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REVISION 1

GENERAL WORK PLAN ADDENDUM

DOT&PF Statewide PFAS Addendum 014-PTH-01 Initial Site Characterization

PORT HEIDEN, ALASKA

SHANNON & WILSON

October 2022

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Submitted To: Alaska Department of Transportation & Public Facilities
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Subject: REVISION 1 GENERAL WORK PLAN ADDENDUM, DOT&PF STATEWIDE PFAS
ADDENDUM 014-PTH-01
INITIAL SITE CHARACTERIZATION, PORT HEIDEN, ALASKA

Shannon & Wilson has prepared this revised Work Plan Addendum on behalf of the Alaska Department of Transportation & Public Factifies (DOT&PF). This Addendum is a supplement to the *DOT&PF Statewide PFAS General Work Plan* (GWP), dated July 2020. The services proposed in this GWP Addendum, 014-PTH-01, describes the DOT&PF planned activities for water supply well (WSW) search and sampling for per- and polyfluoroalkyl substances (PFAS) associated with the Port Heiden Airport (PTH).

The scope of services was specified in our proposal dated June 16, 2022 and authorized by a notice to proceed (NTP) on August 26, 2022 by DOT&PF under Professional Services Agreement Number 25-19-013 *Per- and Polyfluorinated Substances (PFAS) Related Environmental & Engineering Services*.

This revised GWP Addendum was prepared and reviewed by:

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Associate, Statewide Project Manager

MED:ARM:KRF:CBD/med

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ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film forming foam
ARFF	Airport Rescue and Firefighting
COPC	contaminant of potential concern
CSM	Conceptual Site Model
DEC	Alaska Department of Environmental Conservation
DoD	Department of Defense
DOT&PF	Alaska Department of Transportation & Public Facilities
DRO	diesel range organics
DVPP	Data-Validation Program Plan
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
GRO	gasoline range organics
GWP	General Work Plan
IDW	investigative-derived waste
LHA	lifetime health advisory
mg/kg	milligrams per kilogram
ng/L	nanograms per liter
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
POC	point of contact
PTH	Port Heiden Airport
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual 5.3
RL	reporting limit
SSHP	Site Safety and Health Plan
WSW	water supply well

1 INTRODUCTION

This Addendum, 014-PTH-01, is a supplement to the *DOT&PF Statewide PFAS General Work Plan – Revision 1* (GWP). This Addendum, in collaboration with the GWP, provides guidance to conduct a water supply well (WSW) search and sampling event for per- and polyfluoroalkyl substances (PFAS) near the Port Heiden Airport (PTH) in Port Heiden, Alaska (Figure 1, Exhibit 1-1).

Shannon & Wilson has prepared the GWP and this Addendum in accordance with Alaska Department of Environmental Conservation's (DEC) March 2017 *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites* (DEC, 2017) and January 2022 *Field Sampling Guidance* document (DEC, 2022a). If additional activities are required that are not covered in the GWP or deviations are made to the GWP, they will be described in this Addendum.

The PTH is a state-owned airport managed by DOT&PF. Additional information regarding the PTH is listed in Exhibit 1-1 below.

Exhibit 1-1: Airport Information

Airport Name:	Port Heiden Airport
Airport Code:	PTH
DEC File No. / Hazard ID:	
Airport Address:	Port Heiden, Alaska 99549
DOT&PF Region:	Southcoast
DOT&PF Regional POC:	Spencer Gates
DOT&PF PFAS POC:	Sammy Cummings
Airport Type:	Current Part 139 Airport
Airport Coordinates (Lat/Long):	56.9605, -158.6382

POC = point of contact

1.1 Background

General background information relating to sites covered under the GWP is included in Section 1.1 of the GWP. Background information specific to the PTH is detailed below.

Alaska Department of Transportation & Public Facilities (DOT&PF) Aircraft Rescue and Firefighting (ARFF) services has used aqueous film forming foam (AFFF) for training and systems testing for many years. Part 139 Airports are required to conduct annual AFFF systems testing to maintain their certification through the Federal Aviation Administration (FAA). Prior to 2019, FAA inspections required the release of AFFF to the ground surface.

Perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are two PFAS commonly found at sites where AFFF were used. Due to their persistence, toxicity, and bioaccumulative potential, these compounds are of increasing concern to environmental and health agencies. In May 2016 the U.S. Environmental Protection Agency (EPA) published a recommended Lifetime Health Advisory (LHA) level of 70 nanograms per liter (ng/L) for the sum of PFOS and PFOA in drinking water. In June 2022 the EPA published Interim LHAs of 0.004 ng/L for PFOA and 0.02 ng/L PFOS, and Final LHAs of 2,000 ng/L for perfluorobutanesulfonic acid, and 10 ng/L for hexafluoropropylene oxide dimer acid and its ammonium salt (together referred to as "GenX chemicals").

The DEC Contaminated Sites Program published groundwater-cleanup levels of 400 ng/L for PFOS and PFOA in November 2016. Prior to the publication of these levels, there were no state-level cleanup levels established for PFAS. On October 2, 2019, DEC published a Technical Memorandum amending the April 9, 2019, Technical Memorandum to include additional PFAS analytes to the testing requirements. Per DEC guidance, the current action level remains 70 ng/L for the sum of PFOS and PFOA. A summary of the changes to action levels and regulatory requirements is described in Section 1.1 of the GWP.

1.1.1 Previous Environmental Investigations

The following sections summarize various environmental investigations that may be of interest to understand PFAS contamination at the site in the future.

1.1.1.1 2008 Jet Crash

Approximately 240 gallons of Jet A fuel spilled from a jet after it crashed during landing at the PTH in April 2008. Approximately 140 gallons of free product were initially recovered, and 12 cubic yards of contaminated soil were excavated and stored on site. Confirmation samples from the excavation did not identify contaminant concentrations above migration to groundwater cleanup levels; however, we note that PFAS samples were not collected. We note it is believed that no AFFF was needed to address this crash.

Contaminated soil was placed in a treatment cell at the PTH in May 2008. Following three rounds of treatment with nutrients and microbes, gasoline range organics (GRO)

concentrations fell from 389 milligrams per kilogram (mg/kg) to non-detect, diesel range organics (DRO) concentrations decreased from 3,220 mg/kg to 18.9 mg/kg, and ethylbenzene concentrations fell from 8.76 mg/kg to non-detect. The treated soil was approved for reuse at the PTH in September 2010 (DEC, 2010).

1.1.1.2 Monofill B

Monofill B received construction and demolition debris prior to its official closure in 1998 and was covered with an earth cap and vegetation (USACE, 1998). A 2005 site inspection noted that the monofill had sufficient vegetation growing over it, there were no obvious signs of erosion, and no indications of water ponding. The report indicates Monofill B is located near the middle of the circle created by Airport Road, Swan Lake Road, and Pit Road to the south of the airport. (USACE, 2005).

1.1.1.3 Class V Injection Well Closure

A Class V injection well was closed in 2018 in the PTH vehicle maintenance shop. The well was a combined-use system that received wastewater from the building, snowmelt, and incidental amounts of vehicle maintenance waste. Closure activities included filling drains in the shop with concrete, decommissioning the oil/water separator, collection of soil samples from the well and leach field system outside of the building, installation and sampling of two new groundwater monitoring wells, and sampling of three existing monitoring wells.

DRO, residual range organics, naphthalene, and benzo[a]anthracene were detected in soil samples above applicable screening criteria. No contaminants were detected in groundwater samples. Because contamination did not appear to have migrated from soil to groundwater, the site received a Cleanup Complete designation from DEC in 2021 (DEC, 2021).

1.1.2 Climate

Climate conditions in Port Heiden are characterized by small temperature variations, high humidity, heavy precipitation, and frequent cloud cover. High winds, storms, and fog occur frequently, although the village is protected from southeasterly winds and rain by the Aleutian Range, which is approximately 6 miles to the east (USGS, 1995).

1.1.3 Vegetation

Vegetation in and around Port Heiden consists of tundra, shrub tundra, and beach vegetation. Water-tolerant plants like sphagnum grow on poorly drained soils in the lowlands, while alder and willow trees can be found in moderately well-drained soils.

Heath, shrubs, and grasses can be found on terraces, subalpine slopes, and coastal lowlands, and upland areas and the summits of ridges are home to alpine tundra vegetation like lichens and mosses (USGS, 1995).

1.1.4 Geology and Soils

Major geologic units in the Port Heiden area include till and volcanic, estuarine, swamp, alluvial, outwash, and marine terrace deposits. Volcanic deposits consist of pumice, ash, debris-flow, and ash-flow tuff from the Holocene and Pleistocene ages and are visible along either side of the PTH runway.

Soils in the area are generally poorly developed due to frequent volcanic ash deposition from Aniakchak Crater, located approximately 18.5 miles to the east. Soil in developed areas consists of dark brown to reddish brown and consists primarily of sand and gravel size particles. Port Heiden and the surrounding area are generally free of permafrost (USGS, 1995).

1.1.5 Hydrology

Freshwater bodies in Port Heiden include the Meshik River, numerous creeks, lakes, and wetlands. The Meshik River and many of the creeks originate on the slopes of Aniakchak Crater and flow into Bristol Bay. The closest freshwater bodies to the PTH are Abbott Creek (1.25 miles south), Reindeer Creek (2.5 miles north), and Hendrickson Lake (1.5 miles east). Local creeks are generally not considered adequate sources of drinking water due to low discharge, potential tidal influences, and elevated dissolved-iron concentrations.

The primary aquifers near Port Heiden consist of unconsolidated sand and gravel, volcanic tuff, and bedrock. Silt and clay layers act as confining beds and there may be both shallow and deeper aquifers that are not hydraulically connected (DEC, 2008). Shallow groundwater wells (15 to 20 feet below ground surface) produce drinking water for individual households. Concentrations of iron and manganese in the aquifers generally exceed EPA drinking-water regulations, leading to groundwater being treated for iron prior to use (USGS, 1995).

1.2 Project Objectives and Scope

The project objective is to understand the extent of PFAS contamination, if present, resulting from the historic use of AFFF by the DOT&PF at the PTH. This Addendum describes methods used to identify PFAS and evaluate the lateral extent of contamination in WSWs on

and off the PTH, where such wells exist. Refer to Section 2.3 for contaminants of potential concern (COPCs) and Exhibit 4-1 for proposed samples and analyses.

The scope of this initial WSW search and sampling effort includes:

- conducting a WSW search to confirm if groundwater is the source of drinking water near and downgradient of the PTH; and
- sampling identified WSWs for PFAS, where access is provided.

The proposed well search area for the WSW sampling event is presented in Figure 2.

2 SITE AND PROJECT DESCRIPTION

The following sections provide a site and project description.

2.1 Site Location and Boundaries

The PTH is located approximately 3 miles northeast of the former Alutiiq village of Meshik, Alaska. The airfield does not have an associated street address. The PTH consists of a lightly graveled 5,000-feet long by 100-feet wide runway and a 4,000-feet by 100-feet crosswind runway. The facility was built during World War II and used to repair fighter and bomber aircraft.

Port Heiden is an embayment of Bristol Bay located in the Lake and Peninsula Borough. It is approximately 18.5 miles west of Aniakchak Crater, an active volcano that last erupted in 1931. The geographic coordinates of the PTH terminal are latitude 56.9605 and longitude -158.6382.

2.2 Potential Sources of PFAS Contamination

General information regarding potential sources of contamination at DOT&PF sites to be covered under GWP is included in Section 2.1 of the GWP. Specific potential sources of contamination at the PTH are listed below:

- A PTH runway where a jet crashed in 2008. Available site documents do not specify which runway the crash occurred on, but it is possible that AFFF was used to suppress a fuel fire from the crash (if one occurred).
- A Class V injection well and its associate septic field at the DOT&PF's ARFF building. A 1994 Preliminary Site assessment indicates that a common practice at remote

installations was to pour liquids down shop drains for disposal (USAF, 1994). It is possible that AFFF was disposed of this way at the PTH.

- Potential leaks or spills from AFFF storage areas like the DOT&PF's ARFF building.
- PFAS-contaminated material that was accepted for reuse following the treatment of the petroleum contamination. It is unknown where this material was reused at the site or it if contained PFAS.
- Known AFFF release areas where annual FAA certification testing of fire suppression systems and/or firefighting training events took place. Exact quantities of AFFF released are unknown due to various testing requirements the FAA inspector(s) outlined during certification or training events. Additionally, training event documentation was not required and available information on AFFF volumes and release frequency may not be representative.

2.3 Contaminants of Potential Concern and Regulatory Levels

General information regarding COPCs and regulatory levels is included in Section 2.2 of the GWP. The primary COPCs for this project are PFAS compounds, specifically PFOS and PFOA. DEC's *Field Sampling Guidance* also identifies GRO, DRO, residual range organics, benzene, toluene, ethylbenzene, and xylenes, and polynuclear aromatic hydrocarbons as COPCs at ARFF training areas. However, we note this is outside the scope of this Addendum.

Groundwater samples will be compared to Alaska's 18 Alaska Administrative Code (AAC) 75.341 Table C, Groundwater Human Health Cleanup Level and the DEC drinking water action level. The current cleanup levels and analytical reporting limits for the site COPCs are summarized below in Exhibit 2-1.

Exhibit 2-1: COPCs, Regulatory and Laboratory Reporting Limits

Method	Analyte	DEC Regulatory Limit[a] (ng/L)	DEC Drinking Water Action Level (ng/L)	Laboratory RLs[b] (ng/L)
DoD QSM Table B-15[c]	PFOS	400	70	2.0
	PFOA	400		2.0

Notes:

a. 18 AAC 75 *Table C. Groundwater Cleanup Levels*.

b. Current RLs from Eurofins TestAmerica, Inc. for PFAS analyses.

c. All available PFAS analytes will be requested for analytical reports. However, only PFOS and PFOA have DEC Cleanup Levels and are reported in this table.

DEC = Alaska Department of Environmental Conservation, DoD = Department of Defense, ng/L = nanogram per liter, PFAS = per- and polyfluoroalkyl substances, PFOA = perfluorooctanoic acid, PFOS = perfluorooctanesulfonic acid, QSM= Quality Systems Manual, RL = reporting limit

2.4 Conceptual Site Models and Site Safety and Health Plans

A conceptual site model (CSM) describes potential pathways between a contaminant source and possible receptors (i.e., people, animals, and plants) and is used to determine who may be at risk of exposure to those contaminants. A DEC *Human Health Conceptual Site Model Graphic Form* and a *Human Health Conceptual Site Model Scoping Form* were completed based on the preliminary understanding of site conditions. These forms are included in Appendix A of this Addendum.

Very little is known about potential PFAS-affected media at and beneath the PTH. The draft CSM will be revised and presented in the final report following the receipt of analytical data. Potentially affected media include contaminated soil, groundwater, surface water, sediment, and biota. Potential human exposure pathways include:

- Incidental soil ingestion;
- Dermal absorption of contaminants from soil, groundwater, or surface water;
- Inhalation of fugitive dust;
- Ingestion of groundwater (e.g., WSWs);
- Ingestion of surface water;
- Direct contact with sediment; and
- Ingestion of wild or farmed foods.

2.5 Project Team

Chris Darrah will be Shannon & Wilson's Principal-in-Charge and Kristen Freiburger will serve as the overall Statewide Project Manager. A site Project Manager will be selected if additional PFAS investigative efforts are needed following this first round of sampling. Shannon & Wilson's project team also includes other State of Alaska Qualified Environmental Professionals to support the various field and reporting tasks required to achieve the project objectives. The project team and their associated responsibilities are summarized in Exhibit 2-2 below.

Exhibit 2-2: Project Team

Affiliation	Responsibility	Representative	Contact Number
DOT&PF	Client – Regional POC	Spencer Gates	(907) 465-1787
	Client – Statewide PFAS POC	Sammy Cummings	(907) 888-5671
DEC	Regulatory agency POC	Bill O'Connell	(907) 269-3057
Shannon & Wilson	Principal-in-charge	Christopher Darrah	(907) 458-3143
	Statewide Project Manager	Kristen Freiburger	(907) 458-3146
	Project Manager	TBD	TBD
Eurofins/ TestAmerica, Inc.	PFAS analytical laboratory services	David Alltucker	(916) 374-4383

POC = point of contact

2.6 Project Schedule and Submittals

Section 2.5 of the GWP provides general information regarding project schedules (i.e., the general order of occurrence of site characterization activities) and associated submittals.

Once DEC approval is received for the proposed scope of services outlined in this Addendum, Shannon & Wilson will coordinate with DOT&PF staff to collect samples from WSWs at and near the PTH. Field activities are anticipated to occur during October 2022, weather permitting. Laboratory analysis will be requested on a standard 15-business-day turn-around time. Following receipt of the analytical results, we will provide DOT&PF and DEC with a map and table of the results. Results letters will also be prepared and mailed to the sampled WSW owner/user.

The following is the anticipated schedule:

- DEC comments addressed; approval received – Early October 2022
- Work Plan Implementation (field activities) – Late October 2022
- Analytical summary of data reported to DOT&PF and DEC – within 2 business days of data receipt
- Analytical data table and map reported to DOT&PF and DEC – within 3 business days of data receipt
- WSW owner/user notification of results – following delivery of results to DEC

Seasonal factors, including depth to groundwater and freezing conditions, may impact Shannon & Wilson's ability to perform the field effort outlined in this document. We will inform DOT&PF regarding any scheduling changes.

3 WATER SUPPLY WELL SAMPLING ACTIVITIES

The following sections describe the WSW sampling activities to be conducted at and near the PTH. Sampling procedures and analytical methods are described in Section 4. A Quality Assurance Program Plan (QAPP) is included in Section 5.

3.1 Water Supply Well Search

General information regarding WSW search activities is described in Section 3.1 of the GWP.

Available information indicates groundwater is likely the drinking water source near the PTH. Given the relatively small population in Port Heiden (approximately 62 people), proximity to the airport, and logistical concerns to access the site, Shannon & Wilson proposes to investigate most of the structures and homes to conduct a WSW search. Most of the well search area is outside of DOT&PF property (Figure 2).

After reviewing available area maps and property-ownership records for Port Heiden, where available, Shannon & Wilson will prepare detailed maps for the well search field effort. Field staff will visit parcels in the well search area to identify structures that may use groundwater for drinking water (e.g., residences and public buildings). We will make a reasonable attempt to contact the owners or occupants to inquire about their water source and obtain permission to collect samples. Shannon & Wilson will collect PFAS samples from any identified WSWs in the search area for which permission to sample has been given by the owner(s) or occupant(s).

3.2 Water Supply Well Activities

Groundwater characterization activities for this project include groundwater sample collection from WSWs as described in the following sections. General information regarding WSW activities is described in Section 4.1 of the GWP. Field personnel will document field activities with field notes and photographs as well as applicable field forms (Appendix B of GWP), as detailed in Section 5.2. Analytical laboratories and methods employed as a part of this Addendum are identified in Section 4.3.

4 SAMPLING AND ANALYSIS PLAN

This section describes the analytical sampling approach for investigating PFAS contamination associated with the PTH. A DEC-qualified sampler will collect and handle the samples for projects covered under the GWP and this Addendum and collect required

quality control (QC) samples in accordance with DEC's *Field Sampling Guidance*. A general Sampling and Analysis Plan is included as Section 4 of the GWP. Sample containers, preservation methods, and holding times are included in Section 4.4. Sample custody, storage, and transport will be followed as described in Section 4.5. Investigative-derived waste (IDW) management is described in Section 4.7.

4.1 Analytical Sample Summary

We estimate there are approximately 60 structures in the WSW search area. We further estimate that approximately 85% of those locations will have a well and we will be allowed to collect a sample.

An analytical sample summary is detailed in Exhibit 4-1 below.

Exhibit 4-1: Analytical Sample Summary

Number of Samples	Matrix	PFAS (EPA 537.1 to 537.1M)
	Groundwater	50 + 5 DUPs

Notes:
DUP = field-sample duplicate; EPA = U.S. Environmental Protection Agency; PFAS = per- and polyfluoroalkyl substances,

4.2 Special Considerations for PFAS Sampling

Special considerations for PFAS sampling are outlined in Section 4.10 of the GWP.

4.3 Analytical Laboratories and Methods

PFAS samples will be submitted to Eurofins TestAmerica of West Sacramento, California. Based on the DEC Technical Memorandum issued on October 2, 2019, PFAS analysis will report the 18 approved PFAS compounds as listed in EPA 537 Modified Method that complies with the Department of Defense/Department of Energy (DoD/DOE) Quality Systems Manual (QSM) Version 5.3 Table B-15. Upon receipt of the samples, authorized personnel will store and prepare the samples for analysis, taking into consideration sample holding times for the analysis.

4.4 Sample Containers, Preservation, and Holding Times

General information regarding sample containers, preservation, and holding times is described in Section 4.12 of the GWP. This information is provided in Exhibit 4-2, below, for the analytical methods employed for this project.

Exhibit 4-2: Sample Containers, Preservation, and Holding Time Requirements

Analyte	Method	Media	Container and Sample Volume	Preservation	Holding Time
PFAS	DoD QSM 5.3 Table B-15	Drinking Water	2 x 250 mL polycarbonate	0 °C to 6 °C	14 days

NOTES:
DoD = Department of Defense, PFAS = per- and polyfluoroalkyl substances, QSM = Quality Systems Manual

4.5 Sample Custody, Storage, and Transport

Sample custody, storage, and transport procedures are described in Section 4.13 of the GWP.

4.6 Equipment Decontamination

Equipment decontamination procedures are described in Section 4.14 of the GWP. We note that disposable sampling equipment is typically used to collect WSW samples and equipment decontamination is not likely to be needed for this project.

4.7 Investigative Derived Waste Management

IDW will generally consist of purge water generated during WSW sampling. Purge water will be filtered using either a granulated activated carbon filter and then discharged to the ground surface or using the disposal method utilized at the property (e.g., septic system). Other IDW will primarily consist of disposable sampling equipment (nitrile gloves, transfer cups, etc.) and will be disposed of at the nearest landfill.

4.8 Deviations from the General Work Plan

No deviations to the GWP are planned at this time.

5 QUALITY ASSURANCE PROJECT PLAN

This QAPP is intended to guide activities during assessment and review of resulting data. Shannon & Wilson will be responsible for conducting data reduction, evaluation, and reporting under this QAPP. A general QAPP is provided as Section 5 of the GWP. Additionally, a Data-Validation Program Plan (DVPP), which describes the procedures for qualifying analytical data in a consistent manner, has been prepared and is included as Appendix C to the GWP. We note an updated DVPP was submitted to DEC in June 2022. The following sections describe specific procedures to be followed during sampling at the

PTH so that sampling and documentation are effective, laboratory data are usable, and the information acquired is of high quality and reliable.

5.1 Quality Assurance Objectives

Data quality objectives are detailed in Section 5.1 of the GWP. Numeric QA objectives for this project are presented in Exhibit 5-1 below.

Exhibit 5-1: Quality Assurance Objectives for Analytical Samples

Analyte	Method	Matrix	Precision	Accuracy	Completeness
PFAS	DoD QSM 5.3 Table B-15	Water	±30%	(analyte dependent)	85%

NOTES:
PFAS = per- and polyfluoroalkyl substances

5.2 Field Documentation

Field documentation is described in Section 5.2 of the GWP. Field forms to be used for this project are included in Appendix B of the GWP.

5.3 Field Instrument Calibration

Field instrument calibration (e.g., YSI) is discussed in Section 5.3 of the GWP.

5.4 Field Quality Control Samples

The field quality assurance (QA)/QC program for this project includes the collection of the QA/QC samples described in the following sections.

5.4.1 Field Duplicate Sample

Field duplicate sample collection procedures are described in Section 5.4.1 of the GWP. One field duplicate will be collected for every 10 primary samples. Refer to Exhibit 4-1 for the planned number of field duplicates.

5.4.2 Equipment Blank Samples

Equipment blank sample collection procedures are described in Section 5.4.4 of the GWP. We note it is unlikely equipment blanks will be needed for WSW sampling.

5.4.3 Temperature Blank Samples

Temperature blanks are described in Section 5.4.6 of the GWP.

5.5 Laboratory Quality Control Samples

Laboratory quality control samples are described in Section 5.5 of the GWP.

5.6 Laboratory Data Deliverables

Laboratory data deliverables are described in Section 5.6 of the GWP.

5.7 Data Reduction, Evaluation, and Reporting

Data reduction, evaluation, and reporting requirements are discussed in Section 5.7 of the GWP.

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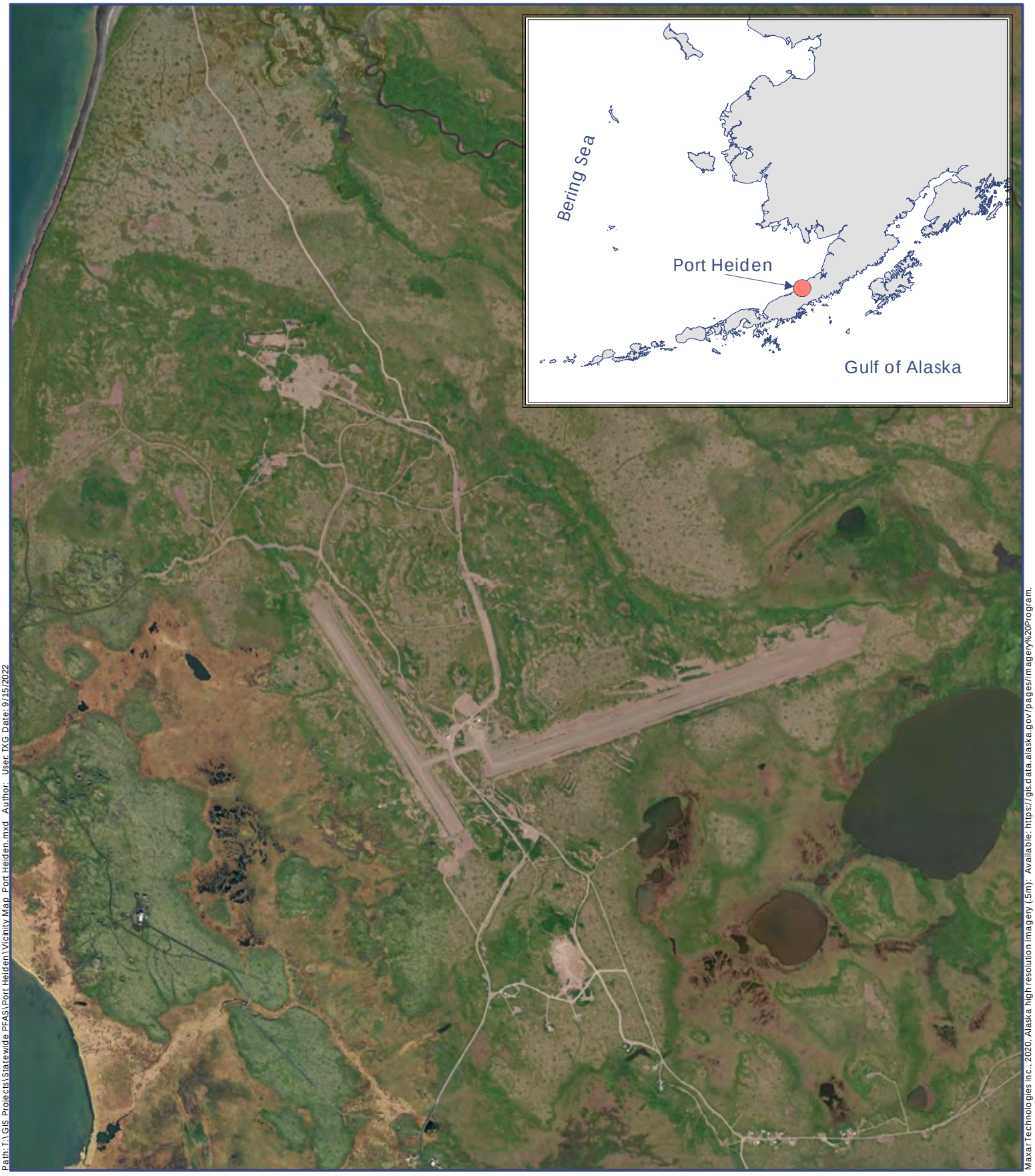

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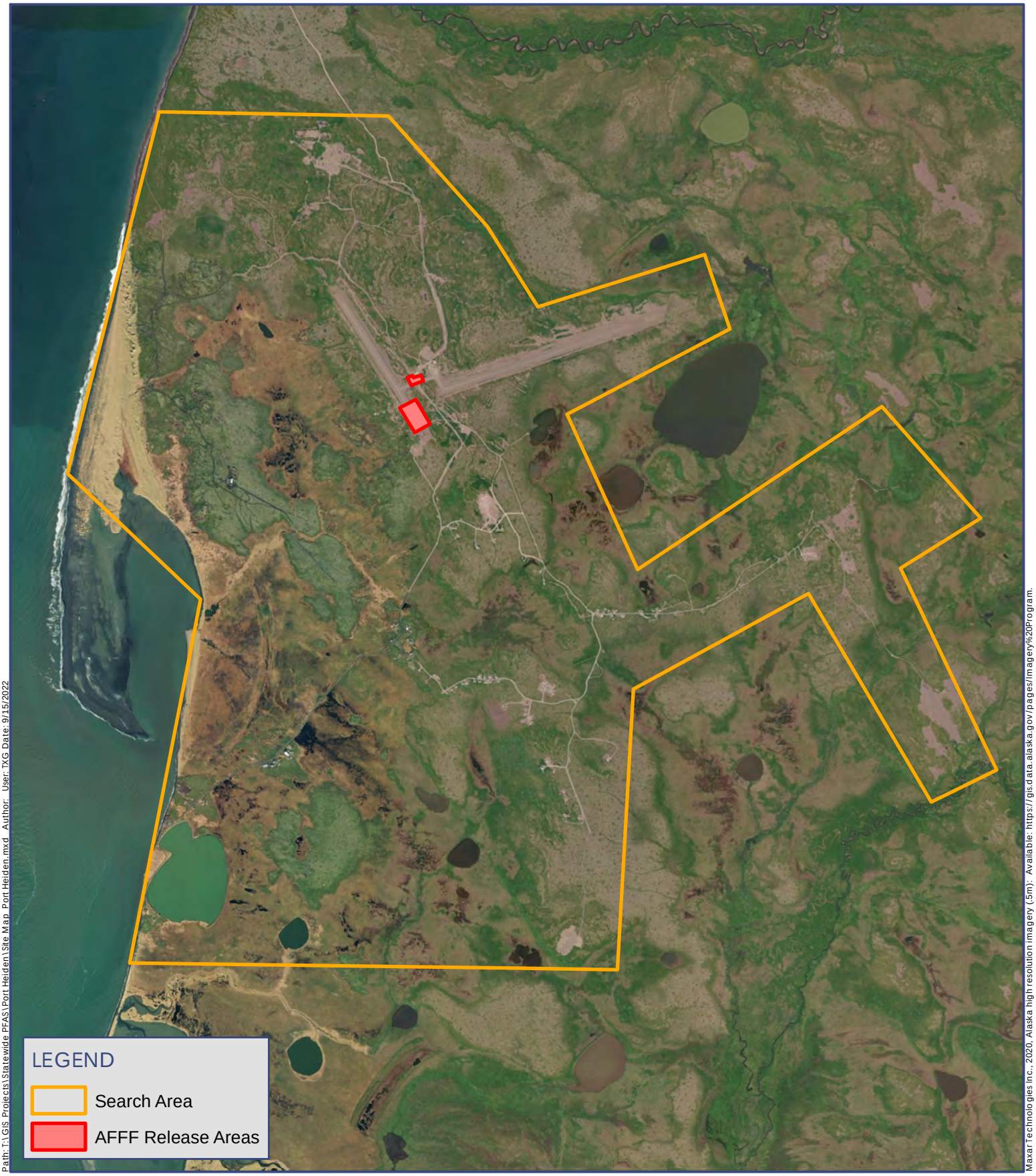
October 2022

VICINITY MAP

Figure 1



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Notes:
1. AFFF: Aqueous Film Foarming Foam
2. Search area is approximate

October 2022

SITE MAP

Figure 2

APPENDIX A: CONCEPTUAL SITE MODEL

Appendix A

Conceptual Site Model

Scoping and Graphics Forms

CONTENTS

Print Form

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name: ADOT&PF Port Heiden Airport Sitewide PFAS

File Number: 2637.57.002

Completed by: Morgen Donohue, Shannon & Wilson, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☒ Other: Aqueous Film Forming Foam (AFFF) releases

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☒ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☒ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☐ Air
- ☒ Sediment
- ☒ Groundwater
- ☒ Surface water
- ☒ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☒ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☒ Subsistence harvester (i.e. gathers wild foods)
- ☒ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☒ Recreational user
- ☒ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

No surface soil samples have been collected at the PTH. However, AFFF releases to the ground surface could cause soil contamination.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

No surface soil samples have been collected at the PTH. However, AFFF releases to the ground surface could cause soil contamination.

According to the Alaska Department of Health and Social Services, PFOS and PFOA are not appreciably

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

No water supply well samples have been collected at or downgradient of the PTH. However, PFAS contaminated groundwater is possible.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☒

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☒

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☒

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Complete

Comments:

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

PFAS are not included in Appendix D. If volatile organic compounds are reported during site characterization activities, this section will be updated with the new information.

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☒

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

See comments for 3.c.1.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

According to the Alaska Department of Health and Social Services, PFOS and PFOA are not appreciably absorbed through the skin. However, Appendix B of the 2017 Guidance on Developing Conceptual Site Models lists both PFOS and PFOA. We consider dermal exposure to these compounds to be insignificant for the purposes of this CSM.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

PFAS are not included in Appendix D.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

No surface soil samples have been collected at the PTH. However, AFFF was likely released to the ground surface on the lightly graveled runways that can be dusty in the summertime.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

No sediment samples have been collected at the PTH. However, AFFF was likely release to the ground surface in unpaved and/or lightly graveled areas open to DOT&PF employees and the public. Additionally, local residents use subsistence practices (e.g., berry picking and fishing) that may expose them to sediment.

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

This initial CSM will be revised following the receipt of analytical data.

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: ADOT&PF Port Heiden Airport Sitewide PFAS
2637.57.002

Completed By: Morgen Donohue, Shannon & Wilson, Inc.
Date Completed: September 2022

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathway/Route	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil — check soil	☑ soil	☑ Incidental Soil Ingestion	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Migration to subsurface — check soil		☑ Dermal Absorption of Contaminants from Soil	I	I	I	I	I	I	
	☑ Migration to groundwater — check groundwater		☑ Inhalation of Fugitive Dust	C/F	C/F	C/F	C/F			
	☑ Volatilization — check air									
	☑ Runoff or erosion — check surface water									
	☑ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil	☑ groundwater	☑ Ingestion of Groundwater	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Migration to groundwater — check groundwater		☑ Dermal Absorption of Contaminants in Groundwater	I	I	I	I	I	I	
	☐ Volatilization — check air		☐ Inhalation of Volatile Compounds in Tap Water							
	☑ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Ground-water	☑ Direct release to groundwater — check groundwater	☐ air	☐ Inhalation of Outdoor Air							
	☐ Volatilization — check air		☐ Inhalation of Indoor Air							
	☐ Flow to surface water body — check surface water		☐ Inhalation of Fugitive Dust							
	☐ Flow to sediment — check sediment									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Surface Water	☑ Direct release to surface water — check surface water	☑ surface water	☐ Ingestion of Surface Water							
	☐ Volatilization — check air		☑ Dermal Absorption of Contaminants in Surface Water	I	I	I	I	I	I	
	☑ Sedimentation — check sediment		☐ Inhalation of Volatile Compounds in Tap Water							
	☑ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Sediment	☑ Direct release to sediment — check sediment	☑ sediment	☑ Direct Contact with Sediment	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Resuspension, runoff, or erosion — check surface water									
	☑ Uptake by plants or animals — check biota	☑ biota	☑ Ingestion of Wild or Farmed Foods	C/F	C/F	C/F	C/F	C/F	C/F	
	☐ Other (list):									

Revised, 10/01/2010

APPENDIX B: SITE SAFETY AND HEALTH PLAN

Appendix B

Site Safety and Health Plan

CONTENTS

APPENDIX B: SITE SAFETY AND HEALTH PLAN

SITE SAFETY AND HEALTH PLAN

Shannon & Wilson prepared this Site Safety and Health Plan (SSHP) for the water supply well (WSW) well search and sampling activities at and near the Port Heiden Airport (PTH). The purpose of this SSHP is to protect the health and safety of field personnel from physical and chemical hazards associated with work at this site.

The provisions of this plan apply to Shannon & Wilson personnel who will potentially be exposed to safety and/or health hazards during this investigation. Shannon & Wilson employees are covered under its Corporate Safety and Health Program. General safety and health requirements described in that program will be met. Each Shannon & Wilson employee on the site will complete the personal acknowledgement form documenting they have read and understand this SSHP and agree to abide by its requirements. A copy of this SSHP will be kept on-site throughout the duration of sampling operations.

B.1. SITE HAZARD ANALYSIS

There are two categories of hazards that may occur during the field work: potential chemical exposure hazards and physical hazards associated with site characterization activities. These hazards are discussed below.

B.1.1 Chemical-Exposure Hazards

Contaminated water may be encountered during site exploration activities. PFAS are believed to be the primary contaminants of potential concern and may be encountered in water at unknown concentrations.

Shannon & Wilson personnel will implement skin protection when they are to contact potentially contaminated soil or water. Field personnel will wear work gloves or nitrile gloves as needed. Field personnel will not require respiratory protection based on the current understanding of site conditions and scope of services.

B.1.2 Physical Hazards

Primary physical hazards associated with site characterization activities include temperature stress; lifting, slipping, tripping, falling; and risk of eye injuries. In addition, wildlife may be a hazard in forested areas around the airport. The best means of protection against accidents related to physical hazards are careful control of equipment activities in

the planned work area and use of experienced and safety- and health-trained field personnel.

Field personnel will not enter confined spaces for site characterization activities, nor will they enter trenches or excavations greater than four feet in depth.

B.1.2.1 Temperature Stress

Wearing personal protective equipment (PPE) may put a worker at risk of developing heat stress; however, since the field work will be conducted during cooler months the risk of heat stress is considered low. Cold stress or injury due to hypothermia will be guarded against by wearing appropriate clothing, having warm shelter available, scheduling rest periods, adequate hydration, and self-monitoring physical and mental conditions.

B.1.2.2 Lifting Hazards

Moving coolers of water samples or other heavy objects presents a lifting hazard. Personnel will use proper lifting techniques and obtain assistance when lifting objects weighing more than 40 pounds.

B.1.2.3 Slips, Trips, and Falls

The most common hazards on a job site are typically slips, trips, and falls. These hazards will be reduced through the following practices:

- Personnel will stay alert.
- All access-ways will be kept free of materials, supplies, and obstructions at all times.
- Tools and other materials will be located so as not to cause tripping or other hazards.
- Personnel should be aware of potential tripping hazards associated with vegetation, debris, and uneven ground.
- Personnel should be aware of limitations imposed by work clothing and PPE.

The project site may be inherently hazardous due to the potential presence of rain, snow, and ice, which can alter the character of the ground surface. The risk for slips, trips, and falls by site workers is increased due to wet or icy surfaces; therefore, workers will use caution when walking at the site.

B.1.2.4 Insects and Animals

During the summer months in Alaska, mosquitoes and other insects are common in areas predominantly covered with vegetation. Wearing PPE should be sufficient to protect site

workers. Animals such as moose and bears are also commonly seen in Alaska. If a large animal approaches the site, workers should keep their distance or seek shelter in their vehicles.

B.1.2.5 Congested Areas

The site investigation may at times require field personnel to work adjacent to or in roadways. Field personnel will observe the speed and frequency of traffic proximal to the work site. Appropriate cones, barricades, or signs to secure the work area will be used when required.

B.1.3 Other Hazards

Biological, ionizing radiation, and other hazards are not expected to be present. However, be aware of the surroundings and maintain safe work practices in accordance with Shannon & Wilson's Corporate Health & Safety Plan.

B.2. PERSONAL RESPONSIBILITIES, TRAINING, AND MEDICAL SURVEILLANCE

Below is a summary of the assignment of responsibilities, training requirements, and medical surveillance information for Shannon & Wilson personnel.

B.2.1 Assignment of Responsibilities

Shannon & Wilson is responsible for understanding and complying with the requirements of this SSHP. Following is a list of responsibilities of all Shannon & Wilson personnel working on the site:

- Review and follow this SSHP.
- Attend and participate in safety meetings.
- Take appropriate action as described in this SSHP regarding accidents, fires, or other emergency situations.
- Take all reasonable precautions to prevent injury to themselves and their fellow workers.
- Perform only those tasks they believe they can do safely, and immediately report any accidents or unsafe conditions to Shannon & Wilson's Project Manager or Office Health and Safety Manager.
- Halt work, by themselves or by others, when they observe an unsafe act or potentially unsafe working condition.

- Report accidents, illnesses, and near-misses to the local contact and to Shannon & Wilson's Fairbanks office Health and Safety Manager.

B.2.2 Personal Training

Shannon & Wilson personnel performing activities on this site and under this plan have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each individual has completed an annual eight-hour refresher-training course and/or initial 40-hour training course within the last year.

A personal acknowledgement form will be completed by field personnel prior to commencing field activities. This acknowledgment form will document that they have read and understand this SSHP.

B.2.3 Medical Surveillance Program

All field personnel performing activities on this site covered by this SSHP have undergone baseline and annual physical/medical examinations as part of Shannon & Wilson's Corporate Health and Safety Program. All field personnel are active participants in Shannon & Wilson's Medical Monitoring Program or in a similar program, which complies with 29 CFR 1910.120(f).

B.3. PERSONAL PROTECTIVE EQUIPMENT

PPE will be required during the course of the field work. PPE selection will be based primarily on work-task requirements and potential exposure. Personnel may wear the following, depending on the area of sampling:

- standard work clothes;
- reflective, high-visibility safety vest;
- safety-toe boots;
- safety glasses;
- hearing protection;
- gloves; and,
- hard hat.

Disposable nitrile gloves will be worn during any activity that may require dermal contact with potentially contaminated media.

B.4. DECONTAMINATION PROCEDURES

Equipment decontamination procedures are necessary for any reusable equipment that comes into contact with contaminated soil and/or water. Decontamination procedures will consist of a rinse with non-phosphate-based detergent, a second rinse with plain tap water, and a final rinse with distilled water. Sampling equipment and PPE that is expendable will be disposed of at the site or in a landfill off-site.

Shannon & Wilson will conduct all site characterization activities in Level D PPE. For this reason, personnel will not be decontaminated when leaving the work site unless gross visual contamination of protective clothing is present.

B.5. ACCIDENTS AND EMERGENCIES

Shannon & Wilson field personnel are current in first aid and cardiopulmonary resuscitation (CPR) training. At a minimum, the following site safety equipment and first aid supplies shall be available in the field:

- PPE and clothing specialized for known site hazards;
- first aid kit, including first aid booklet;
- portable eye wash;
- clean water in portable containers; and
- other decontamination supplies.

The primary emphasis of any health and safety plan is accident prevention. If an injury or illness occurs during the course of field work, the severity of the problem will dictate the level of response. Minor injuries or illness will be addressed with basic first aid measures as recommended by a registered nurse through Shannon & Wilson's corporate Medcor service (1-800-775-5866). More serious injuries will require assistance from the medical staff at the Port Heiden Clinic located at 2200 James St, Port Heiden, Alaska. The telephone number for the Clinic is (907) 837-2208 and the hours of operation are 9 a.m. to 3 p.m. Field phones will be kept easily accessible in the case of an emergency.

Shannon & Wilson's Corporate Health and Safety Program requires accident reporting when there is a site-related accident, near-miss incident, or medical emergency. If an employee is treated by medical personnel, the medical attendant will complete an Incident Medical Treatment Documentation form. Completion of an Alaska Department of Labor Report of Occupational Injury or Illness is also required within 10 days for any work-related injury or illness.

B.6. GENERAL SITE SAFETY REQUIREMENTS

The following measures are designed to augment the specific health and safety guidelines provided in this plan:

- Field personnel should avoid contact with potentially contaminated surfaces such as: walking through puddles or pools of liquid; kneeling on the ground; or leaning, sitting, or placing equipment on contaminated soil or containers.
- Field personnel will be familiar with procedures for initiating an emergency response.
- Hazard assessment is a continual process; personnel must be aware of their surroundings and any chemical/physical hazards present.
- Personnel in the exclusion area shall be the minimum number necessary to perform work tasks in a safe and efficient manner.
- The use of contact lenses is prohibited; soft lenses may absorb irritants, and all lenses concentrate irritants.
- Equipment contacting potentially contaminated soil or water must be decontaminated or properly discarded before leaving the site.

Field personnel will be familiar with the physical characteristics of the work site including wind direction, site access, and location of communication devices and safety equipment.

SITE SAFETY AND HEALTH PLAN PERSONAL ACKNOWLEDGEMENT FORM

DOT&PF STATEWIDE GENERAL WORK PLAN
ADDENDUM 014-PTH-01: PORT HEIDEN PTH SITE CHARACTERIZATION

I have reviewed this document and understand its contents and requirements. A copy of the above-referenced document has been made available to me. I agree to abide by the requirements of this Site Safety and Health Plan.

_____	_____
Signature	Name (printed)
_____	_____
Date	Representing

IMPORTANT INFORMATION

Important Information

About Your Geotechnical/Environmental Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent

IMPORTANT INFORMATION

such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

IMPORTANT INFORMATION

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland