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FINAL

GENERAL WORK PLAN ADDENDUM
DOT&PF Statewide PFAS
Addendum 025-KSM-01 Saint
Mary's Water Supply Well Sampling
SAINT MARY'S, ALASKA

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Submitted To: Alaska Department of Transportation & Public Facilities
2301 Peger Road
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Subject: FINAL GENERAL WORK PLAN ADDENDUM, DOT&PF STATEWIDE PFAS
ADDENDUM 025-KSM-01 SAINT MARY'S WATER SUPPLY WELL
SAMPLING, SAINT MARY'S, ALASKA

Shannon & Wilson has prepared this Work Plan Addendum on behalf of the Alaska Department of Transportation & Public Facilities (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, 025-KSM-01, describes the DOT&PF planned activities for a water supply well (WSW) search and sampling event to evaluate per- and polyfluoroalkyl substances (PFAS) associated with the Saint Mary's Airport (KSM).

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 GWP Addendum was prepared and reviewed by:

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ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film forming foam
ARFF	Airport Rescue and Firefighting
bgs	below ground surface
BLM	U.S. Bureau of Land Management
COPC	contaminant of potential concern
CSD	contaminated sites database
CSM	Conceptual Site Model
DEC	Alaska Department of Environmental Conservation
DoD	Department of Defense
DOT&PF	Alaska Department of Transportation & Public Facilities
DVPP	Data-Validation Program Plan
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
GWP	<i>DOT&PF Statewide PFAS General Work Plan – Revision 1</i>
IDW	investigative-derived waste
KSM	Saint Mary's-Pitka Point Airport
LHA	lifetime health advisory
ng/L	nanograms per liter
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
POC	point of contact
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
USGS	United States Geological Survey
UST	underground storage tank
WSW	water supply well

1 INTRODUCTION

This Addendum, 025-KSM-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) at and near the Saint Mary’s-Pitka Point Airport (KSM) in Saint Mary’s, 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 KSM is a state-owned airport managed by the Alaska Department of Transportation and Public Facilities (DOT&PF). Additional information regarding the KSM is listed in Exhibit 1-1 below.

Exhibit 1-1: Airport Information

Airport Name:	Saint Mary’s Airport
Airport Code:	KSM
DEC File No. / Hazard ID:	No PFAS-related file listing or Hazard ID
Airport Address:	Airport Road, Saint Mary’s, Alaska 99658
DOT&PF Region:	Northern Region
DOT&PF Regional POC:	Jeremy Thompson
DOT&PF PFAS POC:	Sammy Cummings
Airport Type:	Former Part 139 Airport
Airport Coordinates (Lat/Long):	62.0608, -163.3019

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 KSM is detailed below.

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 drinking water 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.

Alaska DOT&PF does not have any records that indicate AFFF discharge at the KSM; however, due to its previous Part 139 certificate and a tote of AFFF present at the airport it is believed there could have been discharges during annual FAA certification inspections. KSM has not been a certificated airport since August 1995.

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. Additional environmental investigations are reported in the DEC Contaminated Sites database (CSD); however, due to the distance from the ARFF building and lack of PFAS-containing contaminants (i.e. AFFF releases), it is unlikely these sites have contributed to PFAS contamination at or from the KSM.

1.1.1.1 DOT&PF - Saint Mary's Airport Retardant Ramp

According to the CSD summary, DOT&PF leases this property to the U.S. Bureau of Land Management (BLM) and it has been subleased to the Alaska Department of Natural

Resources, Division of Forestry for fire suppression activities since the 1960s. The site was investigated in response to a report of a leaking underground storage tank (UST). The investigation revealed extensive soil and groundwater contamination in the area. In a Record of Decision document dated February 12, 2008, the expected future use of the site was a staging area for wildland fire suppression activities. PFAS-containing foam is not typically used for wildland firefighting; however, we note that the CSD summary does not describe the type or volume of fire suppressants used during fire suppression activities (DEC, 2008).

1.1.1.2 FAA Saint Mary's Consolidated Bldg.

The DEC CSD summary indicates that four non-regulated heating oil tanks associated with the consolidation building were removed in 1998. Soil and groundwater were affected by petroleum contamination. The database does not mention the excavation of contaminated soils.

1.1.1.3 KSM Aviation Accident Reports

Multiple crash reports for aircraft accidents at the KSM are available in the National Transportation Safety Board Aviation Accident Database. It is unknown whether AFFF was used at these crash sites.

1.1.1.4 DOT&PF Airport Maintenance Station Injection Well Closure

In 2021 and 2022, Shannon & Wilson conducted injection-well closure and site characterization activities for DOT&PF at the KSM Maintenance Station. PFAS analysis was not included in the scope of services; however, several other pieces of information collected during these activities will be referenced for this WSW search and overall PFAS investigation. A shallow, discontinuous aquifer was observed at 15 to 19 feet below ground surface (bgs) with a flow of north-northeast. Several monitoring wells are available for sampling in this shallow aquifer. WSWs were discovered and are believed to be installed in a deeper aquifer. These WSWs are reportedly not used for drinking due to low water quality.

1.1.2 Climate

Climate conditions in Saint Mary's are a combination of transitional and continental climatic zones with great diurnal and annual temperature variations. Maximum rainfall occurs in July and August. Average annual precipitation is approximately 19 inches. Annual snowfall averages approximately 74 inches (USGS, 1994).

1.1.3 Vegetation

Vegetation in and around Saint Mary's consist of closed spruce hardwood types along the riverbanks with aspen, birch, poplar, and white spruce on the well-drained, high-relief areas. The flat poorly drained areas consist predominantly of black spruce, birch, and alder. The forest floors include mosses, grasses, sedges, and shrubs. Poorly drained, wet areas contain extensive growths of muskeg, sedges, and shrubs (USGS, 1994).

1.1.4 Geology and Soils

Saint Mary's and the airport are underlain by fine- to medium-grained calcareous sandstone interbedded with non-calcareous siltstone. Bedrock at the airport is reported at shallow depths or exposed at the ground surface. The Saint Mary's area is also underlain with discontinuous permafrost. Well logs indicate frost or ice layers at as shallow as 3 feet bgs to approximately 18 feet bgs.

Surficial geology generally consists of fluvial soils. Poorly drained mineral soils are found in meander scars on the flood plain, broad valley bottom, and stream. Peat deposits are present on the flood plains in areas lower than the poorly drained mineral soils. Well-drained mineral soils are found on the natural levees along the existing and former river channels and on the hills and ridges. Permafrost is commonly found at depths ranging from approximately 6 inches to 5 feet bgs (USGS, 1994).

1.1.5 Hydrology

Saint Mary's is located adjacent to the Yukon River and the various forks of the Andreafsky River, which flows into the Yukon River. The mouth of the Andreafsky River is approximately 3 miles southeast of the airport. The airport is surrounded by the headwaters of creeks that discharge into the Yukon River downstream of the mouth of the Andreafsky River. Three creeks run through the village and discharge into the Andreafsky River.

The airport is located on the west side of the drainage divide, which discharges into the Yukon. The village is located on the east of the divide, which generally discharges into the Andreafsky River. Not much is known about the groundwater; however, due to the presence of permafrost and shallow bedrock, groundwater flow should follow topography and reflect surface water flow. The surface-water divide between the airport and the village probably acts as a groundwater divide. Floods are not a frequent occurrence in the Saint Mary's area (USGS, 1994).

1.2 Project Objectives and Scope

The project objective is to search for and sample WSWs at and near the KSM, if any, and interview airport personnel on possible AFFF release sites at the KSM. This Addendum describes methods used to identify PFAS and evaluate the lateral extent of contamination in WSWs on and near the KSM, 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 a source of drinking water near and downgradient of the KSM;
- sampling identified WSWs or monitoring wells for PFAS, where access is provided; and
- discuss potential AFFF release sites at the KSM through interviews with airport personnel.

The proposed well search area for the sampling event and the Pitka's Point municipal water system and associated influence area are presented in Figure 2.

2 SITE AND PROJECT DESCRIPTION

The following sections provide a site and project description.

2.1 Site Location and Boundaries

Pitka Point and Saint Mary's are located in western Alaska, approximately 515 miles southwest of Fairbanks. The KSM is located near the mouth of the Andreafsky River and the Yukon River. The main gravel runway 17/35 lies north to south on a ridge west of the village and north of Pitka's Point. The gravel runway 6/24 is located at the southern end of runway 17/35. Runway 17/35 is 6,008 feet long by 150 feet wide; runway 6/24 is 1,520 feet long by 60 feet wide. The geographic coordinates of the KSM terminal are latitude 62.0608 and longitude -163.3019.

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 KSM are listed below:

- Crash sites at the KSM. Precise locations of crash sites are unknown, but it is possible that AFFF was used to suppress fuel fires resulting from aircraft accidents.

- FAA required AFFF systems testing areas at various, unidentified locations along KSM runways.
- Potential leaks or spills from AFFF storage areas such as the DOT&PF maintenance building.

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 gasoline range organics, diesel range organics, 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 of 70 ng/L for the sum of PFOS and PFOA. The current regulatory 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	Regulatory Limit ^a (ng/L)	DEC Drinking Water Action Level (ng/L)	Laboratory RLS ^b (ng/L)
DoD QSM	PFOS	400	70	2.0
Table B-15 ^c	PFOA	400		2.0

Notes:

- 18 AAC 75 Table C. *Groundwater Cleanup Levels*.
- Current RLS from Eurofins Environment Testing for PFAS analyses.
- 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 = Department of Environmental Conservation, DoD = Department of Defense, ng/L = nanogram per liter, PFOA = perfluorooctanoic acid, PFOS = perfluorooctanesulfonic acid, QSM= Quality Systems Manual, RL = reporting limit

2.4 Conceptual Site Model

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 KSM. 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);
- 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	Daniel Phillips	(907) 451-2926
	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 Environment Testing	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 KSM. Field activities are anticipated to occur during February 2023, 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 – Mid- January 2023
- Work Plan Implementation (field activities) – February 2023
- Analytical summary of data reported to DOT&PF and DEC – within two business days of data receipt
- Analytical data table and map reported to DOT&PF and DEC – within three 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 KSM. Sampling procedures and analytical methods are described in Section 4. A Quality Assurance Program Plan (QAPP) is included in Section 5. The proposed well search and sampling area is presented in Figure 2. A Site Safety and Health Plan (SSHP) is provided as Appendix B.

3.1 Water Supply Well Search

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

Available information indicates water is available through Pitka's Point piped water system; however, groundwater may be a drinking water source near the KSM.

Prior to mobilization to Saint Mary's, Shannon & Wilson will review available utility-connection and property ownership records as well as contact local government or other

resources to collect information on water sources in Saint Mary's. Additionally, we will work with DOT&PF to contact the personnel at KSM to determine their water source.

Most of the search area consists of airport property. Field staff will begin by visiting structures in the search area to identify structures that may use groundwater wells or potentially impacted surface water. 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 that is used for drinking, indoor plumbing, or gardening after receiving permission to sample from the owner(s) or occupant(s). During our site visit, we will also interview the local DOT&PF staff to determine the historical use of AFFF.

If results of analysis collected from the search area indicate detections of PFAS, we will coordinate with DOT&PF and DEC to determine if additional areas are necessary. We note that a bedrock ridge separates the KSM from the village and we do not anticipate finding many WSWs in use near the KSM.

4 SAMPLING AND ANALYSIS PLAN

This section describes the analytical sampling approach for investigating PFAS contamination associated with the KSM. 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 estimated the number of structures present at the KSM using Google Earth. We understand Pitka's Point offers piped public water distribution; however, we assume it has not been piped to the airport or the group of structures visible on Figure 2 (west of Pitka's Point and south of the KSM). From previous investigations, we are aware of WSWs for structures at the airport.

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

Exhibit 4-1: Analytical Sample Summary

Number of Samples	Matrix	PFAS (DoD QSM 5.3 Table B-15)
	Groundwater	15 + 2 QC

Notes:

DoD = Department of Defense; PFAS = per- and polyfluoroalkyl substances; QC = quality control sample (field duplicate); QSM = quality system manual

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 Environment Testing 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 (DoD) 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 HDPE	0 °C to 6 °C	14 days to extraction, analyzed within 40 days of extraction

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 discharged to the ground surface or using the disposal method utilized at the property (e.g., septic system). Where a submersible pump is used to collect a water sample from a well not connected to indoor plumbing, purge water will be filtered using a granulated activated carbon filter and then discharged to the ground surface.

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 or this GWP Addendum 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 KSM 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.

6 REFERENCES

- Alaska Department of Environmental Conservation (DEC), 2017, Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites: Juneau, Alaska, DEC Division of Spill Prevention and Response, Contaminated Sites Program, March, available:
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- Shannon & Wilson, 2022, Data-Validation Program Plan, DOT&PF Statewide PFAS, Various Sites, Alaska, July.
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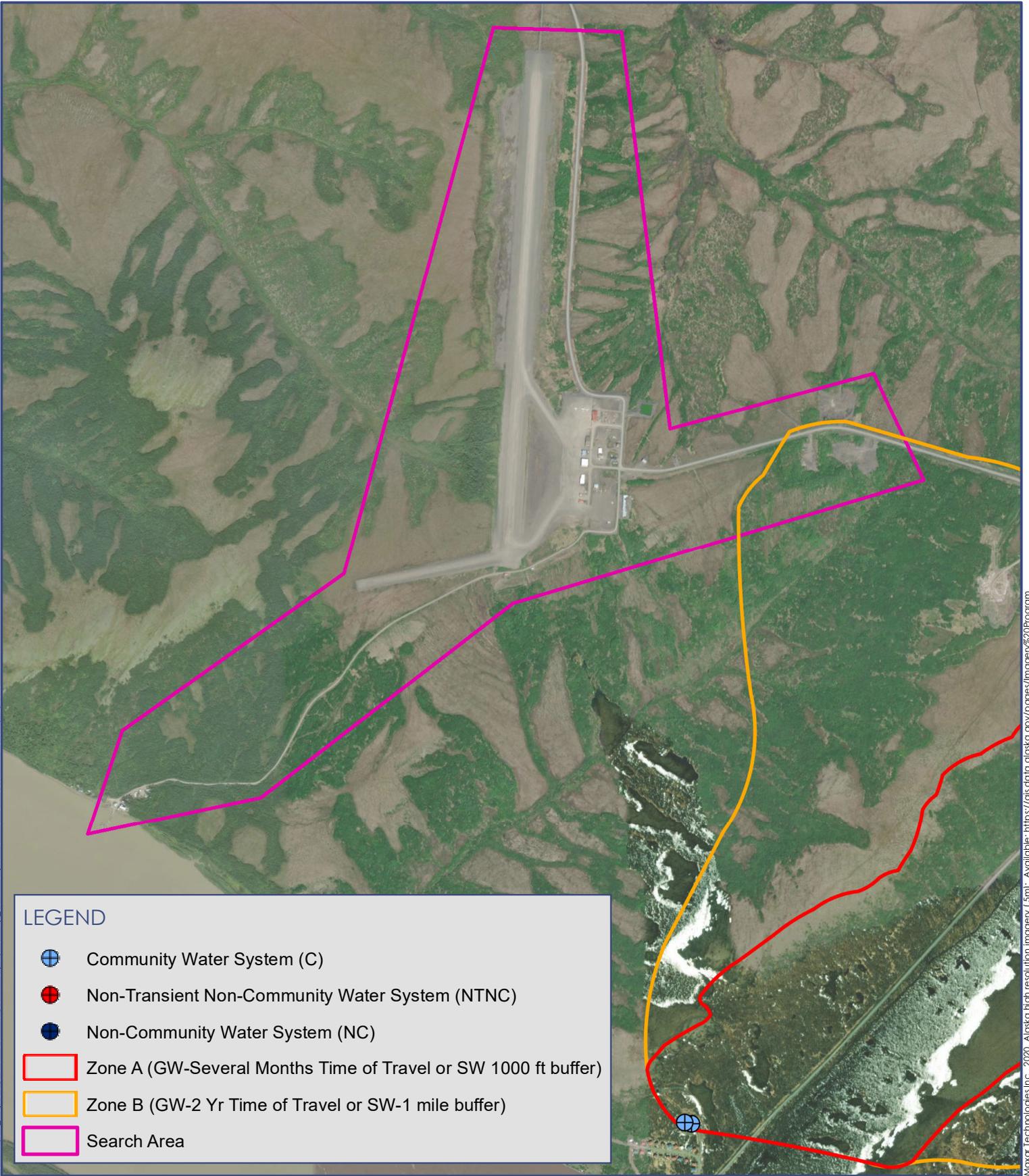


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Maxar Technologies Inc., 2020, Alaska High resolution Imagery (5m). Available: <https://gis.data.alaska.gov/pages/imagery%20Program>.



February 2023
VICINITY MAP
Figure 1



Path: T:\GIS\Projects\Statewide PFAS\Saint Mary's\Site Map_Saint Mary's.mxd Author: User: KRF Date: 1/12/2023

Maxar Technologies Inc., 2020, Alaska High resolution Imagery (.5m); Available: <https://gis.data.alaska.gov/pages/imagery%20Program>.

Notes:
1. Search area is approximate



February 2023
SITE MAP
Figure 2

Appendix A

Conceptual Site Model

Scoping and Graphics Forms

CONTENTS

- Human Health Conceptual Site Model Scoping Form
- Human Health Conceptual Site Model Graphic Form

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

Site Name:

File Number:

Completed by:

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:

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 KSM. 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 KSM. 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 groundwater 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 KSM. 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 contaminated 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 - PM₁₀). 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 KSM. 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 KSM. 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 Saint Mary's Airport Sitewide PFAS

Completed By: Kristen Freiburger, Shannon & Wilson, Inc.

Date Completed: January 2023

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

(1) Media	(2) Transport Mechanisms
<input checked="" type="checkbox"/> Surface Soil (0-2 ft bgs)	<input checked="" type="checkbox"/> Direct release to surface soil <i>check soil</i>
	<input checked="" type="checkbox"/> Migration to subsurface <i>check soil</i>
	<input checked="" type="checkbox"/> Migration to groundwater <i>check groundwater</i>
	<input checked="" type="checkbox"/> Volatilization <i>check air</i>
	<input checked="" type="checkbox"/> Runoff or erosion <i>check surface water</i>
	<input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i>
<input type="checkbox"/> Other (list): _____	
<input checked="" type="checkbox"/> Subsurface Soil (2-15 ft bgs)	<input checked="" type="checkbox"/> Direct release to subsurface soil <i>check soil</i>
	<input checked="" type="checkbox"/> Migration to groundwater <i>check groundwater</i>
	<input type="checkbox"/> Volatilization <i>check air</i>
	<input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i>
<input type="checkbox"/> Other (list): _____	
<input checked="" type="checkbox"/> Ground-water	<input checked="" type="checkbox"/> Direct release to groundwater <i>check groundwater</i>
	<input type="checkbox"/> Volatilization <i>check air</i>
	<input type="checkbox"/> Flow to surface water body <i>check surface water</i>
	<input type="checkbox"/> Flow to sediment <i>check sediment</i>
	<input type="checkbox"/> Uptake by plants or animals <i>check biota</i>
<input type="checkbox"/> Other (list): _____	
<input checked="" type="checkbox"/> Surface Water	<input checked="" type="checkbox"/> Direct release to surface water <i>check surface water</i>
	<input type="checkbox"/> Volatilization <i>check air</i>
	<input checked="" type="checkbox"/> Sedimentation <i>check sediment</i>
	<input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i>
<input type="checkbox"/> Other (list): _____	
<input checked="" type="checkbox"/> Sediment	<input checked="" type="checkbox"/> Direct release to sediment <i>check sediment</i>
	<input checked="" type="checkbox"/> Resuspension, runoff, or erosion <i>check surface water</i>
	<input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i>
<input type="checkbox"/> Other (list): _____	

(3) Exposure Media	(4) Exposure Pathway/Route	(5) 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
<input checked="" type="checkbox"/> soil	<input checked="" type="checkbox"/> Incidental Soil Ingestion <input checked="" type="checkbox"/> Dermal Absorption of Contaminants from Soil <input checked="" type="checkbox"/> Inhalation of Fugitive Dust	C/F	C/F	C/F	C/F	C/F	C/F	
<input checked="" type="checkbox"/> groundwater	<input checked="" type="checkbox"/> Ingestion of Groundwater <input checked="" type="checkbox"/> Dermal Absorption of Contaminants in Groundwater <input type="checkbox"/> Inhalation of Volatile Compounds in Tap Water	C/F	C/F	C/F	C/F	C/F	C/F	
<input type="checkbox"/> air	<input type="checkbox"/> Inhalation of Outdoor Air <input type="checkbox"/> Inhalation of Indoor Air <input type="checkbox"/> Inhalation of Fugitive Dust							
<input checked="" type="checkbox"/> surface water	<input type="checkbox"/> Ingestion of Surface Water <input checked="" type="checkbox"/> Dermal Absorption of Contaminants in Surface Water <input type="checkbox"/> Inhalation of Volatile Compounds in Tap Water							
<input checked="" type="checkbox"/> sediment	<input checked="" type="checkbox"/> Direct Contact with Sediment	C/F	C/F	C/F	C/F	C/F	C/F	
<input checked="" type="checkbox"/> biota	<input checked="" type="checkbox"/> Ingestion of Wild or Farmed Foods	C/F	C/F	C/F	C/F	C/F	C/F	

Appendix B

Site Safety and Health Plan

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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 Saint Mary's Airport (KSM). 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, and Level D personal protective equipment, 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 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 touches 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 Saint Mary's Sub-Regional Clinic located in Saint Mary's, Alaska. The telephone number for the Clinic is (907) 438-3500. Field phones will be kept easily accessible in the case of an emergency. It is unclear where the clinic is located or the hours of operation. Upon arrival to Saint Mary's, field staff should locate the clinic prior to initiating field work.

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 020-KSM-01: SAINT MARY'S KSM WSW GWP ADDENDUM

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

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 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.

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

IMPORTANT INFORMATION