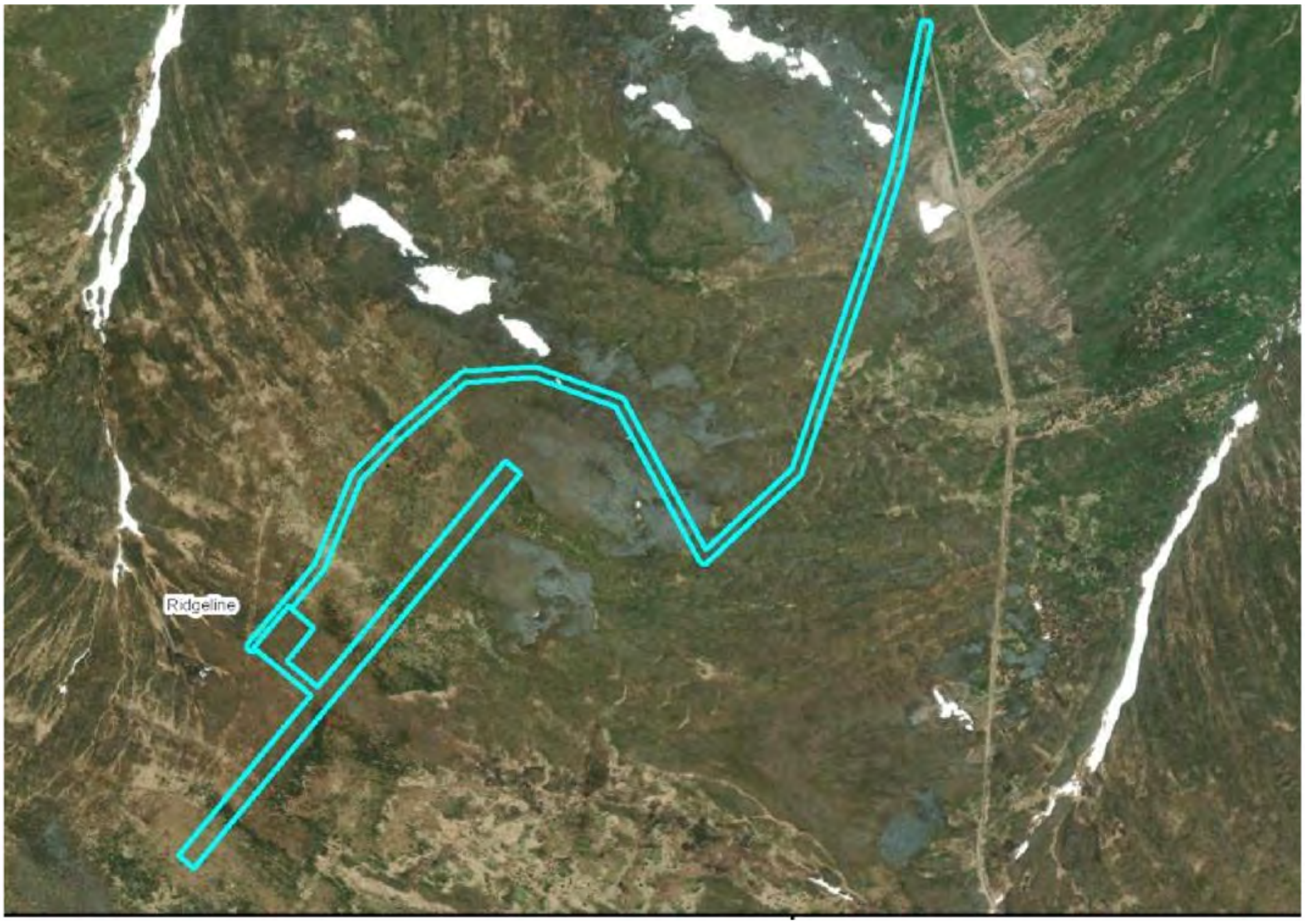
Land Status: Acquire 110 acres of land

Environmental: Relatively high impacts

Constructability: Existing runway would remain operational during construction

Access road may be difficult to construct and maintain

Cost:
$66 M (local material)
$126 M (barged material)



Alternative 5: Ridgeline

Safety and Reliability:
Unknown wind

Protected from erosion

Most inconvenient for passengers

Land Status: Acquire 104 acres of land

Environmental: Relatively high impacts

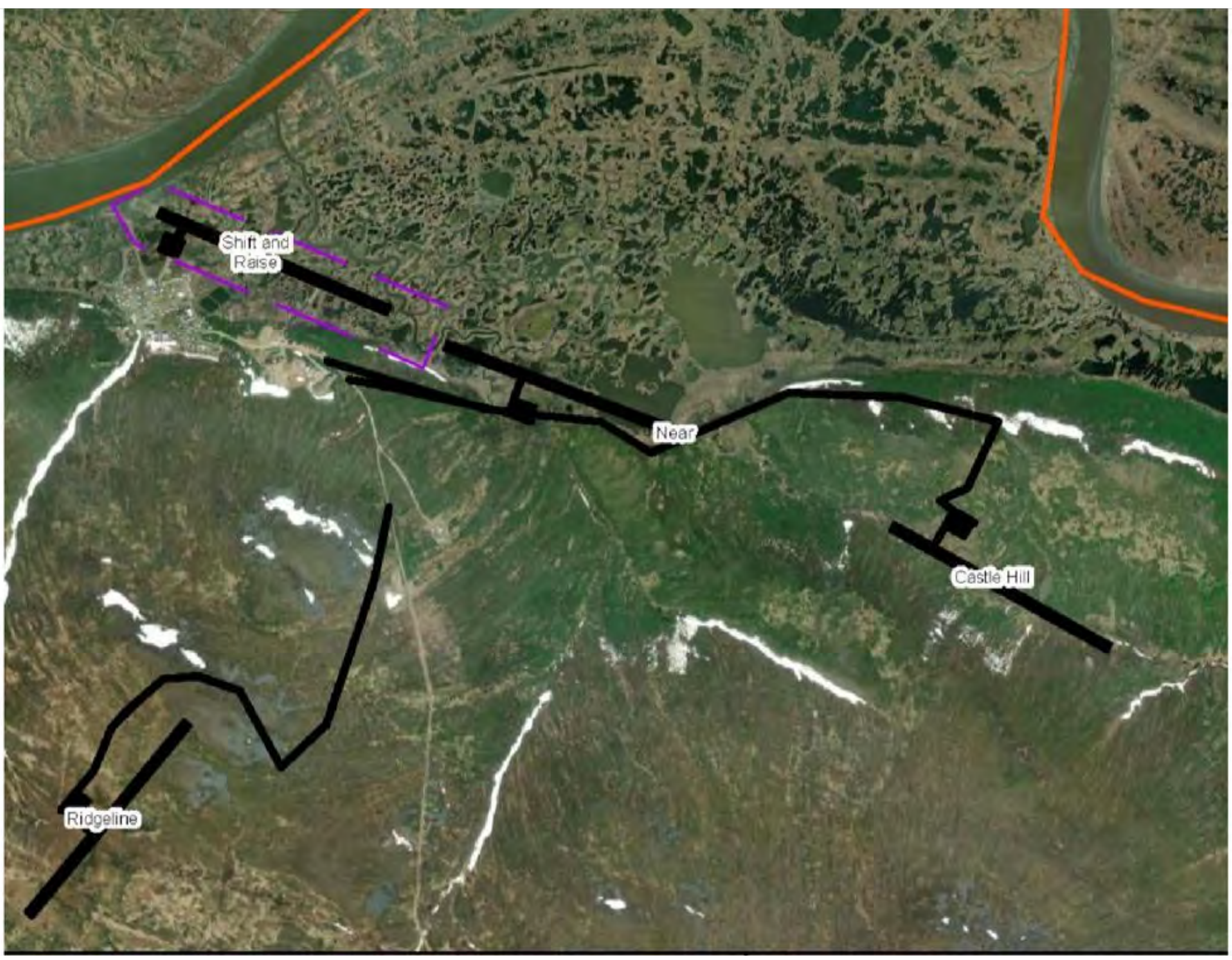
Constructability:
Existing runway would remain operational during construction

Most difficult for land acquisition, construction time, and maintenance

Access road may be difficult to construct and maintain

Cost: Cheapest from planning level – but high uncertainty of cost

$59 M (local material)
$109 M (barged material)



Alternative Comparison

Prior to engaging in Public Involvement

Alternative 5 Ridgeline is least expensive but has the most risk

Alternative 2: Shift & Raise is more expensive, but provides a beneficial mix of operational safety, passenger convenience, limited environmental impact, and cost effectiveness

Questions

What is your alternative preference?

Do you have insights into how to make the process better?

Leave a comment at: ScammonBayAirportPlan@stantec.com

or

https://dot.alaska.gov/creg/scammon/

Brochure

Alaska Department of Transportation & Public Facilities
Scammon Bay Airport Planning Study
Public Meeting: June 18th 12:00 PM (Noon)
Scammon Bay New Armory

The Alaska Department of Transportation and Public Facilities (DOT&PF) is conducting a planning study for the Scammon Bay airport. Scammon Bay is a remote community located near the Bering Sea, along the Kun River. The airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. The project has analyzed the potential for coastal threats at the current airport, and a variety of potential relocation alternatives.

What are the Alternatives?

Alternative 1: No Action: Does not resolve the flooding and erosion threats.

Alternative 2: Shift & Raise: Shifts the runway 340 feet inland and raises the surface elevation to +19.5 feet and installs erosion protection.

Alternative 3: Near: Moves the Airport onto the transition between lowlands and the Askinuk Mountains, near the community of Scammon Bay.

Alternative 4: Castle Hill: Moves the Airport to the valley between Castle Hill and the Askinuk Mountains.

Alternative 5: Ridgeline: Moves the Airport to the ridgeline above Scammon Bay.

Public Scoping

This public scoping will gather stakeholder input on all the potential alternatives. Stakeholder input is an important criteria for selecting a preferred alternative.

How do the Alternatives compare?

Prior to engaging in Public Involvement, the two proposed alternatives for the most erosion protection are Alternative 2: Shift & Raise, and Alternative 5: Ridgeline.

Alternative 2: Shift & Raise: Provides the best combination of operational safety, passenger convenience, limited environmental impacts, and is likely the most cost-effective alternative. This alternative requires land acquisition, which may delay project design and construction.

Alternative 5: Ridgeline has the lowest cost estimate for airport surface construction because it does not require additional flooding and erosion protection. It may be the least feasible option, or most uncertain, due to lack wind data and visibility issues though.

Installation of a weather station and further analysis would be needed to determine the feasibility of this alternative. If the runway alignment needs to be significantly different, the cost of excavation and fill will increase and reduce the overall cost savings.

Alternative 5 ("Ridgeline") would be inconvenient for passengers and would cause significant environmental impact. This alternative requires substantial land acquisition and construction of a new access road, which could delay much needed airport improvements for the community. Access road maintenance would be problematic and expensive.

You can send this comment card to:

Philana Miles, DOT&PF

PO Box 196900, Anchorage, AK 99519,
philana.miles@alaska.gov or e-mail the project at
ScammonBayAirportPlan@stantec.com

Alaska Department of Transportation & Public Facilities
Scammon Bay Airport Planning Study
Public Meeting: June 18th 12:00 PM (Noon)
Scammon Bay New Armory

Evaluation Factor	1: No Action	2: Shift & Raise	3: Near	4: Castle Hill	5: Ridgeline
Safety and Airport Resiliency					
Elevation: Floodplain	+10 - +17.5 feet	+19.5 feet	+19.5 feet	+138 feet	+1,013 feet
Distance from river	0 feet	340 feet	11,000 feet	Above Floodplain	Above Floodplain
Fog & Low Visibility	0.3%	0.3%	0.3%	~0.3 - 6.7%	17.0%
Wind Coverage	90.4%	90.4%	Unknown	Unknown	Unknown
Wind Strength	N/A	Similar to SCM	Unknown	Unknown	Higher
Airport Geology	Good	Poor	Poor	Good	Good
Land Status					
Land Ownership	DOT&PF	DOT&PF, Calista, Askinuk	Calista and Askinuk	Calista and Askinuk	Calista and Askinuk
Likelihood of Acquisition	N/A	Likely	Uncertain	Uncertain	Uncertain
Subsistence Resources	No significant	Low (Fish, Moose, Grouse, Waterfowl, Berries)	Medium (Fish, Moose, Grouse, Waterfowl, Berries)	Medium (Fish, Grouse, Waterfowl, Berries)	Medium (Grouse, Waterfowl, Berries)
Environmental					
Noise	Medium	Medium	Low	Low	Low
Wetlands	0	2.5 acres	11.4 acres	9.5 acres	0.3 acres
Fish	No significant	Runway culvert	No significant	No significant	No significant
Birds & Other Wildlife	No significant	16.6 acres	20.9 acres	39.7 acres	33.2 acres
Cultural Resources	No known	Potential impacts to known area	No known areas	No known areas	No known areas
Contaminated Sites	No significant	No significant	No significant	No significant	No significant
Passenger Convenience	Best	Best	Medium	Low	Very Low
Distance to Community Center	0.3 miles	0.3 miles	2.2 miles	4.5 miles	6 miles
Constructability					
Constructability	Feasible	Challenge	Feasible	Feasible	Feasible
Distance to Solid Waste	3,560 feet	3,260 feet	3,800 feet	14,000 feet	10,900 feet
Distance to Sewage Lagoon	550 feet	550 feet	7,000 feet	9,500 feet	6,000 feet
Maintenance of Access Road	Easy	Easy	Difficult	Very Difficult	Very Difficult
Materials					
Unclassified Excavation	0	15,440 cy	40,306 cy	166,594 cy	47,991 cy
Borrow	0	161,330 cy	370,691 cy	284,495 cy	224,174 cy
Subbase	0	51,215 cy	58,313 cy	72,222 cy	67,426 cy
Crushed Aggregate	0	38,515 ton	41,369 ton	52,797 ton	47,539 ton
Primary Armor Stone	0	61,353 ton	61,353 ton	0	0
Underlayer Stone	0	53,731 ton	53,731 ton	0	0
Material Source Distance (Local)	0	7,300 feet	2,000 feet	600 feet	2,000 feet
Utilities					
Utilities (Cost)	No significant	$237,000	$1,838,500	$3,677,000	$4,911,000
Erosion Protection*	$0	$20 M Local, $31 M Barged	$20 M Local, $31 M Barged	$0	$0
Land Purchase	No significant	$3,000	$5,000	$23,000	$17,000
Cost Summary					
Total Cost (Local)	$0	$75,642,172.51	$94,588,701.28	$66,714,222.21	$59,398,368.40
Total Cost (Barged)	$0	$130,430,801.50	$182,828,675.60	$126,997,026.70	$109,266,097.40
Public Opinion	TBD	TBD	TBD	TBD	TBD

Alaska Department of Transportation & Public Facilities
Scammon Bay Airport Planning Study
All Comments Are Welcome!

Please complete this comment sheet to help us improve your airport. Thank you.

Name: ______________________ Telephone: ______________________

Address: ______________________ Email: ______________________

Please provide comments you think may be helpful for this plan. Are there specific improvements needed at the airport? What are your concerns about operations, maintenance, land use, or other airport issues?

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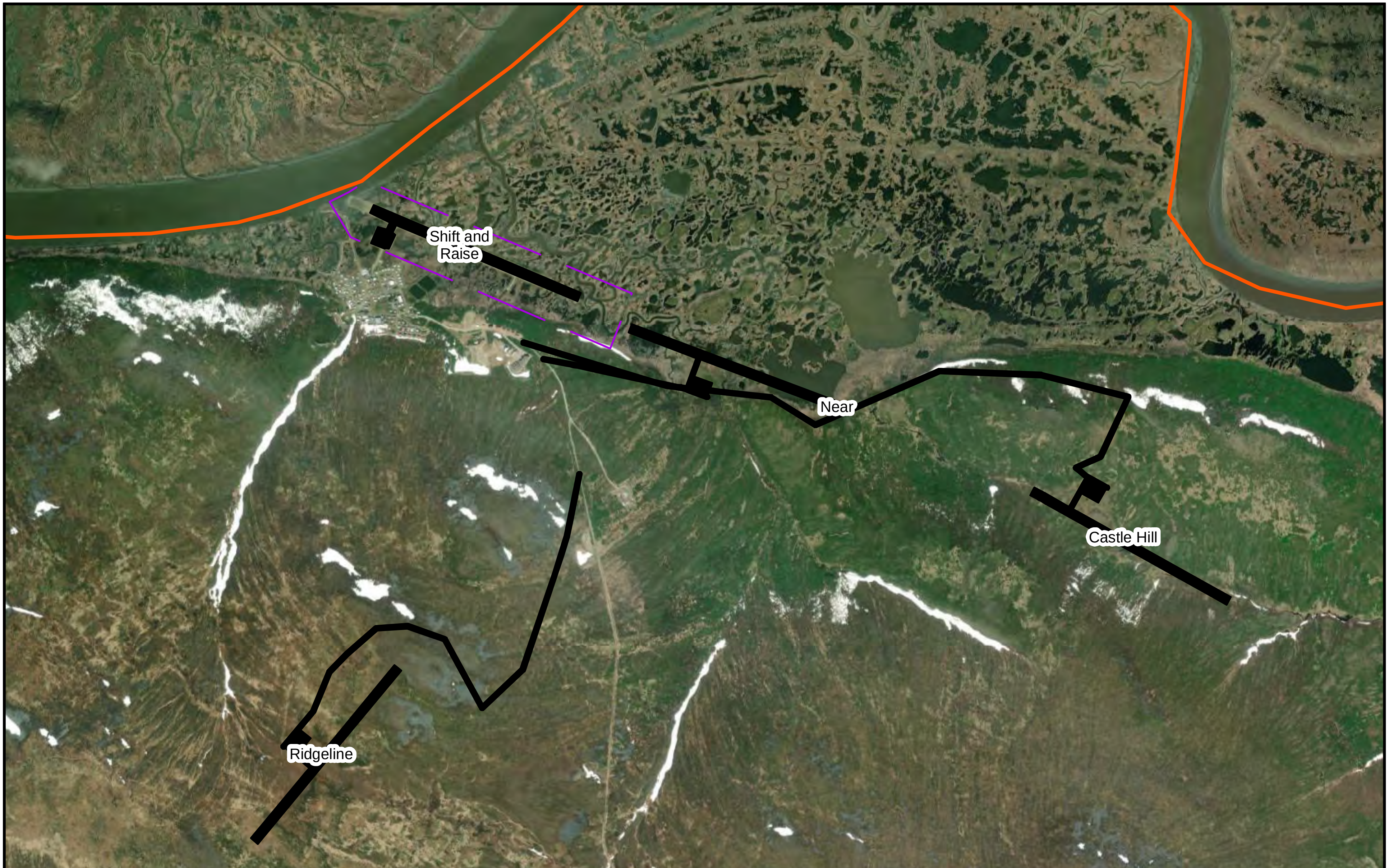
You can send this comment card to:

Philana Miles, DOT&PF

PO Box 196900, Anchorage, AK 99519 or e-mail to
ScammonBayAirportPlan@stantec.com



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1:27,972 (At original document size)

Notes:
1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

Study Area
Airport Boundary
Alternatives (2024)

SCAMMON BAY
AIRPORT PLANNING STUDY

STATE OF ALASKA
Department of Transportation and Public Facilities
4111 Aviation Ave, Anchorage, Alaska 99516

April 2024

Figure 3-1: Alternatives

KYUK Radio Interview

Improving the Scammon Bay Airport

Published June 17, 2024 at 9:39 AM AKDT

LISTEN • 11:12

Ways To Subscribe

Apple
Spotify

There is an effort to improve the Scammon Bay Airport. Joining us for "Coffee" today are Philana (fill-ANN-nah, rhymes with Banana) Miles, the project manager for the state Transportation Department, and Ryan Cooper, Airport Planner with the Stantec Company. Here to speak with them is KYUK's Gabby Salgado.

Coffee at KYUK

Careers and Opportunities

Media Sharing Policy

Contact Us

Reports

Coffee at KYUK | on-demand

Improving the Scammon Ba...

Newspaper Notice

The Delta Discovery

VILLAGE TELEGRAPH

Yup'ik and Inupiaq Spelling Bee has record number of schools participating

The 2023-2024 Yup'ik and Iñupiat statewide spelling bees were held on Saturday, April 13th at the Alaska Native Science and Engineering Program's Acceleration Academy building on the UAA campus in Anchorage. This year the spelling bees had a record number of schools and spellers participating furthering Indigenous language accomplishments and learning.

Below are the results of this year's spelling bees, courtesy of Spelling Bee Organizer Freda Dan. A livestream of the spelling bees may be found on the Alaska Native Language Spelling Bee for Beginners Facebook page: https://fb.watch/rq-DBUEnAX/.

IÑUPIAT SPELLING BEE Results

The winners of the statewide Iñupiat spelling bee, with the Iñupiat names first and the English name in parentheses:

Aġnauraq (Jaeleen Holder)

Uluġina (Annabeth Huntington)

Both Iñupiat spellers were from Kéet Gooshi Héen Elementary School in the Sitka School District, coached by Suzzuk Mary Huntington.

YUP'IK SPELLING BEE Results

The winners of the statewide Yup'ik spelling bee, with the Yup'ik name first, English name in parentheses:

1st Arnayaraq (Kirsten Akaran Manumik), 7th grade

Nunam Iqua School, Lower Yukon School District

2nd Pilinguasta (Brennan Paje), 7th grade

Tukurngailnguq School, Stebbins, Bering Straits School District

3rd Cukanraq (Jaylynn Strongheart), 5th grade

Nunam Iqua School, Lower Yukon School District

***

This year's spelling bee had a record 21 Yup'ik spellers from five districts and eight schools. Below is a list of this year's state spelling bee participants and their coaches.

Yupiit School District

Arlicaq School, Akiak

Coach: Ada Jasper

Cakiller' (Megan Carl), 5th grade

Qakvalria (Cray Philip), 5th grade

Arnaurluq (Sonya Jackson), 5th grade

Tuluksak School, Tuluksak

Coach: Ruth Napoka

Nug'ur (Calvin Allain), 6th grade

Araiyar (Roxann Alexie), 8th grade

Akiachak School, Akiachak

Coach: Henry Kanulie

Caurluq (Brianna Snyder), 5th grade

Aqsatuyaq (Jacelyn Frank), 7th grade

Anguk'aq (Chassidy George), 7th grade

Lower Yukon School District

Nunam Iqua School, Nunam Iqua

Coach: Savanna Strongheart

Cukanraq (Jaylynn Strongheart), 5th grade

Arnayaraq (Kirsten Akaran Manumik), 7th grade

Qiatuaq (Jayden Strongheart), 4th grade

Alakanuk School, Alakanuk

Coach: Kenneth Lee

Lertuli (Ian Agayar), 7th grade

Suqaapiaq (Charity Westlock), 6th grade

Carayak (Kian Beck)

Cherilee Buster, 5th grade

Lower Kuskokwim School District

Ayaprun Elitnaurvik, Bethel

Coach: John Chakuchin

Narr'aq (Alicea Nick), 8th grade

Ciugun (Jesslyn Paul), 6th grade

Cakayak (Nolan Nicholas), 5th grade

Dillingham City School District

Dillingham Middle School

Coach: Katarina Mowrer

Palakia (Alora Wassily), 8th grade

Anaanacuaq (Bridget George), 8th grade

Bering Straits School District

Tukurngailnguq School, Stebbins

Coaches: Qanikcaq Rebecca Atchak and Minnie Aluska

Pilinguasta (Brennan Paje), 7th grade

Keggutailnguq (Natasha Raymond), 7th grade

Photo by Ruth Dan

Yup'ik Spelling Bee winner Arnayaraq Kirsten Akaran Manumik, 7th Grade.

Photo by Dan Hofmann

Inupiaq Spelling Bee winners Agnauraq Jaeleen Holder 1st place (at right) and Ulugina Annabeth Huntington runner-up, both of Sitka.

Notice of Intent to Conduct Preliminary Engineering and Environmental Scoping Activities

Scammon Bay Airport Feasibility Study

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Aviation Administration (FAA) announce:

A public meeting at the Scammon Bay New Armory is occurring at 1pm on May 16th.

This meeting is an opportunity for the public to provide comment about the current airport, airport alternatives, and provide an opinion on the future development for the airport.

Interested persons can attend the public meeting or provide additional comments by contacting:

Philana Miles, C.M., Project Manager, DOT&PF
PO Box 196900, Anchorage, AK 99519-6900, (907) 269-0519, philana.miles@alaska.gov, ttps://dot.alaska.gov/creg/scammon/

Ryan Cooper, Consultant, Stantec, (907) 343-5241, ryan.cooper@stantec.com

NONDISCRIMINATION: It is the policy of the Alaska Department of Transportation and Public Facilities (DOT&PF) that no one shall be subject to discrimination on the basis of race, color, national origin, sex, age, or disability, regardless of the funding source, including Federal Transit Administration, Federal Aviation Administration, Federal Highway Administration, Federal Motor Carrier Safety Administration and State of Alaska funds. Title VI Nondiscrimination Policy: https://dot.alaska.gov/tvi_statement.shtml. To file a complaint: dot.alaska.gov/cvlrts/titlevi.shtml.

The DOT&PF complies with Title II of the Americans with Disabilities Act of 1990. Individuals with disabilities who may need auxiliary aids, services, and/or special modifications to participate in this public meeting should contact: Philana Miles, C.M., Project Manager, DOT&PF, (907) 269-0519, text telephone (TDD) (907) 451-2363

Requests should be made at least 14 days before the accommodation is needed.

Social Media

Social Media

Scammon Bay Airport Planning Study

Love the Scammon Bay Airport? We do too!

A public meeting is being held about the airport in Scammon Bay on

May 16th at 12:00 PM (noon) in the New Armory.

The Scammon Bay Airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. This study has prepared an analysis of the existing conditions of the airport, and potential alternatives for development.

This meeting allows you to provide comments about the airport alternatives and have input on the future development for the airport.

Want to learn more? Visit: https://dot.alaska.gov/creg/scammon/

Online Public Notice

Notice of Intent to Conduct Preliminary Engineering and Environmental Scoping Activities

Scammon Bay Airport Feasibility Study

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Aviation Administration (FAA) announce a public meeting for the Scammon Bay Airport Feasibility Study.

The Scammon Bay Airport is threatened by riverine flooding from the Kun River that overtops the airport every five to ten years. This study has prepared an analysis of the existing conditions of the airport, the airport's needs, and potential alternatives for developing aviation infrastructure.

A public meeting is being held in Scammon Bay on May 16th at 12:00 PM (noon) in the New Armory. This meeting is an opportunity for the public to provide comment about the current airport, airport alternatives, and provide opinions on the future development for the airport.

Interested persons can attend the public meeting or provide additional comments by contacting:

Philana Miles, C.M., Project Manager, DOT&PF
PO Box 196900, Anchorage, AK 99519-6900
(907) 269-0519, philana.miles@alaska.gov
https://dot.alaska.gov/creg/scammon/

Ryan Cooper, Consultant, Stantec, (907) 343-5241, ryan.cooper@stantec.com

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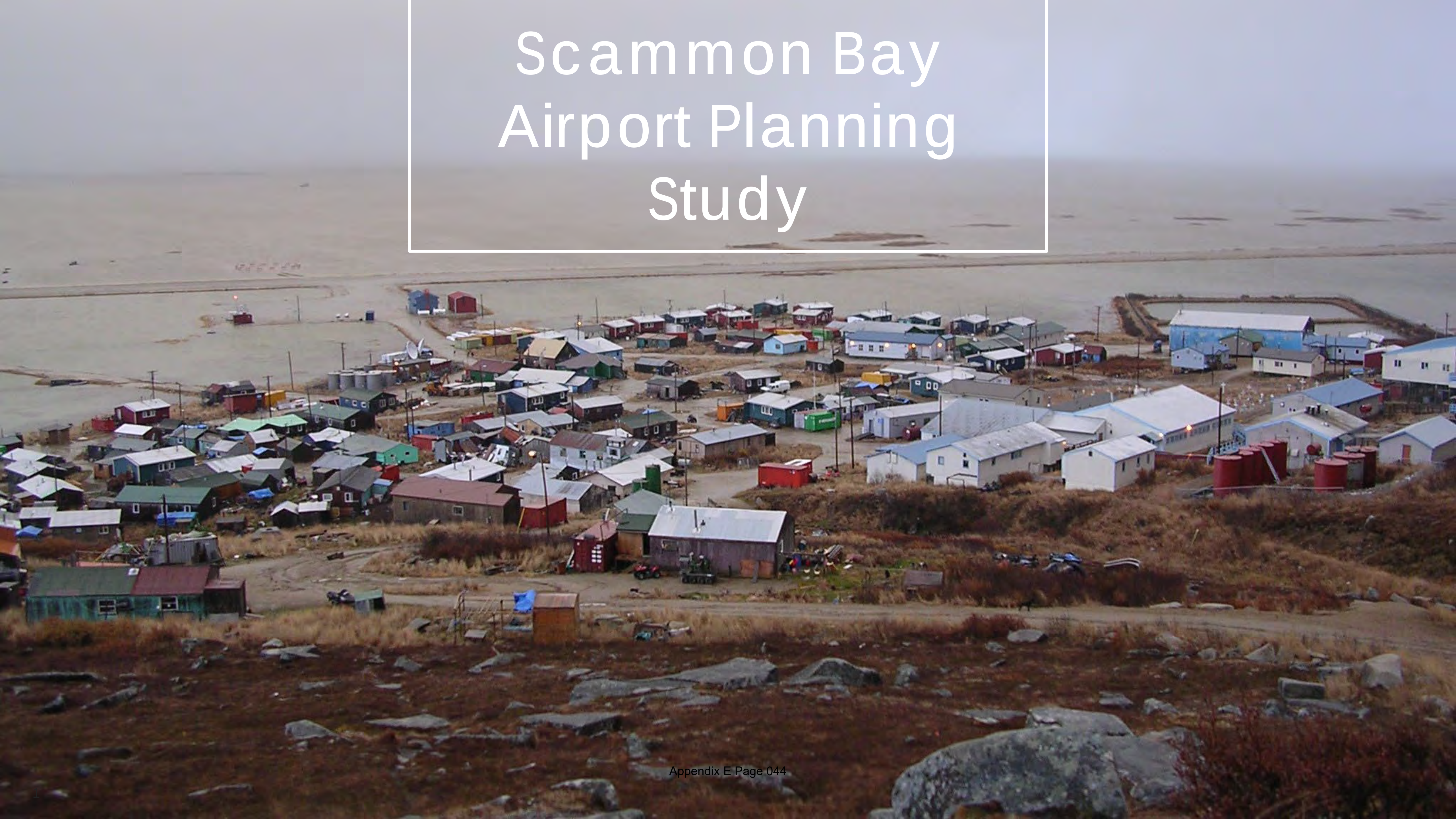
The DOT&PF complies with Title II of the Americans with Disabilities Act of 1990. Individuals with disabilities who may need auxiliary aids, services, and/or special modifications to participate in this public meeting should contact: Philana Miles, C.M., Project Manager, DOT&PF, (907) 269-0519, text telephone (TDD) (907) 451-2363.

Requests should be made at least 14 days before the accommodation is needed.

Public Meeting PowerPoint

Scammon Bay Airport Planning Study



Project Purpose:

Improve the safety of aviation at Scammon Bay

Threats:

- Flooding
- Erosion

Why is this important?

- Scammon Bay is not connected to the road
- Airport is the only year-round access to medical care, groceries, and heating
- Airport is the only year-round access for travel for school events
- Infrequent barge service and no ferry service
- Population is growing in Scammon Bay

Storm History

Date	Event	Description
1976 (August)	Storm surge flood	Storm surge flood from Bering Sea. Flooded the airstrip, sewage lagoon, and two homes
1977	Flood	High wind driven waves
1981	Flood	Wind driven waves
1982	Flood	Wind driven waves
2004 (October)	Storm	High-water levels flooded airport
2011 (November)	Coastal Flood	Storm caused water levels to rise significantly in the lower Yukon River with high-water levels at Scammon Bay
2013 (November)	Coastal Flood	Significant washout of roads and airport
2016	Flood	Flooding of airport and roads
2022 (September)	Storm	High-water levels flooded airport

Coastal Analysis

Recommends

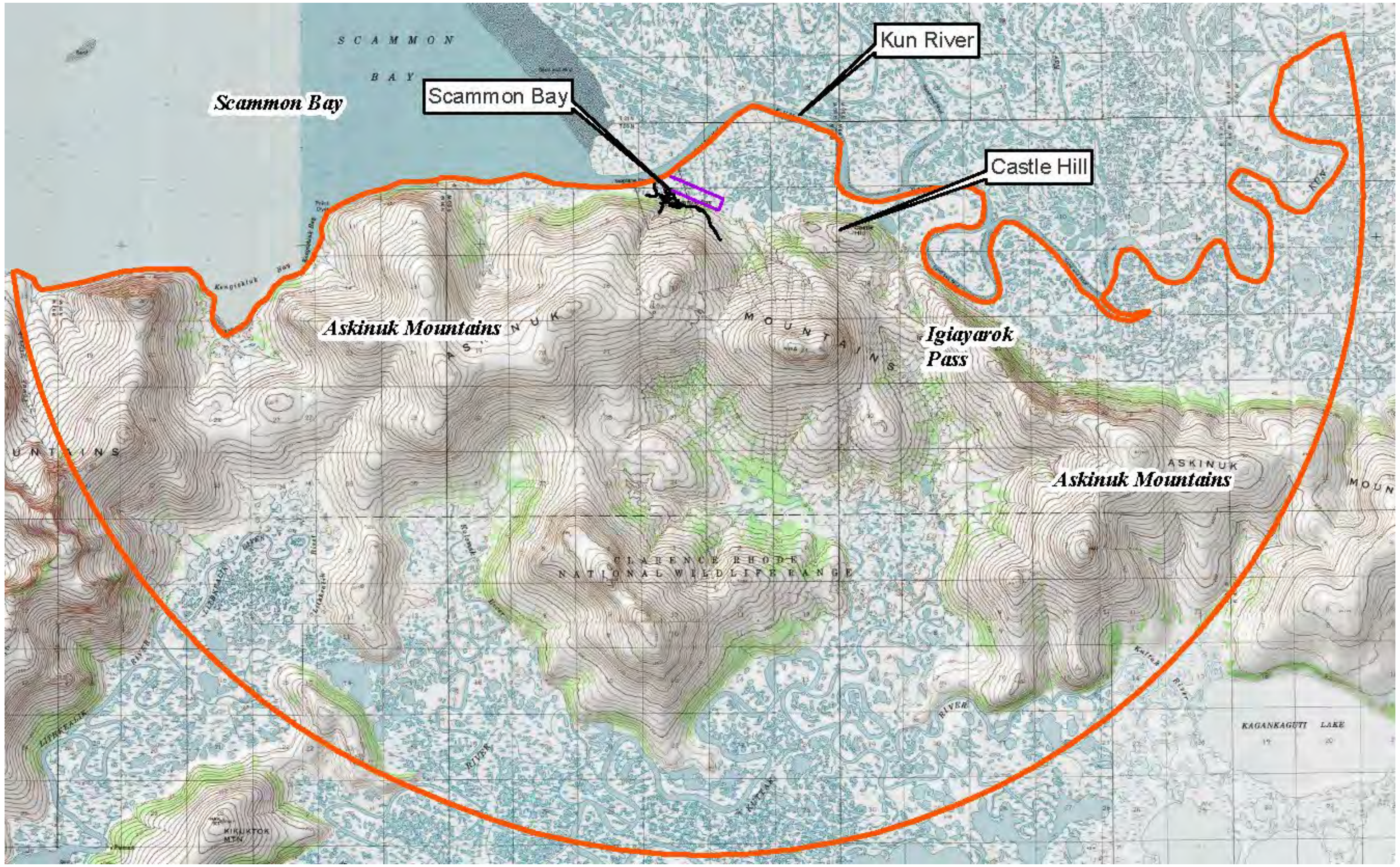
- Shifting airport inland 340 feet +
- Increase in elevation +
- Add erosion protection armoring

Very Expensive

$67 million – $118 million

The cost for shifting the airport is similar to the cost of relocating the airport entirely.

The analysis lead DOT&PF to evaluate potential alternative locations.



Where we looked for alternative locations

Evaluation Criteria

- Constructability
  - Distance to Solid Waste
- Cost
- Environmental
  - AHRS Cultural Resources
  - Birds & Other Wildlife Habitat
  - Contaminated Sites
  - Distance to Community Center
  - Endangered Species
  - Fish
  - Marine Mammal Protection Act
  - Noise (Impacts to Residents)
  - Passenger Convenience
  - Wetlands

Evaluation Criteria

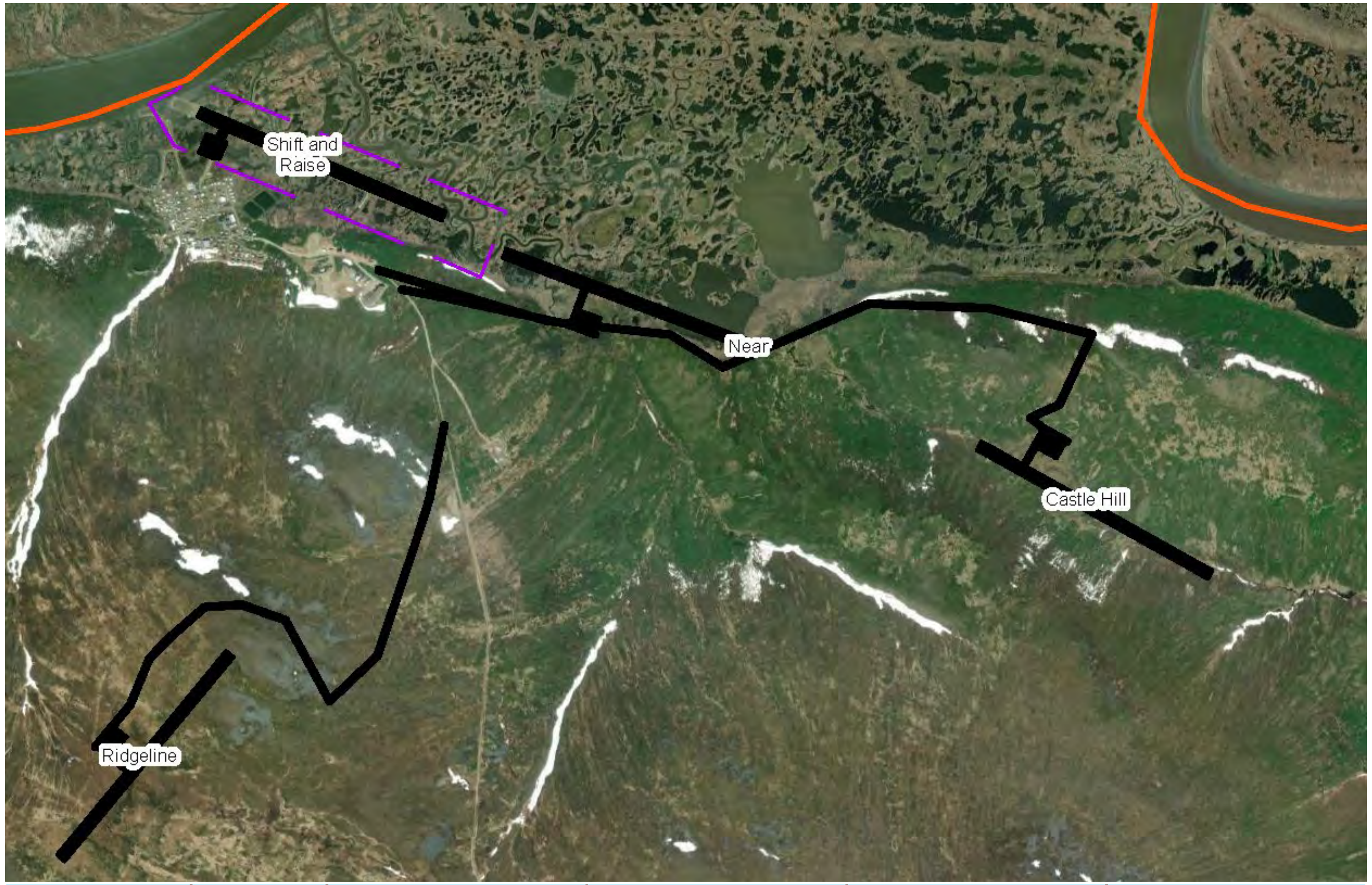
- Land Status
    - Land Ownership
    - Likelihood of Acquisition
    - Subsistence Resources

- Material Required
    - Material Source Distance (Local)

- Safety and Airport Resiliency
    - Airport Geology
    - Distance from river
    - Elevation (Floodplain)
    - Fog and Low Visibility
    - Wind Coverage
    - Wind Strength (Elevation)

- Utilities

Alternatives



	1: No Action	2: Shift & Raise	3: Near	4: Castle Hill	5: Ridgeline
Total Cost (Local)	$0	$75 M	$94 M	$66 M	$59 M
Total Cost (Barged)	$0	$130 M	$182 M	$126 M	$109 M

Alternative 1: No Action

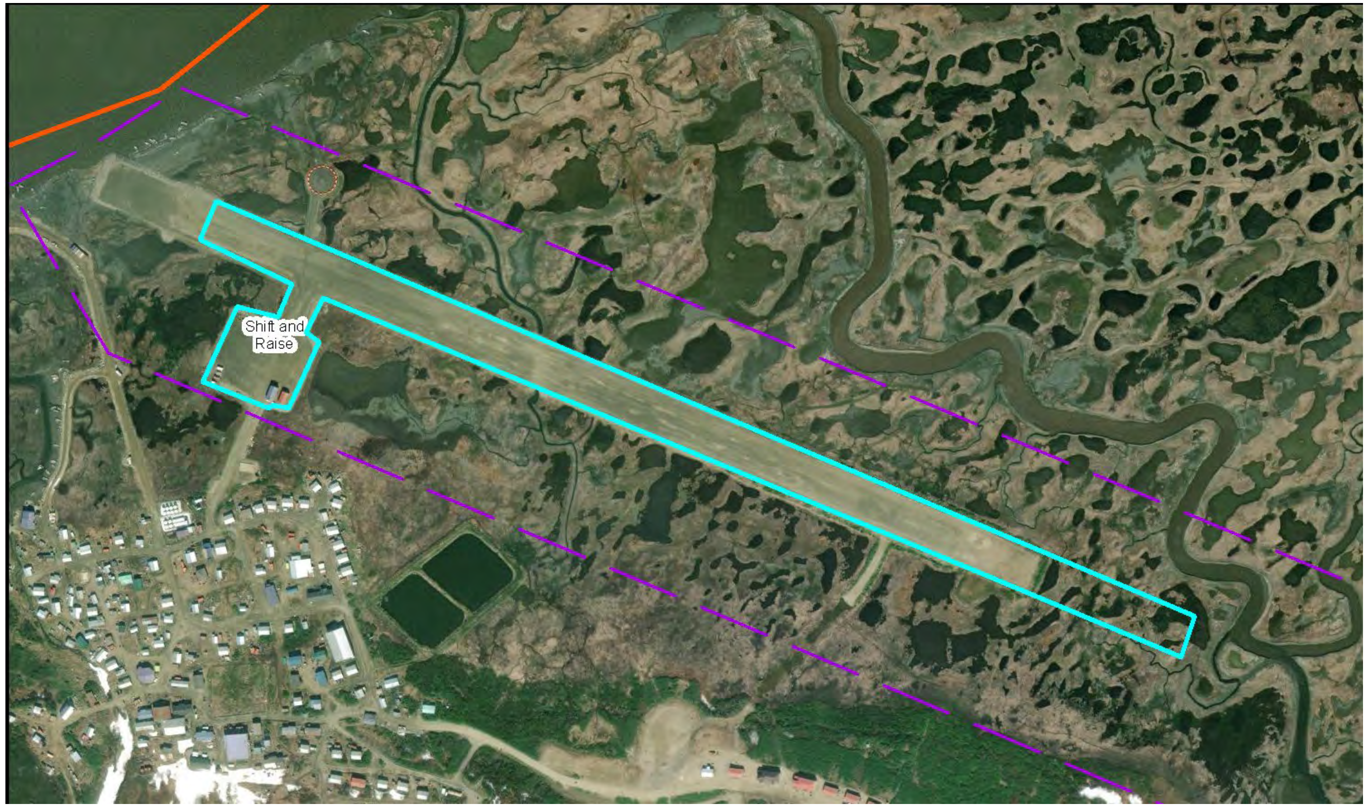
Alternative 2: Shift & Raise

Alternative 3: Near

Alternative 4: Castle Hill

Alternative 5: Ridgeline

Alternative 2: Shift & Raise



Safety and Reliability:
- 90.4% wind coverage
- Protected from erosion
- Convenient for passengers

Land Status:
- Acquire 3 acres of land

Environmental:
- Relatively low impacts

Constructability Challenges:
- Challenge, must allow operations at airport to continue
- Less expensive with local material sites

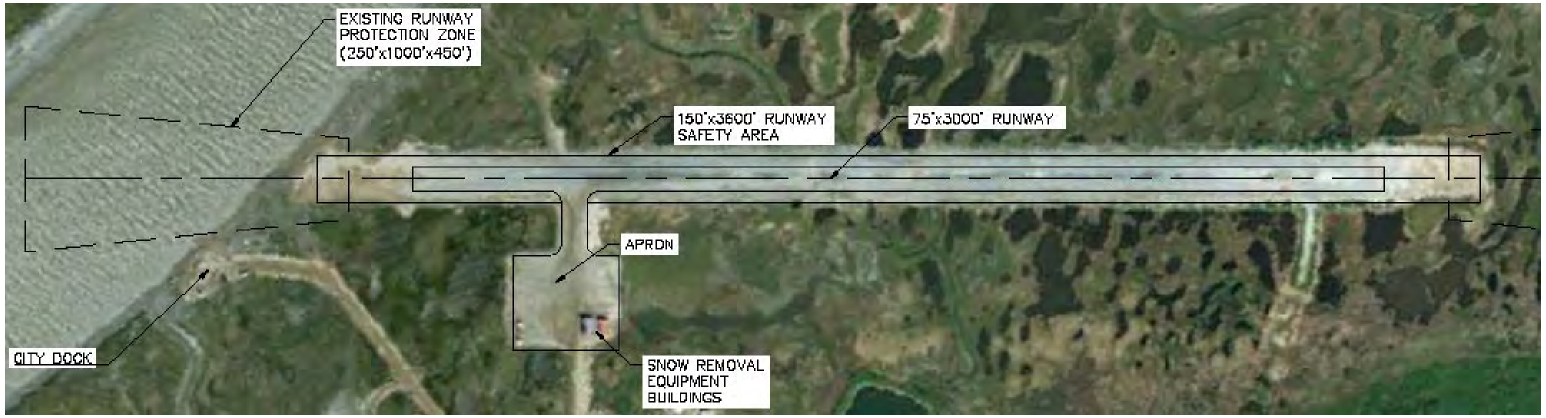
Cost:
$75 million (local material)
$130 million (barged material)

Alternative 2: Shift & Raise

Runway Protection

Would the community allow DOT&PF to purchase land for the airport?

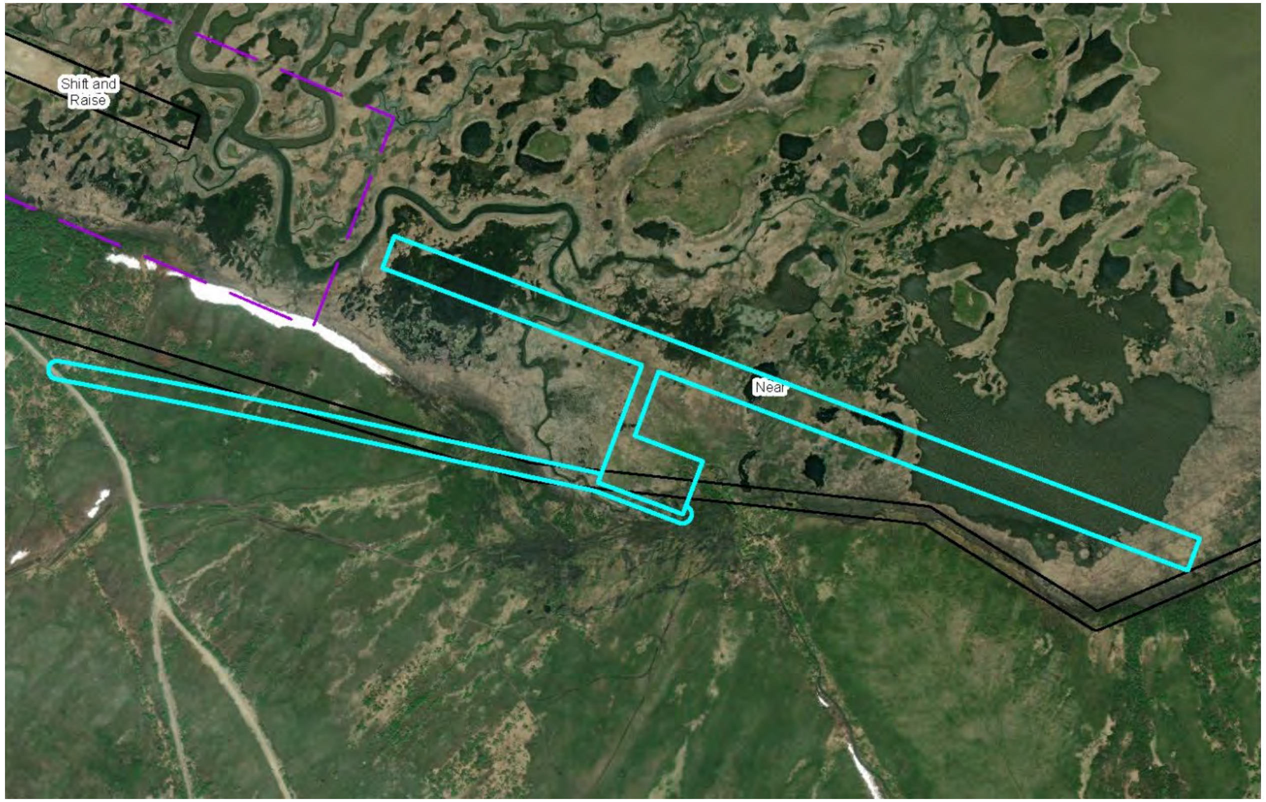
Safety areas are still needed whether the airport stays in the current relocation or is shifted and raised.



Existing Runway

Alternative 2: Shift & Raise

Alternative 3: Near



Safety and Reliability:

- Unknown wind coverage
- Protected from erosion
- Inconvenient for passengers

Land Status:

- Acquire 92 acres of land

Environmental:

- Medium new impacts (less than other move alternatives)

Constructability Challenges:

- Similar to Alternative 2, but existing runway would remain operational during construction
- Access road may be difficult to construct and maintain

Cost:

$94 million (local material)
$182 million (barged material)

Alternative 4: Castle Hill

Safety and Reliability:
- Unknown wind coverage
- Protected from erosion
- Very inconvenient for passengers

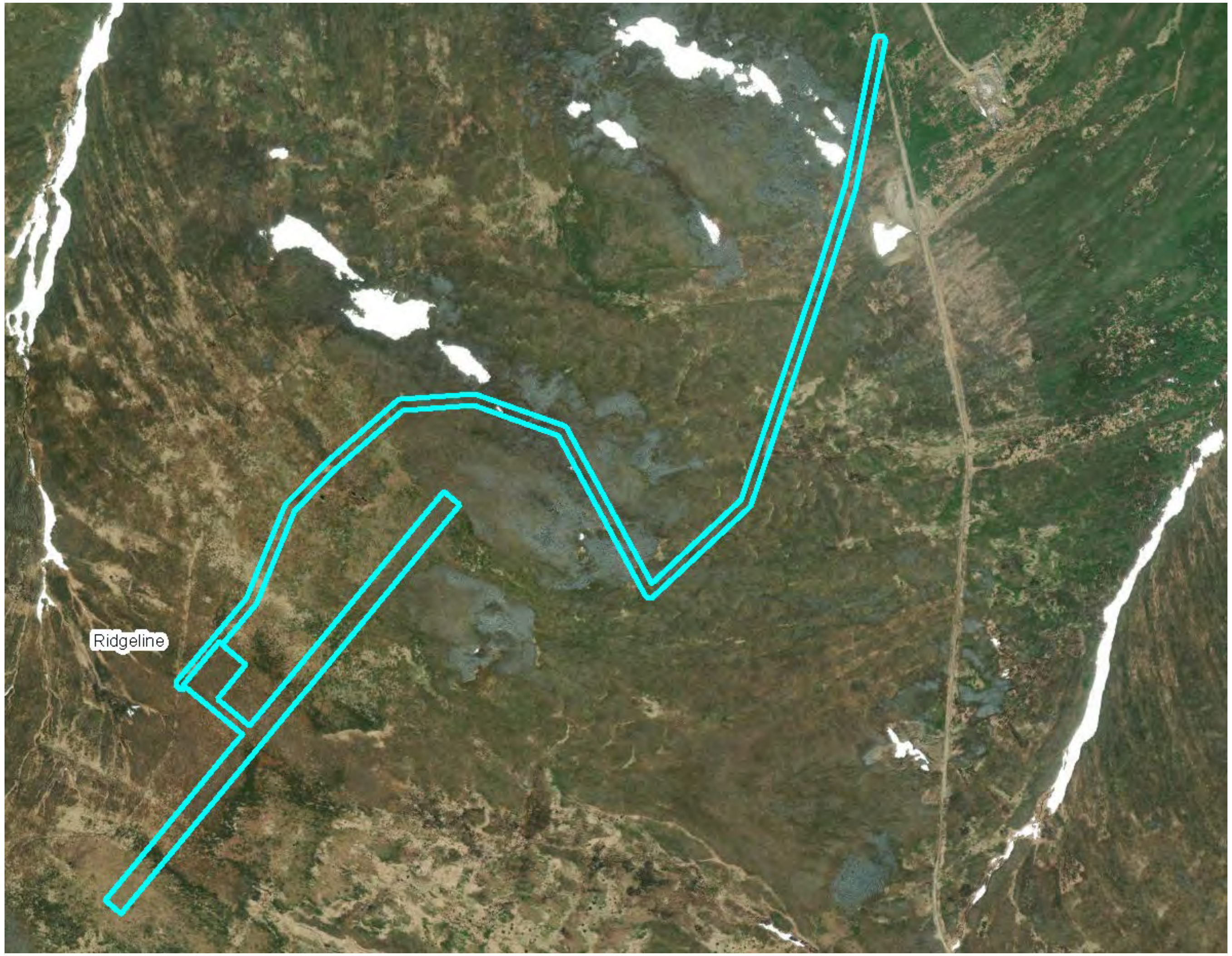
Land Status:
- Acquire 110 acres of land

Environmental:
- Relatively high impacts

Constructability Challenges:
- Existing runway would remain operational during construction
- Access road may be difficult to construct and maintain

Cost:
$66 million (local material)
$126 million (barged material)

Alternative 5: Ridgeline



Appendix E Page 056

Safety and Reliability:

- Unknown wind
- Protected from erosion
- Most inconvenient for passengers

Land Status:

- Acquire 104 acres of land

Environmental:

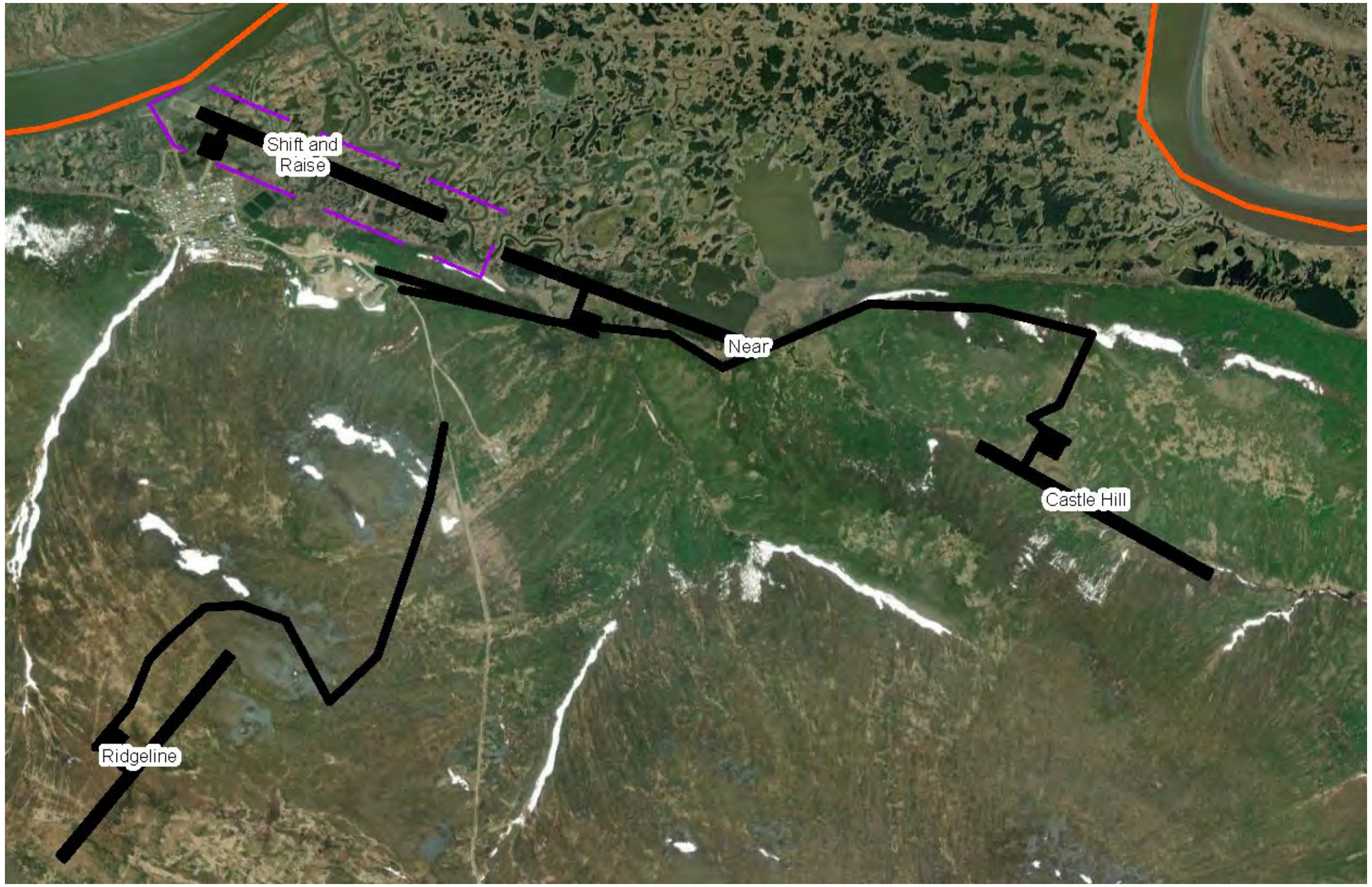
- Relatively high impacts

Constructability Challenges:

- Existing runway would remain operational during construction
- Most difficult for land acquisition, construction time, and maintenance
- Access road may be difficult to construct and maintain

Cost: Least expensive from planning level – but high uncertainty of cost
$59 million (local material)
$109 million (barged material)

Access Roads



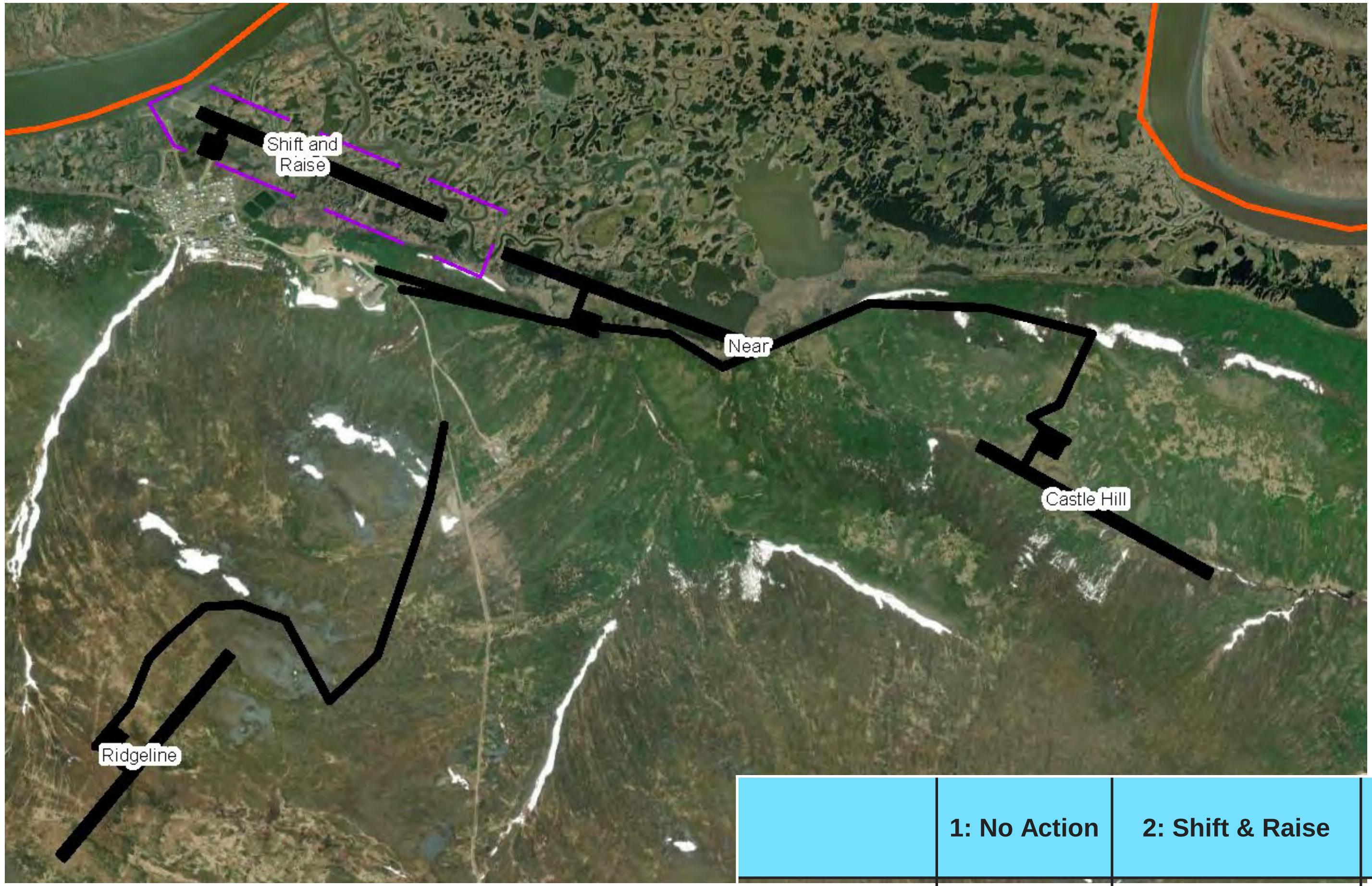
How to plow and maintain the access roads?

Access roads are AIP (Airport Improvement Plan) eligible for funding to the nearest non-aeronautical use intersection; such as a driveway or local road.

Local community typically maintains the roads beyond those points.

DOT&PF lacks the equipment and maintenance personnel to maintain long access roads in rural Alaska.

Alternative Comparison



Prior to engaging in Public Involvement

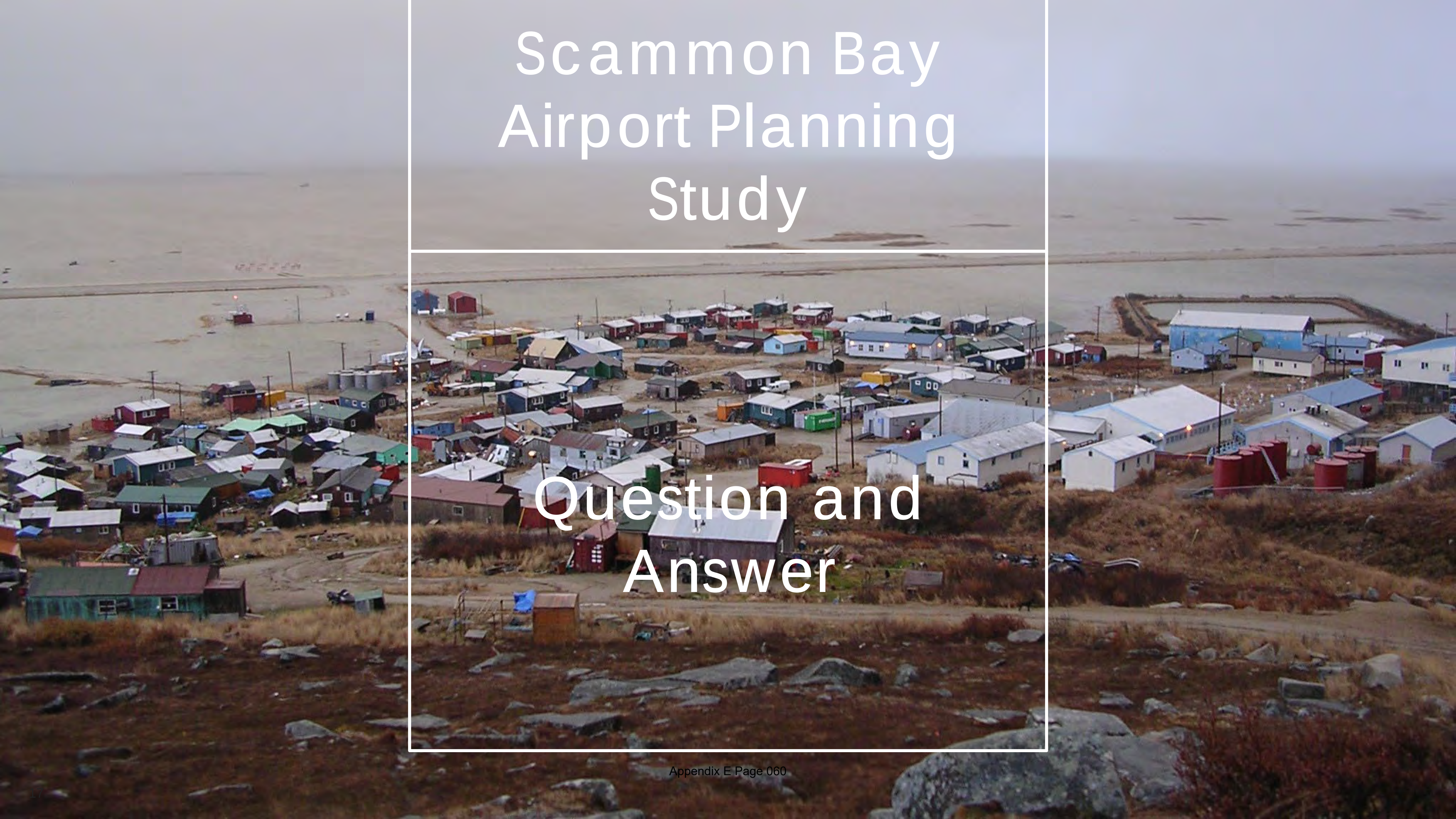
Alternative 5 Ridgeline is least expensive but has the most risk

Alternative 2: Shift & Raise is more expensive, but provides a beneficial mix of operational safety, passenger convenience, limited environmental impact, and cost effectiveness

	1: No Action	2: Shift & Raise	3: Near	4: Castle Hill	5: Ridgeline
Total Cost (Local)	$0	$75 M	$94 M	$66 M	$59 M
Total Cost (Barged)	$0	$130 M	$182 M	$126 M	$109 M

Questions

- Alternative Preference?
- Material Source
  - Opinions on development of a local material source
- Other Local Projects Near the Airport



Scammon Bay Airport Planning Study

Question and Answer

Public Meeting Sign in Sheet

ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES

Scammon Bay Airport Planning Study

Mailing List Sign Up Sheet

PROJECT NAME: Scammon Bay Airport Planning Study **DATE: June 18, 2024**

NAME (PLEASE PRINT)	MAILING ADDRESS and *EMAIL	PHONE	*GENDER (M/F)	*RACE (see below)
Ryan Cooper	Stantec	907 441 7008	M	White

*This information is **voluntary**. Its purpose is to ensure fair and equal representation by the public in all projects and programs administered by the Alaska Department of Transportation and Public Facilities. **RACE CATEGORIES: WHITE (W), ALASKA NATIVE (AN), NATIVE AMERICAN (N), BLACK (B), HISPANIC (H), ASIAN (A), PACIFIC ISLANDER (P), and OTHER (O)**

PROJECT NAME: Scammon Bay Airport Planning Study **DATE: June 18, 2024**

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Dean Maschner	Alaska Energy	907 771-3851		
Mark Swenson	HDL Engineering Consultants, LLC	907 382-0384		
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Lucas Jury		907 744-1088		

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effective: December 2004

PROJECT NAME: Scammon Bay Airport Planning Study **DATE: June 18, 2024**

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Clifford Kaganak Sr	P.O. Box 124 Scm Bay	558-615	m	AN
Noel Uttereyuk	PO Box 195	558-6443	M	AN
Carlie George	PO Box 57	558-6528	M	AN
John Akerelrea	P.O. Box 196	907 558 6100	m	N
River Simon	P.O. Box 44	907-558-6921	M	AN

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PROJECT NAME: Scammon Bay Airport Planning Study **DATE:** June 18, 2024

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effective: December 2004

PROJECT NAME: Scammon Bay Airport Planning Study **DATE: June 18, 2024**

NAME (PLEASE PRINT)	MAILING ADDRESS and *EMAIL	PHONE	*GENDER (M/F)	*RACE (W, AN, N, B, H, A, P, O)
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Mary Agvchak	97 Scm AK	538 7934	F	AN
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Lindsey Uttereyuk	lindseykasayull2024@gmail.com	310-3897	F	AN
Hazel Kaganak	[illegible]@yahoo.com	558 6059	F	AN.
Angelo Uttereyuk	[illegible]@gmail.com	558-6429	M	AN

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PROJECT NAME: Scammon Bay Airport Planning Study DATE: June 18, 2024

NAME (PLEASE PRINT)	MAILING ADDRESS and *EMAIL	PHONE	*GENDER (M/F)	*RACE (W, AN, N, B, H, A, P, O)
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Cooper, Ryan

Subject: RE: Scammon Bay Notes: First Draft

Signin Sheet is attached.

Web people were:

- Cooper, Ryan
- Miles, Philana C (DOT) (External)
- Campbell, Kendall D (FAA)
- Mary Martinez
- Paul Anderson (External)
- Ponozzo, Kristi M (FAA)
- Stephens, Amber D (DFG) (External)
- Bryant, Rory K (FAA)

People booked on the charter is attached.

Ryan

Public Meeting Notes

Scammon Bay Public Meeting Notes

June 18, 2024; Noon

Alternatives (General)

- Access roads across the mountain have runoff erosion concerns. Every spring the current roads need to be rebuilt, because runoff from the mountain erodes away the roads
- Local residents stated they were insulted that the ridgeline or other alternatives were considered, that the only practical alternative is the Shift and Raise
- Homer Hunter is the City of Scammon Bay Land Planner, and is also working for the Village Corp. He is working on the transfer of lands from the Village Corp to the City (14(c) land from Castle Hill to west side of community); and expect that to be completed in 2.5 years. He has established an advisory board that is working on the process.
- Both hill options cost money for everyone (fuel, etc), and would be a major inconvenience.

Ridgeline Alternative

- Ridgeline alternative will have lots of fog – the clouds are often low laying, and while the lower layers are free, the ridgelines are in clouds/fog all the time
- The winds are bad up on the ridgelines. There is lots of turbulence in that area, and would be hard for pilots to land. There would be lots of missed flights.
- The road up the ridgeline is to serve the cell phone tower. It is not plowed or maintained in the winter. (None of the local community roads are plowed or maintained in the winter).
- A local resident maintained the cell phone tower in Scammon Bay and all of the surrounding region and commented that the tower on the ridgeline in Scammon Bay was notorious for being in the worst condition because the winds are so bad on that ridgeline. He commented that the warm sea air and cold land air mix on those ridgelines, making bad winds and bad visibility
- A resident commented that when the winds are bad on the ridgeline, the winds are much better down at lower elevations
- Residents comment on the wind study conducted by AVEC – which the Master Plan already has

Near Alternative

- Valley for the near location is bad for winds – there is a funnel that comes down right there, and blows crosswinds across that area
- The lake and wetlands in the near option was commented as being very much a fill sink – and would require a lot more fill than anticipated.

Castle Hill Alternative

- The winds along the Castle Hill alternative are funneled along the topography to the north side, resulting in a lot of turbulence and cross winds at that location
- Castle Hill would be better than Ridgeline

Shift and Raise Alternative

- The City Manager would support the Shift and Raise option
- All residents who spoke supported the Shift and Raise option
- When Brice constructed the last improvement project, they didn't shut down the runway. Instead they shortened it, and did first one side of improvements, and then the other. (Details were scant, and deserve more research as the planning develops. FAA typically hasn't been allowing runway to be shortened and narrowed at the same time)

Material Sources

- The City Manager and residents don't want to ship in material. They want to develop local material sources.
- The local residents have worked on recent projects, and have found that the local material is good for the bulk of construction; and then a top coat needs to be brought in by barge, as does rip rap
- The local community has been using local large rock as rip rap; but HDL working for AEA on the fuel tank farm has found it is too soft
- HDL and AEA are working on Geotech right now, and are willing to share information. The first pit they found was too silty. They now are looking at a new pit, but do not have results yet.
- John (resident) mentioned that there was additional different kind of rock on the other side of the mountain that should be investigated.

Maintenance Snow Removal Equipment Buildings (not part of public meeting)

- Inspected the 2 Snow Removal Equipment Buildings
- East Building (note this building was scheduled for replacement – old style with dirt floor - in the project that was put on hold)
    - There are some issues with the large equipment bay door. It doesn't close all the way
    - This SREB holds the loader. It hasn't worked for years, and needs to be fixed. This equipment not working means only the grader works, and the grader has to be used for things that it isn't meant to do
- West Building
    - The large equipment bay door has quite a bit of damage. It sounds like strong winds cause damage on doors of both SREBs, and push them in; harming their mechanisms over time
- The light beacon is kept on all the time. It is held together with electrical tape. The beacon is not turned to automatic – because every time it is, and the light starts, the bulbs blow out. As a result the current solution is just to keep it on all the time
- One of the wind socks was repaired some time recently – but has blown away, and so now is no longer present.
- The corner of the apron where the FAA equipment sits (SW Corner) is lower, and sinking into the tundra

General Comments

- James Aquillo – Tribal Council – commented to make sure and use AVEC wind data, and Cape Romanzof wind data. He also commented to make sure that the airport is designed to withstand water events for years – since changes are happening so fast
- George – worked on the last runway project, driving material for Brice. Commented that the finish material was brought in from Nome. Also commented to make sure that to raise the airport – the base needs to be made higher
- On questioning, the residents said that the culvert across the runway is damaged but doesn't currently backup or impede water flow. (side note – this culvert will have to be replaced if this is the chosen option – it was evaluated by HDR and initial discussions were held with ADF&G)
- Residents requested a small crosswind runway. Ryan responded that more likely to get a wider runway; but residents emphasized how much they would like a crosswind
- Residents stated that they watch FlightRadar24 to see when flights are happening – that they are usually mis-reported by the airlines. The Master Plan has noted this, and also been using the FlightRadar24 data
- Residents stated they either wait to hear the airplane, or the local agent calls on the VHF that the plane is coming in, and then everyone goes to see the plane. Residents commented that the distant alternatives would be very difficult to meet the plane – considering inconsistent arrivals, variable weather, no shelter, no road maintenance, and quick turnaround times.
    - As a note, the local commuter service came and left in the time that the Master Planning team took to board the airplane and warm it up for take off
- Local residents like the idea of establishing Scammon Bay as a regional hub, and making the runway longer as a result. Ryan explained that is controlled more by air operator business models, and funding for longer runways needs to be based on actual (not planned) use
- On questioning about subsistence
    - Residents were in full swing of harvesting chum salmon during the visit. They use gill nets, and boat out to the ocean, since the local rivers don't get salmon really at all
    - Residents fish in the local rivers for whitefish
    - Residents said that the major hunt in the local river is for bearded seal. A lookout sits out in the ocean, and then radios in when bearded seal is coming in
    - Residents said that a highly valued hunt is to boat up to the local mountain (Kusilvak Mountain, 30 straight line miles away) and harvest moose – which are overpopulated
    - Residents also hunt for beluga whale, although location is difficult to determine

Future Projects:

- The new tank farm is anticipated to go in right at the old haul road to the airport
    - The tank farm doesn't have a pipeline to serve it – and instead is planning on temporarily trucking from barge landing until a pipeline can be put in. The

community would like to work with the airport to help determine where a pipeline can go. Options discussed included:

        - Along the runway
            - Or maybe along DOT&PF land between the runway and the community
        - Along the south side of the village, away from development (drawback is that any leaks would flow downhill into the community – as a result City Manager opposes this option)
    - An expansion of the wastewater treatment facility is expected, expanding at the same location – final location and extent are TBD, but likely only the smaller phase 2, deeper option in the near-term.
- Winter Ice impacts the community. It comes from the sea, and tends to stack up on the ATV trail west of town – prior to entering the town or airport. Ice can come in at ~ 15mph toward the runway. Other residents also noted that ice could extend the full length of the north side of the runway.
- Local elders don't want just the cheapest option – they want the best for the community. Will be insulted if an option is forced on them
- Might be a good idea to get a City Resolution of support
- Need to realize that the alternatives aren't viable if the landowner won't sell the land to DOT&PF – and so the community gets a large say in where the airport improvements happen

Coordination with City and Leasing

- City Manager needs support and guidance from DOT&PF. The current road to the existing fuel header is on land owned by DOT&PF. They would like to build a new road west of the current road, and also fill in the areas of land adjacent to either road – to provide storage that is now blocking the roads. The City would be willing to lease or other mechanism, they just need to work with DOT&PF on what that mechanism will look like

Request for Comments

From:	Cooper, Ryan
Bcc:	admin marayarmiut.com; AK1900PILOT@GMAIL.COM; FOXAIRCRAFT1@GMAIL.COM; amber.stephens@alaska.gov; angelo.nvsb@gmail.com; askinakcorp@yahoo.com; Ben_dietderich@sullivan.senate.gov; bjulak@yahoo.com; BLM_AK_AKSO_Public_Room@blm.gov; carley.ann.e.wallace@faa.gov; cityclerkscm@hotmail.com; cityofscammon marayarmiut.com; Jaeger, Clare L CIV USARMY CEHQ (USA); Clarence@avcp.org; corpaskinuk@yahoo.com; david@beringair.com; dcra.admin@alaska.gov; DFG, HAB InfoAnc (DFG sponsored); dnr.scro@alaska.gov; epa-seattle@epa.gov; ghsmith99662@gmail.com; greg.balogh@noaa.gov; helen@scmbaytc.org; info@avcp.org; Isaac_Rivers@ykhc.org; Isiah_rivers20@yahoo.com; jferguson@ryanalaska.com; joe.laraux@alaska.gov; kendall.d.campbell@faa.gov; kristi.m.ponozzo@faa.gov; lindseykasagull2004@gmail.com; Louisawalker68@gmail.com; lynn.polacca@bia.gov; maxatsa14@gmail.com; Mary Martinez; phazelkoganah@yahoo.com; Miles, Philana C (DOT); Representative.Neal.Foster@akleg.gov; rlucas@ryanalaska.com; Marasigan, Romorenzo B (DOT); rory.k.bryant@faa.gov; Scott_leathard@sullivan.senate.gov; sean.mcdermott@noaa.gov; Senator.Donald.Olson@akleg.gov; Stephanie.Buss@alaska.gov; stevenwalker613@gmail.com; tcrandall@ryanalaska.com; tkuhns@calistacorp.com; tom.george@aopa.org; Transportation@avcp.org; tsd@avcp.org; ulak2404@yahoo.com; wecare@flygrant.com; wendy_loya@fws.gov
Subject:	Scammon Bay Airport Feasibility Study: Public Comments Requested
Date:	Wednesday, February 19, 2025 12:57:00 PM
Attachments:	Alternative Figures.pdf

Good Afternoon!

The Alaska Department of Transportation & Public Facilities (DOT&PF) has posted the Draft Scammon Bay Airport Feasibility Study on our website for your review and comments at: https://dot.alaska.gov/creg/scammon/

DOT&PF has recommended Alternative 2 (Shift & Raise) as presented in the June 18, 2024 public meeting. This alternative would shift the runway 340 feet inland along its current alignment as protection from river movement. This alternative also includes raising the surface elevation to +19.5 feet and installing erosion protection.

Please visit the project website to review the draft plan and provide comments related to the proposed alternatives. Please use the "LEAVE A COMMENT" link available on the website and let us know which alternative(s) you support and why. You can also simply reply to this email. Please submit comments by Friday, March 21, 2025.

Your feedback and support are essential to secure funding for airport improvements at Scammon Bay. The Federal Aviation Administration (FAA) has provided comments on the draft plan. Concerns were expressed regarding the estimated costs of all proposed alternatives.

Please reply to this email or contact the Project Team with questions.

Thank you in advance for your feedback!

Ryan Cooper
Ryan.cooper@stantec.com
907-343-5241 (office)

3900 C Street, Suite 902, Anchorage, Alaska 99503

Scammon Bay Resolution

Scammon Bay Tri-Entity Resolution 2025-01

RESOLUTION OF SUPPORT FOR A SCAMMON BAY AIRPORT IMPROVEMENT PROJECT

BY THE

City of Scammon Bay, Native Village of Scammon Bay, and the Askinuk Corporation

WHEREAS, the Alaska Department of Transportation and Public Facilities (DOT&PF) has partnered with the Federal Aviation Administration (FAA) to study the required improvements to aviation infrastructure in Scammon Bay and,

WHEREAS, the scope of work for the Scammon Bay Airport Planning Study includes analyzing the existing airport and preliminary Alternative locations for potential new airport and access routes to support safe and efficient air services for passenger, medevac and freight transportation in support of community sustainability, environmental resilience, and expansion activities; and,

WHEREAS, DOT&PF has consulted with the City of Scammon Bay, Native Village of Scammon Bay, and Scammon Bay Traditional Council, regional commercial air carriers, as well as other stakeholders on the development and refinement of preliminary Alternatives to be considered as part of any future Scammon Bay Airport Improvement Project; and,

WHEREAS, DOT&PF has developed preliminary Airport Relocation Alternatives, including a No Action Alternative, to be advanced for further study of engineering design and in necessary National Environmental Policy Act (NEPA) documentation for any future, proposed Scammon Bay Airport Improvement Project; and,

WHEREAS, the existing Scammon Bay Airport is often threatened by flooding, potentially making it unreliable for community use when it may be needed the most during an emergency or other related threats to the community; and,

WHEREAS, the relocation alternatives included:

- Alternative 1 (No Action) is used for comparison purposes and does not resolve the erosion and flooding threats.
- Alternative 2 (Shift & Raise) is shifting the runway 340 feet inland along its current alignment as protection from river movement. This alternative includes raising the surface elevation to +19.5 feet and installing erosion protection.
- Alternative 3 (Near) is moving the Airport onto the transition between lowlands and the Askinuk Mountains, near the community of Scammon Bay.
- Alternative 4 (Castle Hill) is moving the Airport to the valley between Castle Hill and the Askinuk Mountains.
- Alternative 5 (Ridgeline) is moving the Airport to the ridgeline above Scammon Bay in the Askinuk Mountains.

WHEREAS, the community supports Alternative Number 2; and,

WHEREAS, the community specifically does not support Alternative Numbers 1, 3, 4 and 5. These alternatives will have significant impacts on Scammon Bay's ability to use the airport and the safety of aviation service to Scammon Bay; and,

THEREFORE, the City of Scammon Bay, Native Village of Scammon Bay, and Askinuk Corporation agree on and request that the FAA move forward with the engineering design of Alternative Number 2 (shift and raise), and its evaluation under NEPA to support construction of an airport improvement project.

Adopted by the City of Scammon Bay, Native Village of Scammon Bay and Askinuk Corporation on February 24, 2025, by,

[signature]	2/24/25
Mayor, City of Scammon Bay	Date
[signature]	2/24/25
President, Native Village of Scammon Bay	Date
[signature]	2/24/25
Chairman, Askinuk Corporation	Date

ADF&G Comment Letter

MEMORANDUM

State of Alaska

Department of Fish and Game
Habitat Section

TO:	Brian Elliot Regional Environmental Manager Alaska Department of Transportation and Public Facilities	DATE:	October 11, 2021
THRU:	Ron Benkert RCB Southcentral Regional Supervisor	SUBJECT:	ADFG comments on CFAPT00691
FROM:	Andrew Kastning Habitat Biologist II	PHONE NO:	267-2813

The Alaska Department of Fish and Game (ADF&G) Habitat Section has reviewed the information provided on the Scammon Bay Airport Improvements project (CFAPT00691). The project will involve raising airport surface elevations while extending and shifting the runway away from the Kun River (AWC #335-40-10200). Plans include improving drainage, installing culverts, replacing one culvert, and adding erosion protection as needed.

Scammon Bay Airport is situated in a tidally influenced area 8-12 feet above sea level. The comment request letter states that no permanent adverse impacts to fish habitat are anticipated. However, construction activities could temporarily affect resident and anadromous fish, necessitating trapping and removal prior to commencing construction activities. The Kun River supports chum salmon, inconnu and whitefish species. Area biologists and a local resident indicate that Alaska blackfish, ninespine stickleback, and northern pike are also in the project area. Resident and anadromous fish may be present in wetlands and side channels, particularly during high tide, as they navigate up the Kun River. Project considerations and construction timing should include plans to reduce turbidity in adjacent waters and relocation of fish from the construction area. Fish Habitat permits will be required to replace the culvert crossing under the runway and installation of any necessary erosion control along the Kun River.

Thank you for the opportunity to provide comments on this project. Please contact Habitat Biologist Andrew Kastning at andrew.kastning@alaska.gov or 267-2813 if you have any questions.

Attachments: Site Maps

Email cc:

Al Ott, ADF&G Habitat, Fairbanks
N. Smith, ADF&G CF, Region III
J. Rypkema, ADEC, Anchorage

Calista Comment Letter

CALISTA CORPORATION

March 26, 2025

Philana Miles, C.M.
Project Manager, DOT&PF
P.O. Box 196900
Anchorage, Alaska 99519-6900

Via Email: philana.miles@alaska.gov

RE: Scammon Bay Airport Planning Study State/Federal Project No.: CFAPT01005/AIP 3-02 - 0255-005-2023

Dear Ms. Miles,

Calista agrees with the recommended design to shift the runway 340 feet away from the Kun River for a project life duration of 50 years and raise the runway surfaces above the modeled +18.5 feet NAVD88 50-year storm surge for Alternative 2 to reduce potential for flood inundation to the runway and lighting system, which is the major issue facing the airport. With respect to airport access, Calista understands the importance of proximity, as most residents currently arrive at the airport by foot, four-wheel vehicle and snowmachine. The current cost for snow removal equipment, operators, vehicles to transport people to an airport further away from the community are also high.

The airport has flooded in past years, making it inaccessible to aircraft and passengers. It is known that air transport is the main means of reaching a community immediately after natural disasters such as a storm surge, flood or wildfire and so improvements to the Scammon Bay airport is critical for the community of Scammon Bay which is adjacent to the Bering Sea, and which parts of the river is exposed to coastal erosion. Calista supports Scammon Bay's preference for Alternative 2 to shift the runway away from Kun River and raise the surface runway to assure the community, which comprise of Calista Shareholders, has a safe and reliable runway it depends on for air transportation for travel, air cargo and medical evacuation services which is a critical need in the community. Thank you for the opportunity to comment on the Scammon Bay Airport Feasibility Study.

Sincerely,

CALISTA CORPORATION

Mary Martinez

Mary Martinez, Land Planner
Land and Natural Resources

5015 Business Park Blvd., Suite 3000
Anchorage, AK 99503
Phone: 907-275-2800
Fax: 907-275-2919
www.CalistaCorp.com

APPENDIX F: 2016 FEMA GRANT

State of Alaska
Department of Military and Veterans Affairs
Homeland Security & Emergency Management

DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
DIVISION OF HOMELAND SECURITY AND EMERGENCY MANAGEMENT

Obligating Award Document for

PUBLIC ASSISTANCE GRANT PROGRAM (PAGP)

PAGP Grant No. DR-4162-AK CFDA No. *97.036* *Date of Disaster Declaration* 01/23/2014

1. Project Worksheet #	2. DUNS #	3. Award ☐ Amendment ☒	4. Employer Tax ID #
PW 0034(1)	617616495	Amendment Number 2	92-6001185

5. Recipient Name and Address

DOT&PF- Central Region
PO Box 196900
Anchorage, AK 99519

6. Issuing Office and Address

Department of Military and Veterans Affairs
Division of Homeland Security and Emergency Management
PO Box 5750
JBER, AK 99505–5750
http://www.ready.alaska.gov

7. PW Obligation Date 08-05-2014

Method of Payment: Electronic

9. *Purpose of Award/Amendment:*

Change in Scope of Work, Cost Increase of, $3,914,073.98 and Time Extension Approval

10. *Grant Award and Terms and Conditions:* ***(see attached Grant Terms and Conditions)***

Total Awarded Amount:	$ 6,990,353.00
Federal Share:	$ 5,242,764.70
State Share:	$ 1,747,588.30
Sub-Grantee Share:	

Grant Performance Period: 01/23/2014 through 01/23/2018

See attached: Approved PAGP Project Worksheet

For State Use Only: CC # Program No. Account No.

11. Grant Requirements, Assurances and Agreements: ***(see attached Grant Requirements, Assurances and Agreements)***
The acceptance of a grant from the United States creates a legal duty on the part of the grantee to use the funds or property made available in accordance with the conditions of the grant. (GAO Accounting Principles and Standards for Federal Agencies, Chapter 2, Section 16.8[c])

12. Project Award Title:

Airport Taxi Runway Safety Area

13. Recipient is required to sign and return one (1) copy of this document with the terms and conditions to the issuing address in Block 6, within 30 days from the date in Block 17.

14. DHS&EM Project Manager Printed Name of SPAO: Amber Price	Phone: (907) 428-7091 Fax: (907) 428-7009 Email: amber.price@alaska.gov
15. Signature of Jurisdiction Project Manager Ericka C Moore Printed Name: Ericka Moore	Phone: 907-269-4550 Fax: 907-248-1573 Email: ericka.moore@alaska.gov
16. Signature of Jurisdiction Chief Financial Officer [signature] Printed Name: Greg Williams	Phone: 907-269-0480 Fax: 907-248-1573 Email: greg.williams@alaska.gov
17. Signature of Jurisdiction Signatory Official Gregory S Patz Printed Name and Title: Greg Patz Maintenance & Operations Manager	Date: 07/07/17 Phone: 907-269-0763 Fax: 907-248-1573 Email: greg.patz@alaska.gov
18. DHS&EM Signatory Official [signature] Michael J. Sutton, Deputy Director Alternate Governor's Authorized Representative	Date: 07/10/17 Phone: (907) 428-7000 Fax: (907) 428-7009 Email: mike.sutton@alaska.gov

Turn over to complete instruction acknowledgement.

Grant Award Instructions

As a Sub-Recipient, you are only entitled to costs that are eligible. All eligible work must conform to the Scope of Work as specified in the applicable Project Worksheet (PW). Do not assume all costs or changes will be allowed at project completion. Any change request must contain justification for the eligibility of additional costs or work.

All Emergency Work PWs (Category A and B, "Emergency Work") must be complete six months from the date of the Disaster Declaration. All Permanent Work PWs (Categories C-G, "Permanent Work") must be complete 18 months from the date of the Disaster Declaration. If more time is required, contact your Division Representative before the associated deadline to request a Time Extension. Ample justification is required for approval of any Time Extension Request.

Please carefully review the Damage Description and Dimensions, Scope of Work, and Cost Estimate. If you do not agree with the PW as written, or determinations regarding project eligibility, Scope of Work, time limits, funding, or other determinations, an appeal process is available. This process requires written correspondence identifying the action under appeal with an appropriate justification within 60 days of receipt of this Award. Please attach all pertinent documentation supporting your appeal and mail to:

Michael F. O'Hare, Director
Division of Homeland Security
and Emergency Management
PO Box 5750
JBER, AK 99505

Failure to follow these guidelines will jeopardize project funds and may impact future disaster assistance. Additional PWs pending approval will be transmitted in future correspondence. Please review all PWs and ask us about pending PWs to ensure all damaged sites or facilities are identified .

As the Authorized Representative of the Alaska Department of Transportation & Public Facilities I have reviewed these instructions and acknowledge our appeal rights and responsibilities under the Public Assistance Program.

Gregory D. Patz Maintenance & Operations Manager
Printed Name and Title of Authorized Representative

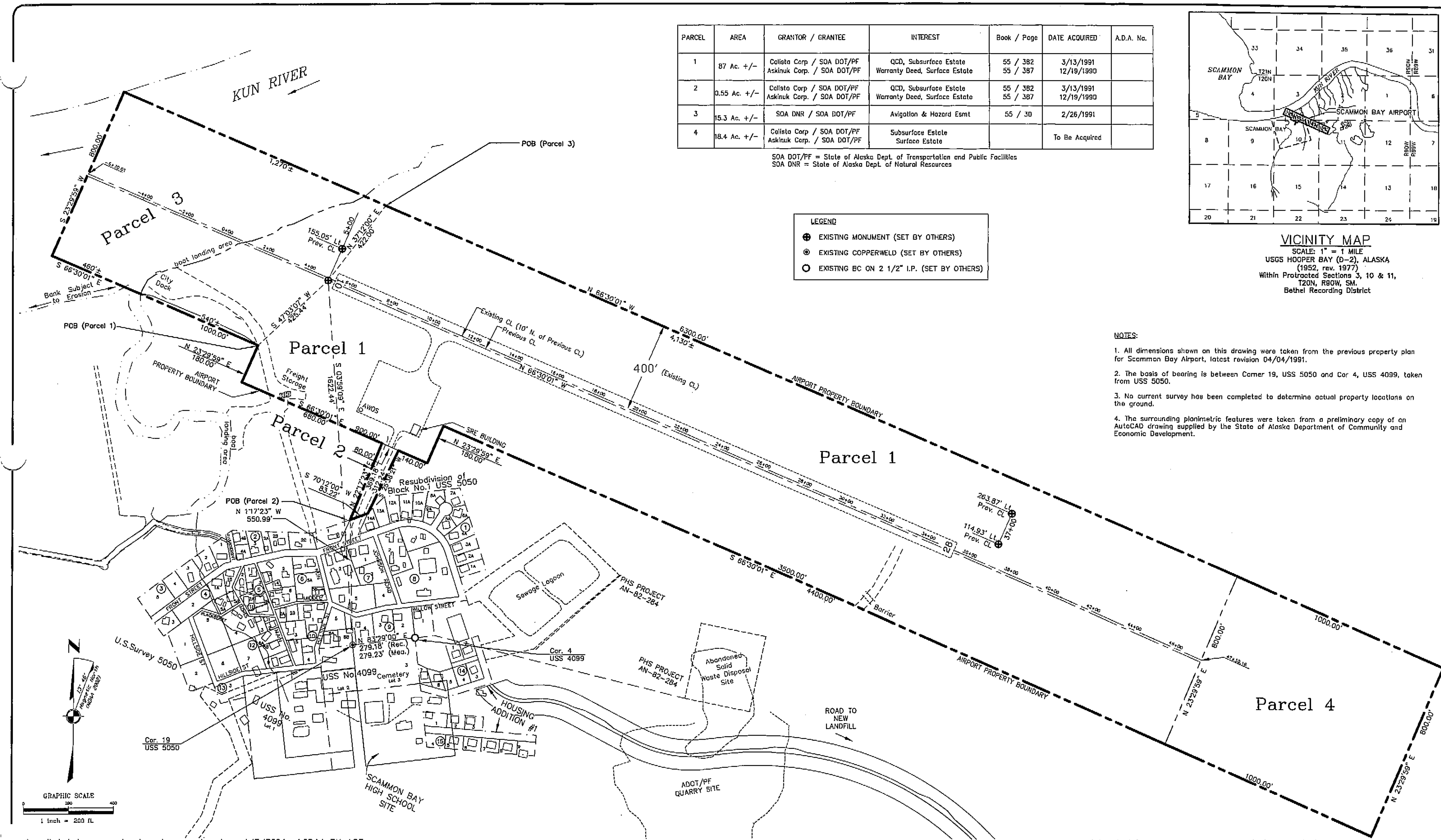
Gregory D Patz
Signature

07/07/17
Date

APPENDIX G: AIRPORT LAYOUT PLAN PROPERTY MAP\

PARCEL	AREA	GRANTOR / GRANTEE	INTEREST	Book / Page	DATE ACQUIRED	A.D.A. No.
1	87 Ac. +/-	Calista Corp / SOA DOT/PF Askinuk Corp. / SOA DOT/PF	QCD, Subsurface Estate Warranty Deed, Surface Estate	55 / 382 55 / 387	3/13/1991 12/19/1990	
2	0.55 Ac. +/-	Calista Corp / SOA DOT/PF Askinuk Corp. / SOA DOT/PF	QCD, Subsurface Estate Warranty Deed, Surface Estate	55 / 382 55 / 387	3/13/1991 12/19/1990	
3	15.3 Ac. +/-	SOA DNR / SOA DOT/PF	Avigation & Hazard Esmt	55 / 30	2/26/1991	
4	18.4 Ac. +/-	Calista Corp / SOA DOT/PF Askinuk Corp. / SOA DOT/PF	Subsurface Estate Surface Estate		To Be Acquired	

SOA DOT/PF = State of Alaska Dept. of Transportation and Public Facilities
SOA DNR = State of Alaska Dept. of Natural Resources



LEGEND
- ⊕ EXISTING MONUMENT (SET BY OTHERS)
- ◉ EXISTING COPPERWELD (SET BY OTHERS)
- ○ EXISTING BC ON 2 1/2" I.P. (SET BY OTHERS)

VICINITY MAP
SCALE: 1" = 1 MILE
USGS HOOPER BAY (D-2), ALASKA
(1952, rev. 1977)
Within Protracted Sections 3, 10 & 11,
T20N, R80W, SM.
Bethel Recording District

NOTES:

1. All dimensions shown on this drawing were taken from the previous property plan for Scammon Bay Airport, latest revision 04/04/1991.
2. The basis of bearing is between Corner 19, USS 5050 and Cor 4, USS 4099, taken from USS 5050.
3. No current survey has been completed to determine actual property locations on the ground.
4. The surrounding planimetric features were taken from a preliminary copy of an AutoCAD drawing supplied by the State of Alaska Department of Community and Economic Development.

\cad\data\scammonbay\row\prop_plan.dwg 1/5/2004 1:09:14 PM AST

THIS PLAN SUPERSEDES PREVIOUS PLAN DATED 1/25/90, REV. 4/04/1991

AIRPORT LAYOUT PLAN CONDITIONAL APPROVAL SUBJECT TO ALP APPROVAL LETTER DATED 2/2/04
By: [signature] DATE: 2/2/04
FAA AIRPORTS DIVISION
ALASKAN REGION, AAL-601
F.A.A. AIRSPACE REVIEW NUMBER: 03-AAL-18NRA

FILE:
DATE:

BY	DATE	REVISIONS

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
CENTRAL REGION
APPROVED: [signature] STEPHEN M. RYAN, P.E. — DESIGN SECTION CHIEF
APPROVED: [signature] HARVEY M. COUTHIT, P.E. — PROJECT MANAGER

DATE 02/05/03
DESIGN
DRAWN PLH
CHECKED

SCAMMON BAY AIRPORT
AIRPORT PROPERTY PLAN

SHEET 7 OF 8

APPENDIX H: CULTURAL RESOURCES EVALUATION

Scammon Bay Airport Planning Study
Cultural Resource Evaluation

Project Number: CFAPT01005
AIP 3-02-0255-005-2023

Alaska Department of Transportation & Public Facilities, Central Region
Preliminary Design & Engineering Section
June 17, 2025

Table of Contents

Figures

Acronyms

AC&W…………….. Aircraft Control and Warning
AHRS……………… Alaska Heritage Resources Survey
ANCSA……………. Alaska Native Claims Settlement Act
ATG………………... Alaska Territorial Guard (ATG)
CEMML…………….Center for Environmental Management of Military Lands
DEW……………….. Distant Early Warning
DOT&PF……………Alaska Department of Transportation & Public Facilities
FEMA……………… Federal Emergency Management Agency
MHHW…………….. Mean High Higher Water
NARA………………National Archives and Records Administration
NEPA……………….National Environmental Policy Act
NHPA……………….National Historic Preservation Act
NOAA………………National Oceanic and Atmospheric Administration
NRHP……………….National Register of Historic Places
PD&E……………….Preliminary Design & Engineering
TEKLEK……………Traditional Ecological Knowledge / Local Environmental Knowledge
USS…………………United States Survey
WACS………………White Alice Communication System

Scammon Bay Airport Cultural Resource Evaluation

The Alaska Department of Transportation & Public Facilities (DOT&PF), Preliminary Design and Engineering (PD&E) Section, conducted a literature and data review of known and potential historic and cultural resources on or near the Scammon Bay Airport and within the area identified in the Scammon Bay Airport Feasibility Study area (CFAPT01005). The review is consistent with the requirements of the National Historic Preservation Act (NHPA) Section 106 and the National Environmental Policy Act (NEPA). This review establishes historic context for the Scammon Bay area. To date, the known historic and cultural properties have not qualified for listing in the National Register of Historic Places (NRHP). The discussion focuses on the level of potential harm to known and potential historic and cultural resources but does not recommend a preferred alternative.

Environment

The area between the Yukon and Kuskokwim rivers is a vast area of river delta, lakes and streams with two mountainous areas, including the Askinuk Mountains where the modern community of Scammon Bay was built. Scammon Bay is bounded on the south by the rocky cliffs of the Askinuk Mountains, to the west by a series of sand bar islands (Neragon, Sand and Krakatok) and to the north by the flat wet tundra which continues to the north and the mouth of the Yukon River. The current runway, apron, road and lighting system is constructed on a flood plain of the Kun River that is subject to periodic flooding from storm surge, ice jams and other fluvial processes.

The vast sedimentary plain to the south and east is the remains of delta which developed as the Yukon and Kuskokwim Rivers changed level and flow as the late Pleistocene deglaciation began (Ager 2003; Knebel and Creager 1973; Olson and Lang 2020). Yukon River channels were abandoned and lakes formed as the ice beneath the surface melted and the formerly exposed surfaces of Beringia were inundated (Nelson and Creager 1977; McManus and Creager 2017). The existing Yukon River delta configuration is approximately 2,500 years in age. One of a few rare volcanic vents emerges from the sediment near Scammon Bay (Hoare and Condon 1968). A synthesis for the Yukon Delta just to the north was published by the Minerals Management Service (Thorsteinson, Becker and Hale 1989). The landscape is dynamic yet vulnerable to climate change, storms, flooding, wind and rapid erosion (Jorgenson, Frost and Dissing 2018; Frost, Bhatt, Jorgenson, Macander, Bieniek, Whitley and Fienup-Riordan 2017).

Prehistoric Period

The prehistory of Western Alaska is limited to data recovered from a few sites and only recently have long term extensive excavations been conducted in the region (Knecht and Jones 2019). Funk (2010) provides an overview of the historical and archaeological context of the region specific to the Scammon Bay-Hooper Bay-Chevak Triangle. Robert D. Shaw (1983, 1985) indicated that the earliest defined archaeological culture in the region was Norton, which began some 2,000 years ago. Norton is characterized by check stamped pottery, chipped slate tools, and well-developed fish nets with specialized floats and sinkers for their use. Shaw supposes that the advent of this highly productive fishing technology enabled the occupation of this region at the beginning of the Norton period (Shaw 1998).

Approximately one thousand years ago a new technological regime appeared in the archaeological record that indicates the influence of or incursion by people using what has been named the Thule culture, which is named for its distant expression in Greenland in a form consistent with that around Bering Strait (McCartney 1979; Mason, Jensen, Rinck, Alix, Bowers and Hoffecker 2020). This culture had a greater focus on marine resource harvests, perhaps fostered by climate induced productivity increase of marine mammal resources which supported expansion of Thule east and south (Mason et al 2020). Thule is marked by toggling harpoon points, ground rather than pecked stone tools, corrugated or paddled pottery transitioning to plain ware, elaborate engraved decoration on items, and location of architecturally distinctive village sites in locations to facilitate interception of migratory marine mammals (Ackerman 2001).

Perihistoric Period

This period is marked by the recollection and recitation of oral histories of persons, places and events which preceded written records. The most prominent subject matter for these perihistoric narratives are the oral narratives of what became known as the Bow and Arrow War. Dr. Caroline Funk (2010) directly and the many works of Ann Fienup-Riordan (e.g. Fienup-Riordan and Rearden 2016) more broadly address this period of Yup'ik history as recorded in oral narratives and through ethnographic interviews. Key episodes include the Bow and Arrow Wars which took place during an indefinite time period but may be associated with a series of population migrations through the region with the "Triangle" of communities including Scammon Bay, Hooper Bay and Chevak (Funk 2010; Kurtz 1985). Speculation and contemporary accounts regarding the movement of the Aglurmiut south towards the Nushagak River may indicate the end of the period of warfare, attributed in narratives to the contacts with Russians (Funk 2010; Kurtz 1985).

John Pingayak (1998) wrote an important curriculum document for Chevak schools from an emic perspective describing important aspects of traditional life, history and culture for Cup'ik students. Yup'iit people living in the delta region thrived through knowledge of the land and waters with cultural and technical skills that fostered life in the challenging subarctic environment, and a rich heritage of transmitted local and traditional knowledge.

History

Russia

Russian maritime exploration began in the 1600s as Dezhnev sought to discover and map the separation of Russian lands from the New World (Fisher 1999). Russian efforts to develop the fur trade that lured independent fur traders into the North Pacific for sea otters also moved into the Bering Sea in pursuit of walrus, seals, sea lions and other peltry through direct harvest and trade. Bering and Chirikov followed the Aleutian Islands along the North Pacific Coast in a harrowing journey in 1741. Other exploration soon followed north of the Aleutians into the Bering Sea. Subsequent explorations were in the service of the independent fur traders, mostly by sea from Okhotsk but also overland as fur traders sought routes to new markets in the interior.

Independent parties of fur traders spread mostly along the sea otter habitat of the north Pacific, establishing a practice of coercion, hostage-taking and theft from Aleuts and Koniags engaged as hunters during the expeditions. As profits, distance, risks and costs increased, larger companies were organized to pursue sea otters, seals, sea lions and walrus, with the Lebedev-Lastochkin and Shelikhov-Golikov companies engaged in aggressive competition. This increased cost to Alaska Native peoples in the hunt as resource producers were abducted from their families and communities. Abuses led to blowback including coordinated resistance by Alaska Native groups to Russian incursions (Black 2004; Boraas and Leggett 2013). These abuses and the financial and political issues related to the fur trade as well as lobbying by parties at the imperial court resulted in the forced unification of the remaining companies in Alaska under royal charter which dictated company behavior and practice in the colony and made some indigenous persons Russian colonial citizens and those of mixed Russian- Alaska Native heritage as creoles (Black 2004).

The newly unified company established the capital at Sitka and bases at numerous locations on the North Pacific littoral. Expansion was focused on following sea otter habitat down the coast of north, central and south America until sea otters were nearly extinct. The company effort looked north for land peltry. From Cook Inlet and Kodiak, by land and sea, company traders proceeded to explore over land and by sea.

The Russian America company established a trading post at Novoalexandrovsk Redoubt on the Nushagak River in 1824 with direct, sustained contact with the Yup'iit on Bristol Bay. Vasilev explored over land to Norton Sound in 1828-1830. A Russian trading post was established at St. Michael near the mouth of the Yukon River in 1833 and from there, trails went overland to the Kuskokwim River, thence to the Nushagak River before crossing the Alaska Peninsula, with a string of trading posts leading to the first Russian capital of Alaska at Kodiak across the Shelikof Strait. Trade was mainly conducted at the posts, but traders would also arrange trades during travel rounds between posts when encountering groups of Yup'iit dispersed on the landscape during their resource harvest pursuits. Russian Orthodoxy and the presumption that indigenous people were subjects of the Russian crown were concepts with limited penetration in the vicinity of Scammon Bay, greater along the Yukon River where contact was direct and sustained (Black 2004).

Epidemic disease arrived with Russian expansion but was not limited by the geographic limits of Russian presence. The first pandemic to devastate the region was smallpox in 1838-1842 (Pingayak 1998; Zagoskin in Michael 1967). Other diseases that were novel to indigenous people followed and were an additive problem to diseases which may have been present, such as tuberculosis (Fortuine 1989; 2005).

Russian trade effort shifted to the Kuskokwim and Yukon rivers because of fur market shifts and geopolitical changes across the world. Lt. Lavrentiy Zagoskin was tasked to explore the Kuskokwim and Yukon River drainages in order to map the rivers and to establish whether the state, chartered Hudson's Bay Company had encroached on Russian land claims in Alaska by establishing trading posts on the Yukon River west of the treaty boundary (Zagoskin in Michael 1967). Zagoskin did not visit Scammon Bay, but related descriptions of the people given him by asking residents of Ikogmiut and other neighboring trade centers (e.g. Kurtz 1985). Trade continued from St. Michael, served by sea, up rivers, and over land via portages between the Nushagak, Kuskokwim, and Yukon River portages. Despite this penetration, it appears that no resources were present in sufficient quantity to drive Russian traders along the shallow coast of the Yukon River delta nor over land to Scammon Bay. All trade was indirect or by voyage undertaken by Yup'iit seeking the products available from the Russian company.

Russia lost its monopoly on trade with China as Portugal, Spain and Britain made incursions on China. This led to territorial incursions as British, French, and American explorers moved into the Russian possessions in the Pacific. Whaling ships crossed north of the Aleutians in 1840 in a rush for marine mammal oil, peltry and meat, defying Russian control or regulation (Black 2004). Gold rushes saw California taken by the United States with the discovery near the former Russian Fort sold to John Sutter, and gold rushes in British Columbia were concerning as they moved north up the coast from the Fraser River mouth to the Stikeen River in Russian territory. Russia lacked the ability to control the vast territory it claimed and had not acculturated many of its colonial residents. Russia had lost the Crimean War with Britain, France and Turkey in 1856 and began a period of reforms including ending serfdom in 1861. Russia sought favor with the United States and offered to sell Alaska to the United States on several occasions, provided naval military support to the Union during the Civil War and after the Civil War a treaty of cession was concluded.

United States

The United States purchased Alaska in 1867 from Russia but did not immediately assert authority or control over the territory. A cruise of the Yukon River was performed to remove the Hudson's Bay Company fort from Fort Yukon but little further effort was expended on governance for many years.

Interest in Western Alaska grew with the discovery of gold at the upper end of the Yukon River and later at Nome and other locations. The Klondike Gold Rush saw a vast number of people trying to access the upper Yukon River by one of two routes: overland such as through Chilkoot Pass and up the Yukon River by steamboat. The Russian fort at St. Michael was occupied by the U.S. Army and the area became a port of call and transfer point with warehouses for supply of gold prospectors via the Yukon River (Antonson 1976).

The influx of mass numbers of people into the region, many exposed to novel diseases, pausing at St. Michael and Yukon River ports created additional vectors and reservoirs (e.g. Fortuine 1989, 2024; Nome Semi-Weekly Nugget 1904). Scammon Bay was also affected by the 1918 flu which victimized young healthy people, leaving many children orphaned and villages no longer occupied (Pingayak 1998). Children's homes were established in many locations to care for orphaned children.

Efforts to shift the lifeways of local peoples took two paths in the American period: missionaries and later government schooling organized around reindeer herding (Willis 2010). The Bureau of Education under Sheldon Jackson assigned this area of Alaska to the Catholic church for missionization, and Jesuit priests and volunteer missionaries established schools and facilities to support a mobile mission that could travel between widespread communities in their region

(Balcom 1970; Llorente 1990; Renner 2008). The church placed missionaries at Hooper Bay in 1928 with the task of traveling to Scammon Bay and Chevak once a month (Balcom 1970). The Swedish Evangelical covenant mission in the same year sent Alaska Native missionaries to Hooper Bay in 1926 and Scammon Bay in 1928 to evangelize and run day schools (Anderson 1935).

World War II saw the formation of the Alaska Territorial Guard (ATG), which included soldiers from Scammon Bay (Marston 1972). With relatively small investments in people, arms and equipment a capable scout force was assembled to defend Western Alaska from credible threat of invasion. This was not necessarily an easy experience, however, and substantial cultural conflict and prejudice had to be overcome (Marston 1972). The demonstration of competence and ability by ATG members had significance which lasted beyond the end of the war (Annabel 1947).

The federal government, through Alaska's delegation, sought money to develop Scammon Bay and other Western Alaska communities after World War II. Edmond Smagge, his wife and two adopted children established a Christian Day School in their home after following a calling to evangelize in Scammon Bay (Hansen 1952). This called them to take a 1600-mile trip in four boats down the Yukon River to establish their mission. They were replaced by Dwight Milligruk and his family, Inupiat from Barrow who trained at the seminary in Unalakleet (Milligruk 1953). The Bureau of Indian Affairs had established boarding schools but the remoteness of Scammon Bay may have deterred efforts at outreach. These efforts appear to have missed Scammon Bay/Kutmiut.

In 1952 the BIA began construction of a school at the site of Scammon Bay. This likely drove consolidation of people who were formerly seasonally dispersed at locations along the rivers and on the tundra. Martha Teeluk was the first teacher for the Alaska Native Service in Scammon Bay (Teeluk 1962). Teeluk started teaching in a log cabin day school building provided by the church. School lunch program supplies and educational materials were stored in local residents' homes. 45 children attended class in the 15x25 foot cabin which had three-foot-high walls and a five-foot-high gabled roof, leading to problems with deep snow. By the mid-1950s the building collapsed, and the BIA began construction of the local school (Teeluk 1962). A new BIA school was dedicated on September 27, 1964 (Canoe and Sundown 1964).

The Cold War was manifested on the area with the construction of an Aircraft Control and Warning (AC&W) station at Cape Romanzof in 1952 for the U.S. Air Force. Soon a Distant Early Warning (DEW) Line radar site with companion White Alice Communication System (WACS) were completed on the same site.

In 1961 the federal government began to assert legal authority over game harvests in rural Alaska under the game laws in place, including the Migratory Waterfowl Treaty of 1916. The result of the new enforcement effort and the arrest and citation of subsistence hunters resulted in an uprising against the federal government as represented by the US Fish and Wildlife Service. In Barrow and other places hunters turned themselves in to law enforcement as a protest against the new enforcement regime. These issues were among those of great concern to Alaska Native peoples in the 1960s that reached a crescendo with the discovery of oil on the North Slope in 1968 and subsequent events with the rapid development of oil production infrastructure and the

Trans Alaska Pipeline. The development of the oilfields required settlement of outstanding Alaska Native land claims; the result was the Alaska Native Claims Settlement Act (ANCSA).

Ethnographic Overview

The Western Union Telegraph Expedition explored the proposed route of a telegraph line from the United States to Europe through Siberia in 1865 (Dall 1870). This was the first systematic accounting in English by Americans of the territory. Dall made the following statement about the vicinity:

> North of Cape Dyer, a small river called by Captain Smith the *Maria Louisa River* (*Kun* of the Innuit), empties into Scammon Bay. Ten miles from the mouth is a native settlement, known as Kúttenmut. Several other shallow streams come to the coast between Scammon Bay and the Yukon delta.

Dall's accounts were followed by those of Edward W. Nelson (1900). Nelson purchased artifacts and recorded observations of the Yup'iit between the Kuskokwim and Yukon rivers. The Handbook of North American Indians (Hodge 1907) puts a village called Igiak (aka Igiagamute, Igiogagamut, Igragamiut) as inland from Scammon Bay with a population of 10.

Hrdlička (1930) described the area based on his view from the USRCS *Bear* in 1912, listing it as "90. Kut (Kutmiut)-Small village on Kut River, head of Scammon Bay." Hrdlička goes on to describe the area from Cape Romanzof to Apoon Pass:

> On this coast there is little information since the time of Nelson. There are a number of occupied villages as well as old sites. The region is bleak and the Eskimo there are reported to live miserably.

Kutmiut appears to have been abandoned, and the trading post labeled on earlier maps as Scammon Bay (Figure 1) with the construction of a BIA school in 1952. Some documentation in the National Archives and Records Administration (NARA) document the funding of the school, the survey of the lots on which the BIA facilities were built, and the other facilities constructed at the same time to provide clean water.

Botanist Eric Hultėn (1962) visited Scammon Bay June 16-27, 1961, to conduct research on plants and mosses, with a discussion by Persson of the bryophytes. No indication is given of use of indigenous knowledge of plants, but assistance was provided by the schoolteacher.

More recently scientific research on the environment of the area has involved indigenous perspectives. Marine mammal research most recently has included direct informant interviews to elicit Traditional Ecological Knowledge / Local Environmental Knowledge (TEKLEK) focused on seals, walrus, sea lion and beluga whales (Huntington, Nelson and Quakenbush 2017).

Geodesy

In the USGS map sheet for Hooper Bay compiled in 1951 (Figure 1) the village of Kutmiut is depicted as downstream from the confluence of the Ear and Kun rivers 2.6 miles east of the present Scammon Bay airport. A trading post north of the river mouth was listed as the community of Scammon Bay on early maps (Figure 1). In the 1953 edition of the map Kutmiut is absent, the former Scammon Bay is marked “cabins,” and a new community of Scammon Bay is located near the mouth of the Kun River where it reaches Scammon Bay.

Surveys of the Yukon Delta were completed in 1899 by J.F. Pratt, G.R. Putnam and R.L. Fairs for the Coast and Geodetic Survey. Geodetic survey was conducted in the area beginning with the 1899 placement of the marker at a rock formation listed as ‘BOULDER’ on National Oceanic and Atmospheric (NOAA) maps (NOAA, 2025). Photographs were taken at this time but do not show indications of human occupation (Putnam 1899; Figure 2).

The Bulletin of the American Geographical Society of New York (1899) reported that:

> Dr. Edmunds passed around the whole delta from the south mouth to Kotlik in a Peterborough canoe, finding it necessary sometimes to drag it through miles of mud or go out of sight of land to obtain sufficient depth of water. Scammon Bay near Cape Dyer, south of the mouth of the Yukon, was examined as a possible port in lieu of St. Michaels, but the harbor was found to be useless, and the route to the Yukon mouth necessarily out to sea, whereas from St. Michaels craft can hug the shore.

Jarvis (1900) gives a brief description of the waters of Scammon Bay for navigation of ships but makes no mention of people or landmarks of human construction. Marcus Baker (1906) makes multiple mentions of Kutmiut based on the Dall and Putnam accounts, with the river named Khun by the Coast and Geodetic Survey. Figure 3 shows the subsequent USGS map for the Askinuk Mountains area as of 1964 following the reorganization of communities into towns centered on schools, post offices, stores and churches. This concentration was enabled by the development of small, motorized vehicles and outboard powered boats which reduced the time needed for residents to access traditional lands and resources but tied them to the wage economy (e.g. Wolfe and Walker 1987).

Trail maps held by DOT&PF (1973) and Bureau of Land Management (BLM) were documented as ANCSA 17(b) easements conveyed to Askinuk Corporation (Figure 4) which document trails connecting Scammon Bay in its current location with public lands in the surrounding area including Kongishluk Bay to the west, Igiayarok Pass in the Askinuk Mountains to the east, the former trading post to the north on the trail to Kotlik, the former village location of Kunmiut, and subsistence lots which may have had seasonal residences in the perihistoric period and before (e.g. Jenness and Rivers 1989). Pipkin (2015) inventoried a trail to the north as RST 323, the Scammon Bay-Hamilton-Kotlik Winter Trail (ARC trail 73c) heading north. RST 93 is the Hooper Bay-Scammon Bay trail by which Scammon Bay received mail from the post office in Hooper Bay (Pipkin 2015).

In 1952, survey markers were placed at STAFF, MAGMA, and IVUK, and the marker for BOULDER (placed 1899) was revisited. Points were placed as controls for establishing boundaries for the AC&W site at Cape Romanzof and later for parcels in Scammon Bay for the school, armory, and cemetery (USS 4099) (CEMML 2013). The Cape Romanzof site became a DEW Line/White Alice site and is still active as a Long-Range Radar Station. These were revisited in 1974 when STAFF and IVUK were reported as missing. Surveys took place to outline lots in the community of Scammon Bay including for the school and other facilities (USS 4099 and USS 5050) and re-established STAFF.

Orth (1967) reported that the present Scammon Bay was established as a permanent village with the post office in 1951, called by residents Mariuk and the residents called Mariagamiut. The bay and community were named in honor of Captain Charles M. Scammon of the US Revenue Cutter Service, chief of the maritime component of the Western Union Telegraph Expedition of 1867 (ibid.).

Newspaper Reports

Historic news articles regarding the area of Scammon Bay are sparse or nonexistent until a 1911 newspaper article in the Nome Nugget (1911) regarding the Goodnews Bay area platinum placer deposits. The article interviews Frank Waskey, a notable Alaska figure, as having sailed from Goodnews Bay to Nome from the discovery with a stop at Scammon Bay where a Richard Negus was reported as in residence and prospecting for gold (Nome Nugget 1911, Pratt 2015, Waskey 2015). Negus was reportedly a fur trader in residence at Scammon Bay (Daily Nome Industrial Worker 2013; Nome Nugget 1924). This was likely not the current village location. He and his indigenous wife Alice were at Mountain Village on the Yukon River in the 1920 Census (US Bureau of the Census 1920). Negus was in court in 1924 for the alleged manslaughter of a Scammon Bay man named Mike, for which he was found not guilty (Nome Nugget 1924). He reportedly sold his trading post in 1927 but promised to return (Daily Alaska Empire 1928). Negus was in Seattle and involved in fraternal group the Elks in 1929 (Nome Nugget 1929). Negus visited several places from his youth in the continental U.S. but reiterated his desire to return to Alaska (Denver Post 1929). Dan Campbell of the UPI wire service interviewed Negus in a lighthearted piece on the life and times of a sourdough Klondike prospector (Campbell 1929). No information regarding Scammon Bay or Kutmiut was found in newspapers again until 1951.

The Scammon Bay school had a newspaper, Fresh Water News, published by the elementary and middle school children. Issues were archived by the BIA during the years 1961 to 1964. The name was taken from the stream from which the community took its drinking water. Students reported numerous significant events, such as the establishment of a town site and city government, public health service visits to immunize and test residents for preventable diseases, and the daily and seasonal events as people went fishing for needlefish and tomcod through the ice, or sea mammals at locations up the coast. Descriptions of life included the split of the town between Catholic parishioners whose clergy came once a month from Hooper Bay for services and the Evangelical Covenant church with migrants living in town.

There are broad concerns in communities in Western Alaska and among emergency services and infrastructure agencies regarding the changes to the landscape, including the human environment, due to climate change. One example is that of the community of Quinhagak, which has sponsored archaeological salvage work at their former village site. Threats to Yup'ik lands from climate effects in synergistic collusion result in the loss of large areas of land when storms and floods arise in the absence of permanently frozen ground and shore fast ice to stabilize the sediment and persistent sea ice to minimize sea wave heights Documentation of recent historic changes to the land in the area between the Yukon and Kuskokwim rivers were presented as part of the multidisciplinary studies at Nunalleq near Quinhagak (Gleason, S., Lim, J., Marsden, D., Pleasant, J., Jones, W., & Church, W. 2022; Knecht and Jones 2019).

Areas of Potential Effect

Scammon Bay was established to be closer to the Bering Sea to facilitate supply by barge and ship. Air traffic was by seaplane from Bethel and Nome. The current Scammon Bay airport was built in 1973, more than 20 years after the establishment of the community, and has existing facilities and utilities on the site. The area where the runway was constructed is subject to tidal inundation, storm surges, and seasonal flooding, and areas of the runway prism have been previously armored with rock. The Federal Emergency Management Agency (FEMA) sponsored emergency repairs in 2016 as project 58357 that included building a temporary gravel haul road from the barge landing to the runway, replaced the lighting, wind cone and segmented circle, and resurfaced and repaired the runway, apron, taxiway, access road, wind cone access and segmented circle pad. DOT&PF widened the runway 20 feet, extended the runway safety area 400 feet and expanded the apron by 40,000 square feet as part of project 57981 in 1988.

The areas of potential effect for an airport improvement project would include the area within the property boundary of the runway, taxiway and aprons, the access roads and material sources which may be located off the airport property.

The relocation sites are distant from the community and would require construction of miles of access roads and new material sites in addition to the runway, aprons, utilities and other improvements required for construction of an airport in a greenfield location.

Identified Historic Sites

There are no known historic properties on the airport property or the access roads. The airport is located within the Alaska Heritage Resources Survey (AHRS) polygon associated with Scammon Bay village. Due to confidentiality concerns, a reference map is not included.

The Scammon Bay Village site (XHB-00113) is a large polygon that includes within it several other AHRS sites and 1.56 square kilometers or 386 acres. This polygon is intended to encompass a large potential prehistoric and historic archaeological deposit, the historic town site and activity areas, a transportation corridor and part of an adjacent landform at the base of the Askinuk Mountains which includes a large wetland delta facing Scammon Bay proper where XHB-00112 is located. This property has not been determined eligible.

Within Scammon Bay proper are sites associated with installation of buried water pipes (XHB-00119, XHB-00120, and an evaluation of the Federal Scout Readiness Center (FSRC, XHB-00117). XHB-00119, a surface deposit of discarded materials, and XHB-00120, a buried water pipe, were determined not eligible for listing on the National Register of Historic Places (NRHP). The FSRC XHB-00117 was found not eligible for listing but by agreement with SHPO would treat the structures as eligible for listing on the NRHP.

Outside the townsite but within the polygon for XHB-00113 is XHB-0112, Northern Commercial Company Store ruins. This site is in a stream cut indentation and flood plain beyond the mouth of the river proper with better access for lightering freight from ships to shore, including possibly Revenue Cutter Service ships and Alaska Native Service ships like the Northstar. A tugboat, the Helen Lee, and two lighters used to move freight to shore was beached in the bay in 1950 and later salvaged (Nome Nugget 1950).

Outside the polygon for Scammon Bay (XHB-00113) are the former village site of Kutmiut (XHB-00002) east of the modern community, a site on Kongishluk Bay (XHB-00094), and Kangirrlak (XHB-00095). Only the former Kutmiut site (XHB-00002) is located near an alternative airport location. Review of aerial photographs indicates that there are numerous candidates for possible residential surface depression sites in this area and indications of ATV use.

The alternative airport facilities locations identified in the Scammon Bay Planning Study, intersect with trails which have been documented as part of RS 2477 and Section 17(b) of the Alaska Native Claims Settlement Act (ANCSA). These trails likely originated in the prehistoric past and their significance continues to the present day as paths for travel to neighboring communities and resource harvest locations. Winter trails with summer use, especially in the uplands of the Askinuk Mountains, transitioned from muscle powered sleds to motorized vehicles in the 1950s and 1960s. The trails have not been archaeologically assessed in the field.

Discussion

The Scammon Bay Feasibility Study evaluated five potential alternatives:

- Alternative 1 (“No Action”) would maintain the airport in its current configuration and provide improvements based on eligibility.
- Alternative 2 (“Shift & Raise”) would shift the runway 340 feet inland along its current alignment as protection from river movement. This alternative includes raising the surface elevation of the edge of the embankment to +19.5 feet MHHW to 19.5’ to meet and exceed the 50-year flood plain requirement.
- Alternative 3 (“Near”) would relocate the Airport onto the transitional area between lowlands and the Askinuk Mountains, near the community of Scammon Bay.
- Alternative 4 (“Castle Hill”) would relocate the Airport to the valley between Castle Hill and the Askinuk Mountains.
- Alternative 5 (“Ridgeline”) would relocate the Airport to the ridgeline south of Scammon Bay in the Askinuk Mountains.

Based on the geographic area of potential new impacts for the proposed alternatives, the least harm alternative would be the “No Action” alternative. Reconstruction of the existing airport within its existing footprint, including armoring of the existing facilities, without raising the elevation of the embankment, would have the least new ground disturbance because construction impacts would occur on areas already disturbed by prior airport construction and maintenance. This alternative does not remove the risk of flooding or erosion damage to the runway facilities.

The Shift & Raise alternative would cause new ground disturbance, but it would be less than the alternatives that would relocate the airport. Many improvements would occur within the footprint of the existing airport, utilizing the existing embankment and access road. Some of the land that would need to be acquired for the project has experienced prior ground disturbance. However, land associated with the runway shift and a potential new local material source site would require subsurface geotechnical testing as part of a capital improvement project. A cultural resource survey would also be required under the NHPA and NEPA process as part of the capital improvement project for this alternative.

The three airport relocation alternatives, Near, Castle Hill, and Ridgeline, would have more ground disturbances than the No Action and Shift & Raise alternatives. The most disturbance would be with the Ridgeline Alternative. Airport relocation would require the construction of new roads, potential new material source sites, in addition to the new areas of disturbance required for the runway, apron, taxiway, pads, lighting and segmented circle/navaids. These alternatives would require more expansive cultural resource surveys under the NHPA and NEPA process as part of a capital improvement project. These alternatives would also require subsurface geotechnical testing and potentially other NEPA impacts analyses before further evaluation. The three relocation alternatives have the potential for the most harm due to significant new ground disturbance.

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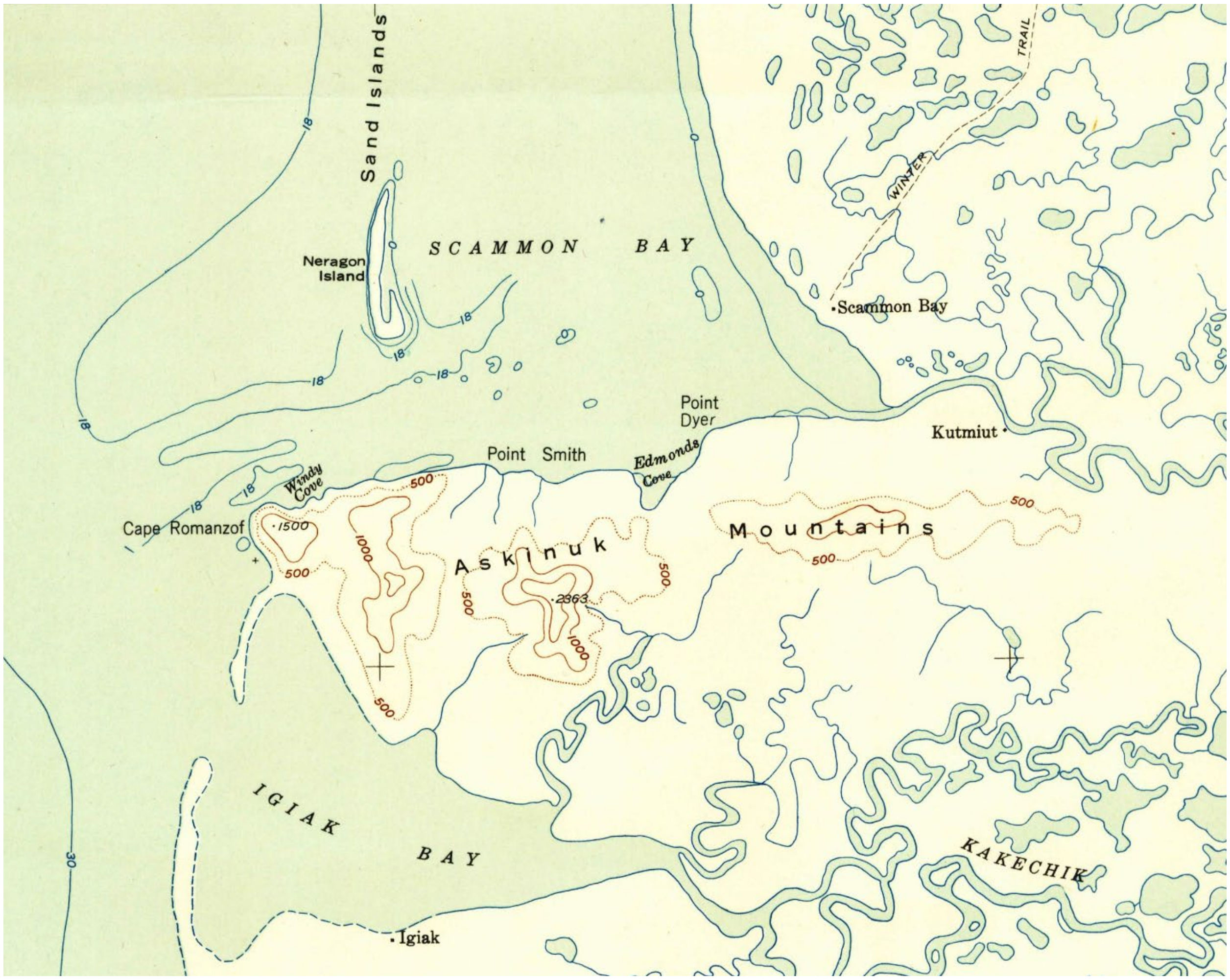

FIGURE 1: 1951 HOOPER BAY QUADRANGLE EXTRACT FROM 1942-1943 AIR PHOTOS AND 1945 STEREOPHOTOGRAMMETRY.

FIGURE 2: GEORGE PUTNAM PHOTOGRAPH OF KUN RIVER FROM SURVEY POINT, 1899.

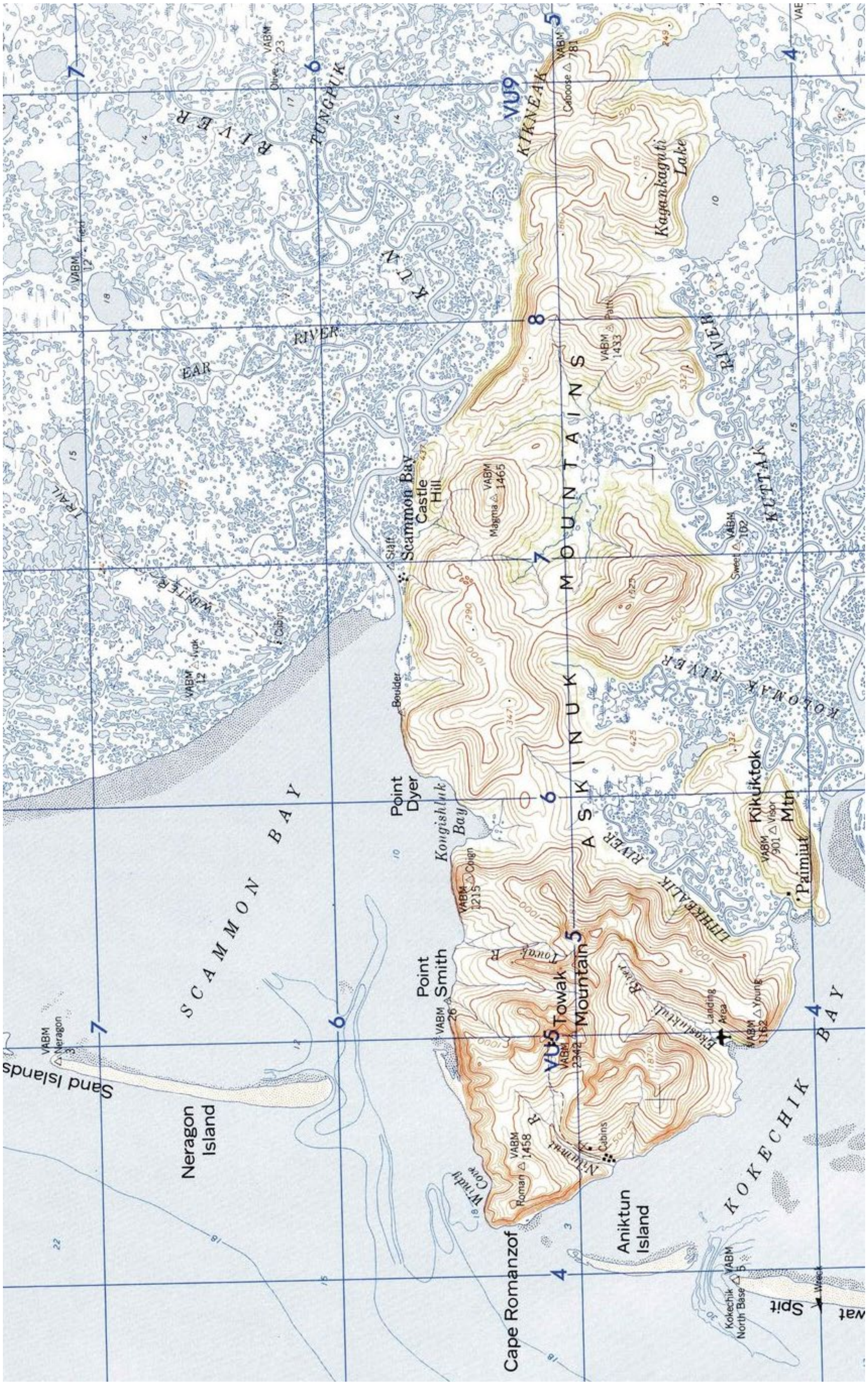

FIGURE 3: 1964 HOOPER BAY MAP EXTRACT SHOWING THE ASKINUK MOUNTAINS.

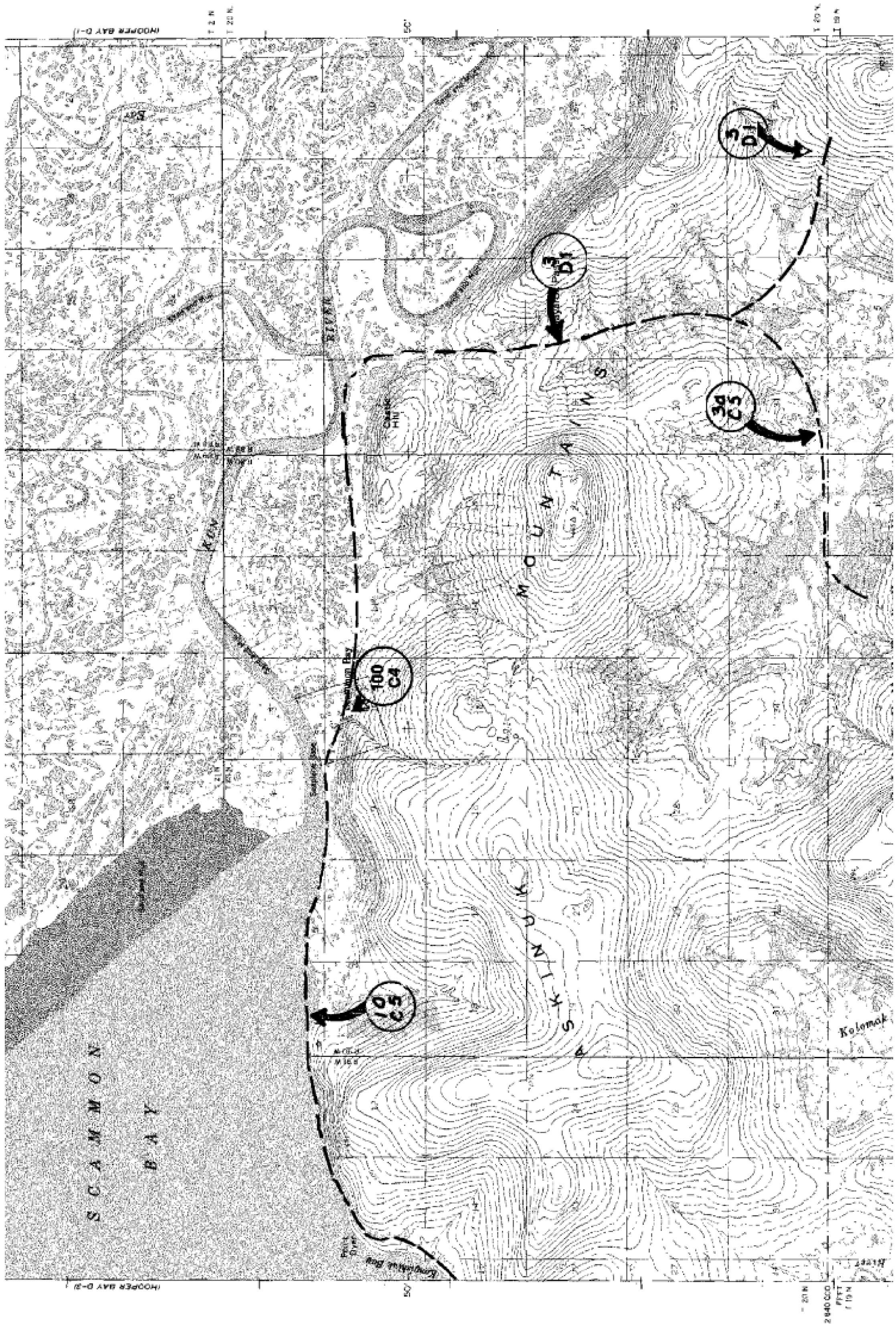

FIGURE 4: BLM MAP SHOWING 17(B) EASEMENT TRAILS

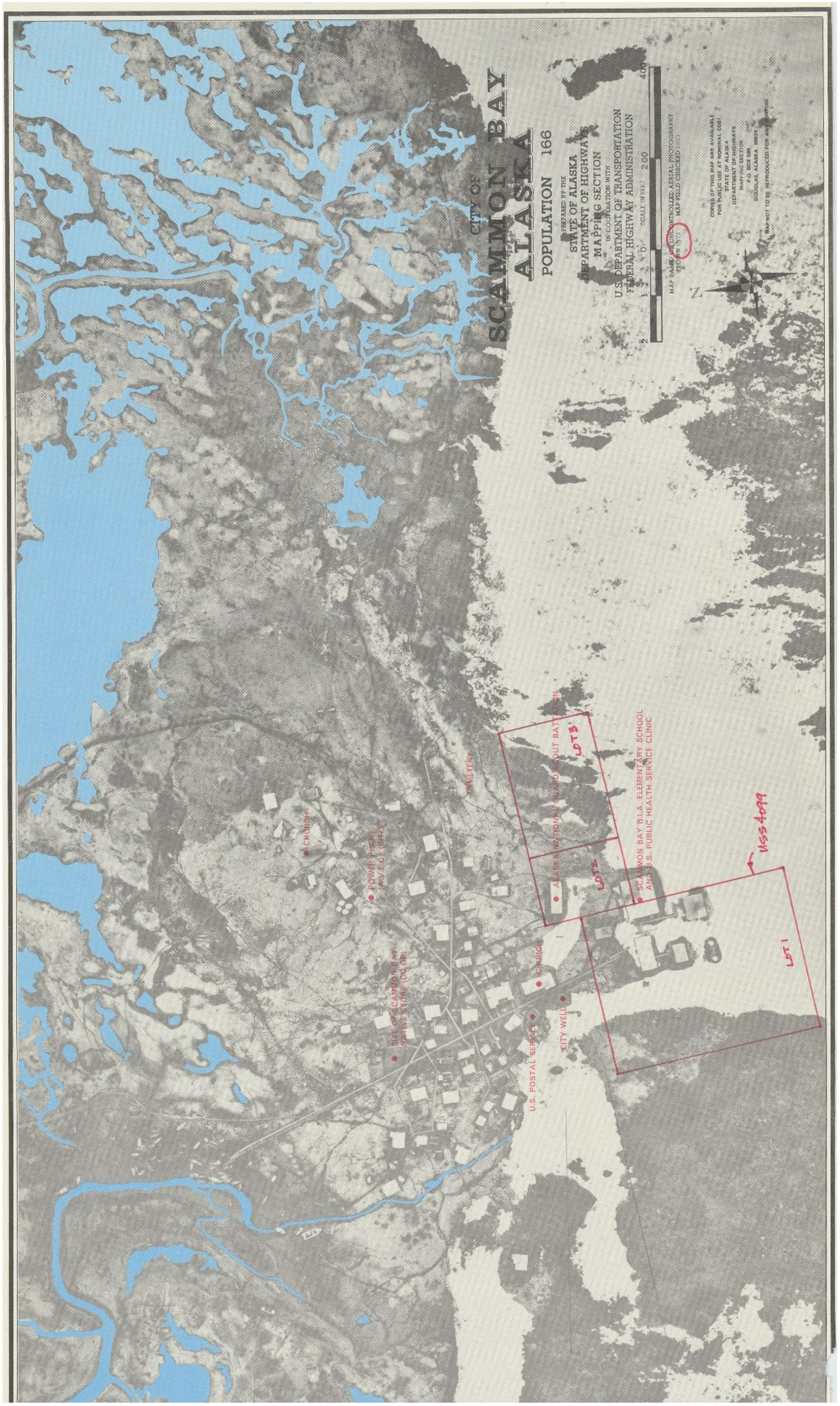

FIGURE 5: CROPPED 1972 AERIAL MAP OF SCAMMON BAY.