2022

City of Saint Paul, Alaska
Local Hazard Mitigation Plan

CITY OF SAINT PAUL, ALASKA

2022 LOCAL HAZARD MITIGATION PLAN

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ºF	degrees Fahrenheit
AECOM	AECOM Technical Services, Inc.
AVO	Alaska Volcano Observatory
BRIC	Building Resilient Infrastructure and Communities
CFR	Code of Federal Regulations
COVID-19	coronavirus disease 2019
DMA 2000	Disaster Mitigation Act of 2000
EHS	Extremely Hazardous Substance
EMS	Emergency Medical Services
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
LHMP	Local Hazard Mitigation Plan
M	Magnitude
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
PGA	Peak Ground Acceleration
SARS-CoV-2	severe acute respiratory syndrome coronavirus-2
SNAP	Scenarios Network for Alaska + Arctic Planning
STAPLEE	social, technical, administrative, political, legal, environmental, and economic
US	United States
USGS	United States Geological Survey

1 INTRODUCTION

1.1 CITY OF SAINT PAUL, ALASKA OVERVIEW

The City of Saint Paul, Alaska (City of Saint Paul) is in the central Bering Sea in the Pribilof Islands. The main population center of the City of Saint Paul is on a narrow peninsula on the southern tip of Saint Paul Island, the largest of the four islands and main settlement in the Pribilof Islands (Figure 1). The city encompasses a total 295.5 square miles, with 40.3 square miles of land and 255.2 square miles of water.

The city was incorporated in 1971. According to local census data, the population of the City of Saint Paul is 357 (2022). The population of the City of Saint Paul is predominately Alaska Native. The City of Saint Paul is in the Aleutians West Census Area.

1.2 HAZARD MITIGATION PLANNING

As defined in Title 44 of the Code of Federal Regulations (CFR), Subpart M, Section 206.401, hazard mitigation is "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards." As such, hazard mitigation is any work to minimize the impacts of any type of hazard event before it occurs. Hazard mitigation aims to reduce losses from future disasters. It is a process that identifies and profiles hazards, analyzes the people and facilities at risk, and develops mitigation actions to reduce or eliminate hazard risk. The implementation of the mitigation actions—which include short- and long-term strategies that may involve planning, policy changes, programs, projects, and other activities—is the end result of this process.

Over the past two decades, local hazard mitigation planning has been driven by a federal law, known as the Disaster Mitigation Act of 2000 (DMA 2000). On October 30, 2000, Congress passed the DMA 2000 (Public Law 106-390), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Title 42 of the US Code Section 5121 et seq.) by repealing the act's previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This new section also provided the legal basis for the Federal Emergency Management Agency's (FEMA's) mitigation plan requirements for the Hazard Mitigation Assistance (HMA) grant programs.

1.3 2022 LOCAL HAZARD MITIGATION PLAN SYNOPSIS

To meet the requirements of the DMA 2000, the City of Saint Paul is updating its 2016 Local Hazard Mitigation Plan (LHMP). The goal of this planning process is to assess risks posed by hazards and to develop prioritized action plans to reduce risks in the City of Saint Paul. The 2022 LHMP is organized to follow FEMA's Local Mitigation Plan Review Tool (Appendix B), which demonstrates how hazard mitigation plans meet the DMA 2000 regulations. As such, specific planning elements of this review tool are in their appropriate plan sections.

The 2022 LHMP structure has been updated to include the following sections:

- **Section 1 Introduction** introduces the City of Saint Paul and provides information on hazard mitigation planning.
- **Section 2 Planning Process** includes an overview of the planning process, starting with a timeline. This section includes identification of planning team members and describes their involvement with the planning process. This section also includes details on stakeholder outreach,

public involvement, and continued public involvement. It provides an overview of the existing plans and reports, details how those documents were incorporated into the 2022 LHMP and provides a plan update method and schedule. Supporting planning process documentation is provided in Appendix C.

- **Section 3 Hazard Identification** includes a description of each of the nine hazards addressed in this plan. Hazard figures are provided in Appendix A.
- **Section 4 Risk Assessment** includes hazard impact tables or descriptions for land area, population centers, and critical facilities. An overall summary of vulnerability for each hazard is also provided.
- **Section 5 Mitigation Strategy** includes a description of the City of Saint Paul's mitigation goals; potential mitigation actions and projects; and prioritization process. A capability assessment, prioritized action plan, and the process to integrate the 2022 LHMP into other planning mechanisms are also addressed.
- **Section 6 Plan Review** includes an overview of development changes that have occurred since the 2018 plan, the progress in local mitigation efforts, and changes in priorities for mitigation actions.
- **Section 7 Plan Adoption** includes information about the formal adoption.
- **Section 8 Appendices** include Appendix A (Figures), Appendix B (FEMA's Local Mitigation Plan Review Tool), and Appendix C (Planning Process).

2 PLANNING PROCESS

This section addresses Element A of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element A: Planning Process
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

2.1 OVERVIEW OF THE 2022 LHMP PLANNING PROCESS

The development of the 2022 LHMP was collaborative effort between the City of Saint Paul, AECOM Technical Services, Inc. (AECOM), and a planning team. The planning process officially kicked off in December 2021, and ended in [month, year]. A timeline of the major planning tasks and milestones by month, including the three times the planning team met, is provided in Table 2-1. A list of the planning team members and how they contributed to the development of the plan is provided in Table 2-2. Planning team agendas are provided in Appendix B.

Table 2-1: LHMP Timeline

Date	Tasks	People Involved
December 2021	LHMP kick-off call Initial information collected: hazards to be profiled, critical facility information mapped	LHMP project manager, consultant, planning team
January 2022	Initial public outreach and stakeholder involvement Hazard profiles drafted	LHMP project manager, consultant, planning team
February 2022	Hazard figures created; hazard impact assessments drafted	consultant
April 2022	Draft mitigation actions developed	Consultant, LHMP project manager
May 2022	Second planning team meeting (draft mitigation actions reviewed) Prioritization action plan developed Integration of LHMP into other planning documents determined	LHMP project manager, consultant, planning team

Table 2-1: LHMP Timeline

Date	Tasks	People Involved
May 2022	Internal Draft LHMP	LHMP project manager, consultant, planning team
June 2022	Public Draft LHMP Follow-up public outreach and stakeholder involvement	LHMP project manager, consultant, public
[month, year	Final Draft LHMP	LHMP project manager, consultant, Alaska Division of Homeland Security and Emergency Management, FEMA Region X
[month, year	Adoption of Final LHMP	LHMP project manager, City of Saint Paul City Council, consultant

Table 2-2: Planning Team

Name	Department/Agency, Title	Contribution
Philip Zavadil	City of Saint Paul, Administration Department, City Manager, LHMP project manager	Served as the LHMP project manager. Led planning team meetings; reviewed and commented on hazard figures, risk assessment tables, mitigation strategies, and the Internal Draft LHMP.
Lynn Sternbenz	City of Saint Paul, Administration Department, Projects/Grants Specialist	Participated in planning team meetings and/or reviewed planning team documents; reviewed and commented on hazard figures, mitigation strategies, and the Internal Draft LHMP.
Michael Castro	City of Saint Paul, Department of Public Safety, Director of Public Safety/Chief of Police	Participated in planning team meetings and/or reviewed planning team documents; reviewed and commented on hazard figures, mitigation strategies, and the Internal Draft LHMP.

2.2 OPPORTUNITIES FOR STAKEHOLDERS

On January 6, 2022, the LHMP project manager reached out to stakeholders via email (Appendix C) about the 2022 LHMP and invited them to participate in the planning process. Stakeholders included Aleut Community of Saint Paul Island (President), Aleut Corporation (Shareholder Relations), Central Bering Sea's Fishermen's Association (Chief Operating Officer), Coastal Transportation, Inc. (Vice President), Lynden Air Cargo, National Oceanographic and Atmospheric Administration (NOAA) (Pribilof Islands Program Manager and Fur Seal Research Coordinator), Pribilof School District (Superintendent/K-12 principal), State of Alaska, Department of Homeland Security and Emergency Management (Hazard Mitigation Planner), State of Alaska, Department of Transportation and Public Facilities (Kodiak/Aleutian District Superintendent), TDX Corp (Chief Executive Office / Vice-Chairperson of the Board), Trident Seafoods (Western Alaska Operation Manager), and US Fish and Wildlife Service (Refuge Manager).

Comments were received from the Pribilof School District and Trident Seafoods in January 2022. The Superintendent / K-12 principal of the Pribilof School District requested clarification on school-based

hazard planning; the planning team lead responded that the hazard mitigation plan is community-wide and not specific to the schools. The planning team lead also pointed out that the school gym has been identified in the plan as a potential shelter. The Western Alaska Operations Manager of Trident Seafoods suggested a mitigation strategy for shelters and supplies to be included in the plan. A copy of the email and a summary of comments received are provided in Appendix C.

The LHMP project manager reached out to the stakeholders again via email on [date], inviting them to review and provide comments about the Public Draft LHMP. A copy of the emails and a summary of comments received are provided in Appendix C.

2.3 PUBLIC INVOLVEMENT

The City of Saint Paul posted information about the 2022 LHMP kickoff in the City's February 2022 issue of Berings, the City's monthly emailed newsletter (Appendix C). No public comments were received. All newsletters can also be found on the City's website.

Also, on Date the City of Saint Paul posted information about the Public Draft LHMP and comment period on the Berings newsletter. Copies of the City of Saint Paul's newsletters and a summary of public comments received are provided in Appendix C.

2.4 REVIEW AND INCORPORATION OF EXISTING PLANS AND REPORTS

A list of the major relevant plans and reports reviewed and incorporated into the 2022 LHMP is provided in Table 2-3.

Table 2-3: Existing Plans and Reports

Plans and Reports	Information to be Incorporated into the 2022 LHMP
Aleut Community of Saint Paul, 2020. Draft Tribal Hazard Mitigation Plan	Plan compatibility and community-wide information
Baker, Monique, City Clerk, City of Saint Paul, Alaska. June 2022. City of Saint Paul Local Census.	City of Saint Paul Overview
City of Saint Paul, 2016. Alaska Draft Hazard Mitigation Plan Update	Mitigation actions
City of Saint Paul, 2008. Alaska Local Multi-Hazard Mitigation Plan	Mitigation actions
Markon, C., S. Gray, M. Berman, L. Eerkes-Medrano, T. Hennessy, H. Huntington, J. Littell, M. McCammon, R. Thoman, and S. Trainor, 2018, Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II	Climate change hazard profile; nature
State of Alaska. 2018. State Hazard Mitigation Plan	Hazard profiles
Stabeno, P.J., Thoman, R.L., and Wood, K. 2019. Recent Warming in the Bering Sea and Its Impact on the Ecosystem. In NOAA Arctic Report Card; Update for 2019.	Climate change hazard profile; history (sea ice maximum extent)

Table 2-3: Existing Plans and Reports

Plans and Reports	Information to be Incorporated into the 2022 LHMP
State of Alaska, Department of Environmental Conservation Division of Spill Prevention and Response, 2007. Ten Year Statewide Summary Oil and Hazardous Substance Spill Data	Hazardous materials event hazard profile; history
State of Alaska, Division of Geological & Geophysical Surveys, 2020. Regional Tsunami Hazard Assessment for Communities of Bristol Bay and the Pribilof Islands, Alaska.	Tsunami hazard profile; location and extent/severity
State of Alaska, Division of Public Health, 2017. Alaska Facts and Figures: 1918 Pandemic Influenza Mortality in Alaska.	Infectious disease hazard; history
US Fish and Wildlife Service. 2019. 2019 Alaska seabird Die-off Fact Sheet.	Climate change hazard profile; extent/severity (impact on marine ecosystems)
US Army Corps of Engineers, 2007. Alaska Baseline Erosion Assessment, Erosion Information Paper – Saint Paul, Alaska	Erosion hazard; location and extent/severity

2.5 CONTINUED PUBLIC PARTICIPATION

A copy of the 2022 LHMP will remain available at the City's office and website along with contact information. The LHMP project manager will use the City of Saint Paul's monthly emailed newsletter to notify the public of, and seek input on, any changes or updates to the 2022 LHMP, including prioritized action plan and the 2027 LHMP kickoff.

2.6 PLAN UPDATE METHOD AND SCHEDULE

The 2022 LHMP will be monitored, evaluated, and updated by a subset of the planning team, specifically the LHMP project manager, specifically the city manager in the administration department. Should the 2022 LHMP project manager no longer be involved with the 2027 LHMP, the project manager and/or City Council will select a new LHMP project manager to oversee the annual reviews and plan update.

The LHMP project manager will get input from specific planning team members as needed. The LHMP project manager will complete the Annual Review Tracker every January and after any major disaster to ensure that the 2027 LHMP is relevant and effective in achieving the plan's goals. Annual review will be tracked in a table in this document (Table 2-4). FEMA-funded mitigation projects will continue to be tracked and reviewed using FEMA Mitigation Progress Report forms; progress summaries will be included in the Annual Review Tracker (Table 2-4) at the beginning of each year.

Four years after the 2022 LHMP's adoption:

- The city manager or designee will complete the Annual Review Tracker.
- The city manager or designee will reconvene the planning team and update membership, if necessary.
- The city manager or designee will review Table 2-4, which provides annual summaries of the disasters that have occurred; new permanent information that becomes available; implementation

measures; and public outreach and response to determine the hazards to be included in the next LHMP.

- The city manager or designee will develop a new work plan.
- The city manager or designee —with support from the planning team—will begin the plan update process, which is expected to take up to 6 months.

Table 2-4: Annual Review Tracker

Year	Disasters that Occurred	Mitigation Actions Implemented	New Relevant Studies/Reports to Include in 2022 LHMP	Public Outreach Conducted	Changes Made to 2022 LHMP
2023					
2024					
2025					
2026					

3 HAZARD IDENTIFICATION AND RISK ASSESSMENT

This section addresses Element B of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element B: Hazard Identification and Risk Assessment
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement § 201.6(c)(2)(ii))
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement § 201.6(c)(2)(i))

Hazard identification consists of describing the nature of the hazard, disaster history, location, extent/severity, and probability of future events. Hazard identification profiles have been developed for each of the hazards addressed in Section 3.1 through Section 3.9. The hazards profiled for this LHMP are discussed in alphabetical order and not hazard classification. The order does not signify level of risk.

The City of Saint Paul is a remote island community accessible via sea and air. Of particular concern is the impact of hazards on shipments and deliveries of fuel and supplies that come in from outside the community. According to the Alaska Division of Community and Regional Affairs, The City of Saint Paul receives most perishable groceries from air. Cargo vessels from Seattle arrive approximately every six weeks carrying dry and frozen goods plus large items such as furniture, autos, construction materials, and personal orders.

3.1 CLIMATE CHANGE

Table 3-1: Climate Change

Profile	Description
Nature	Climate is defined as the average statistics of weather, which includes temperature, precipitation, and seasonal patterns in a particular region. Climate change refers to the long term and irrevocable shift in these weather-related patterns. The Fourth National Climate Assessment Report (2018) states that Earth's climate is now changing at a faster rate than at any time in the history of modern civilization, primarily due to human activities. The disruption in the climate is already impacting the way people live, the food they grow, their health, the wildlife, the availability of water, and much more. The impacts of global climate change are being felt today, from sea level rise and storm surge in coastal areas, increased riverine flooding and stormwater inundation; more frequent and prolonged higher temperatures (leading to heat events, wildfires, and permafrost thaw); and more severe and frequent extreme weather events. Changing climate conditions are more pronounced in the polar regions. Alaska is often identified as being at the forefront of climate change because it is warming faster than any other state and faces multiple issues associated with a changing climate.
Location	All of the City of Saint Paul is affected by increased temperatures and rainfall as a result of climate change. Along Saint Paul Island's coastline, sea level rise combined with a shift in the timing and extent of sea ice and storm surge have caused flooding and erosion. In addition, cliffs along the southeastern side of the island have been subject to erosion because the timing and extent of freezing temperatures that normally would help stabilize the cliffs has been altered.
History	The Fourth National Climate Change Assessment Report (2020) states that the impacts of climate change are already being felt today. The changes are due to the increased atmospheric concentrations of greenhouse gases since the industrial revolution (mid 1800s). Alaska has warmed twice as fast as the global average since the mid-twentieth century. The Alaska Climate Research Center observed a change of annual average daily temperature in the City of Saint Paul from 34.4ºF from 1950-1960, to 36.7ºF from 2010-2020 (a 7% increase). During that time period, Alaska Climate Research Center also observed an increase of annual precipitation from 23.7 inches to 26 inches (11% increase) in the City of Saint Paul.
Extent / Severity	The University of Alaska Fairbanks Scenarios Network for Alaska + Arctic Planning (SNAP) models climate data for mid-range global emissions. SNAP temperature models show that the City of Saint Paul will experience a temperature increase of 4.9 degrees Fahrenheit (ºF) (12.9%) by the end of the century. Likewise, precipitation models show that for the same reporting period the City of Saint Paul will experience an average rainfall increase of 3.3 inches (13.7%). NOAA reported record low maximum sea-ice extent levels in 2018 and 2019 in the Bering Sea. The levels measured in 2018 and 2019 are less than half of the long-term mean (1980-2010).
Recurrence Probability	Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods of time ranging from decades to millions of years. It may be a change in average weather conditions or in the distribution of weather around the average conditions (i.e., more or fewer extreme weather events). According to the National Aeronautics and Space Administration, "the current warming trend is of particular significance because most of it is extremely likely (i.e., greater than 95% probability) to be the result of human activity since the mid-twentieth century and proceeding at a rate that is unprecedented over decades to millennia." The National Aeronautics and Space Administration also states that "scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gases produced by human activities.

3.2 EARTHQUAKE

Table 3-2: Earthquake

Profile	Description
Nature	An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and can cause massive damage and extensive casualties in a few seconds. Common effects of earthquakes are ground motion and shaking; surface fault ruptures; and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can amplify ground motions. In addition to ground motion, several secondary hazards can occur from earthquakes, such as the following: • Surface faulting, which is the differential movement of two sides of a fault at the Earth's surface. Displacement along faults—in terms of both length and width—varies but can be significant (e.g., up to 20 feet), as can the length of the surface rupture (e.g., up to 200 miles). Surface faulting can cause severe damage to linear structures including railways, highways, pipelines, tunnels, and dams. • Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its granular structure and causing some of the empty spaces between granules to collapse. Pore water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (i.e., horizontal movements, typically 10 to 15 feet, but up to 100 feet), flow failures (i.e., massive flows of soil, typically hundreds of feet, but up to 12 miles), and loss of bearing strength (i.e., soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property. • Landslides/debris flows occur as a result of horizontal seismic inertia forces induced in the slopes by the ground shaking. The most common earthquake-induced landslides include shallow, disrupted landslides such as rock falls, rockslides, and soil slides. Debris flows are created when surface soil on steep slopes becomes totally saturated with water. Once the soil liquefies, it loses the ability to hold together and can flow downhill at very high speeds, taking vegetation and/or structures with it. Slide risks increase after an earthquake during a wet winter. The two most common measures of earthquake intensity used in the US are the Modified Mercalli Intensity scale, which measures felt intensity; and peak ground acceleration (PGA), which measures instrumental intensity by quantifying how hard the earth shakes in a given location. Magnitude (M) is measured by the amplitude of the earthquake waves recorded on a seismograph using a logarithmic scale.
Location	The Alaska Earthquake Center describes the central region of the Bering Sea as virtually aseismic, (lacking earthquake activity) and Alaska's Division of Geological and Geophysical Surveys does not have a fault mapped within several hundred miles of the Pribilof Islands (Figure 2). The closest mapped fault is the Alaska-Aleut Megathrust subduction zone fault, over 350 miles to the south. A large earthquake at this fault zone could be strong enough to impact Saint Paul Island. However, Saint Paul Island could also be impacted by earthquake swarms, or a series of earthquakes that is different from a typical mainshock-aftershock sequence and can occur in areas not typically associated with a fault line.

Table 3-2: Earthquake

Profile	Description
History	The Alaska Earthquake Center lists three earthquakes that occurred in the Bering Sea from 1991 through 2021: - 1991: A M 6.5 earthquake in the Bering Sea was felt on Saint Paul Island, Pribilof Islands and at Adak, Andreanof Islands. It caused a small tsunami. - 2010: Bering Sea Earthquakes (M 6.5 and 6.3) (approximately 330 miles from the City of Saint Paul) - 2015: Pribilof Island Swarm; more than 100 events were recorded with M between 2.8 and 5.4. No earthquakes have occurred since the 2016 LHMP.
Extent / Severity	The strength of an earthquake's ground movement can be measured by PGA. PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity (g = 980 centimeters per second). PGA is used to predict the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (e.g., 10%, 5%, or 2%) of being exceeded in 50 years. The ground motion values are used for reference in construction design for earthquake resistance and can also be used to assess the relative hazard between sites when making economic and safety decisions. The current US Geological Survey seismicity model for Alaska was developed in 2007. For the City of Saint Paul, there is a 5% probability of an earthquake with a PGA of 6.35 occurring within 50 years, as shown in Figure 2. Based on this model, 100% of the City of Saint Paul is in a moderate perceived shaking zone.
Recurrence Probability	According to the US Geological Survey's Probabilistic Seismic Hazard Analysis Maps, there is a 5% probability of an earthquake resulting in moderate perceived shaking and exceeding 6.35 PGA in the next 50 years in the City of Saint Paul (Figure 2).

3.3 EROSION

Table 3-3: Erosion

Profile	Description
Nature	Erosion is the wearing and transportation of land. Erosion is typically gradual land loss through wind or water scour. In developed regions, erosion undermines buildings and infrastructure. Erosion can be experienced from coastal, riverine, or wind sources. Erosion forces are embodied in waves, currents, and winds; surface and groundwater flow; and freeze-thaw cycles may also play a role. Not all of these forces may be present at any particular location. In the US, Alaska is unique because of how permafrost thaw interacts with flooding and erosion to exacerbate the impacts of these hazards. Frozen ground can disintegrate under the compounding influences of permafrost thaw, flooding, and erosion in an escalating feedback loop that can result in damage that is much greater than would be expected from the individual processes alone. Coastal erosion is a common term used to describe the retreat of the shoreline along the ocean. It describes the attrition of land resulting in loss of beach; shoreline; or dune material from natural activity or human influences and rarely causes death or injury. However, erosion can cause property destruction, prohibit development, and impact community infrastructure. Erosion can occur rapidly as the result of floods, storms, or other event; or slowly as the result of long-term environmental changes such as melting permafrost. Erosion is a natural process, but its effects can be easily exacerbated by human activity. Coastal erosion can occur from rapid short-term daily, seasonal, or annual natural events such as waves, storm surge, wind, coastal storms, and flooding; or from human activities including boat wakes and dredging. The most dramatic erosion often occurs during storms, particularly because the highest energy waves are generated under storm conditions. Coastal erosion occurs over the area from roughly the top of the shore into the nearshore region to about 30 feet water depth. It is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time. Bluff recession is the most visible aspect of coastal erosion because of the dramatic change it causes to the landscape. As a result, this aspect of coastal erosion usually receives the most attention. Coastal erosion may also be due to multi-year impacts and long-term climatic change such as sea-level rise; lack of sediment supply; subsidence; or long-term human factors such as aquifer depletion or the construction of shore protection structures and dams. Attempts to control erosion using shoreline protective measures such as groins, jetties, seawalls, or revetments can lead to increased erosion.
Location	There are three areas identified by the City of Saint Paul as heavily impacted by coastal erosion, shown in Figure 3: 1. Adjacent to one of the cemeteries in the southeast area near Lukanin Bay 2. On Southwest Point Road approximately 3 miles west of the population center near Southwest Bay 3. On Northeast Point Road about 12 miles northeast of the City of Saint Paul
History	The City of Saint Paul is periodically eroded by high tides, storm surges, wind, and waves. Warming weather related to climate change makes cliffs less stable during periods of strong wind or waves and leading to more severe erosion. No major erosion events have occurred.
Extent / Severity	The statewide threat assessment conducted by the Denali Commission in 2019 placed the City of Saint Paul in erosion severity group 2, defined as an area where the threat of erosion not expected to detrimentally impact critical infrastructure, but the community is still vulnerable to the threat and more research and data collection are needed. According to the Army Corps of Engineers in 2007 and in reference to a community survey, the rate of erosion estimated in the City of Saint Paul is 2.5 feet per year.

Table 3-3: Erosion

Profile	Description
Recurrence Probability	The community should expect erosion to continue at the current estimated rate of approximately 2.5 feet per year. As the temperature continues to be warmer, erosion will accelerate as coastal landforms that have not frozen and stabilized become for frequently exposed to strong storms.

3.4 HAZARDOUS MATERIALS EVENT—AMMONIA

Table 3-4: Hazardous Materials Event —Ammonia

Profile	Description
Nature	Hazardous materials are substances that may have negative effects on health or the environment. Exposure to hazardous materials may cause injury, illness, or death. Effects may be felt over seconds, minutes, or hours (short term); or not emerge until days, weeks, or even years after exposure (long term). In addition, some substances are harmful after single exposures of short duration, while others require long episodes of exposure or repeated exposure over time to create harm. Hazardous materials that pose the greatest risk for causing catastrophic emergencies, as identified by the Environmental Protection Agency, are classified as Extremely Hazardous Substances (EHSs). Releases of EHSs and other hazardous substances can occur at facilities or during transport. In addition to accidental, human-caused hazardous material events, natural phenomena may cause the release of hazardous materials and complicate response activities. Earthquakes pose a particular risk because they can damage or destroy facilities containing hazardous substances. The threat of any hazardous material event may be amplified by restricted access; reduced fire suppression and spill containment capability; and even complete cutoff of response personnel and equipment. Hazardous materials events or releases can also cause a host of secondary effects, depending on the nature and size of the incident. The Environmental Protection Agency lists ammonia as an EHS. Ammonia is used as a refrigerant at commercial fishery facilities in the City of Saint Paul. Ammonia is a toxic gas under ambient conditions.
Location	Ammonia (an EHS) is stored in tanks at the Trident Seafoods Saint Paul Plant Seafood Processing Facility in the City of Saint Paul (Figure 4).
History	According to the Alaska Department of Environmental Conservation, during the period between 2001 and 2022, there were 18 ammonia spills in the City of Saint Paul, the largest of which was 1,600 pounds released from Trident Seafoods in 2013. The most recent was a small release from Trident Seafoods in February 2022.
Extent / Severity	Releases of ammonia have the potential for harmful health effects on workers and the public, including burning of the eyes, nose, throat, and respiratory tract and can result in blindness, lung damage, or death. Of particular concern is the location of the ammonia tanks in close proximity to tanks storing fuel in the City of Saint Paul, a combined event could result in a significant and dangerous explosion.
Recurrence Probability	On average, ammonia spills occur in the City of Saint Paul once per year based on records from 2001 through 2022. The number per year is highly variable with a range of 0 to 7 spills per year. If this pattern were to continue, the City of Saint Paul could experience a range of spills from 0 to less than 10 per year.

3.5 INFECTIOUS DISEASE

Table 3-5: Infectious Disease

Profile	Description
Nature	A disease is a pathological condition of a part, organ, or system of a living organism resulting from various causes (e.g., infection or exposure to toxins) and characterized by an identifiable group of signs or symptoms. The major concern here is an epidemic, when a disease affects a disproportionally large number of individuals within a population, community, or region at the same time, or pandemic that affects the world. Infectious diseases are diseases caused by a pathogen that enters the body, triggering development of an infection. Such pathogens may include bacteria, viruses, fungi, or parasites. Infectious diseases can have a range of causes and are often contagious or communicable, meaning they can be passed from person to person. They can be transmitted through numerous modes, including direct contact (person-to-person, animal-to-person, or mother-to-unborn child), insect bites, food and water contamination, or airborne inhalation. Many infectious diseases can make the body vulnerable to secondary infections, which are caused by other organisms taking advantage of an already weakened immune system. According to the Global Health Council, over 9.5 million people die each year from infectious diseases. Although progress has been made to control or eradicate many infectious diseases, humans remain vulnerable to many new emerging organisms (such as the coronavirus disease 2019 [COVID-19] caused by severe acute respiratory syndrome coronavirus-2 [SARS-CoV-2]) a novel coronavirus discovered in 2019). In addition, previously recognized pathogens can evolve to become resistant to available antibiotics and other treatments. For example, malaria, tuberculosis, and bacterial pneumonias are appearing in new forms that are resistant to drug treatments. The spread of infectious diseases also increases with population growth and the ease of travel. The State of Alaska Department of Health and Social Services, Division of Public Health has established a list of 19 infectious diseases requiring healthcare providers to report immediately and 49 additional infectious diseases with routine reporting (i.e., within 2 working days). These diseases are those of public interest by reason of their communicability, severity, or frequency.
Location	The entire City of Saint Paul is susceptible to infectious diseases.
History	Notable historical outbreaks, epidemics, and pandemics in Alaska include: • 1918 to 1919: The influenza pandemic resulted in 1,113 deaths during the 2-year pandemic period (population of Alaska was almost 58,000 people in 1917). Half of all deaths in Alaska during that time period were attributable to influenza. • 1925 Diphtheria epidemic, Nome (approximately 540 miles from the City of Saint Paul). • 1957, 1968, and 2009: Influenza pandemics. • 2019 to present: COVID-19 pandemic, first confirmed in Alaska in March 2020. As of May 18, 2022, there have been 249,522 confirmed total cases and 1,252 deaths related to COVID-19 in Alaska. In the Aleutian-West Census Area, which includes the Pribilof Islands where the City of Saint Paul is located, there were 874 total cases as of May 18, 2022.

Table 3-5: Infectious Disease

Profile	Description
Extent / Severity	Each infectious disease has a different pathogenicity, which can affect the probability of occurrence and the extent of occurrence. In addition, infectious diseases are affected by factors such as environmental changes; human behavior and demographics; and technological advancement. According to the Mayo Clinic, most infectious diseases only have minor complications; however, some can be life threatening. When a disease affects a greater portion of the population than would normally be expected, it is called either an outbreak (if limited in geography) or an epidemic. An epidemic that spreads across countries or continents is called a pandemic. Depending on the organism, outbreaks, epidemics, or pandemics may be considered public health emergencies that require timely implementation of appropriate control measures. Such emergencies are commonly addressed through quarantine and immunization.
Recurrence Probability	The probability and magnitude of an infectious disease occurrence is difficult to evaluate due to the wide variation in disease characteristics, such as rate of spread; morbidity and mortality; detection and response time; and the availability of vaccines and other forms of prevention. Influenza pandemics are likely to occur approximately four times per century, as occurred in the 1900s. Other pandemics occur approximately every 100 years; this rate is likely to continue in the future.

3.6 SEVERE WEATHER

Table 3-6: Severe Weather

Profile	Description
Nature	Severe weather occurs throughout Alaska with extremes including thunderstorms; lightning; hail; heavy and drifting snow; freezing rain/ice storm; extreme cold; and high winds. Severe weather events can include the following: • A winter storm is an event in which the main types of precipitation are snow, sleet, or freezing rain and be accompanied by high winds, cold temperatures, and storm surge. A winter storm can range from a moderate snow over a few hours, to blizzard conditions with blinding wind-driven snow that lasts several days. Some winter storms may be large enough to affect several states, while others may affect only a single community. In more temperate continental climates (such as Southeast Alaska) these storms are not necessarily restricted to the winter season and may occur in the late autumn and early spring as well. • Heavy snow and rain occur frequently in coastal areas, and snowfall can accumulate 4 inches or more in 12 hours or less. • Freezing rain and ice storms occur when rain or drizzle freezes on surfaces and can cause damage to powerlines, pipelines, and other infrastructure. • Extreme cold varies according to normal regional climate. Alaska's extreme cold usually involves temperatures between -20ºF to -50ºF. Excessive cold may accompany winter storms, occur after storms, or can occur without storm activity. • High winds in Alaska can equal hurricane force but fall under a different classification because they are not cyclonic nor possess other hurricane characteristics. Strong winds occasionally occur over the interior due to strong pressure differences, especially where influenced by mountainous terrain; however, the windiest places in Alaska are generally along the coastlines. • Thunderstorms typically last 20 to 30 minutes and can produce hazards including lightning; heavy rain; snow; updrafts and downdrafts; aircraft turbulence and icing; damaging hail; high winds; and flash flooding. Thunderstorms are generally associated with warmer summer months but can occur in the winter. They are relatively uncommon and do not occur uniformly over the State. There have been observations of an increase in thunderstorm activity in certain areas. Lightning strikes are hazardous to human health, can start wildfires, and can damage infrastructure. • Storm surge is caused by coastal storms when a low-pressure weather system draws water toward the storm's center creating a bulge of water that moves with the storm. Flooding occurs when the bulge or storm surge meets up with land and is worse when the timing of its arrival coincides with a high tide. Other factors that influence the amount of flooding experienced are the shape and orientation of the coast relative to the oncoming storm.
Location	Severe weather can affect all of the City of Saint Paul. The low lying and exposed shoreline is most vulnerable to storm surge caused by coastal storms while the higher elevations are most vulnerable to lightning strikes caused by thunderstorms.
History	The City of Saint Paul is in the southwest maritime climate zone, which is characterized by persistently overcast skies, high winds, and frequent cyclonic storms. Due to its location in the Bering Sea, the island experiences cool weather year-round and a narrow range of average temperatures varying from 19ºF to 51ºF. Heavy fog is common during the summer months. According to NOAA's Storm Events Database, there were 50 severe weather events between 2010 and 2020 including 38 blizzards and 12 high wind events in the Pribilof Islands. The island averaged 5 events per year with 2012 as the busiest year with 18 recorded storm events.
Extent / Severity	Severe weather in the City of Saint Paul can bring winds gusting over 100 knots (115 miles per hour), high surf with the possibility of over 50-foot waves, and blizzards conditions.

Table 3-6: Severe Weather

Profile	Description
Recurrence Probability	The City of Saint Paul frequently experiences severe weather events and will continue to experience several events per year. Based on historical events, the City of Saint Paul will likely experience five severe weather events a year. However, climate change may alter the previously experienced trends with a shift toward more severe weather events, or more events occurring as heavy rain and fewer heavy snow events.

3.7 TSUNAMI

Table 3-7: Tsunami

Profile	Description
Nature	A tsunami is a series of traveling ocean waves of extremely long length, generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Subduction zone earthquakes at plate boundaries often cause tsunamis. However, tsunamis can also be generated by submarine landslides, sub-marine volcanic eruptions, the collapse of volcanic edifices, and—in very rare instances—large meteorite impacts in the ocean. In the deep ocean, a tsunami may have a length from wave crest to wave crest of 100 miles or more, but a wave height of only a few feet or less. Therefore, the wave period can be up to several hours and wavelengths can exceed several hundred miles. Tsunamis are unlike typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of up to 300 feet. Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are not symmetrical, the waves may be much stronger in one direction than another depending on the nature of the source and the surrounding geography. However, tsunamis propagate outward from their source; therefore, coasts in the shadow of affected land masses are safer. Secondary hazards can occur from tsunamis, such as: • Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features. • Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters; debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects. • Release of sewage and hazardous or toxic materials when wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed. • Flood waters can pose health risks such as contaminated water and food supplies. • Loss of shelter leaves people vulnerable to insect exposure, heat, and other environmental hazards. The majority of deaths associated with tsunamis are related to drownings, but traumatic injuries are also a primary concern. Injuries such as broken limbs and head injuries can be caused by the physical impact of people being washed into debris such as houses, trees, and other stationary items. As the water recedes, the strong suction of debris being pulled into largely populated areas can cause further injuries and undermine buildings and services.
Location	The City of Saint Paul's location within the Bering Sea makes it vulnerable to tectonic tsunamis as well as underwater landslide-generated tsunamis. The Alaska-Aleutian subduction zone has the highest potential to generate tsunamis in Alaska. According to the Alaska Division of Geological and Geophysical Surveys, a tsunami generated by an earthquake on the Alaska-Aleutian subduction zone would have a relatively low amplitude in the western part of the Bering Sea where the City of Saint Paul is situated. The actively eroding edge of the Bering Sea shelf is approximately 64 miles from the City of Saint Paul at its closest point. This feature has unstable sediment on steep underwater slopes that can be triggered by earthquake-induced shaking and other events such as severe weather or a volcanic eruption. In the population center, areas most at risk include those along the approximately 5 miles of waterfront (Figure 5).

Table 3-7: Tsunami

Profile	Description
History	According to NOAA's National Centers for Environmental Information / World Data Service Global Historical Tsunami Database, reports of tsunami inundation are rare but do exist for scattered locations around the Bering Sea: • 1872. An earthquake originating at Fox Islands (in the Aleutian chain approximately 270 miles from the City of Saint Paul) resulted in a tsunami. Maximum water height of 0.75 feet was recorded in the City of Saint Paul. • 1991. A small tsunami was generated from a M 6.5 earthquake in the Bering Sea. No tsunamis have occurred since the 2016 LHMP. The most recent tsunami advisory for Saint Paul was in 2021 following the Chignik Earthquake (M 8.1); however, it was canceled.
Extent / Severity	According to the Alaska Division of Geological and Geophysical Surveys, the maximum value of a tectonic-sourced tsunami runup is 52.5 feet at along the southern shore of Saint Paul Island. Modeling was also done for landslide-generated tsunamis; however, the results were inconclusive with highly variable amplitudes based on how location-specific the wave generation is related to the landslide event. The extent and severity of a tsunami also relates to the amount of time the community has to evacuate. A tsunami generated by a nearby earthquake or landslide represents a "near-field" hazard, meaning people may have minutes; however, the—rather than hours—to reach safety.
Recurrence Probability	The source of tsunamis that could potentially impact the City of Saint Paul include an earthquake at the Alaska-Aleutian subduction zone, an earthquake outside of a major fault line, or an underwater landslide. The underwater landslide can be triggered by an earthquake, volcanic eruption, or severe weather. Each of these triggers has a different recurrence probability making it nearly impossible to calculate an overall recurrence probability of a tsunami. Given the frequency of past occurrences, the City of Saint Paul could experience tsunami inundation every 100 years.

3.8 VOLCANO

Table 3-8: Volcano

Profile	Description
Nature	A volcano is a vent or opening in the earth's crust from which molten lava (magma), pyroclastic materials, and volcanic gases are expelled onto the surface. The vent may be visible as a small bowl-shaped depression at the summit of a cone or shield-shaped mountain. Through a series of cracks within and beneath the volcano, the vent connects to one or more linked storage areas of molten or partially molten rock. There are four general volcano types: • Lava domes, which are formed when lava erupts and accumulates near the vent. • Cinder cones, which are shaped and formed by cinders, ash, and other fragmented material accumulations that originate from an eruption. • Shield volcanoes, which are broad, gently sloping volcanic cones with a flat dome shape that usually encompass several tens or hundreds of square miles, built from overlapping and inter-fingering basaltic lava flows. • Composite or stratovolcanoes are typically steep-sided large dimensional symmetrical cones built from alternating lava, volcanic ash, cinder, and block layers; most composite volcanoes have a crater at the summit containing a central vent or a clustered group of vents. There are three types of volcanic eruptions, described below. Some volcanoes may exhibit only one type of eruption during an event, while others may display an entire sequence of all three types in one event. • Magmatic eruptions are the most well-observed eruptions. Magmatic eruptions produce juvenile clasts (composed fragments) during explosive decompression from gas releases. Magnetic eruption subtypes include: Hawaiian, Strombolian, Vulcanian, Peléan, and Plinian. • Phreatomagmatic eruptions are volcanic eruptions resulting from the interaction between magma and water. Grain deposits from phreatomagmatic explosion involving high water to magma ratios are extremely fine-grained and distinctly poorly sorted, while deposits resulting from low water to magma ratios are commonly coarse and relatively well-sorted. Phreatomagmatic eruption subtypes include: Surtseyan, Submarine, and Subglacial. • Phreatic eruptions are steam-blast eruptions. These eruptions occur when cold ground or surface water come into contact with hot rock or magma. Phreatic eruptions blast out steam, water, ash, volcanic bombs, and volcanic blocks, but no new magma. Other hazards potentially caused a volcanic eruption include: • Volcanic Ashfall • Lava Flows • Lahars (Debris Flows) • Volcanic Gas • Pyroclastic Surges or Flows • Volcanic Landslides

Table 3-8: Volcano

Profile	Description
Location	According to the Alaska Volcano Observatory (AVO), most of Saint Paul Island consists of coalescing small volcanoes, each composed of a central cinder cone and surrounding lava flows that were active in historic records. Active volcanoes from the Aleutian chain and farther distances may impact the City of Saint Paul depending on the direction the ash plume is carried by air currents. Active volcanoes around Saint Paul Island are shown in Figure 6. Bering Sea Volcanoes: • Saint George Volcanic Field: The lavas are older than those on nearby Saint Paul, and the original volcanic topography has been subdued by weathering and later redefined by faulting, uplift, and glaciation; 45 miles from the City of Saint Paul. • Nunivak Island: Inactive volcano in the eastern Bering Sea, approximately 230 miles from Saint Paul. • Amak: Small, young volcano in the Bering Sea north of the main Aleutian volcanic front. Most recent activity from 1796. Approximately 300 miles from the City of Saint Paul. • Bogoslof Island: The largest of a cluster of small, low-lying islands composing the emergent summit of a large submarine stratovolcano slightly north of the main Aleutian volcanic front. Most recent activity 2016; approximately 240 miles from the City of Saint Paul. Aleutian Volcanoes on AVO Alert List (Advisory or Watch): • Pavlof Volcano: is a snow- and ice-covered stratovolcano on the southwestern end of the Alaska Peninsula. With over 40 historic eruptions, it is one of the most consistently active volcanoes in the Aleutian arc. Approximately 345 miles from the City of Saint Paul. • Great Sitkin Volcano: is a basaltic andesite volcano that occupies most of the northern half of Great Sitkin Island, a member of the Andreanof Islands group in the central Aleutian Islands. The most recent significant eruption in 1974 produced at least one ash cloud that likely exceeded an altitude of 25,000 feet above sea level. Approximately 430 miles from the City of Saint Paul. • Semisopochnoi Volcano: occupies the largest, young volcanic island in the western Aleutians. The volcano is dominated by a 5-mile) diameter caldera that contains a small lake and a number of post-caldera cones and craters. The last known eruption of Semisopochnoi occurred in 1987, probably from Sugarloaf Peak on the south coast of the island, but details are lacking. Approximately 550 miles from the City of Saint Paul. • Davidof Volcano: is a mostly submerged stratovolcano in the Rat Islands group in the western Aleutian Islands. There are no known historical eruptions from Davidof. Approximately 570 miles from the City of Saint Paul. Southwestern Aleutian Basin (Russia)Volcanoes on AVO Alert List (Advisory or Watch): • Shiveluch, approximately 1,075 miles from the City of Saint Paul • Bezymianny, approximately 1,120 miles from the City of Saint Paul • Karymsky, approximately 1,190 miles from the City of Saint Paul

Table 3-8: Volcano

Profile	Description
History	AVO Lists the following recent eruptions for Saint Paul Island: • 1943: A very uncertain possible eruption account of a submarine eruption offshore of Saint Paul Island in the Pribilof Island is contained in Lyman Ellsworth's 1952 memoir, titled "Guys on Ice." Carbon dating of lava flows on Saint Paul Island estimate the following historic eruptions: • Fox Hill, 3230 (± 40 years) years before present • Bogoslof Hill, 40,000 (± 20,000 years) years before present • Hutchinson Hill, 80,000 (± 50,000 years) years before present • Cone Hill Complex, start 180,000 (±40,000 years) stop 120,000 (±40,000 years) years before present • Crater Hill, 360,000 (±80,000 years) years before present AVO and the Smithsonian Institution's Glocab Volcanism Program lists the following most recent eruptions that occurred since the 2016 LHMP Plan in the Aleutian Chain and Southwestern Aleutian Basin: • 2022 Sheveluch (lava dome in summit crater expanding as of May 13, 2022) • 2022 Bezymianny (effusive eruption with lava dome descending from crater and steam and ash emissions from April 8-15, 2022) • 2022 Karymsky (explosions generating ash plumes as high as 19,700 feet on May 12, 2022) • 2022 Pavlof (eruption on vent of Pavlof's upper east flank ongoing as of May 17, 2022) • 2022 Great Sitkin (minor advancement of lava dome in summit crater flowing downslope at two locations as of May 17, 2022) • 2022 Semisopochnoi (low-level eruptive activity as of May 17, 2022)
Extent / Severity	Volcanoes within 50 miles of Saint Paul Island are unmonitored and considered inactive. However, some volcanoes can remain dormant for hundreds or thousands of years between eruptions; therefore, the greatest risk caused by volcanic activity is not always apparent or known. Volcanic eruptions in the active Aleutian area have created: fragmented rock flows, lava flows, landslides, and mudflows; falling ash and drifting clouds of fine volcanic ash that has caused severe damage to both the built and natural environment hundreds of miles from the eruption location; and volcanic deposits which have created new landforms. Eruptions can last weeks or longer.
Recurrence Probability	The probability of trace amounts of ashfall (1/32 inch) coming from a distant eruption that could impact the City of Saint Paul either directly (from damages and health issues of the ash) or indirectly (from disruptions in air travel and supply delivery) is approximately once per year (or, equal to the overall probability of a volcanic eruption occurring in Alaska).

3.9 WILDFIRE

Table 3-9: Wildfire

Profile	Description
Nature	A wildfire—sometimes referred to as a wildland fire—is a fire in an area of combustible vegetation occurring in rural areas. Wildfires can be caused by human activities (e.g., unattended burns, campfires, or off-road vehicles without spark-arresting muffles); or by natural events, such as lightning, drought, or infestation. Wildfires can be classified as forest, urban, tundra, or interface or intermix fires, and prescribed burns. The following three factors contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas: • Topography describes slope increases, which influences wildfire spread rate increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridge tops may mark the end of wildfire spread because fire spreads more slowly or may even be unable to spread downhill. • Fuel is the type and condition of vegetation that plays a significant role in wildfire spread occurrence. Certain plant types are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available as fire fuel (referred to as the "fuel load"). The living-to-dead plant matter ratio is also important. Certain climate changes may increase wildfire risk significantly during prolonged drought periods as both living and dead plant matter moisture content decreases. Both the horizontal and vertical fuel load continuity is also an important factor. • Weather is the most variable factor affecting wildfire behavior. Temperature, humidity, wind, and lightning can affect ignition opportunities and fire spread rate. Extreme weather—such as high temperatures and low humidity—can lead to extreme wildfire activity. Climate change increases fire to vegetation ignition susceptibility due to longer dry seasons. By contrast, cooling and higher humidity often signal reduced wildfire occurrence and easier containment. Indirect wildfire effects can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and exacerbate river and stream siltation thereby increasing flood potential, harming aquatic life and degrading water quality. Vegetation-stripped lands are more susceptible to increased debris flow hazards.
Location	Saint Paul Island is susceptible to grass-fuel fires across most of the island and structural fires in the population center.
History	The Alaska Interagency Coordination Center does not have records for fires on Saint Paul Island. The community reported five fires occurring between 2003 and 2022. • 2003: 1 fire • 2004: 1 fire • 2014: 1 fire • 2020: 2 fires
Extent / Severity	As shown in Figure 7, a wildfire susceptibility model using best available Light Detection and Ranging (Lidar) and 2011 National Land Cover Database data show that most of the island (71% of the total area) is in a moderate wildfire risk area factoring in the low grassy vegetation and slope. Some portions of the interior of the island have a very high fire risk.
Recurrence Probability	Based on the community-reported rate of fires, the recurrence probability is relatively low at an average of two to three fires per decade.

4 RISK ASSESSMENT

This section addresses Element B of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element B: Hazard Identification and Risk Assessment
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

4.1 HAZARD IMPACT

A hazard impact assessment predicts the current or expected impact of a hazard on a community or given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage.

For the 2022 LHMP, a conservative exposure-level analysis was conducted to assess the risks associated with the identified hazards. Due to a combination of a lack of adequate information and methodology, a semi-quantitative hazard impact assessment has only been prepared for the following hazards: earthquake, erosion, hazardous material event (ammonia spill), tsunami, volcano, and wildfire. Climate change, infectious disease, and severe weather impact the entire community and have been included in the hazard assessments below.

For the 2022 LHMP, hazard impact assessments were prepared for the City of Saint Paul's land area, population center, and critical facilities (Table 4-1). A land area of 27, 934 acres (43.6 square miles) was determined using geographic information system (GIS). The population center (i.e., a geographic point that describes a center point of the city's population) of 240 acres (0.4 square miles) was also determined using GIS. The critical facilities include a list of facilities that provide services and functions essential to the City of Saint Paul, especially during and after a disaster. Common types of critical facilities include fire stations; police stations; hospitals; schools; water and wastewater systems; and utilities. Critical facilities may also include places that can be used for sheltering or staging purposes, such as community centers and libraries. Critical facilities may also include large public gathering spots and places of worship. For the 2022 LHMP, a list of 50 critical facilities and private critical facilities was collected from the City of Saint Paul (Figure 8 through Figure 10). Critical facilities were geocoded to a location and the resulting geographic features were used for hazard impact assessment. Facility-specific information was given to the City and will be kept on file.

The overall results of the hazard assessments are provided below. This analysis is a simplified assessment of the potential effects of the hazards on land area (Table 4-2), population center (Table 4-3), and critical facilities (Table 4-4) at risk, without consideration of the probability or level of damage. In addition, elevation data were not available; therefore, additional analysis will need to be conducted to develop a more accurate understanding of hazard vulnerabilities.

Table 4-1: Total Land Area, Population Center and Critical Facilities

Category	Number (Acres)
Land Area	27,934.84
Population Center	240.18
Critical Facilities	50

Table 4-2: Total Acres of Land in a Hazard Area

Hazard Area	Acres	Percent of Total Acres
Climate Change	27,934.84	100
Earthquake		
Weak-Light	0	0
Moderate	27,934.84	100
Strong-Severe	0	0
Erosion	6.98	0.02
Hazardous Materials Event (Ammonia)		
First Level Isolation (200 ft)	288	0.01
Second Level Isolation (0.5 mi)	214.75	0.77
Third Level Isolation (1.5 mi)	1,281.87	4.59
Infectious Diseases	27,934.84	100
Severe Weather	27,934.84	100
Tsunami	538.22	1.93
Volcano		
Low	27,934.84	100
Low-Moderate/Moderate	0	0
High	0	0
Wildfire		
Moderate Fuel Rank	20,051.89	71.78
High Fuel Rank	7,681.35	27.50
Very High Fuel Rank	201.60	0.72
Extreme Fuel Rank	0	0

Table 4-3: Total Number of Acres of Population Center in a Hazard Area

Hazard Area	Acres	Percent of Total Acres
Climate Change	240.18	100
Earthquake		
Weak-Light	0	0
Moderate	240.18	100
Strong-Severe	0	0
Erosion	0.06	0.02
Hazardous Materials Event (Ammonia)		
First Level Isolation (200 ft)	2.88	1.2
Second Level Isolation (0.5 mi)	143.13	59.59
Third Level Isolation (1.5 mi)	240.18	100
Infectious Diseases	240.18	100
Severe Weather	240.18	100
Tsunami	130.61	54.38
Volcano		
Low	240.18	100
Low-Moderate/Moderate	0	0
High	0	0
Wildfire		
Moderate Fuel Rank	225.02	93.69
High Fuel Rank	15.16	6.31
Very High Fuel Rank	0	0
Extreme Fuel Rank	0	0

Table 4-4: Total Number of Critical Facilities in a Hazard Area

Hazard Area	Number	Percent of Total Facilities
Climate Change	50	100
Earthquake		
Weak-Light	0	0
Moderate	50	100
Strong-Severe	0	0
Erosion	1	2

Table 4-4: Total Number of Critical Facilities in a Hazard Area

Hazard Area	Number	Percent of Total Facilities
Hazardous Materials Event (Ammonia)		
First Level Isolation (200 ft)	1	2
Second Level Isolation (0.5 mi)	30	60
Third Level Isolation (1.5 mi)	37	74
Infectious Diseases	50	100
Severe Weather	50	100
Tsunami	24	48
Volcano		
Low	50	100
Moderate	0	0
High	0	0
Wildfire		
Moderate Fuel Rank	45	90
High Fuel Rank	5	10
Very High Fuel Rank	0	0
Extreme Fuel Rank	0	0

4.2 OVERALL SUMMARY OF VULNERABILITY

A list of the key issues, or overall summary of vulnerability, for each hazard profiled in the 2022 LHMP is provided in Table 4-5.

Table 4-5: Overall Summary of Vulnerability

Hazard	Vulnerability
Climate Change	The City of Saint Paul is vulnerable to climate change related to changes in temperature and precipitation and associated climate change impacts. All of the City of Saint Paul is impacted by climate change. In low-lying coastal areas, facilities and other structures are vulnerable to inundation and storm surge associated with sea level rise. Elevated water levels and warmer ground temperatures will also exacerbate erosion problems. Climate change will impact the City of Saint Paul in many ways, including changes to distribution of species in the Bering Sea and associated impacts to subsistence food gathering and tourism; increases in the hazardous conditions for hunting and fishing; impacts to the fishing industry; and more frequent and destructive storm surges threatening harbor infrastructure and potentially more flooding and/or erosion farther inland.

Table 4-5: Overall Summary of Vulnerability

Hazard	Vulnerability
Earthquake	All of the City of Saint Paul is vulnerable to ground shaking from an earthquake and the entire community is in an area of moderate perceived ground shaking hazard. For City of Saint Paul residents, moderate shaking potential can cause light damage to buildings, especially those that are not built to withstand earthquakes.
Erosion	The coastal areas of Saint Paul Island are most vulnerable to erosion. In particular, the cemetery near Lukanin Bay on Southwest Point Road and Northeast Point Road. Erosion causing damage to roads would restrict access on the island. These three main areas of erosion represent less than 1% of the total land area in the population center, and directly impacting one critical facility (the cemetery). The primary impact from erosion is loss of land for transportation and access on the island, impacts to development, and restriction of subsistence activities. Important natural and cultural sites could be impacted such as the community's cemetery and seabird nesting cliffs. Risk of injury could occur from unstable banks or other structures that might collapse under the weight of a person or vehicle.
Hazardous Materials Event: Ammonia	Releases of hazardous materials such as ammonia have the potential for harmful health effects on workers and the public. The Centers for Disease Control and Prevention lists isolation buffer areas for spill response and prevention in order to protect workers and residents. Approximately 3 acres (or about 1% of the total land area in the population center) are included in the first level isolation area. The second and third level isolation areas are 0.5 miles from the spill site and 1.5 miles, respectively; this equates to 143 acres and 240 acres, or 60% and 100% of the total land area of the main population center. Depending on the severity of the event, spills can cause fire, injury, human health problems, and environmental damage. Of particular concern in the City of Saint Paul is the location of the Trident Seafoods ammonia tanks in close proximity to tanks storing fuel. A combined event could result in a significant and dangerous explosion.
Infectious Disease	All of the City of Saint Paul is vulnerable to infectious diseases. People who have weakened immune systems are particularly vulnerable to infectious diseases. Others who may be disproportionately affected by infectious diseases include the young, elderly, and people with inadequate access to healthcare. In addition, pregnant women and people who care for small children are generally at higher risk for acquiring infectious diseases. Infectious disease impacts in the City of Saint Paul will likely include: • Physical: morbidity, mortality, and indirect health impacts • Psychosocial: social isolation, stress, mental health, substance use, and violence • Socioeconomic: loss of wages and work, unemployment, small business strain, housing, and basic living needs • Institutional/structural: health system burden, social safety net strain, and health and social inequalities.
Severe Weather	The City of Saint Paul frequently experiences severe weather that impacts the entire community with high winds, storm surges, thunderstorms producing lightning, and blizzard conditions. A major storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. A storm may damage harbor infrastructure, wind turbines, water supply storage, and lead to dangerous driving and maritime conditions.

Table 4-5: Overall Summary of Vulnerability

Hazard	Vulnerability
Tsunami	The City of Saint Paul's location within the Bering Sea makes it vulnerable to tectonic tsunamis as well as underwater landslide-generated tsunamis. Based on the modeling for tectonic tsunami scenarios completed by Alaska Division of Geological and Geophysical Surveys, approximately 140 acres or 54% of the total land area in the population center are vulnerable to tsunami. This includes a total of 24 critical facilities along the waterfront and in low-lying areas. While tsunami wave heights may not be large, there is potential for a tsunami to cause localized flooding, damage to harbor infrastructure, or injuries by knocking people down.
Volcano	All of the City of Saint Paul is vulnerable to volcanoes. While the volcanoes on Saint Paul Island are considered inactive, there is a possibility of an eruption in communities outside of the Pribilof Islands that could impact the City of Saint Paul through ashfall and possibly disruption of services. Although unlikely, even a small ashfall event in the City of Saint Paul can cause respiratory problems, eye problems, and skin irritation for humans. The community could experience a variety of impacts such as property damage; structural damage from ash loading; transportation interruptions; impacts to commercial fisheries; mass casualties of fish and seabirds; wind energy production impacts; and water supply contamination. Ashfall events outside of the City of Saint Paul could also result in disruptions of critical supply delivery of food and fuel.
Wildfire	A wildfire susceptibility model using best available Lidar and 2011 National Land Cover Database data shows that most of Saint Paul Island (71% of the total area) is in a moderate wildfire risk area factoring in the low grassy vegetation and slope. Only 27% of the total land area is located within a high wildfire risk area (4 critical facilities), and less than 1% is in a very high wildfire risk area (no critical facilities). Wildfires are not only capable of burning down vegetation, homes, critical facilities, and infrastructure, but they can also cause loss of life to humans and animals, soil erosion, debris flows, air pollution, serious health problems, and restriction of access to recreational areas.

4.3 NATIONAL FLOOD INSURANCE PROGRAM INSURED STRUCTURES

The City of Saint Paul is not mapped to a Flood Insurance Rate Map and therefore does not participate in the National Flood Insurance Program (NFIP). Localized flood issues are managed by the City of Saint Paul public works director.

5 MITIGATION STRATEGY

This section addresses Element C of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element C: Mitigation Strategy
C1. Does the Plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement § 201.6(c)(3))
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement § 201.6(c)(3)(i))
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))

5.1 AUTHORITIES, POLICIES, PROGRAMS, AND RESOURCES

The City of Saint Paul's existing authorities, policies, programs, and resources available for hazard mitigation are provided in Table 5-1 (human and technical resources), Table 5-2 (financial resources), and Table 5-3 (planning and policy resources). The ways in which the City is looking to expand and improve on its hazard mitigation authorities, policies, programs, and resources are provided in Table 5-4.

Table 5-1: Human and Technical Resources for Hazard Mitigation

Staff/Personnel	Department/Agency	Principal Activities Related to Hazard Mitigation
City Council and Mayor	City of Saint Paul	Responsible for legislative function of the City such as establishing policy, passing local ordinances, voting appropriations, and developing an overall vision.
City Manager	Administration Department, City of Saint Paul	Chief executive office responsible for executing the policies set by the City Council and administering the government of the City. The city manager is responsible for emergency preparedness and services.
Fire Chief	City of Saint Paul, Saint Paul Island Volunteer Fire Department	Dedicated to protecting life and property through public safety education, fire prevention, and fire suppression.
Chief of Police	City of Saint Paul, Department of Public Safety	Conduct preventive patrols of the community, attend community events, provide assistance to the community when requested, perform traffic control, conduct criminal investigations, and serve the community as Emergency Medical Service (EMS) / first responders (below).
EMS	Saint Paul Island Emergency Medical Services	Serves the resident population of Saint Paul Island as well as the fishing fleet in the central Bering Sea.
Projects/Grants Specialist	Administration Department, City of Saint Paul	Responsible for submitting grant proposals for City of Saint Paul programs and policies.
City Clerk/COVID-19 Response Coordinator	Administration Department, City of Saint Paul	Responsible for COVID-19 communication and distribution of supplies and resources, including quarantine units.
Harbormaster	Public Safety Department, City of Saint Paul	Responsible for patrolling the harbor and flagging violations of marine and health laws.
Public Works Director	Public Works Department, City of Saint Paul	Maintains and operates the water/wastewater systems, landfill, bulk fuel, and other facilities servicing the City of Saint Paul.

Notes:
The City of Saint Paul does not have a Planning Department

Table 5-2: Financial Resources for Hazard Mitigation

Type	Source	Purpose	Amount
General Fund	City of Saint Paul	Program operations and specific projects.	Variable
Lease Revenues	Dockage and Wharfage Revenues	Revenue bonds are used to finance capital projects that: 1) have an identified budgetary stream for repayment (e.g., specified fees, tax receipts); 2) generate project revenue but rely on a broader pledge of general fund revenues to reduce borrowing costs; or 3) finance the acquisition and installation of equipment for the local jurisdiction's general governmental purposes.	Variable
Renewable Energy Fund	Alaska Energy Authority	Provides funding for the development of qualifying and competitively selected renewable energy projects in Alaska. The program is designed to produce cost-effective renewable energy for both heat and power. For fiscal year 2019, $11 million has been allocated by the governor to fund the Renewable Energy Fund. This program runs through 2023.	Project-specific
HMA: Hazard Mitigation Grant Program (HMGP)	FEMA	Supports pre- and post-disaster mitigation plans and projects. Available to communities in Alaska after a presidentially declared disaster has occurred in Alaska.	Project-specific
HMA: Building Resilient Infrastructure and Communities (BRIC)	FEMA	Focuses on reducing the nation's risk by funding public infrastructure projects that increase a community's resilience before a disaster affects an area.	Project-specific
Homeland Security Preparedness Technical Assistance Program	FEMA/Department of Homeland Security	Build and sustain preparedness technical assistance activities in support of the four homeland security mission areas (i.e., prevention, protection, response, recovery) and homeland security program management.	Project-specific
Assistance to Firefighters Grant Program	FEMA/US Fire Administration	Provides equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards. Available to fire departments and nonaffiliated emergency medical services providers.	Project-specific
Community Action for a Renewed Environment	US Environmental Protection Agency	Through financial and technical assistance, this program offers an innovative way for a community to organize and take action to reduce toxic pollution (e.g., stormwater) in its local environment. Through this program, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize exposure to them.	Project-specific

Table 5-2: Financial Resources for Hazard Mitigation

Type	Source	Purpose	Amount
Community Block Grant Program Entitlement Communities Grants	US Department of Housing and Urban Development	Acquisition of real property; relocation and demolition; rehabilitation of residential and nonresidential structures; construction of public facilities and improvements, such as water and sewer facilities, streets, neighborhood centers; and the conversion of school buildings for eligible purposes.	Project-specific
Rural Development	US Department of Agriculture	Committed to helping improve the economy and quality of life in rural America. Program helps to extend access to clean, reliable water and waste disposal systems for households and businesses.	Project-specific
Village Safe Water	Alaska Department of Environmental Conservation	Working with rural communities to develop sustainable water and sanitation facilities.	Project-specific
American Rescue Plan, Economic Development Administration	US Economic Development Administration	Funding to assist communities nationwide in their efforts to accelerate economic recovery from the coronavirus pandemic and building local economies that will be resilient to future economic shocks.	Project-specific

Table 5-3: Planning and Policy Resources for Hazard Mitigation

Name	Description	Hazards Addressed	Emergency Management
Ataqan Akun Community Plan, 1995	Update of previous Saint Paul Comprehensive Plan written to be based on the values of the community. Policies are outlines for all key sectors of the community including cultural, land, economic development, water sand shoreline, parks and recreation, transportation, utilities, environmental protection.	All	Mitigation, Preparedness, Response
City of Saint Paul Strategic Plan: 2021-2023	The plan identifies the City's Mission, Vision, Values, and Guiding Principles. The Strategic Plan also identifies goals to improve staff capacity and expertise, improve citizen understanding of city finances and functions, and make Saint Paul Island a safer place to live; to improve City processes and replace/update related equipment and software; construct new, improve, and adequately maintain vital community facilities; and diversity the City's economic portfolio.	All	Response, Recovery
Saint Paul Island Comprehensive Economic Development Strategy: 2017-2022	Presents economic development goals to support the economic vision for Saint Paul ("An Aleut community of healthy, resilient people working together to sustain a strong fishing-based economy"). Used for community based and regionally driven economic planning with strategies and implementation plan; important part of US Department of Commerce Economic Development Administration programs.	All	Recovery
City of Saint Paul, Alaska, 2017-2021 Capital Improvement Plan	Identifies capital projects and equipment purchases, provides a planning schedule, and identifies options for financing the plan.	All	Mitigation, Preparedness

Table 5-4: Ability to Expand Resources

Capability	Type/Description	Expansion
Financial	HMA funding	Apply for BRIC and HMGP funding as it becomes available. The focus should be on projects that mitigate critical infrastructure, provide protection for disadvantaged areas, and address climate change.
Planning and Policy	Climate Action Plan	Develop a Climate Action Plan to reduce or continue to greenhouse emissions through a series of local transportation, land use, building energy, water, waste, and green infrastructure programs and policies.
Planning and Policy	Emergency Operations Plan	Develop an Emergency Operations Plan to organize structures, roles, and responsibilities and protocols for providing emergency response and short-term recovery.

Table 5-4: Ability to Expand Resources

Capability	Type/Description	Expansion
Planning and Policy	Community Hazard Communications Education Plan	Develop a Community Hazard Communications Education Plan to organize structures, roles, and responsibilities and protocols for communicating hazards to the community.
Planning and Policy	Planning and Zoning Ordinances	Modify City planning and zoning ordinances to limit development in hazardous areas.

5.2 NATIONAL FLOOD INSURANCE PROGRAM PARTICIPATION

The City of Saint Paul is not mapped to a Flood Insurance Rate Map and therefore does not participate in the NFIP. Localized flood issues are managed by the City of Saint Paul public works director.

5.3 MITIGATION GOALS

Mitigation goals are defined as general guidelines that explain what an agency wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing a community-wide vision. FEMA's 2022 BRIC priorities are the basis for the three goals (Table 5-5) for the 2022 LHMP.

Table 5-5: Mitigation Goals

Goal #	Description
1	Enhance climate protection and adaptation efforts
2	Create a healthy and safe community
3	Protect critical facilities and infrastructure against hazards

5.4 RECOMMENDED MITIGATION ACTIONS

Mitigation actions help achieve the goals of the LHMP. The recommended mitigation actions provided in Table 5-6 include: education and awareness; structure and infrastructure projects; preparedness and response; local plans and regulations; and floodplain management (which includes preventive, property protection, natural resource protection, structural projects, and public information). This list addresses every hazard profiled in this plan and is based on the plan's risk assessment as well as lessons learned from recent disasters. The list addresses hazards that impact the critical facilities shown in Figure 6 and takes into consideration the built environment. It was developed using FEMA success stories and best management practices; FEMA job aids; local and regional plans and reports; and input from planning team members, and sustainability practitioners.

Table 5-6: Recommended Mitigation Actions

No.	Project Name	Hazard Mitigated	Project Description	Type of Development
1	Emergency Warming and Feeding Shelter(s)	All	Implement Red Cross recommendations for emergency shelter(s); ensure adequate supplies for use during severe cold or if there is a disruption in the shipment or delivery or supplies.	New
2	Emergency Operations Plans	All	Complete Emergency Operations Plan, Continuity of Operations Plan, and Evacuation Plan	New
3	Community Hazard Communications Education Plan	All	Develop and implement a Community Hazard Communications Education Plan.	New
4	Modify Planning and Zoning Ordinances	All	Modify City planning and zoning ordinances to limit development in hazardous areas.	New
5	Assessment of Vulnerable Population	All	Conduct an assessment of the vulnerable individuals in our community that would need assistance during a hazard event.	New
6	Emergency Sirens	All	Acquire and install two additional emergency sirens with voice message capabilities to service the areas in the community that are not currently covered by existing sirens (two existing sirens to be installed Summer 2022).	New and Existing
7	Food Security	All	Construct community greenhouses to provide for locally grown fruits and vegetables; ensure structures are built to withstand severe weather and are not at risk of damage from tsunami, storm surge, or other hazards.	New
8	Enclosure and Automatic Functionality for Existing Generator	All	Install enclosure and to protect emergency generator at City Hall; also retrofit existing generator for automatic load bank capability.	Existing
9	Generators	All	Purchase and install emergency generators for the school, public works building, fire station, water wells, and motor pool buildings.	New and Existing
10	Fuel Storage	All	Determine and secure enough fuel storage for generators to use. Develop contingency plans for obtaining generator fuel.	Existing
11	Mutual Aid Agreements	All	Develop mutual aid agreements with governmental and nongovernmental entities operating on Saint Paul Island.	New and Existing

Table 5-6: Recommended Mitigation Actions

No.	Project Name	Hazard Mitigated	Project Description	Type of Development
12	Cultural and Natural Resource Protection	Climate Change	Establish cultural and natural resource protection regulations for tundra, cliff, wetlands, and other areas of cultural and ecological importance for protection of local ecology, subsistence food gathering, and tourism.	Existing
13	Water Storage	Drought, Earthquake	Determine and secure enough water storage for periods of drought including backup water supply if infrastructure is damaged in natural disaster.	New and Existing
14	Reduce Structural Vulnerability	Earthquake and Tsunami	Elevate, add seismic retrofits, and/or other measures to reduce structural vulnerability to earthquake and tsunami damage.	Existing
15	Shoreline Stabilization near Critical Roads	Erosion	Implement shoreline stabilization to protect critical transportation routes at risk of severe damage from erosion (e.g., Southwest Point Road, Northeast Point Road, and others as identified by the community).	New and Existing
16	Cliff Stabilization at Cemetery	Erosion	Implement cliff stabilization projects at cemetery; coordinate with Aleut Community of Saint Paul for funding and implementation of this project.	Existing
17	Relocate Ammonia Storage Tanks	Hazardous Materials – Ammonia	Work with Trident Seafoods to identify location and perform design and construction to relocate ammonia storage tanks	Existing
18	Integrate Spill Notification with City Emergency Notification System	Hazardous Materials – Ammonia	Trident Seafoods' internal spill notification needs to be communicated with City of Saint Paul for community-wide dissemination on emergency notification system.	Existing
19	Training of On-Site Staff for Ammonia Leak Response	Hazardous Materials – Ammonia	Train Trident employees and City of Saint Paul volunteer firefighter department on appropriate response to an ammonia leak.	Existing
20	Increase Quarantine Units and Provide Supplies to Quarantine Units	Infectious Disease	Increase the number of quarantine units available for infectious disease-related uses and ensure adequate medical and other supplies available for each unit.	New and Existing

Table 5-6: Recommended Mitigation Actions

No.	Project Name	Hazard Mitigated	Project Description	Type of Development
21	Protect Critical Facilities from Storm Surge	Severe Weather – Storm Surge	Identify and reduce flood and erosion damage and protect critical facilities in areas prone to storm surge, such as the pond near the school and ball field as well as breakwater and harbor facilities.	New and Existing
22	Search and Rescue Equipment and Training	Severe Weather – Storm Surge, Tsunami	Purchase search and rescue vessel, water rescue equipment, and provide search and rescue training for personnel.	New
23	Protect Wind Turbines from Lightning Strikes	Severe Weather – Lightning	Identify and retrofit wind turbines with protective devices for lightning strikes.	Existing
24	Wind Protection	Severe Weather	Reinforce critical facilities and homes against high winds.	Existing
25	Tsunami Warning and Evacuation	Tsunami	Replace and/or install new evacuation route signs.	New and Existing
26	Protect Power Plant	Tsunami	Protect power plant from possible tsunami impacts.	Existing
27	Tsunami Inundation Study	Tsunami	Prepare a Tsunami Inundation Study with inundation maps specific to Pribilof Islands that includes scenarios covering underwater landslides and earthquake faults.	New
28	Expand and Upgrade Fire Facilities and Equipment	Wildfire	Expand and upgrade facilities and equipment for volunteer fire program including trucks, water storage, and fire hydrants.	Existing
29	Training for Volunteer First Responders	Wildfire	Provide training for volunteer fire and EMS personnel.	Existing

5.5 PRIORITIZED ACTION PLAN

A prioritized action plan is an itemized list of recommended mitigation actions that a community/agency hopes to put into practice to reduce its risks and vulnerabilities.

For the 2022 LHMP, the planning team created a two-tier prioritization process based on the following:

- High-priority mitigation actions are those that address hazards of immediate concern and are also cost-effective (positive cost-benefit ratio) and have an identified funding source.
- Medium-priority mitigation actions are those that address hazards that are not of immediate concern and/or those that are of immediate concern but are not cost effective or do not have an identified funding source.

The City of Saint Paul determined the following hazards and threats of immediate concern based on the 2022 LHMP's hazard profiles, risk assessment, and capability assessment: climate change; earthquake; erosion; hazardous materials event—ammonia; infectious disease; severe weather; tsunami; volcano; and wildfire.

The results of the above prioritization process are provided in Table 5-7. For each mitigation action listed, potential funding sources; responsible departments or agencies; and implementation timelines have been identified.

Table 5-7: Prioritized Action Plan

No.	Project Name	Priority	Potential Funding Source	Responsibility	Timing
2	Emergency Operations Plans	High Priority	Homeland Security Grant Program (HSGP)	Mayor and City Council; City Manager	0 to 5 years
3	Community Hazard Communications Education Plan	High Priority	HSGP	Mayor and City Council; City Manager	0 to 5 years
8	Enclosure and Automatic Functionality for Existing Generator	High Priority	HMA: HMGP	Mayor and City Council; City Manager	0 to 5 years
13	Water Storage	High Priority	Community Block Grant Program Entitlement Communities Grants	Mayor and City Council; City Manager	0 to 5 years
17	Relocate Ammonia Storage Tanks	High Priority	Community Block Grant Program Entitlement Communities Grants	Mayor and City Council; City Manager	0 to 5 years
18	Integrate Spill Notification with City Emergency Notification System	High Priority	Assistance to Firefighters Grant Program	Mayor and City Council; City Manager; Fire Chief	0 to 5 years
19	Training of On-Site Staff for Ammonia Leak Response	High Priority	Assistance to Firefighters Grant Program	Mayor and City Council; City Manager; Fire Chief	0 to 5 years

Table 5-7: Prioritized Action Plan

No.	Project Name	Priority	Potential Funding Source	Responsibility	Timing
21	Protect Critical Facilities from Storm Surge	High Priority	HMA: HMGP	Mayor and City Council; City Manager	0 to 5 years

5.6 PLAN INTEGRATION

Information about how the 2022 LHMP will be integrated into the City of Saint Paul's relevant plans and programs moving forward is provided in Table 5-8.

Table 5-8: Integration of 2022 LHMP

LHMP Section	Existing Plan/Policy/Program	Process/Timeframe
Section 3—Hazard Identification	Ataqan Akun Community Plan	Update of the Ataqan Akun Community Plan to address hazards in the LHMP that are not currently included in the Ataqan Akun Community Plan.
Section 5—Mitigation Strategy	City of Saint Paul, Alaska 2017-2021 Capital Improvement Plan	Incorporate the mitigation actions provided in Table 5-6 into the Capital Improvement Plan by further studying and evaluating the underlying problems or if studies exist that outline potential solutions. Begin the design stage to develop a plan for each identified project, the actions to be taken, engineering and construction required, schedule, and estimated costs.

6 PLAN REVIEW, EVALUATION, AND IMPLEMENTATION

This section addresses Element D of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element D: Plan Review, Evaluation and Implementation
D1. Was the plan revised to reflect changes in development? (Requirement § 201.6(d)(3))
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement § 201.6(d)(3))
D3. Was the plan revised to reflect changes in priorities? (Requirement § 201.6(d)(3))

6.1 CHANGES IN DEVELOPMENT

The 2016 LHMP was updated to reflect the following changes that affect development:

- New vessel repair building located on the waterfront in previously developed area. New vessel building does not increase community vulnerability from the hazards profiled.
- New housing units 167A, 167B, 168A, 168B, 169A, 169B Colonel Fouke were constructed in the population center but do not increase community vulnerability from the hazards profiled.

6.2 PROGRESS IN LOCAL MITIGATION EFFORTS

The City of Saint Paul reviewed its 2018 LHMP's mitigation strategy and documented progress made toward each local mitigation effort, provided in Table 6-1. Mitigation actions that had not be implemented were considered for the 2022 LHMP (Table 5-6).

Table 6-1: Progress in Local Mitigation Efforts

Action #	Action	Status
MH 1	Provide outreach activities to educate and promote recognizing and mitigating all natural and human-made hazards that affect the city and the Aleut Community of Saint Paul Island (tribe)	Ongoing, mitigation action included in the 2022 LHMP.
MH 2	Cross-reference mitigation goals and actions with other city and tribal planning mechanisms and projects.	Deferred, included in Plan Integration section of 2022 LHMP, and will not be included the 2022 LHMP as a Mitigation Strategy.
MH 3	Develop construction activities that reduce possibility of losses from all natural and human-made hazards that affect the city and tribe.	Ongoing, mitigation action modified and included in the 2022 LHMP.
EQ 4	Reduce structural vulnerability to earthquake damage	Deferred, mitigation action modified and included in the 2022 LHMP.
FL 5	Reduce flood and erosion damage and loss possibly.	Deferred, mitigation action modified and included in the 2022 LHMP.

Table 6-1: Progress in Local Mitigation Efforts

Action #	Action	Status
SW 6	Reduce structural vulnerability to severe weather damage.	Ongoing, new emergency sirens to be installed July 2022, mitigation action modified and included in the 2022 LHMP.
TS 7	Reduce vulnerability, damage, or loss of structures from tsunami or seiche.	Ongoing, new emergency sirens to be installed July 2022, mitigation action modified and included in the 2022 LHMP.

6.3 CHANGES IN PRIORITIES

The 2016 LHMP's mitigation strategy was prioritized using the STAPLEE (social, technical, administrative, political, legal, environmental, and economic) method, which FEMA recommended (FEMA 386-9) as a prioritization method in the early to mid-2000s. While the STAPLEE method has been replaced in the 2022 LHMP by a more streamlined prioritization process, the priorities (listed below) have not changed:

- To build a culture and practice of disaster resilience by addressing hazards of immediate concern, a mitigation project must have social support.
- To be implemented in a timely manner, a mitigation project must be economically feasible and have an identified funding source.

7 PLAN ADOPTION

This section addresses Element E of the Local Mitigation Plan Regulation Checklist.

Regulation Checklist – 44 CFR 201.6 Local Mitigation Plans
Element E: Plan Adoption
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))

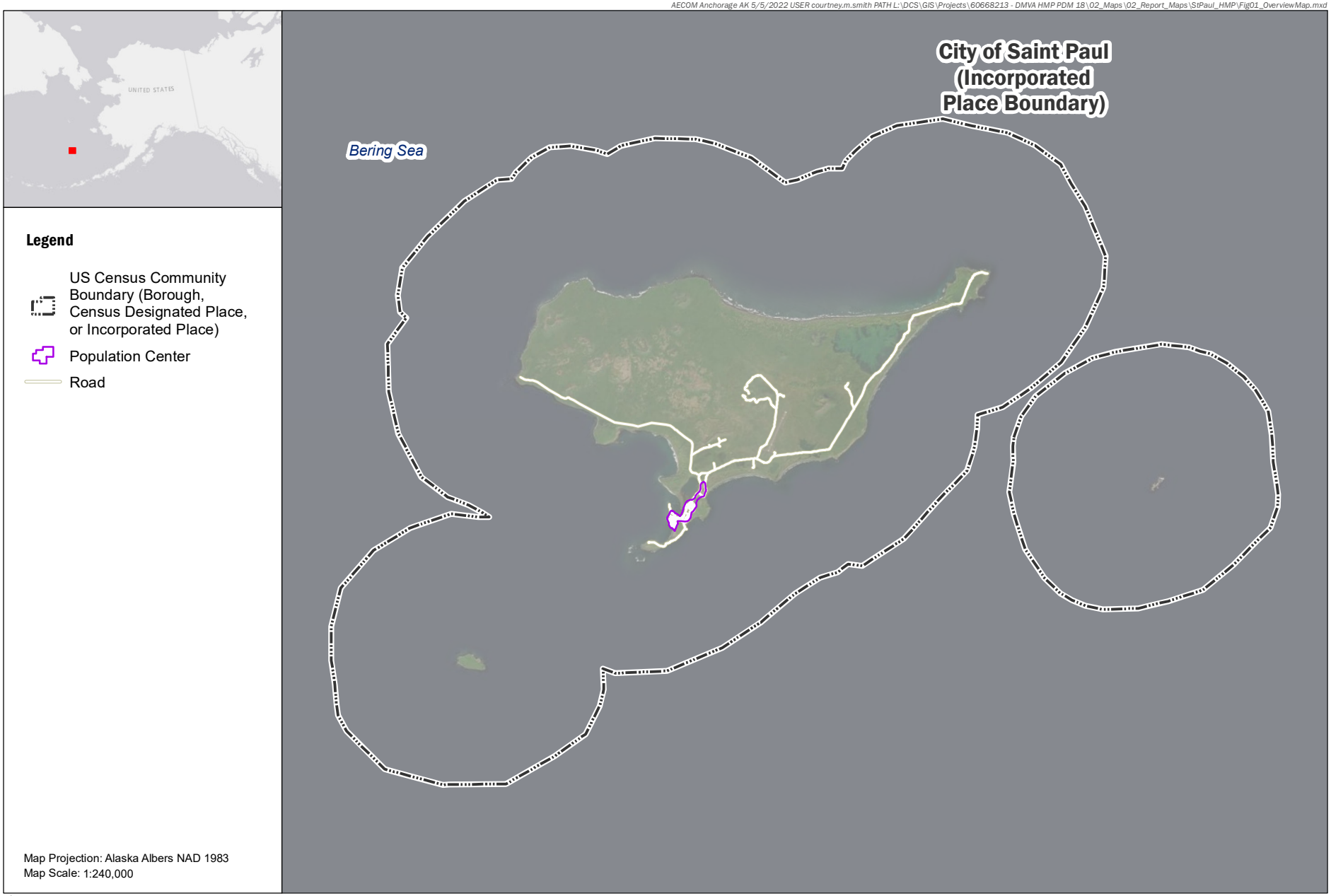
7.1 FORMAL ADOPTION

The 2022 LHMP was formally adopted on [date] by the City of Saint Paul City Council. A copy of the adoption resolution in on file with the community and the Alaska Division of Homeland Security and Emergency Management.

8 APPENDICES

APPENDIX A—FIGURES

AECOM Anchorage AK 5/5/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig01_OverviewMap.mxd

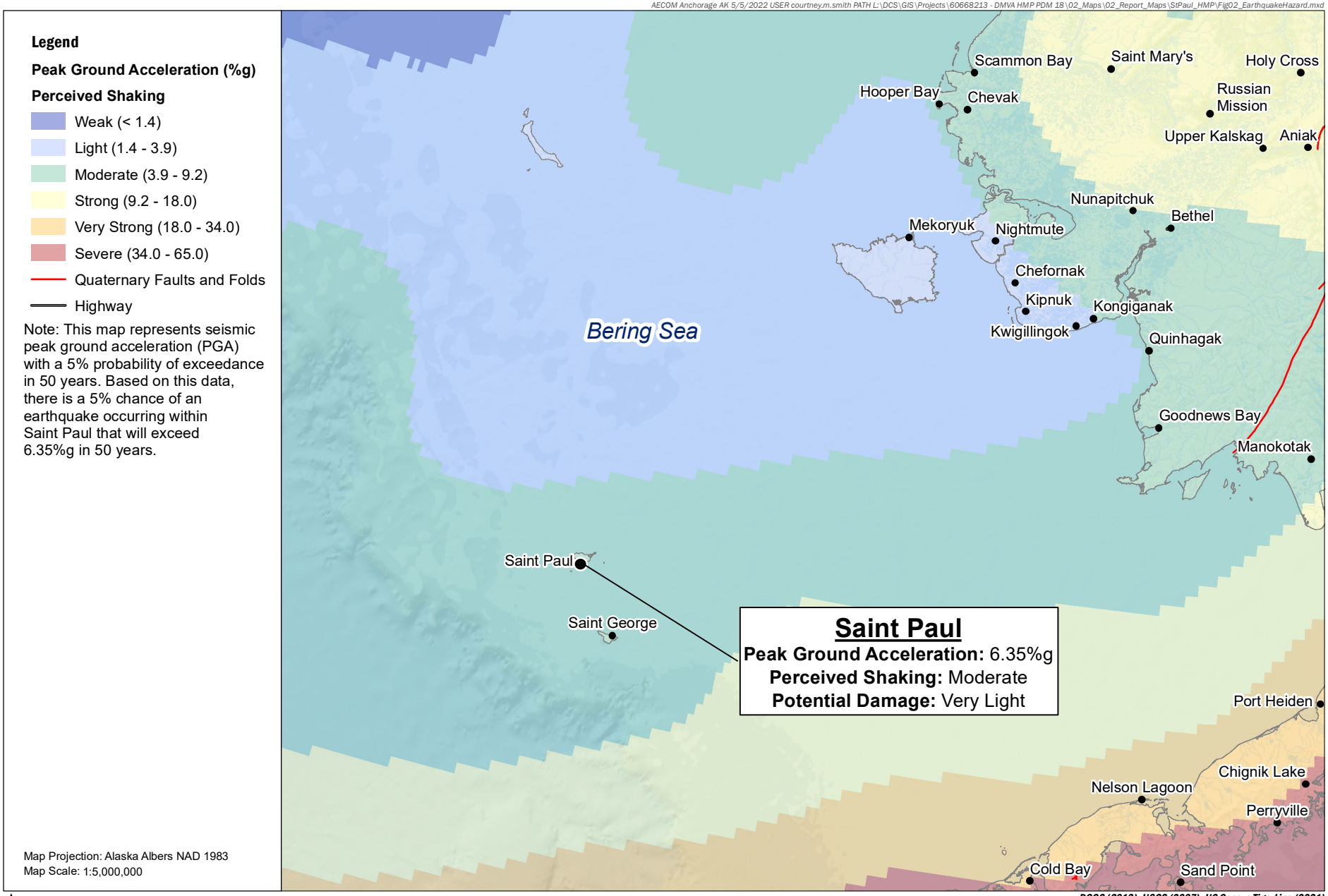


US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM
City of St. Paul City 2022
Local Hazard Mitigation Plan

OVERVIEW MAP

Figure 1



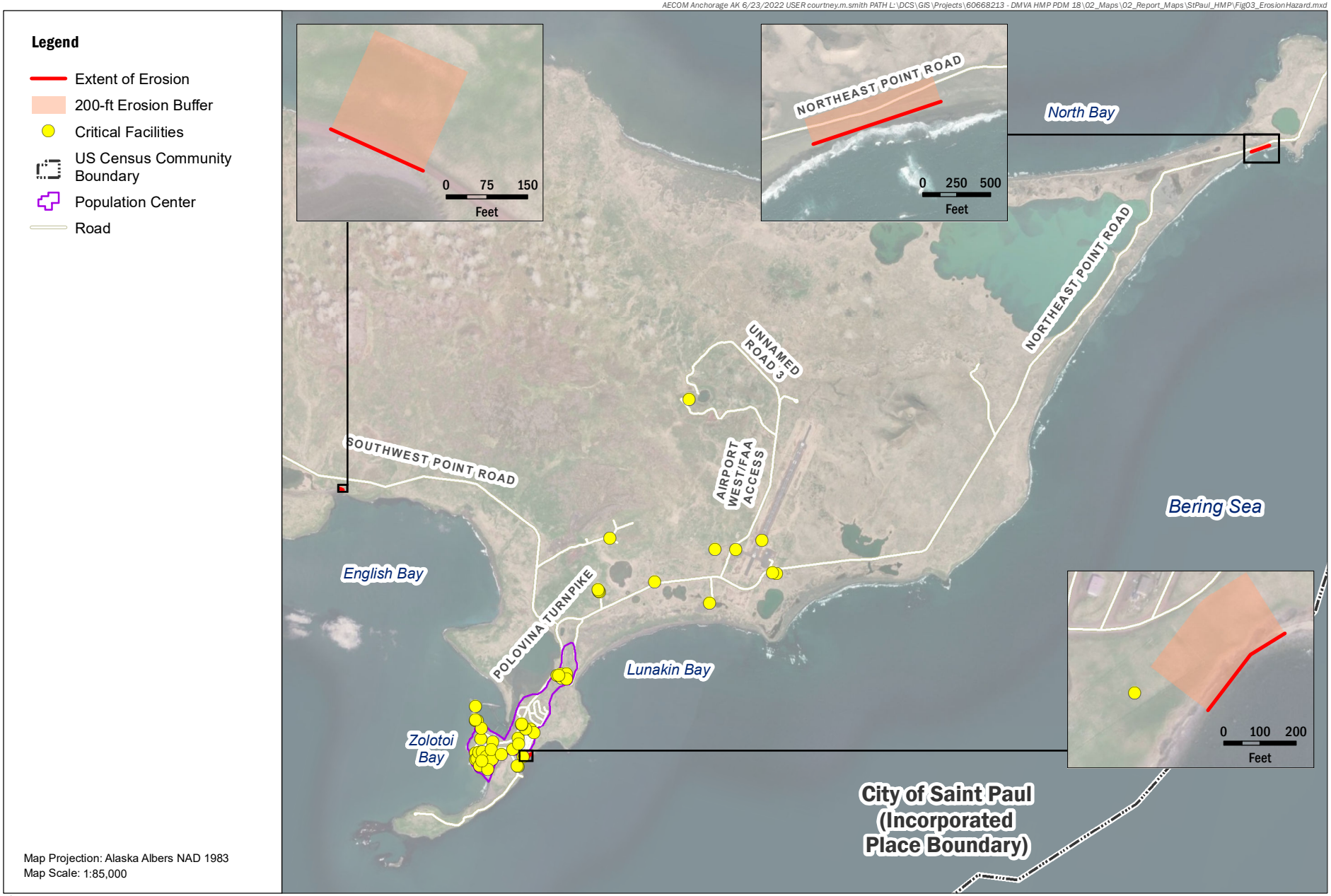
DGGS (2013); USGS (2007); US Census TigerLine (2021)
Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

AECOM
City of Saint Paul 2022
Local Hazard Mitigation Plan

EARTHQUAKE HAZARD AREAS

Figure 2

AECOM Anchorage AK 6/23/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig03_ErosionHazard.mxd



USACE (2007); US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM
City of Saint Paul 2022
Local Hazard Mitigation Plan

EROSION HAZARD AREAS

Figure 3

AECOM Anchorage AK 5/19/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig04_AmmoniaSpillRisk.mxd

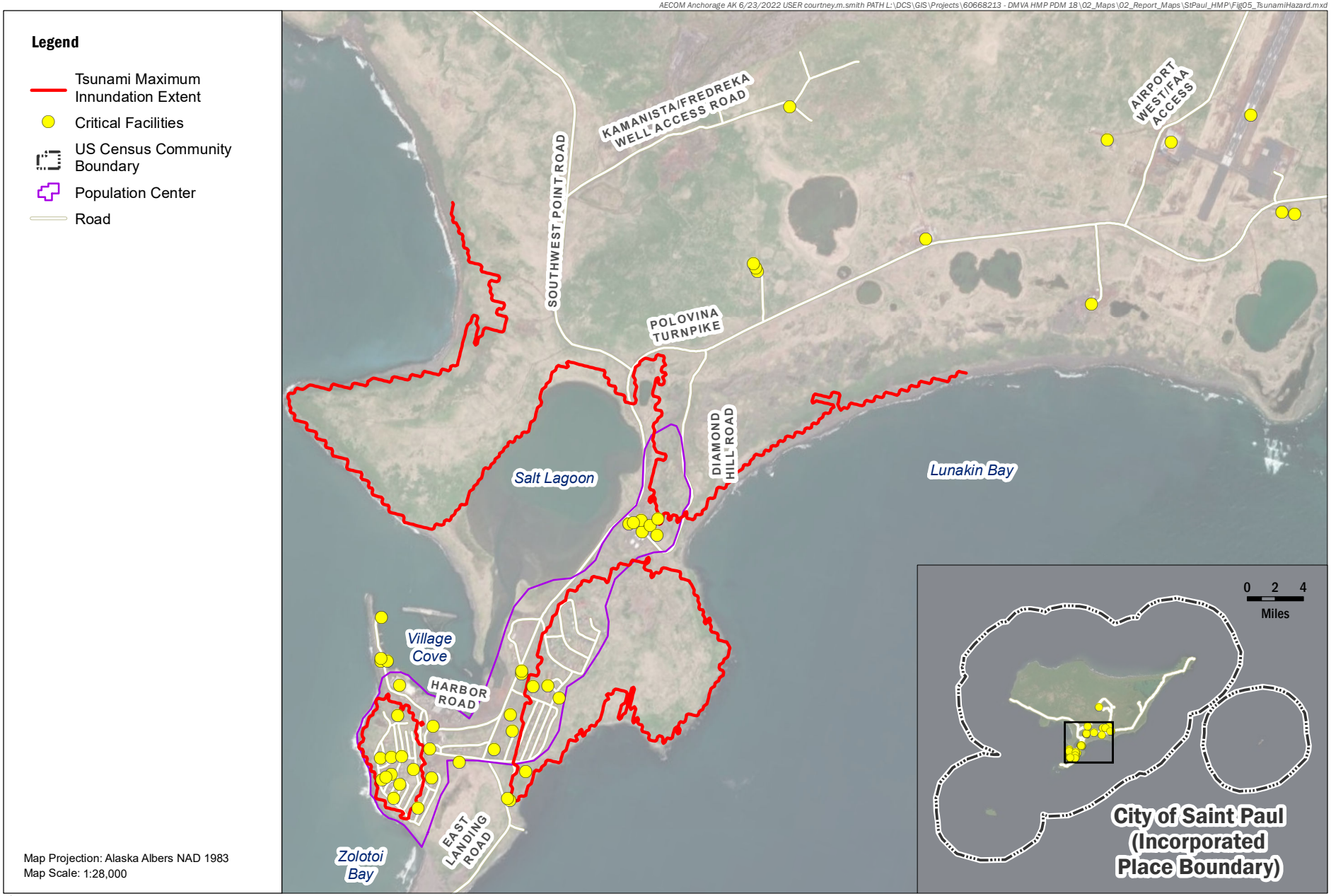
US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM
City of Saint Paul 2022
Local Hazard Mitigation Plan

AMMONIA SPILL RISK

Figure 4

AECOM Anchorage AK 6/23/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig05_TsunamiHazard.mxd



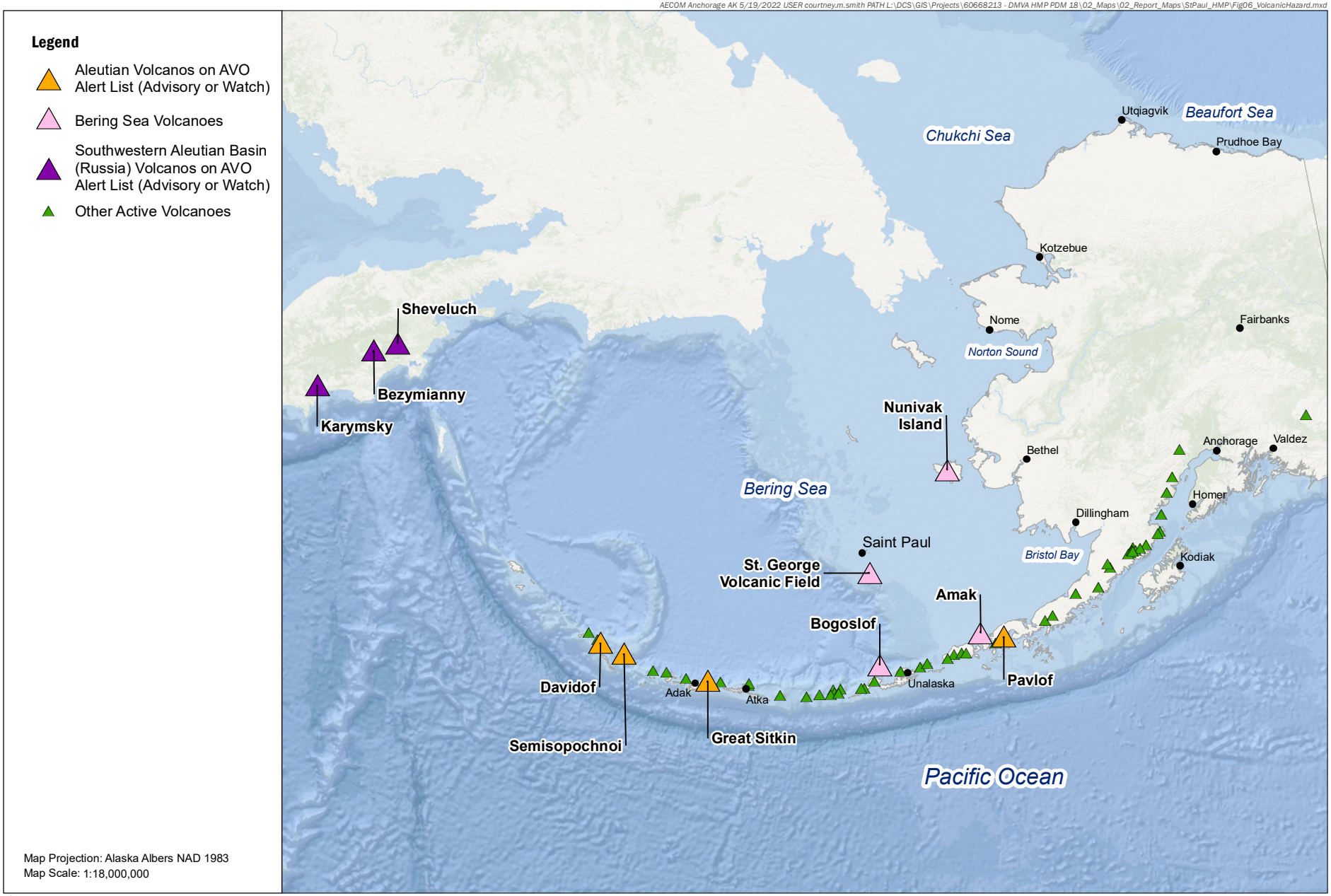
DGGS (2020); US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM
City of Saint Paul 2022
Local Hazard Mitigation Plan

TSUNAMI HAZARD AREAS

Figure 5

AECOM Anchorage AK 5/19/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig06_VolcanicHazard.mxd



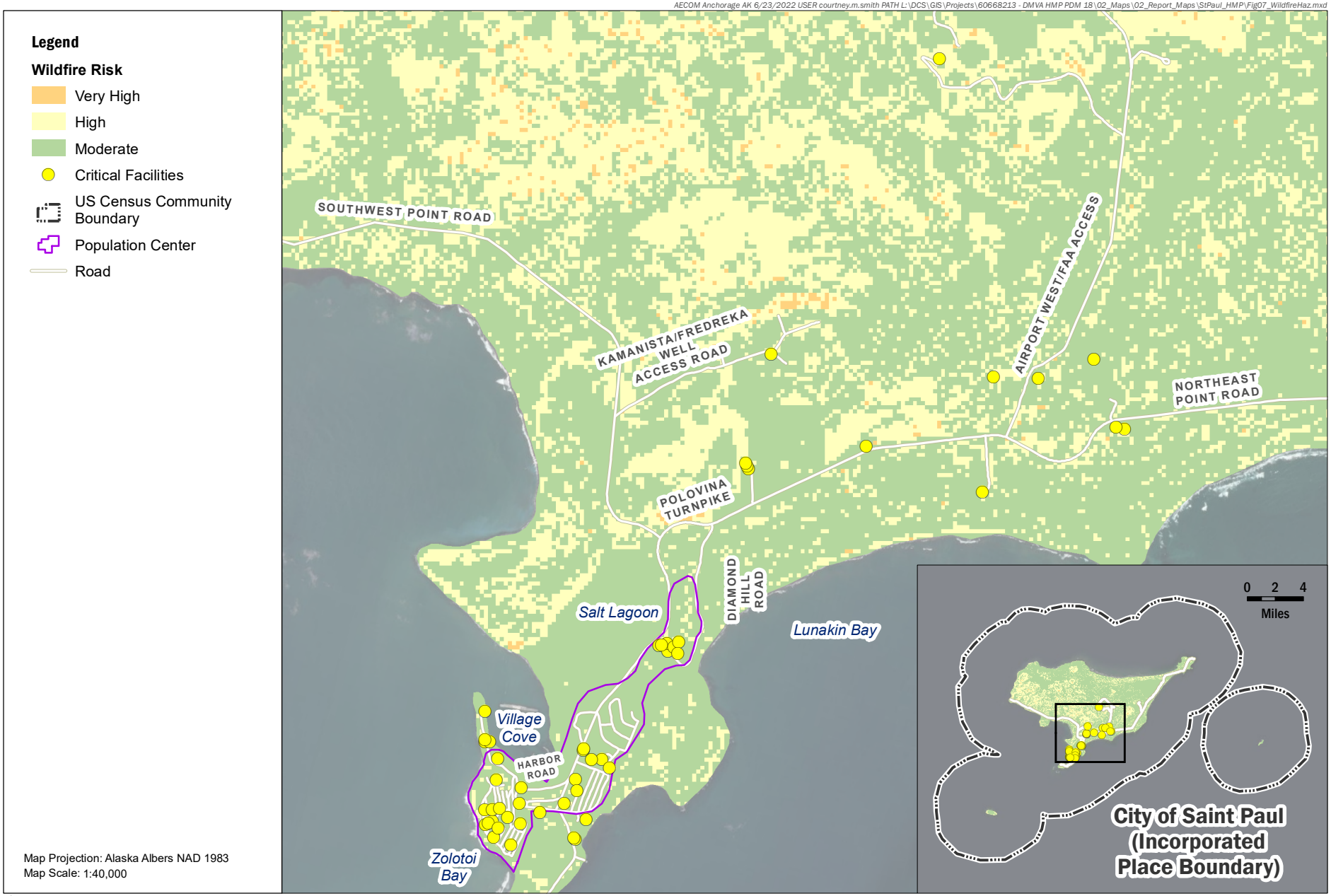
Alaska Volcano Observatory (2022); American Geological Institute (2003); US Census TigerLine (2021)
Service Layer Credits: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

AECOM
City of Saint Paul 2022
Local Hazard Mitigation Plan

ACTIVE VOLCANOS

Figure 6

AECOM Anchorage AK 6/23/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig07_WildfireHaz.mxd



US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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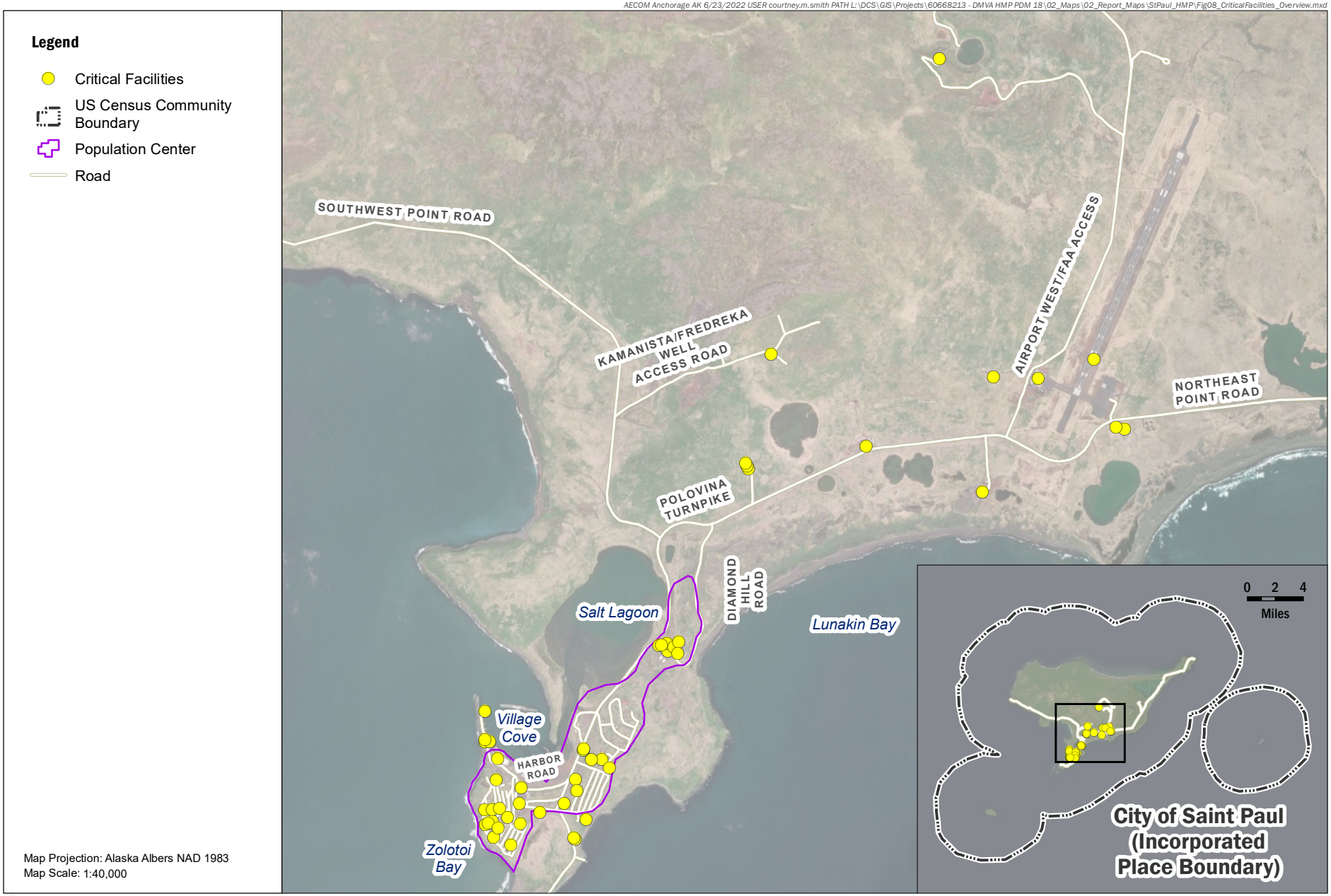
WILDFIRE HAZARD AREAS

Figure 7

AECOM Anchorage AK 6/23/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig08_CriticalFacilities_Overview.mxd



US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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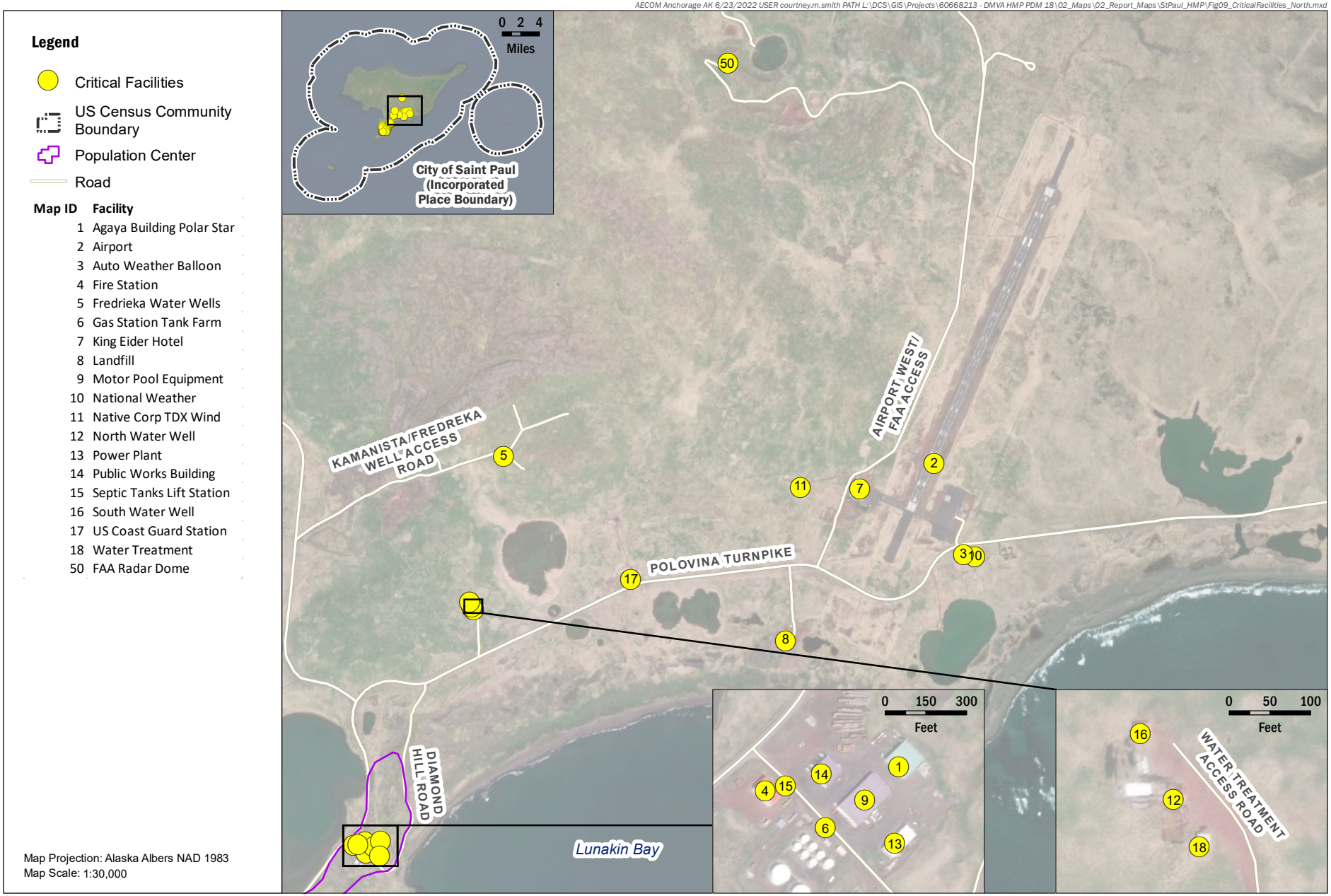
CRITICAL FACILITIES OVERVIEW

Figure 8

AECOM Anchorage AK 6/23/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig09_CriticalFacilities_North.mxd



US Census TigerLine (2021)
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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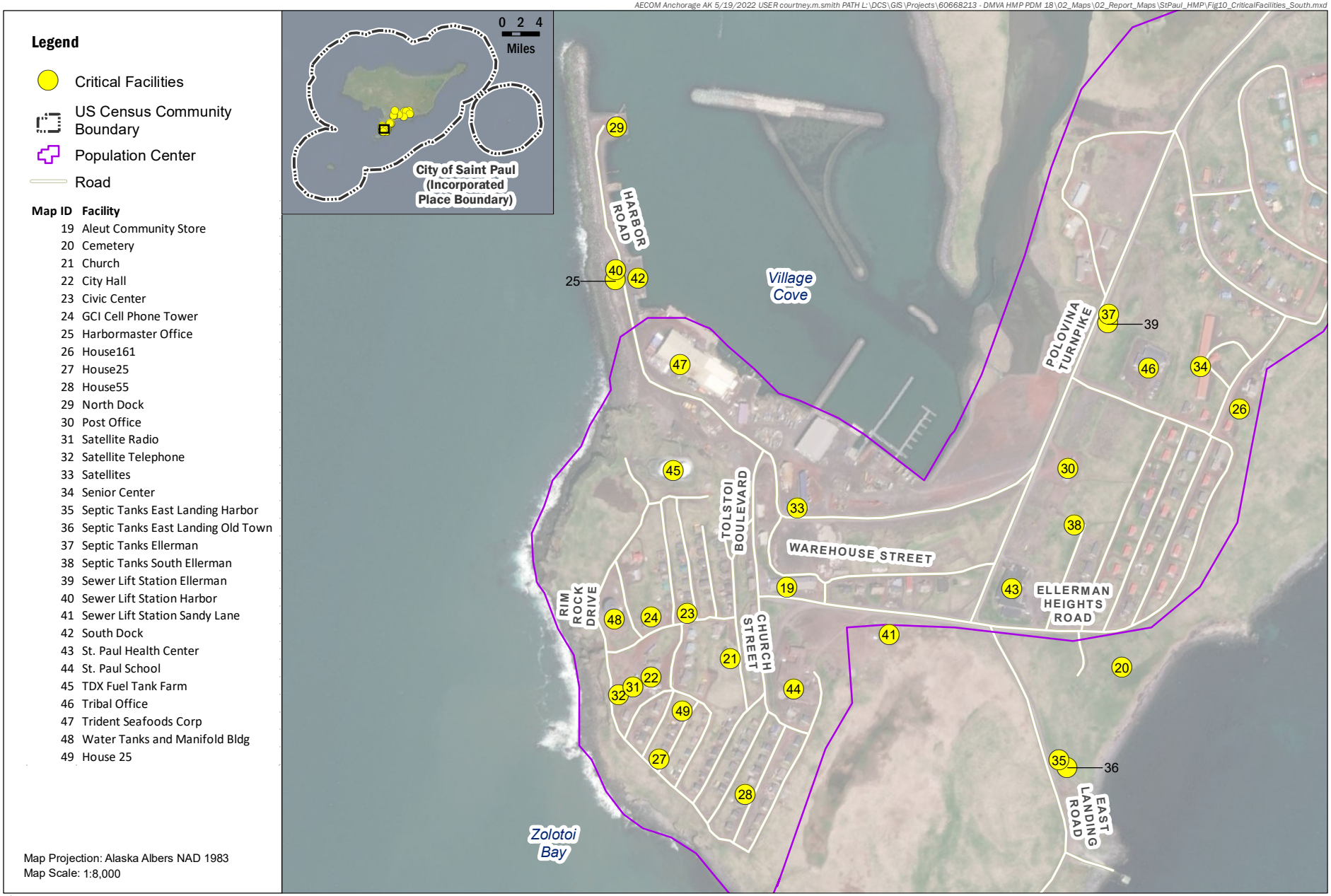
CRITICAL FACILITIES (NORTH)

Figure 9

AECOM Anchorage AK 5/19/2022 USER courtney.m.smith PATH L:\DCS\GIS\Projects\60668213 - DMVA HMP PDM 18\02_Maps\02_Report_Maps\StPaul_HMP\Fig10_CriticalFacilities_South.mxd



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CRITICAL FACILITIES (SOUTH)

Figure 10

APPENDIX B—FEMA REVIEW TOOL

APPENDIX C—PLANNING PROCESS